AIR TOXICS "HOT SPOTS" PROGRAM (AB2588)
HEALTH RISK ASSESSMENT REPORT

GRAYSON POWER PLANT
CITY OF GLENDALE,
GLENDALE WATER & POWER
SCAQMD FACILITY ID: 800327

FOR SUBMITTAL TO:

South Coast Air Quality Management District
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LIST OF ACRONYMS

AB2588	Air Toxics "Hot Spots" Information and Assessment Act
AERMOD	American Meteorological Society Regulatory Model
AER	Annual Emission Report
ATIR	Air Toxics Inventory Report
BPIPPRIME	Building Profile Input Program PRIME
CARB	California Air Resources Board
CAS	Chemical Abstract System
CPF	Cancer Potency Factor
GIS	Geographic Information System
GLC	Ground Level Concentrations
HARP	Hot Spots Analysis and Reporting Program
HI	Hazard Index
HRA	Health Risk Assessment
MEIR	Maximum Exposed Individual Resident
MEIW	Maximum Exposed Individual Worker
MICR	Maximum Individual Cancer Risk
OEHHA	Office of Environmental Health Hazard Assessment
PM	Particulate Matter
PMI	Point of Maximum Impact
REL	Reference Exposure Level
SCAQMD	South Coast Air Quality Management District
TAC	Toxic Air Contaminants
USEPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
ZOI	Zone of Impact

LIST OF DEFINITIONS

Acute Health Impacts: Health effects that occur over a relatively short period of time. The term is used to describe brief exposures and effects that appear promptly after exposure (usually less than 24 hours).

Cancer Burden: the estimated increase in the occurrence of cancer cases in a population subject to maximum exposure of one in one-million or greater.

Cancer Health Impacts: An exposure to a carcinogenic substance that causes an increase in the likelihood of cancer in the exposed individual.

Chronic Health Impacts: Adverse non-cancer effects that develop and persist over time after long-term exposure to a substance (typically months or years).

8-Hour Chronic Impacts: Chronic health impacts after exposure for 8 hours on a daily basis.

SECTION 1.0

EXECUTIVE SUMMARY

1.1 Project Overview

Glendale Water & Power (GWP) is submitting this Air Toxics Hotspots Program Health Risk Assessment Report (HRA) for the Grayson Power Plant in response to the South Coast Air Quality Management District (SCAQMD) notification letter dated March 22, 2018. This HRA report is prepared based on an Air Toxics Inventory Report (ATIR) for calendar year 2015, which was reviewed and approved by SCAQMD. Additionally, This HRA report has been prepared in accordance with SCAQMD Supplemental Guidelines for Preparing Risk Assessment and Risk Reduction Plan for the Air Toxics "Hot Spots" Information and Assessment Act (AB2588), dated November 4, 2016, with assistance from Montrose Air Quality Services (MAQS).

1.2 Facility and Emissions Information

The Grayson Power Plant is located at 800 Air Way in Glendale and operates under SCAQMD Facility ID 800327. The facility has been providing electrical power to the City of Glendale since 1941. The facility operates two steam turbines (Units 1 and 2), three boilers (Units 3, 4, and 5), and four gas turbines (Units 8A, 8B, 8C, and 9) as the power generating equipment. The boilers and gas turbines are the primary emission sources at the facility. In 2015, Units 3, 4, and 5 combusted landfill gas from the nearby Scholl Canyon Landfill. GWP has discontinued the combustion of landfill gas at Grayson Power Plant in 2018. Other potential emissions sources include a diesel-fired emergency engine, spray coating and abrasive blasting operations, storage tanks, fuel dispensing operations, and cooling towers. Based on the 2015 ATIR, only the boilers, gas turbines, emergency engine, and the gas turbines ammonia injection lines were identified as AB2588 Toxic Air Contaminant (TAC) sources.

The combustion sources at Grayson Power Plant emit a variety of TACs that have been identified by OEHAA to have health impacts and that can enter the human body through multiple pathways. For this HRA, there are thirty-one (31) chemicals which have been identified by OEHHA to potentially cause cancer to exposed individuals. Additionally, there are thirty-two (32) chemicals with non-cancer chronic health impacts, ten (10) chemicals with non-cancer 8-hour chronic health impacts, and fourteen (14) chemicals with non-cancer acute health impacts. TACs can contribute to non-cancer chronic and acute health impacts by affecting human target organ systems, including the respiratory system, reproductive system, and others. Section 4.2 of this report contains a list of TACs from Grayson sources. Section 5.1 contains a list of pathways through which each TAC can enter the human body.

1.3 Health Risk Air Dispersion Modeling

This HRA was prepared in accordance with SCAQMD Supplemental Guidelines for Preparing Risk Assessment and Risk Reduction Plan for the Air Toxics "Hot Spots" Information and Assessment Act, dated November 4, 2016 and Office of Environmental Health Hazard Assessment (OEHHA) Guideline dated February 2015.

Two software programs, AERMOD (Version 18081) and HARP2 were used to estimate and analyze the TAC emissions impact to the community surrounding the facility. AERMOD is an air dispersion model used to estimate the ground level TAC concentrations beyond the facility fence line. The Hotspot Analysis and Reporting Program (HARP2) software estimates cancer and non-cancer health impacts for individual receptors using AERMOD ground level concentration data.

1.4 Cancer (Carcinogenic) Risk

Table 1-1 shows the cancer risk that was estimated using AERMOD and HARP2 based upon the assumption that the calendar year 2015 operating profile of Grayson would continue indefinitely. Cancer risk is shown for specific receptor points, including point of maximum impact (PMI), the maximum exposed individual resident (MEIR), and maximum exposed worker (MEIW) locations. Assumed emissions of chlorinated dioxins and dibenzofurans (dioxins and furans) compounds contribute approximately 80% of the cancer risk attributed to the facility. Hexavalent chromium and arsenic contribute approximately 14% of the assumed cancer risk. These pollutants are attributed to landfill gas combustion in the boilers that occurred in 2015, but the use of landfill gas in these units was discontinued in 2018. Detailed cancer risk data for each pollutant is provided in Section 5.2 and Appendix C of this report.

TABLE 1-1
MAXIMUM CANCER RISK

Type of Receptor	Cancer Risk (in one million)	Receptor #	UTM Coordinates
PMI	277	84	382164.7 E, 3780317 N
MEIR	186	27	382167.5 E, 3780462 N
MEIW	7.1	1363	382160 E, 3780400 N

As shown in Table 1-1, the point of maximum impact (PMI) for cancer risk is located along the eastern facility fence line with a cancer risk of 277 in one-million. The MEIR is located in the residential area to the northeast of the facility with a cancer risk of 186 in one-million. The MEIW is located in the industrial complex to the northeast of the facility with a cancer risk of 7.1 in one-million. Figures 1-1 through 1-3 includes isopleth maps showing the cancer risk at MEIR and MEIW.

FIGURE 1-1
MAP OF CANCER RISK BASED ON 30-YEAR EXPOSURE

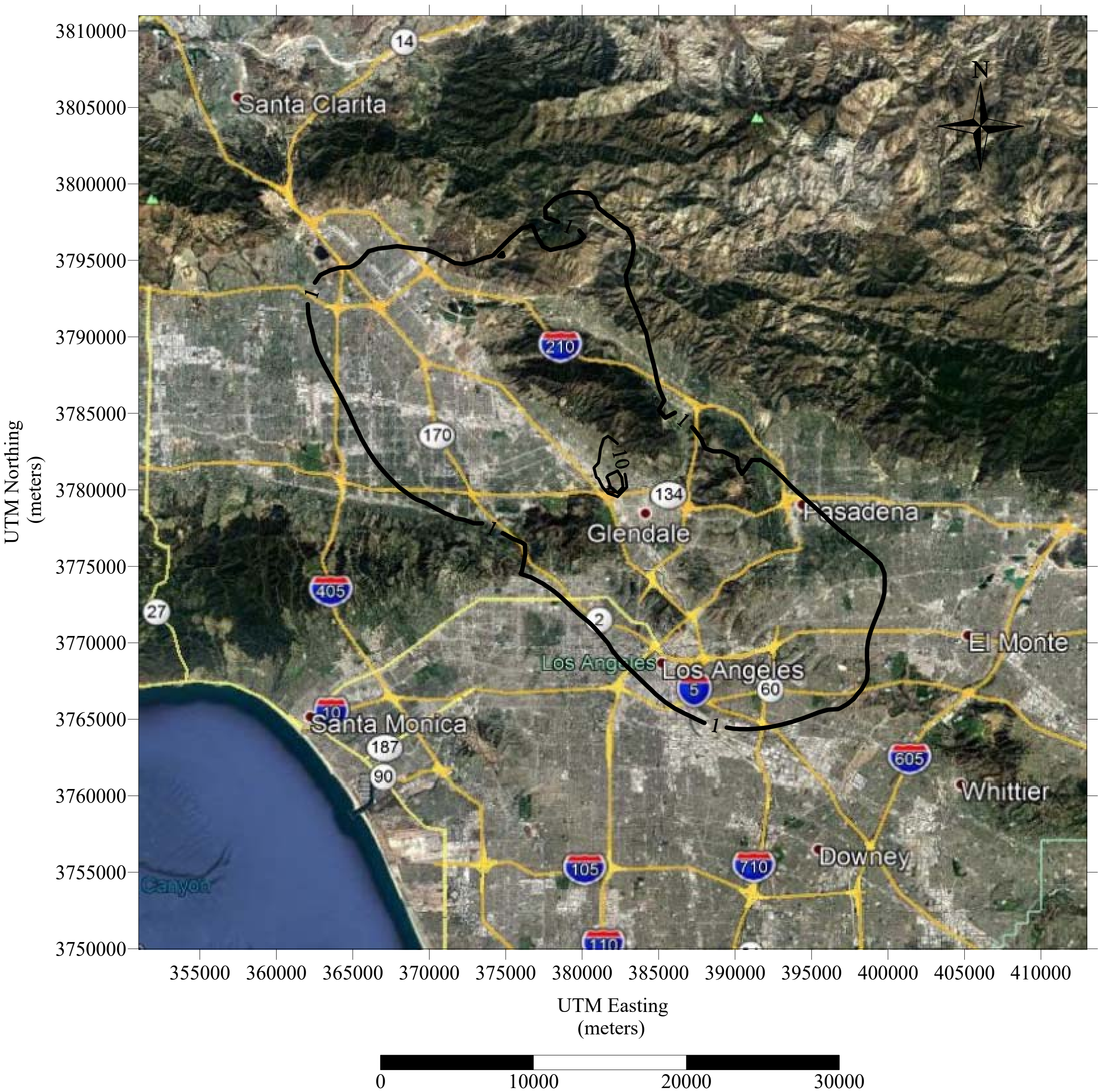


FIGURE 1-2
MAP OF MAXIMUM INCREASE IN CANCER RISK FOR RESIDENTIAL RECEPTORS BASED ON 30-YEAR EXPOSURE

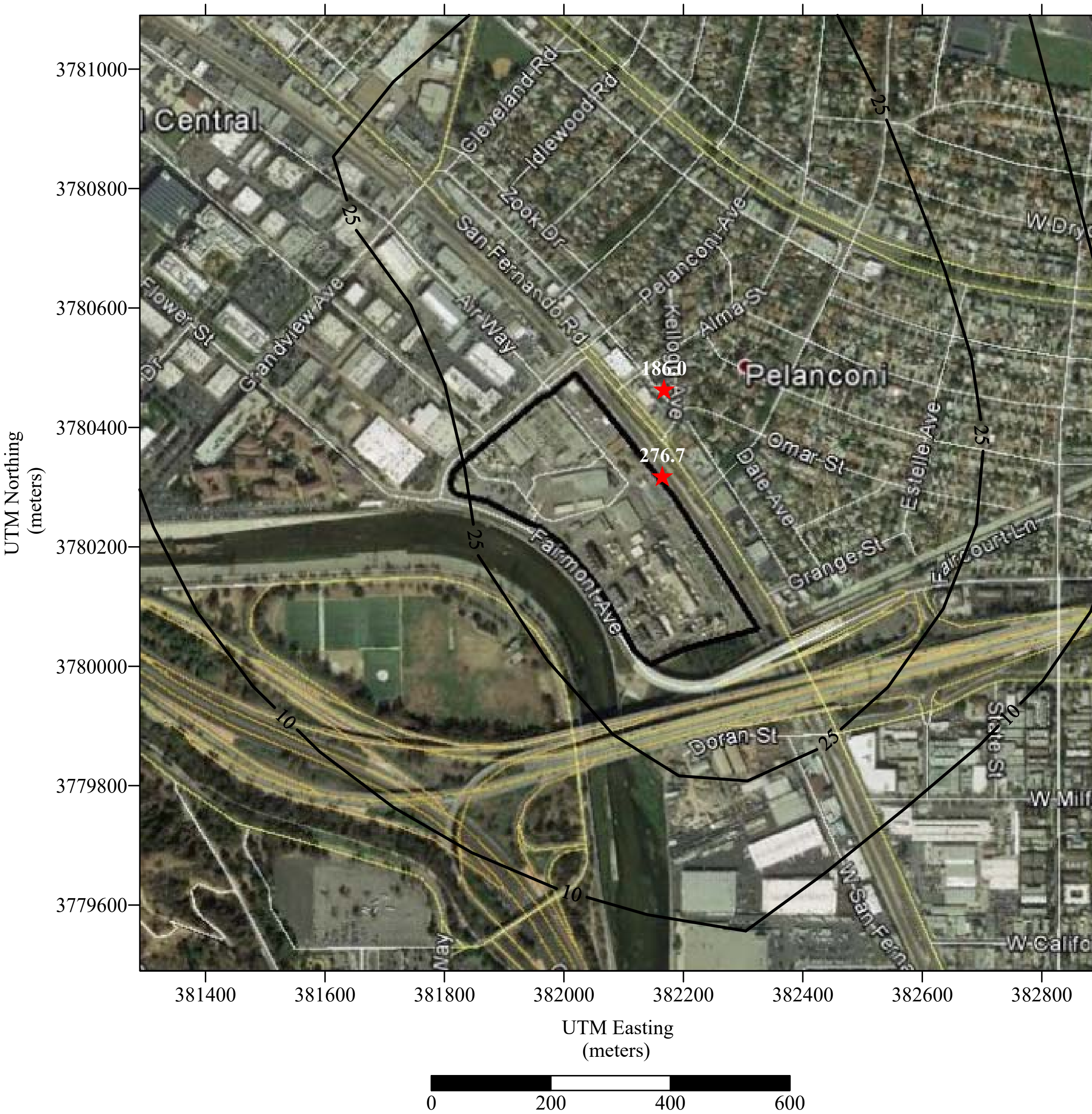
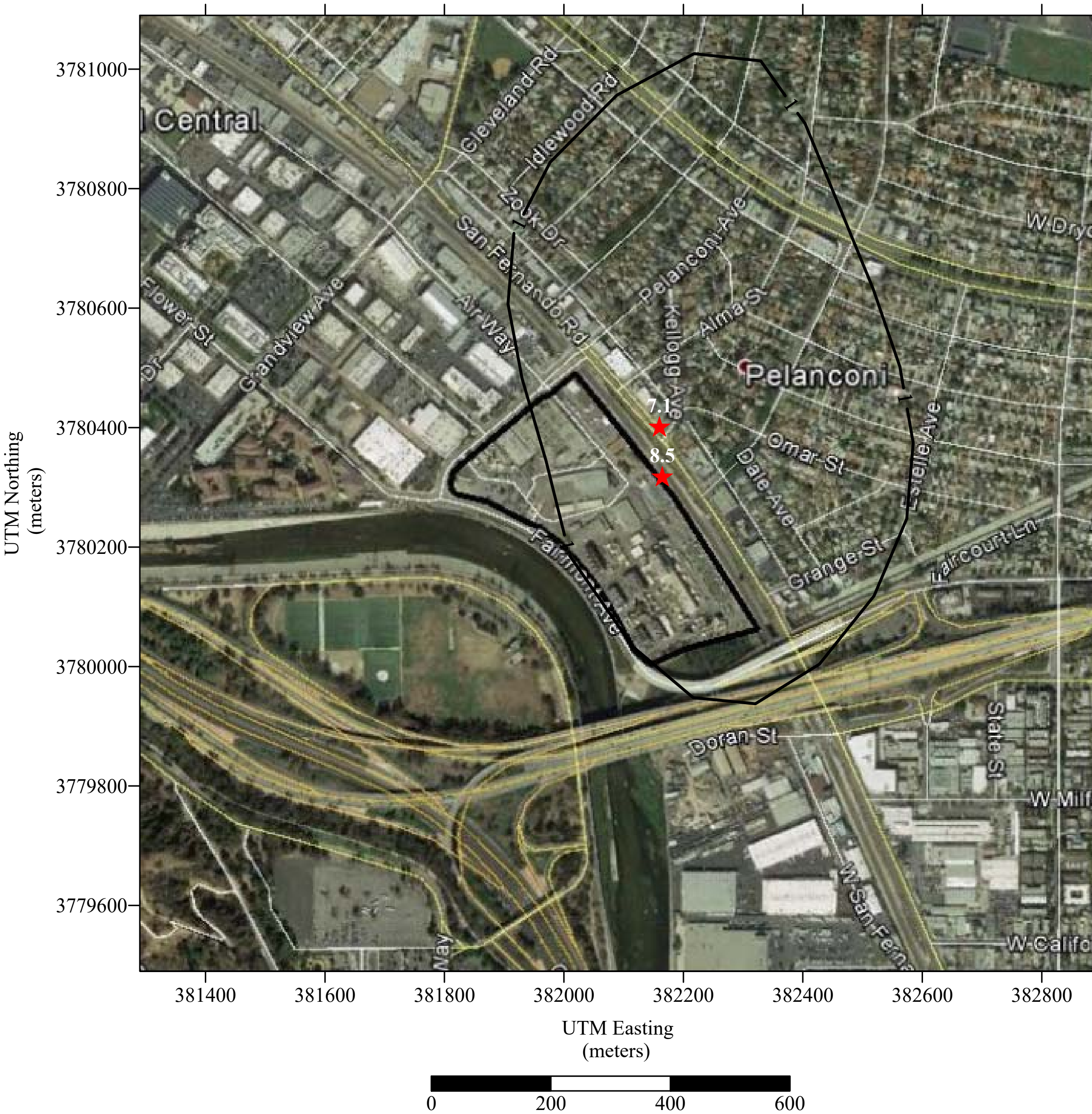


FIGURE 1-3
MAP OF MAXIMUM INCREASE IN CANCER RISK FOR WORKER RECEPTORS BASED ON 25-YEAR EXPOSURE



In addition to private homes, there are schools and day care facilities surrounding the facility with a cancer risk of more than ten in one-million. Table 1-2 identifies information for these facilities. Cancer risk at school locations was calculated based upon a 30-year lifetime exposure, rather than the typical tenure of a student at the school location.

TABLE 1-2
LIST OF SCHOOLS OR DAY CARE FACILITIES
AT CANCER RISK EXPOSURE OF TEN IN ONE-MILLION OR MORE

Facility Name	Address	Facility UTM (m)
Balboa Elementary School	1844 Bel Air Drive, Glendale, CA 91201	381441E 3782764N
Mark Keppel Elementary School	730 Glenwood Road, Glendale, CA 91202	382729E 3781204N
Eleanor J. Toll Middle School	700 Glenwood Road, Glendale, CA 91202	382893E 3781140N
Herbert Hoover High School	651 Glenwood Road, Glendale, CA 91202	382893E 3781257N
Taline Mehrabian Christian Pre-School	632 West Stocker Street, Glendale, CA 91202	382947E 3781061N
Glendale Sharon Preschool	635 West Dryden Street, Glendale, CA 91202	382995E 3780743N
Bonnie Academy	534 West Glenoaks Blvd., Glendale, CA 91202	383334E 3780540N
Scholars Armenia School and Art Center	1021 Grandview Ave., Glendale, CA 91201	381780E 3780988N
Grandview Children's Center	1130 Ruberta Avenue, Glendale, CA 91201	381519E 3781667N
Thomas Jefferson Elementary School	1540 5TH Street, Glendale, CA 91201	381396E 3781734N
Gohar Daycare	1336 Highland Avenue, Glendale, CA 91202	382672E 3781445N
Milky Way Child Care & Preschool	1325 Idlewood Road, Glendale, CA 91202	382244E 3781478N

1.5 Non-Cancer Chronic Hazard Index

Table 1-3 shows the chronic hazard indices for the PMI, MEIR, and MEIW. Assumed total emissions of arsenic, dioxins and furans compound, and nickel contribute approximately 98% of the non-cancer chronic hazard index (HIC) attributed to the facility. The primary target organ impacted by chronic exposure is the respiratory system.

TABLE 1-3
MAXIMUM CHRONIC HAZARD INDEX

Type of Receptor	HIC	Receptor #	UTM Coordinates
PMI	2.61	84	382164.7 E, 3780317 N
MEIR	1.75	27	382167.5 E, 3780462 N
MEIW	0.76	1403	382160 E, 3780420 N

1.6 Non-Cancer 8-hour Chronic Hazard Index

Assumed emissions of manganese contribute approximately 90% of the non-cancer 8-hour chronic hazard index (HIC-8) attributed to the facility. The primary target organ impacted by 8-

hour chronic exposure is the central nervous system. The PMI for HIC-8 is 0.146, which is located at receptor #84 with UTM coordinates of 382164.7 E and 3780317 N.

1.7 Non-Cancer Acute Hazard Index

Table 1-4 shows the acute indices for the PMI, MEIR, and MEIW. Assumed emissions of nickel contribute approximately 99% of the non-cancer acute hazard index (HIA) attributed to the facility. The primary target organ impacted by acute exposure is the immune system.

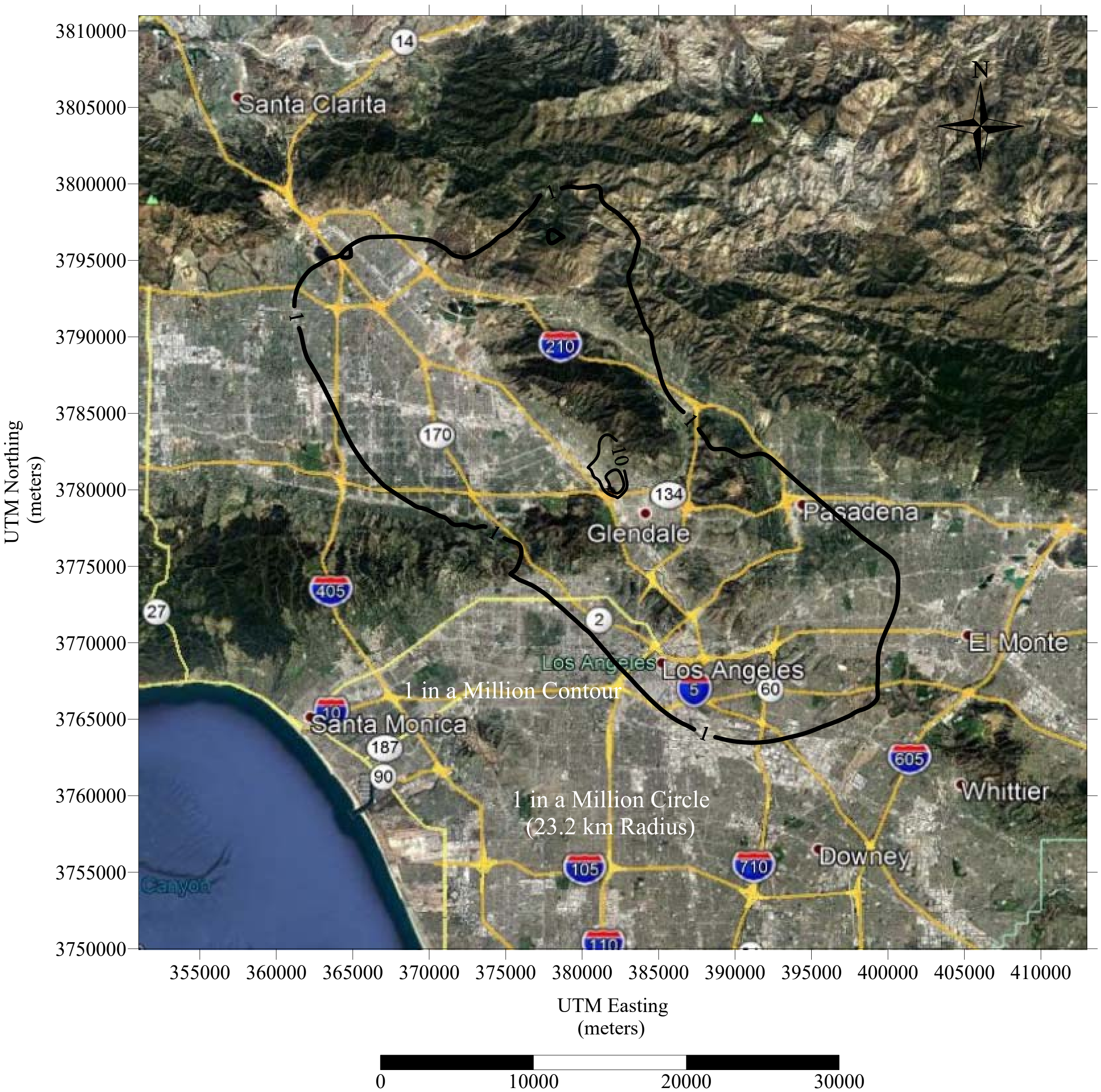
TABLE 1-4
MAXIMUM ACUTE HAZARD INDEX

Type of Receptor	HIA	Receptor #	UTM Coordinates
PMI	0.86	95	382275.4 E, 3780141 N
MEIR	0.48	1261	382260 E, 3780340 N
MEIW	0.52	961	382340 E, 3780160 N

1.8 Cancer Burden

Since the cancer risk is greater than one in one-million, the cancer burden is analyzed using a 70-year exposure period. The number of people exposed to a cancer risk of one in one-million or greater is estimated to be 2,250,655 based on 2010 US Census Data. The cancer burden was calculated to be 4.81. Figure 1-4 shows a map with a risk contour of more than 1 in one-million based on a 70-year lifetime exposure.

FIGURE 1-4
MAP OF CANCER RISK BASED ON 70-YEAR EXPOSURE



1.9 Uncertainties Attributed to the Health Risk Assessment

The risk assessment contained in this report reflects an ATIR that GWP prepared for the 2015 operating year. It also reflects analysis methodology that may not be well-suited for the operating characteristics of the Grayson Power Plant. Additionally, the submitted and approved ATIR contains inaccuracies that overstate the emissions inventory. Therefore, modeling that is based upon the inventory overstates the health risks that can be attributed to the facility. Uncertainties and inaccuracies of the HRA include:

- Use of default emission factors rather than test results for chlorinated dioxins and furans in the ATIR.

- Assumed operating schedule of 8,760 hours per year to determine ambient concentrations of pollutants for a facility with very limited fuel supply and very limited operations.

- Incorrect default emission factors and double counting of ammonia emissions in the 2015 ATIR.

- Applicability of the HRA based upon 2015 operations to current and future operations of the facility.

Section 6 of this report includes additional information regarding uncertainties of the analysis results.

1.10 Alternate Health Risk Assessments

Due to the uncertainty discussed above, two alternate and one residual HRAs have been prepared to provide more accurate representations of potential cancer risk and non-cancer hazard indices attributed to the facility. Preliminary alternative HRA results are summarized in Section 7 of this report and include the following modifications:

- Alternate HRA#1: Air dispersion model with actual 2015 hourly operating profile, actual measured stack temperature and exhaust flow rate and velocity.

- Alternate HRA#2: Removed dioxins and furans compounds from the ATIR emissions inventory. Adjusted ammonia emissions by using accurate default emission factors and removal of duplicate ammonia emissions.

- Residual HRA: Reflects the recent decision to discontinue combusting landfill gas. Limit potential future facility operations in accordance with Proposed Amended SCAQMD Rule 1135.

Table 1-5 summarizes the cancer risk results of alternate and residual HRAs in comparison with the original HRA. Pursuant to SCAQMD AB2588 Guidelines, the complete discussion of these alternative HRAs is included in Appendix E to this HRA. Table 1-5 also includes a summary of health risks that can be attributed to the proposed project to repower the Grayson Power Plant with new combustion turbines and emission control systems. Detailed information regarding the proposed repower project and its associated health risks can be found in the Environmental Impact Report for the project that was prepared by GWP in 2018. Information regarding the repower project is also contained in SCAQMD engineering files for permit application numbers 595673 through 595684.

TABLE 1-5
CANCER RISK RESULTS COMPARISON

Health Risk Assessment (HRA)	Cancer Risk (The values multiply by 1,000,000)		
	PMI	MEIR	MEIW
Original HRA (Based on Submitted 2015 ATIR)	277	186	7
Alternate HRA #1 (Modified Air Dispersion Model)	187	113	3.7
Preliminary Alternate HRA#2 (Based on Proposed Modified 2015 ATIR)	41	27	1.8
Preliminary Residual HRA (Based on operation since April 2018, No Landfill Gas Combustion, Rule 1135 Operating Limits)	5.5	3.0	0.2
Proposed Grayson Repower Project	1.19	0.91	0.06

1.11 Conclusion.

The health risk assessment for the Grayson Power Plant HRA that is based upon 2015 reported emissions results in a MICR of more than one-hundred in one-million, a non-cancer total HIA of less than 1.0, and a non-cancer total HIC of less than 1.0. Pursuant to Rule 1402, the facility is required to do the following:

- Submit an early action reduction plan;
- Submit a risk reduction plan;
- Distribute public notification materials; and
- Participate in a District-approved public meeting.

The City of Glendale will comply with Rule 1402 and Air Toxics "Hot Spots" (AB2588) Program requirements. In fact, the actions already taken in 2018 to cease landfill gas combustion serves as the basis for the pending risk reduction plan. At this point only natural gas fuel is being combusted in Grayson Power Plant's gas-fired equipment units. Without landfill gas combustion, the cancer risk of the plant is expected to be less than ten in one-million; the non-cancer acute and chronic hazard indices are expected to be less than one. Additionally, the City of Glendale has submitted permit applications to SCAQMD to replace all existing boilers and three combined-cycle gas turbines with two new combined-cycle gas turbines and two new simple-cycle gas turbines. Although the proposed repower project has not yet been approved by the Glendale City Council, it will be appropriately reflected as an alternative operating scenario in the risk reduction plan.

SECTION 2.0

INTRODUCTION

2.1 Project Summary

In July 2017, Glendale Water & Power (GWP) submitted Air Toxic Inventory Report (ATIR) for calendar year 2015. This ATIR has been reviewed and approved by SCAQMD. Subsequently, GWP received a notification letter dated March 22, 2018 to prepare and submit a Health Risk Assessment (HRA) based on the approved 2015 ATIR. This HRA report has been prepared with assistance from Montrose Air Quality Services (MAQS) in accordance with SCAQMD Supplemental Guidelines for Preparing Risk Assessment and Risk Reduction Plan for the Air Toxics "Hot Spots" Information and Assessment Act, dated November 4, 2016 and OEHHA Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, dated February 2015.

2.2 Facility Information

The GWP facility is called Grayson Power Plant and is located at 800 Air Way in the City of Glendale. The SCAQMD Facility ID is 800327. Grayson Power Plant is located in an industrial area of the City of Glendale, northeast of the Interstate 5 and Highway 134 interchange. The facility is bounded to the south by Verdugo Wash and Highway 134, to the west by the Los Angeles River and Interstate 5, to the north by commercial properties, and to the east of a mixture of residential and commercial properties. The approximate latitude and longitude coordinates of the facility are 34º19'19" N and 118º16'42" W. Facility diagrams and area map are included in Appendix A.

2.3 Technical Project Contacts

For the purposes of this submittal, MAQS will be the primary contact for technical issues related to air quality.

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SECTION 3.0

HAZARD IDENTIFICATION

In 2015, Grayson Power Plant emitted a variety of chemical compounds that have been identified as Toxic Air Contaminants (TAC) in Appendix A of the SCAQMD *Air Toxics Hot Spots Program Guidance Manual*. Each chemical was evaluated for its potential cancer risk, non-cancer acute health hazard, and non-cancer chronic health hazard. This evaluation also includes the exposures routes (pathways) through which a person's health can be impacted.

Cancer risk was assessed using inhalation and oral slope factors in the units of increased occurrences per milligram dosage per kilogram of body weight per day. Non-cancer chronic impacts were assessed using inhalation and oral reference exposure level (REL), expressed as an HI for specific target organs. Non-cancer acute impacts were assessed using an inhalation REL to estimate health hazard impacts for each specific target organ. Table 3-1 shows the list of these substances along with associated dose-response reference exposure values for both oral and inhalation pathways.

TABLE 3-1
DOSE-RESPONSE VALUES OF EMITTED TAC

Pollutants	CAS	Cancer Risk Factor		Chronic			Acute
		Inhalation Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$	Oral Slope Factor $(mg/kg\text{-}d)^{-1}$	Inhalation REL (ug/m^3)	8-Hour Inhalation REL (ug/m^3)	Oral REL (mg/kg-d)	Inhalation REL (ug/m^3)
Acetaldehyde	75070	1.0E-02		1.4E+02	3.0E+02		4.7E+02
Acrolein	107028			3.5E-01	7.0E-01		2.5E+00
Ammonia	7664417			2.0E+02			3.2E+03
Arsenic	7440382	1.2E+01	1.5E+00	1.5E-02	1.5E-02	3.5E-06	2.0E-01
Benzene	71432	1.0E-01		3.0E+00	3.0E+00		2.7E+01
Beryllium	7440417	8.4E+00		7.0E-03		2.0E-03	
Butadiene, 1,3-	106990	6.0E-01		2.0E+00	9.0E+00		6.6E+02
Cadmium	7440439	1.5E+01		2.0E-02		5.0E-04	
Copper	7440508						1.0E+02
Chromium, hexavalent	18540299	5.1E+02	5.0E-01	2.0E-01		2.0E-02	
Diesel Particulate Matter	9901	1.1E+00		5.0E+00			
Dioxins and dibenzofurans	1080						
1-3,6-8HxCDD	57653857	1.3E+04	1.3E+04	4.0E-04		1.0E-07	
1-3,6-8HxCDF	57117449	1.3E+04	1.3E+04	4.0E-04		1.0E-07	
1-3,7,8PeCDD	40321764	1.3E+05	1.3E+05	4.0E-05		1.0E-08	

Pollutants	CAS	Cancer Risk Factor		Chronic			Acute
		Inhalation Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$	Oral Slope Factor $(mg/kg\text{-}d)^{-1}$	Inhalation REL (ug/m^3)	8-Hour Inhalation REL (ug/m^3)	Oral REL (mg/kg-d)	Inhalation REL (ug/m^3)
1-3,7,8PeCDF	57117416	3.9E+03	3.9E+03	1.3E-03		3.3E-07	
1-4,6-8HpCDD	35822469	1.3E+03	1.3E+03	4.0E-03		1.0E-06	
1-4,6-8HpCDF	67562394	1.3E+03	1.3E+03	4.0E-03		1.0E-06	
1-8OctaCDD	3268879	3.9E+01	3.9E+01	1.3E-01		3.3E-05	
1-8OctaCDF	39001020	3.9E+01	3.9E+01	1.3E-01		3.3E-05	
2,3,7,8-TCDD	1746016	1.3E+05	1.3E+05	4.0E-05		1.0E-08	
2,3,7,8-TCDF	51207319	1.3E+04	1.3E+04	4.0E-04		1.0E-07	
Ethyl Benzene	100414	8.7E-3		2.0E+03			
Formaldehyde	50000	2.1E-02		9.0E+00	9.0E+00		5.5E+01
Hexane, n-	110543			7.0E+03			
Hydrochloric Acid	7647010			9.0E+00			2.1E+03
Lead	7439921	4.2E-02	8.5E-03				
Manganese	7439965			9.0E-02	1.7E-01		
Mercury	7439976			3.0E-02	1.6E-04		6.0E-01
Nickel	7440020	9.1E-01		1.4E-02	6.0E-02	1.1E-02	2.0E-01
PAHs-w/o individual components	1151						
Acenaphthene	83329						
Acenaphthylene	208968						
Anthracene	120127						
B[a]anthracene	56553	3.9E-01	1.2E+00				
B[a]P	50328	3.9E+00	1.2E+01				
B[b]fluoranthen	205992	3.9E-01	1.2E+00				
B[g,h,i]perylen	191242						
B[k]fluoranthen	207089	3.9E-01	1.2E+00				
Chrysene	218019	3.9E-02	1.2E-01				
D[a,h]anthracen	53703	4.1E+00	4.1E+00				
Fluoranthene	206440						
Fluorene	86737						
In[1,2,3-cd]pyr	193395	3.9E-01	1.2E+00				
Naphthalene	91203	1.2E-01		9.0E+00			
Phenanthrene	85018						
Pyrene	129000						
Propylene Oxide	75569	1.3E-02		3.0E+01			3.1E+03
Selenium	7782492			2.0E+01	5.0E-03		
Toluene	108883			3.0E+02			3.7E+04

Pollutants	CAS	Cancer Risk Factor		Chronic			Acute
		Inhalation Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$	Oral Slope Factor $(mg/kg\text{-}d)^{-1}$	Inhalation REL (ug/m^3)	8-Hour Inhalation REL (ug/m^3)	Oral REL (mg/kg-d)	Inhalation REL (ug/m^3)
Xylenes	1330207			7.0E+02			2.2E+04

Many of the toxic compounds in Table 3-1 may also harm people's health via non-inhalation routes of exposure. Those routes can include soil ingestion, dermal, oral (which includes meat, milk, eggs, vegetables, and water consumption), and mother's milk. Table 3-2 reflects compounds subject to multipathway exposure routes.

TABLE 3-2
MULTIPATHWAY POLLUTANTS AND THEIR PATHWAYS

Pollutant	Inhalation	Soil Ingestion	Dermal	Oral	Mother's Milk
Arsenic	X	X	X	X	
Beryllium	X	X	X	X	
Cadmium	X	X	X	X	
Chromium (VI)	X	X	X	X	
Lead	X	X	X	X	X
Mercury	X	X	X	X	
Nickel	X	X	X	X	
Selenium	X	X	X	X	
PCBs	X	X	X	X	X
Dioxins and Furans	X	X	X	X	X
PAHs	X	X	X	X	X

For this HRA, there are thirty-one (31) chemicals which have been identified by OEHHA to potentially cause cancer to exposed individuals. Additionally, there are thirty-two (32) chemicals with non-cancer chronic health impacts, ten (10) chemicals with non-cancer 8-hour chronic health impacts, and fourteen (14) chemicals with non-cancer acute health impacts. TACs can contribute to non-cancer chronic and acute health impacts by affecting human target organ systems, including the respiratory system, reproductive system, and others. Table 3-3 shows the target organs potentially affected by each TAC attributed to Grayson Power Plant emissions.

TABLE 3-3
TARGET ORGANS OF NON-CANCER RISK CHEMICALS

Pollutants	Target Organs												
	AT	BO	CV	DV	EN	EY	HE	IM	KI	CN	RE	RP	SK
Acetaldehyde						A					AC		
Acrolein													
Ammonia						A							
Arsenic			AC	AC						AC	C		C
Benzene				AC			AC	A		C			
Beryllium	C							C			C	C	
Butadiene, 1,3-											C		
Cadmium									C		C		
Copper											A		
Chromium, hexavalent							C						
Diesel Particulate Matter											C		
Dioxins and dibenzofurans													
1-3,6-8HxCDD	C			C	C		C				C	C	
1-3,6-8HxCDF	C			C	C		C				C	C	
1-3,7,8PeCDD	C			C	C		C				C	C	
1-3,7,8PeCDF	C			C	C		C				C	C	
1-4,6-8HpCDD	C			C	C		C				C	C	
1-4,6-8HpCDF	C			C	C		C				C	C	
1-8OctaCDD	C			C	C		C				C	C	
1-8OctaCDF	C			C	C		C				C	C	
2,3,7,8-TCDD	C			C	C		C				C	C	
2,3,7,8-TCDF	C			C	C		C				C	C	
Ethyl Benzene	C		C	C					C				
Formaldehyde						A					C		
Hexane, n-													
Hydrochloric Acid													
Lead													
Manganese										C			
Mercury									C	AC			
Nickel	C						C	A			AC		
PAHs-w/o individual components													
Acenaphthene													
Acenaphthylene													

Pollutants	Target Organs												
	AT	BO	CV	DV	EN	EY	HE	IM	KI	CN	RE	RP	SK
Anthracene													
B[a]anthracene													
B[a]P													
B[b]fluoranthen													
B[g,h,i]perylen													
B[k]fluoranthen													
Chrysene													
D[a,h]anthracen													
Fluoranthene													
Fluorene													
In[1,2,3-cd]pyr													
Naphthalene											C		
Phenanthrene													
Pyrene													
Propylene Oxide						A					AC	A	
Selenium	C		C							C			
Toluene				AC		A				AC	AC	A	
Xylenes						A				C	AC		

Notes: A = Acute Toxicity, C = Chronic Toxicity, AC = Acute and Chronic Toxicity, AT = Alimentary Tract, BO = Bone, CN = Central Nervous System, CV = Cardiovascular System, DV = Developmental, EN = Endocrine, EY = Eye, HE = Hematologic, IM = Immunological System, KI = Kidneys, RE = Respiratory System, RP = Reproductive System, SK = Skin.

SECTION 4.0

EXPOSURE ASSESSMENT

4.1 Facility Description

Glendale Water and Power (GWP) of City of Glendale owns and operates Grayson Power Plant located at 800 Air Way in Glendale, CA. Its SCAQMD facility ID is 800327. The facility's power generating equipment consists of two steam turbines, three dual-fuel boilers, and four gas turbines. As reported in the 2015 ATIR, these power generating units are the primary emission sources at the facility. In addition to these boilers and gas turbines, a diesel-fired emergency engine was operated in 2015 and emitted TACs.

4.1.1 Boilers

There are three boilers (Boilers 3, 4, and 5) currently operating at Grayson Power Plant. Boiler 3 is rated at 260 MMBtu/hr.; Boiler 4 is rated at 492 MMBtu/hr.; and Boiler 5 is rated at 527.25 MMBtu/hr. Each boiler utilizes natural gas and landfill gas as its primary fuel; and fuel oil no.6 as a backup fuel. Table 4-1 shows the estimated fuel consumption and operating hour of each boiler in 2015.

TABLE 4-1
BOILERS 2015 OPERATING PROFILE

Unit	Fuel Type	Fuel Consumption MMCF	Fuel Consumption MMBTU*	Operating Hours
Boiler 3	Natural Gas	81.123	84,043	1,260
	Landfill Gas	322.427	102,209	
Boiler 4	Natural Gas	172.402	178,608	1,881
	Landfill Gas	649.937	206,030	
Boiler 5	Natural Gas	692.641	717,576	5,259
	Landfill Gas	1,564.606	495,980	

*Fuel in MMBTU is estimated using higher heating values of 317 MMBTU/MMCF for landfill gas and 1036 MMBTU/MMCF for natural gas.

TAC emissions from the boilers were calculated based on the fuel consumption, SCAQMD default emission factors, and the results of an ammonia slip test that was conducted in 2015.

4.1.2 Combined Cycle Gas Turbines

There are three combined cycle gas turbines (Turbines 8A, 8B, and 8C) currently operating at Grayson Power Plant. As combined cycle units, gas turbines 8A, 8B, and 8C operate in conjunction with steam turbines or boilers that recover and use the waste heat from the gas turbines to generate additional power. Gas turbine 8A works with Boiler 8A to generate power at a capacity of 30MW; Gas turbines 8B and 8C operate with one common Boiler 8BC to generate power at a capacity of 60MW. The Unit 8 boilers operate as heat recovery units to produce steam without combusting additional fuel. Each of gas turbines 8A, 8B, and 8C is rated at 350 MMBtu/hr. and is equipped with air pollution control systems consisting of selective catalytic reduction (SCR) and oxidation catalysts. Only natural gas is combusted in these devices. Table 4-2 shows the fuel consumption and operating hours of each gas turbine in 2015.

TABLE 4-2
COMBINED CYCLE TURBINES 2015 OPERATING PROFILE

Unit	Fuel Type	Fuel Consumption MMCF	Fuel Consumption MMBTU*	Operating Hours
Turbine 8A	Natural Gas	228.106	236,318	902
Turbine 8BC	Natural Gas	101.876**	105,544**	211**

*Fuel in MMBTU is estimated using higher heating values of 1036 MMBTU/MMCF for natural gas.
**This is total combined quality of Turbine 8B and 8C.

TAC emissions from gas turbines were calculated based on the fuel consumption, SCAQMD default emission factors, and the results of ammonia slip tests that were conducted in 2015.

4.1.3 Simple Cycle Gas Turbines

Unit 9 currently operates as a simple cycle gas turbine, which means the turbine is the only unit connected to the generator. Similar to the other gas turbines, Unit 9 is also equipped with an air pollution control system consisting of SCR and oxidation catalyst. Unit 9 is rated at 470 MMBtu/hr., and utilizes only natural gas as its fuel. Unit 9 was operated for 609 hours in 2015 and its natural gas consumption was 168.405 MMCF. TAC emissions from Unit 9 were calculated based on the fuel consumption, SCAQMD default emission factors, and the result of an ammonia slip test conducted in 2015.

4.1.4 Emergency Diesel Internal Combustion Engine

There is one diesel-fired internal combustion engine driving a standby generator installed at the facility. The engine is a Cummins model NTA-855-G2 and is rated at 486 bhp. The facility operated the engine for 18.2 hours in 2015 using ultra-low sulfur diesel fuel. TAC emissions from the engine were calculated based on the fuel consumption, SCAQMD default emission factors, and manufacturer emission data.

4.2 Emission Inventory

This HRA report is based on emission information in an ATIR, which was reviewed and approved by SCAQMD. The approved ATIR does not include diesel particulate matter (PM) emissions from the emergency diesel-fired internal combustion engine. Diesel PM was identified as a TAC by the California Air Resource Board (CARB) in 1998; therefore, Diesel PM was added in this HRA.

Diesel PM emissions were calculated based on an emission factor of 0.30 grams per horsepower-hour as referenced in manufacturer emission data specifications. The 18.2 annual operating hours that were used to calculate emissions were derived from facility operator logs. Based on these factors, diesel PM emissions from the emergency engine are estimated to be approximately 5.6 pounds for the entire 2015 calendar year.

Tables 4-3 and 4-4 show the annual emissions and maximum hourly emissions for each emission source operating at the facility. Table 4-5 shows the facility wide annual and maximum hourly emissions for the 2015 calendar year. Detailed emission inventory data by TAC and emission source is contained in Appendix C.

TABLE 4-3
ANNUAL EMISSIONS BY EACH EMISSION SOURCE

Toxic Air Contaminants	CAS	Boiler 3 (LFG)	Boiler 3 (NG)	Boiler 4 (LFG)	Boiler 4 (NG)	Boiler 5 (LFG)	Boiler 5 (NG)	Turb. 8A	Turb. 8B	Turb. 8C	Turb. 9	NH3 Inj. Turb. 8A	NH3 Inj. Turb. 8BC	NH3 Inj. Turb. 9	Diesel ICE
Acetaldehyde	75070	0.0E+00	7.3E-02	0.0E+00	1.6E-01	0.0E+00	6.2E-01	9.3E+00	2.1E+00	2.1E+00	6.9E+00	0.0E+00	0.0E+00	0.0E+00	3.1E-01
Acrolein	107028	0.0E+00	6.5E-02	0.0E+00	1.4E-01	0.0E+00	5.5E-01	1.5E+00	3.3E-01	3.3E-01	1.1E+00	0.0E+00	0.0E+00	0.0E+00	1.3E-02
Ammonia	7664417	7.6E+02	1.5E+03	1.5E+03	3.1E+03	3.7E+03	1.2E+04	4.1E+03	9.2E+02	9.2E+02	3.0E+03	5.9E+01	3.4E+01	9.5E+02	1.1E+00
Arsenic	7440382	1.3E+00	0.0E+00	2.6E+00	0.0E+00	6.2E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.2E-04
Benzene	71432	0.0E+00	1.4E-01	0.0E+00	2.9E-01	0.0E+00	1.2E+00	2.8E+00	6.2E-01	6.2E-01	2.1E+00	0.0E+00	0.0E+00	0.0E+00	7.3E-02
Beryllium	7440417	3.5E-01	0.0E+00	7.1E-01	0.0E+00	1.7E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Butadiene, 1,3-	106990	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-01	2.2E-02	2.2E-02	7.4E-02	0.0E+00	0.0E+00	0.0E+00	8.5E-02
Cadmium	7440439	2.2E+00	0.0E+00	4.4E+00	0.0E+00	1.0E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.8E-04
Copper	7440508	3.6E+00	0.0E+00	7.2E+00	0.0E+00	1.7E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.6E-03
Chromium, hex.	18540299	2.3E-01	0.0E+00	4.6E-01	0.0E+00	1.1E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.9E-05
Diesel PM	9901	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.6E+00
Dioxins and dibenzofurans	1080														
1-3,6-8HxCDD	57653857	2.3E-04	0.0E+00	4.7E-04	0.0E+00	1.1E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1-3,6-8HxCDF	57117449	2.3E-04	0.0E+00	4.7E-04	0.0E+00	1.1E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1-3,7,8PeCDD	40321764	2.3E-04	0.0E+00	4.7E-04	0.0E+00	1.1E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1-3,7,8PeCDF	57117416	2.3E-04	0.0E+00	4.7E-04	0.0E+00	1.1E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1-4,6-8HpCDD	35822469	4.7E-04	0.0E+00	9.4E-04	0.0E+00	2.3E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1-4,6-8HpCDF	67562394	4.7E-04	0.0E+00	9.4E-04	0.0E+00	2.3E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1-8OctaCDD	3268879	4.7E-04	0.0E+00	9.4E-04	0.0E+00	2.3E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1-8OctaCDF	39001020	4.7E-04	0.0E+00	9.4E-04	0.0E+00	2.3E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2,3,7,8-TCDD	1746016	2.3E-04	0.0E+00	4.7E-04	0.0E+00	1.1E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2,3,7,8-TCDF	51207319	2.3E-04	0.0E+00	4.7E-04	0.0E+00	1.1E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ethyl Benzene	100414	0.0E+00	1.6E-01	0.0E+00	3.4E-01	0.0E+00	1.4E+00	7.4E+00	1.7E+00	1.7E+00	5.5E+00	0.0E+00	0.0E+00	0.0E+00	4.2E-03
Formaldehyde	50000	4.3E+01	2.9E-01	8.7E+01	6.2E-01	2.1E+02	2.5E+00	1.7E+02	3.7E+01	3.7E+01	1.2E+02	0.0E+00	0.0E+00	0.0E+00	6.7E-01
Hexane, n-	110543	0.0E+00	1.1E-01	0.0E+00	2.2E-01	0.0E+00	9.0E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-02
Hydrochloric Acid	7647010	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.3E-02
Lead	7439921	2.2E+00	0.0E+00	4.5E+00	0.0E+00	1.1E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.2E-03
Manganese	7439965	1.2E+02	0.0E+00	2.5E+02	0.0E+00	5.9E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-03
Mercury	7439976	2.5E-02	0.0E+00	5.1E-02	0.0E+00	1.2E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.8E-04
Nickel	7440020	3.7E+01	0.0E+00	7.5E+01	0.0E+00	1.8E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E-03
PAHs-w/o individual components	1151	0.0E+00	8.1E-03	0.0E+00	1.7E-02	0.0E+00	6.9E-02	2.1E-01	4.7E-02	4.7E-02	1.5E-01	0.0E+00	0.0E+00	0.0E+00	1.4E-02
Acenaphthene	83329	1.4E-01	0.0E+00	2.7E-01	0.0E+00	6.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Acenaphthylene	208968	1.4E-01	0.0E+00	2.7E-01	0.0E+00	6.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Anthracene	120127	1.4E-01	0.0E+00	2.7E-01	0.0E+00	6.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
B[a]anthracene	56553	1.4E-01	0.0E+00	2.7E-01	0.0E+00	6.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Toxic Air Contaminants	CAS	Boiler 3 (LFG)	Boiler 3 (NG)	Boiler 4 (LFG)	Boiler 4 (NG)	Boiler 5 (LFG)	Boiler 5 (NG)	Turb. 8A	Turb. 8B	Turb. 8C	Turb. 9	NH3 Inj. Turb. 8A	NH3 Inj. Turb. 8BC	NH3 Inj. Turb. 9	Diesel ICE
B[a]P	50328	1.4E-01	0.0E+00	2.7E-01	0.0E+00	6.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
B[b]fluoranthen	205992	1.4E-01	0.0E+00	2.7E-01	0.0E+00	6.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
B[g,h,i]perylen	191242	1.4E-01	0.0E+00	2.7E-01	0.0E+00	6.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
B[k]fluoranthen	207089	1.4E-01	0.0E+00	2.7E-01	0.0E+00	6.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Chrysene	218019	1.4E-01	0.0E+00	2.7E-01	0.0E+00	6.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
D[a,h]anthracen	53703	1.4E-01	0.0E+00	2.7E-01	0.0E+00	6.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Fluoranthene	206440	1.4E-01	0.0E+00	2.7E-01	0.0E+00	6.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Fluorene	86737	1.4E-01	0.0E+00	2.7E-01	0.0E+00	6.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
In[1,2,3-cd]pyr	193395	1.4E-01	0.0E+00	2.7E-01	0.0E+00	6.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Naphthalene	91203	8.4E+01	2.4E-02	1.7E+02	5.2E-02	4.1E+02	2.1E-01	3.0E-01	6.8E-02	6.8E-02	2.2E-01	0.0E+00	0.0E+00	0.0E+00	7.7E-03
Phenanthrene	85018	1.4E-01	0.0E+00	2.7E-01	0.0E+00	6.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pyrene	129000	1.4E-01	0.0E+00	2.7E-01	0.0E+00	6.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Propylene Oxide	75569	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.8E+00	1.5E+00	1.5E+00	5.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Selenium	7782492	1.6E-01	0.0E+00	3.3E-01	0.0E+00	7.9E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.6E-04
Toluene	108883	0.0E+00	6.3E-01	0.0E+00	1.3E+00	0.0E+00	5.4E+00	3.0E+01	6.8E+00	6.8E+00	2.2E+01	0.0E+00	0.0E+00	0.0E+00	4.1E-02
Xylenes	1330207	0.0E+00	4.7E-01	0.0E+00	1.0E+00	0.0E+00	4.0E+00	1.5E+01	3.3E+00	3.3E+00	1.1E+01	0.0E+00	0.0E+00	0.0E+00	1.7E-02

TABLE 4-4
HOURLY EMISSIONS BY EACH EMISSION SOURCE

Toxic Air Contaminants	CAS	Boiler 3 (LFG)	Boiler 3 (NG)	Boiler 4 (LFG)	Boiler 4 (NG)	Boiler 5 (LFG)	Boiler 5 (NG)	Turb. 8A	Turb. 8B	Turb. 8C	Turb. 9	NH3 Inj. Turb. 8A	NH3 Inj. Turb. 8BC	NH3 Inj. Turb. 9	Diesel ICE
Acetaldehyde	75070	0.0E+00	1.0E-05	0.0E+00	2.2E-05	0.0E+00	8.9E-05	1.3E-03	3.0E-04	3.0E-04	9.8E-04	0.0E+00	0.0E+00	0.0E+00	4.4E-05
Acrolein	107028	0.0E+00	9.3E-06	0.0E+00	2.0E-05	0.0E+00	7.9E-05	2.1E-04	4.8E-05	4.8E-05	1.6E-04	0.0E+00	0.0E+00	0.0E+00	1.9E-06
Ammonia	7664417	1.1E-01	2.1E-01	2.2E-01	4.4E-01	5.3E-01	1.8E+00	5.9E-01	1.3E-01	1.3E-01	4.3E-01	7.0E-02	1.8E-01	1.6E+00	1.6E-04
Arsenic	7440382	1.8E-04	0.0E+00	3.7E-04	0.0E+00	8.8E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.9E-08
Benzene	71432	0.0E+00	2.0E-05	0.0E+00	4.2E-05	0.0E+00	1.7E-04	4.0E-04	8.9E-05	8.9E-05	2.9E-04	0.0E+00	0.0E+00	0.0E+00	1.0E-05
Beryllium	7440417	5.1E-05	0.0E+00	1.0E-04	0.0E+00	2.5E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Butadiene, 1,3-	106990	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-05	3.2E-06	3.2E-06	1.1E-05	0.0E+00	0.0E+00	0.0E+00	1.2E-05
Cadmium	7440439	3.1E-04	0.0E+00	6.2E-04	0.0E+00	1.5E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.4E-08
Copper	7440508	5.1E-04	0.0E+00	1.0E-03	0.0E+00	2.5E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.3E-07
Chromium, hex.	18540299	3.3E-05	0.0E+00	6.6E-05	0.0E+00	1.6E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.6E-09
Diesel PM	9901	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.5E-02
Dioxins and dibenzofurans	1080														
1-3,6-8HxCDD	57653857	3.4E-08	0.0E+00	6.8E-08	0.0E+00	1.6E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1-3,6-8HxCDF	57117449	3.4E-08	0.0E+00	6.8E-08	0.0E+00	1.6E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1-3,7,8PeCDD	40321764	3.4E-08	0.0E+00	6.8E-08	0.0E+00	1.6E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1-3,7,8PeCDF	57117416	3.4E-08	0.0E+00	6.8E-08	0.0E+00	1.6E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Toxic Air Contaminants	CAS	Boiler 3 (LFG)	Boiler 3 (NG)	Boiler 4 (LFG)	Boiler 4 (NG)	Boiler 5 (LFG)	Boiler 5 (NG)	Turb. 8A	Turb. 8B	Turb. 8C	Turb. 9	NH3 Inj. Turb. 8A	NH3 Inj. Turb. 8BC	NH3 Inj. Turb. 9	Diesel ICE
1-4,6-8HpCDD	35822469	6.7E-08	0.0E+00	1.3E-07	0.0E+00	3.2E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1-4,6-8HpCDF	67562394	6.7E-08	0.0E+00	1.3E-07	0.0E+00	3.2E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1-8OctaCDD	3268879	6.7E-08	0.0E+00	1.3E-07	0.0E+00	3.2E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1-8OctaCDF	39001020	6.7E-08	0.0E+00	1.3E-07	0.0E+00	3.2E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2,3,7,8-TCDD	1746016	3.4E-08	0.0E+00	6.8E-08	0.0E+00	1.6E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2,3,7,8-TCDF	51207319	3.4E-08	0.0E+00	6.8E-08	0.0E+00	1.6E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ethyl Benzene	100414	0.0E+00	2.3E-05	0.0E+00	4.9E-05	0.0E+00	2.0E-04	1.1E-03	2.4E-04	2.4E-04	7.9E-04	0.0E+00	0.0E+00	0.0E+00	6.1E-07
Formaldehyde	50000	6.2E-03	4.2E-05	1.2E-02	8.9E-05	3.0E-02	3.6E-04	2.4E-02	5.3E-03	5.3E-03	1.7E-02	0.0E+00	0.0E+00	0.0E+00	9.6E-05
Hexane, n-	110543	0.0E+00	1.5E-05	0.0E+00	3.2E-05	0.0E+00	1.3E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E-06
Hydrochloric Acid	7647010	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-05
Lead	7439921	3.2E-04	0.0E+00	6.4E-04	0.0E+00	1.5E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.6E-07
Manganese	7439965	1.7E-02	0.0E+00	3.5E-02	0.0E+00	8.5E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E-07
Mercury	7439976	3.6E-06	0.0E+00	7.3E-06	0.0E+00	1.8E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-07
Nickel	7440020	5.3E-03	0.0E+00	1.1E-02	0.0E+00	2.6E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.2E-07
PAHs-w/o individual components	1151	0.0E+00	1.2E-06	0.0E+00	2.5E-06	0.0E+00	9.9E-06	3.0E-05	6.7E-06	6.7E-06	2.2E-05	0.0E+00	0.0E+00	0.0E+00	2.0E-06
Acenaphthene	83329	1.9E-05	0.0E+00	3.9E-05	0.0E+00	9.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Acenaphthylene	208968	1.9E-05	0.0E+00	3.9E-05	0.0E+00	9.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Anthracene	120127	1.9E-05	0.0E+00	3.9E-05	0.0E+00	9.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
B[a]anthracene	56553	1.9E-05	0.0E+00	3.9E-05	0.0E+00	9.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
B[a]P	50328	1.9E-05	0.0E+00	3.9E-05	0.0E+00	9.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
B[b]fluoranthen	205992	1.9E-05	0.0E+00	3.9E-05	0.0E+00	9.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
B[g,h,i]perylen	191242	1.9E-05	0.0E+00	3.9E-05	0.0E+00	9.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
B[k]fluoranthen	207089	1.9E-05	0.0E+00	3.9E-05	0.0E+00	9.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Chrysene	218019	1.9E-05	0.0E+00	3.9E-05	0.0E+00	9.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
D[a,h]anthracen	53703	1.9E-05	0.0E+00	3.9E-05	0.0E+00	9.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Fluoranthene	206440	1.9E-05	0.0E+00	3.9E-05	0.0E+00	9.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Fluorene	86737	1.9E-05	0.0E+00	3.9E-05	0.0E+00	9.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
In[1,2,3-cd]pyr	193395	1.9E-05	0.0E+00	3.9E-05	0.0E+00	9.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Naphthalene	91203	1.2E-02	3.5E-06	2.4E-02	7.4E-06	5.8E-02	3.0E-05	4.3E-05	9.7E-06	9.7E-06	3.2E-05	0.0E+00	0.0E+00	0.0E+00	1.1E-06
Phenanthrene	85018	1.9E-05	0.0E+00	3.9E-05	0.0E+00	9.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pyrene	129000	1.9E-05	0.0E+00	3.9E-05	0.0E+00	9.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Propylene Oxide	75569	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.7E-04	2.2E-04	2.2E-04	7.1E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Selenium	7782492	2.3E-05	0.0E+00	4.7E-05	0.0E+00	1.1E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-07
Toluene	108883	0.0E+00	9.1E-05	0.0E+00	1.9E-04	0.0E+00	7.7E-04	4.3E-03	9.7E-04	9.7E-04	3.2E-03	0.0E+00	0.0E+00	0.0E+00	5.9E-06
Xylenes	1330207	0.0E+00	6.7E-05	0.0E+00	1.4E-04	0.0E+00	5.7E-04	2.1E-03	4.8E-04	4.8E-04	1.6E-03	0.0E+00	0.0E+00	0.0E+00	2.4E-06

TABLE 4-5
FACILITY WIDE EMISSIONS

Toxic Air Contaminants	CAS	Annual Emissions, lbs./year	Maximum Hourly Emissions, lbs./hr.
Acetaldehyde	75070	2.1E+01	3.1E-03
Acrolein	107028	4.0E+00	5.8E-04
Ammonia	7664417	3.3E+04	6.4E+00
Arsenic	7440382	1.0E+01	1.4E-03
Benzene	71432	7.8E+00	1.1E-03
Beryllium	7440417	2.8E+00	4.0E-04
Butadiene, 1,3-	106990	3.0E-01	4.3E-05
Cadmium	7440439	1.7E+01	2.4E-03
Copper	7440508	2.8E+01	4.0E-03
Chromium, hex.	18540299	1.8E+00	2.6E-04
Diesel PM	9901	5.6E+00	5.5E-02
Dioxins and dibenzofurans	1080		
1-3,6-8HxCDD	57653857	1.8E-03	2.6E-07
1-3,6-8HxCDF	57117449	1.8E-03	2.6E-07
1-3,7,8PeCDD	40321764	1.8E-03	2.6E-07
1-3,7,8PeCDF	57117416	1.8E-03	2.6E-07
1-4,6-8HpCDD	35822469	3.7E-03	5.3E-07
1-4,6-8HpCDF	67562394	3.7E-03	5.3E-07
1-8OctaCDD	3268879	3.7E-03	5.3E-07
1-8OctaCDF	39001020	3.7E-03	5.3E-07
2,3,7,8-TCDD	1746016	1.8E-03	2.6E-07
2,3,7,8-TCDF	51207319	1.8E-03	2.6E-07
Ethyl Benzene	100414	1.8E+01	2.6E-03
Formaldehyde	50000	7.0E+02	1.0E-01
Hexane, n-	110543	1.2E+00	1.8E-04
Hydrochloric Acid	7647010	7.3E-02	1.0E-05
Lead	7439921	1.7E+01	2.5E-03
Manganese	7439965	9.6E+02	1.4E-01
Mercury	7439976	2.0E-01	2.9E-05
Nickel	7440020	2.9E+02	4.2E-02
PAHs-w/o individual components	1151	5.7E-01	8.1E-05
Acenaphthene	83329	1.1E+00	1.5E-04
Acenaphthylene	208968	1.1E+00	1.5E-04
Anthracene	120127	1.1E+00	1.5E-04
B[a]anthracene	56553	1.1E+00	1.5E-04
B[a]P	50328	1.1E+00	1.5E-04
B[b]fluoranthene	205992	1.1E+00	1.5E-04
B[g,h,i]perylene	191242	1.1E+00	1.5E-04
B[k]fluoranthene	207089	1.1E+00	1.5E-04
Chrysene	218019	1.1E+00	1.5E-04
D[a,h]anthracen	53703	1.1E+00	1.5E-04
Fluoranthene	206440	1.1E+00	1.5E-04
Fluorene	86737	1.1E+00	1.5E-04
In[1,2,3-cd]pyr	193395	1.1E+00	1.5E-04
Naphthalene	91203	6.6E+02	9.4E-02

Toxic Air Contaminants	CAS	Annual Emissions, lbs./year	Maximum Hourly Emissions, lbs./hr.
Phenanthrene	85018	1.1E+00	1.5E-04
Pyrene	129000	1.1E+00	1.5E-04
Propylene Oxide	75569	1.5E+01	2.1E-03
Selenium	7782492	1.3E+00	1.8E-04
Toluene	108883	7.4E+01	1.1E-02
Xylenes	1330207	3.8E+01	5.4E-03

4.3 Air Dispersion Modeling

The American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Dispersion Model (AERMOD), Version 18081 was used to estimate off-site ambient concentrations of pollutants. AERMOD is a Gaussian plume dispersion model which is based on planetary boundary layer principles for characterizing atmospheric stability. The model evaluates the non-Gaussian vertical behavior of plumes during convective conditions with the probability density function and the superposition of several Gaussian plumes. The AERMOD dispersion model estimated the ground level TAC concentration resulting from the emission sources. A normalized emission rate of one gram per second (unit emission factor) was used to model each emission source. Table 4-6 summarizes the selected model options and parameters for this model.

TABLE 4-6
AERMOD MODEL OPTIONS AND PARAMETERS

Description	Specification
AERMOD Version:	18081
Coordinate System Type:	Universal Transverse Mercator (UTM)
UTM Zone:	11
Datum:	WGS84 – World Geodetic System 1984
Hemisphere:	Northern
Regulatory Default Option:	Yes
Urban or Rural Model Option:	Urban
Flat or Complex terrain Option:	Complex
Include Building Downwash:	Yes
Meteorology Option:	SCAQMD Burbank Meteorological Data
Receptor Grid:	500 square kilometers

4.3.1 Model Input Defaults/Options

The AERMOD model was run with regulatory default options as recommended in the EPA Guideline on Air Quality Models (EPA, 2016). The following supporting pre-processing programs for AERMOD will also be used:

- BPIP-Prime (*Version 04274*)
- AERMAP (*Version 18081*)

The technical options selected for the AERMOD model include receptor elevations and controlling hill heights obtained from the AERMAP output. The AERMOD model predicts ground-level concentrations of any generic pollutant without chemical transformations. Since exhaust from the boilers, gas turbines, and emergency engine would be vented to dedicated vertical stacks, all of these sources were categorized and modeled as point sources. Table 4-7 identifies all the emission sources included in the modeling analysis.

TABLE 4-7
EMISSION SOURCES PARAMETERS

Model ID	Source Description	Stack Height (ft)	Stack Diameter (ft)	Stack Temperature (°F)	Stack Velocity (ft/sec)
S0001	D1-Unit 4 Boiler (NG)	89.0	8.00	595	51.3470
S0002	D2-Unit 3 Boiler (NG)	72.0	5.94	327	60.6447
S0003	D3-Unit 5 Boiler (NG)	89.0	7.92	220.9	51.2306
S0004	D4 – Unit 8A (NG)	100.0	10.97	408	63.7340
S0005	D5, D6 – Unit 8BC (NG)	100.0	17.42	413.5	57.8054
S0006	D58 – Unit 9 (NG)	85.0	10.00	790.5	132.9065
S0007	D12-Emergency ICE	11.0	0.67	900.00	121.46
S0028	Unit 8A-Ammonia Injection Line	100.0	10.97	408	63.7340
S0029	Unit 8BC-Ammonia Injection Line	100.0	17.42	413.5	57.8054
S0030	Unit 9-Ammonia Injection Line	85.0	10.00	790.5	132.9065
S0031	D1-Unit 4 Boiler (LG)	89.0	8.00	280.9999	20.8148
S0032	D2-Unit 3 Boiler (LG)	72.0	5.94	311.0000	46.9382
S0033	D3-Unit 5 Boiler (LG)	89.0	7.92	235.2000	55.0661

Except for gas turbines ammonia injection lines (S0028 through S0030), the point source parameters used for the analysis are in accordance with the parameters in the ATIR that GWP submitted to SCAQMD. The point sources parameters for S0028 through S0030 were not included in the ATIR. Because these point sources are associated with gas turbines 8A, 8BC, and

9, stack parameters for S0004 through S0006 were used to model the S0028 through S0030. A facility diagram showing the location of facility emission sources is included in Appendix A. Additionally, detailed information for each of the emission sources is provided in Appendix B.

4.3.2 Topography and Meteorology

Topography

The facility is located 1.7 miles northwest of downtown Glendale, California along the Los Angeles River. The nearest complex terrain (i.e., terrain exceeding stack height) in relation to the proposed project is located in the Santa Monica Mountains, approximately 2.5 miles to the west-southwest and the Verdugo Mountains, approximately 4.2 miles to the to the north and northwest. Area elevations surrounding the Project site are either similar or higher, so the dispersion modeling analysis includes detailed terrain data.

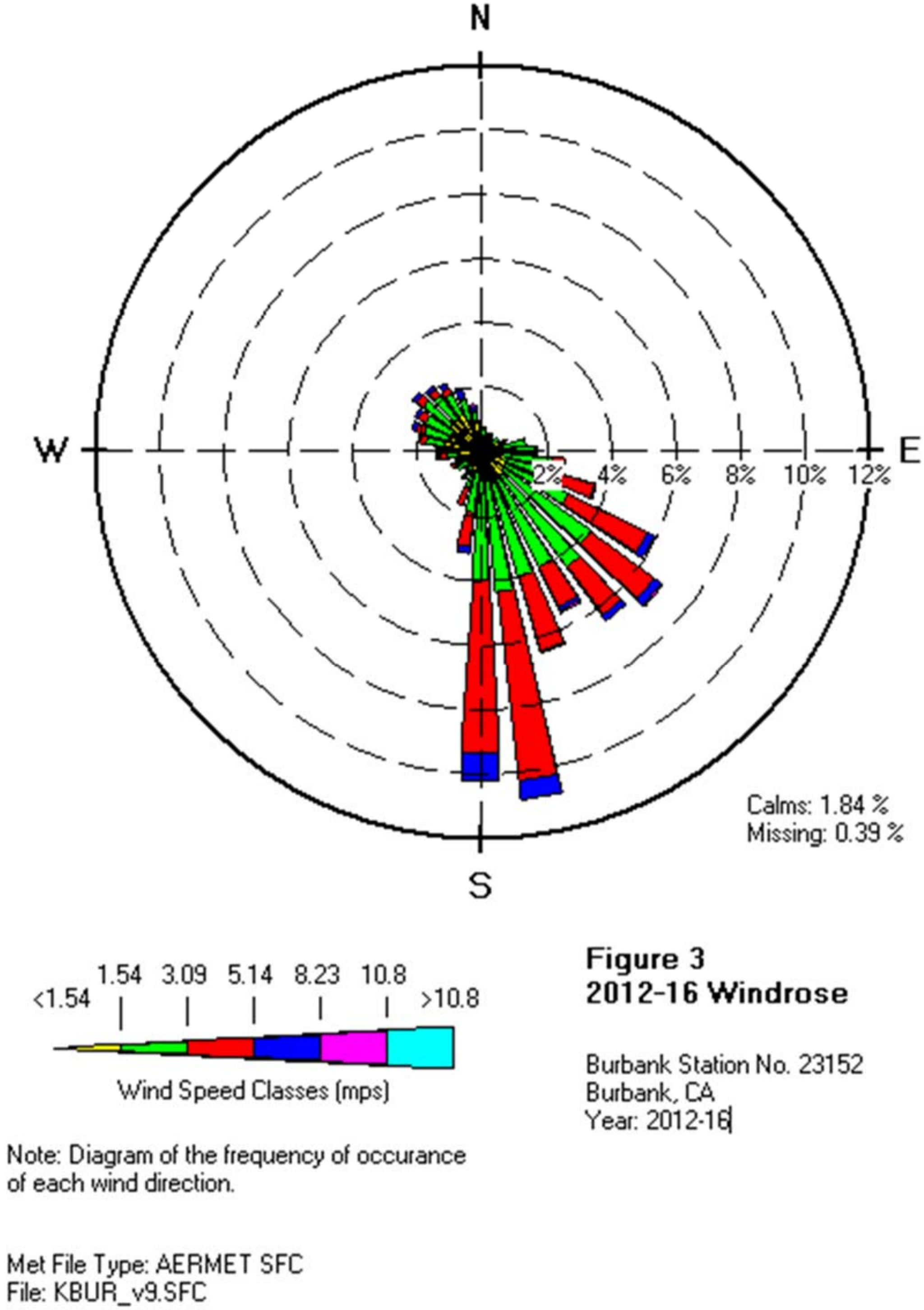
Meteorology

Meteorological data collected at the SCAQMD Burbank meteorological monitoring station was used to model ambient air quality impacts. The meteorological data used for this analysis has been compiled by SCAQMD using AERMET (*Version 14134)* and include the period from January 1, 2012, through December 31, 2016.

According to EPA's Guideline on Air Quality Models (EPA, 2016), representativeness of meteorological data used in dispersion modeling depends on (1) the proximity of the meteorological monitoring site to the area under consideration; (2) the complexity of the terrain; (3) the exposure of the meteorological monitoring site; and (4) the period of time during which data are collected.

The monitoring site is located approximately 2.5 miles northwest of the existing Grayson Power Plant. There are no complex terrain features between the monitoring site and the existing power plant. The local historical prevailing wind direction is predominantly northwesterly winds and is consistent with local terrain considerations. A wind rose for the Burbank Airport meteorological monitoring station is presented in Figure 4-1.

FIGURE 4-1
WINDROSE OF BURBANK METEOROLOGICAL DATA (2012-2016)



The land uses surrounding the meteorological monitoring site and the existing Grayson Power Plant are similar and have been categorized as industrial and medium density residential. Therefore, the monitoring station is considered representative of the Project site. For this dispersion modeling analysis, five years of monitored data, 2012 – 2016, was obtained from SCAQMD.

4.3.3 Receptor Network

The base modeling receptor grid for the AERMOD model includes receptors that are placed at the ambient air boundary as well as Cartesian-grid receptors that are placed beyond the facility boundary. The facility property boundary was used as the ambient air boundary. Property boundary receptors were placed at 20-meter intervals. The cartesian receptor grid covers approximately 500 square kilometers with 50-meter spacing between receptors from the facility boundary to 500 meters, 100-meter spacing from 500 meters to 1,000 meters, 250-meter spacing from 1,000 meters to 5,000 meters, 500-meter spacing from 2,000 meters to 10,000 meters, 1,000-meter spacing from 10,000 meters to 20,000 meters. Discrete receptors, with 20-meter spacing, were established for nearby sensitive and off-site worker receptor locations. No flagpole receptors were included in the model.

A total of 9,901 receptors are included in the model. Table 4-8 summarizes the identification of these receptors.

TABLE 4-8
RECEPTOR GRID SPACING

Receptor No.	Receptor Type	Number of Receptors	Spacing (meters)
1 – 54	Discrete	54	20
55-136	Fenceline (Boundary)	82	50
137-9,901	Grid	9,753	50 from 0 to 500 meters 100 from 500 to 1,000 meters 250 from 1,000 to 5,000 meters 500 from 2,000 to 10,000 meters 1,000 from 10,000 to 20,000 meters

AERMAP (*Version 18081*) was used to calculate the receptor elevations and the controlling hill heights. Terrain files for the area were from the National Elevation Dataset (NED) 1 Arc Second found at http://landfire.cr.usgs.gov. The AERMAP domain is large enough to encompass the 10 percent slope factor required for calculating the controlling hill height.

4.3.4 Building Wake Downwash and Good Engineering Practice

AERMOD can account for building downwash and cavity zone effects. Evaluation of building downwash on adjacent stack sources is deemed necessary, since most (if not all) of the stack source heights may be below Good Engineering Practice (GEP) heights. The formula for GEP height estimation is:

$H_s = H_b + 1.50L_b$
where: H_s = GEP stack height
H_b = building height
L_b = the lesser building dimension of the height, length, or width

The effects of aerodynamic downwash due to buildings and other structures is accounted for by using wind direction-specific building parameters calculated by the USEPA-approved Building Parameter Input Program Prime (BPIP-Prime (*Version 04274*)) and the algorithms included in the AERMOD air dispersion model. Based on examination of plot plans for the relationship of sources to the location of facility structures, the locations and dimensions of emission sources and facility structures were input to the BPIP-Prime software package, which calculates the direction-specific building dimensions for input into the AERMOD model. A downwash analysis was performed for each point source. Project buildings dimensions were input into the dispersion model to assess the potential for downwash effects on emissions from nearby point sources. A building downwash analysis, using the latest version of BPIP-Prime, was conducted and incorporated into the modeling analysis to account for potential effluent downwash due to the tanks and buildings. Output from BPIP-Prime was then incorporated into the AERMOD modeling input files.

4.3.5 Ground Level Concentrations

The AERMOD output files calculates ground level concentrations (GLCs) at each receptor. These average annual, maximum one-hour, or maximum 8-hour GLCs will be used to determine the cancer and non-cancer risk exposure of each receptor in the HRA. Table 4-9 summarizes the annual average, maximum one-hour, and average 8-hour concentrations at the PMI, MEIR, and MEIW.

TABLE 4-9
GROUND LEVEL CONCENTRATIONS

Type of Receptor	Average Annual (ug/m^3)	Max. 1-hour (ug/m^3)	Average 8-hour (ug/m^3)*
PMI	47.84	391.7	200.93
MEIR	18.37	178.9	77.15
MEIW	25.6	116.4	107.52

*8-hour concentration is estimated using average annual concentration with adjustment factor of 4.2.

SECTION 5.0

RISK CHARACTERIZATION

In accordance with the applicable guideline, all AB2588 risk assessments prepared for the SCAQMD must use the most recent version of Hotspots Analysis and Reporting Program (HARP2; Version 2.1.1). HARP2 utilizes the air dispersion modeling plot files generated by AERMOD to predict ground level concentrations of each TAC at each receptor location. HARP2 then assigns health risk values to each TAC, such as cancer potency ("CP") for carcinogens and reference exposure levels ("RELs") for compounds that may cause chronic or acute health conditions.

The following HARP files were submitted to SCAQMD in electronic format along with this report:

1. AERMOD input file
2. AERMOD output file
3. HARP input file
4. HARP output file

5.1 Exposure Pathways

As discussed in Section 3, TACs can impact human health through multiple pathways, such as inhalation, dermal, soil ingestion, vegetables ingestion, meat and dairy products ingestion, and mother's milk. For this HRA, inhalation is the primary exposure pathway for all TAC emissions from the modeled emission sources. While most TACs analyzed in this HRA impact human health through inhalation only, there are some TACs are capable of harming human health through multiple pathways.

In accordance with SCAQMD guideline, the HARP modeling options summarized in Table 5-1 were utilized to analyze health risk:

TABLE 5-1
HARP2 MODEL OPTIONS

Description	Specification
Analysis Type:	Cancer, 8-hour Chronic, Chronic, and Acute Risk
Receptor Type:	Residential, sensitive, and worker
Exposure Duration:	30 years for residential and sensitive receptors 25 years for off-site workers
Analysis Option:	OEHHA derived method, except RMP using the derived method for residential cancer risk

Description	Specification
Pathways to Evaluate:	Inhalation, soil ingestion, dermal, home grown produce for resident and sensitive receptors; Inhalation, soil ingestion, and dermal for off-site worker receptors.
Deposition Velocity:	0.02 m/s
Multi-Pathway Exposure Assumption:	HARP2 defaults except ‘warm’ climate for dermal pathway

5.2 HRA Result

Table 5-2 summarizes the results of the health risk assessment, which include the location (UTM coordinates) and description for the point of maximum impact (PMI), maximum exposed individual resident (MEIR), and maximum exposed individual worker (MEIW) for cancer risk and non-cancer (chronic, 8-hour chronic, and acute) risk.

TABLE 5-2
SUMMARY OF HRA RESULTS

Exposure Parameters	Result	Receptor No.	Location (UTME, UTMN)
Cancer Risk – PMI	277×10^{-6}	84	382165, 3780317
Cancer Risk – MEIR	186×10^{-6}	27	382168, 3780462
Cancer Risk - MEIW	7.1×10^{-6}	1363	382160, 3780400
Cancer Burden	4.81	NA	NA
Chronic HI – MEIR	1.75	27	382168, 3780462
Chronic HI - MEIW	0.76	1403	382160, 3780420
8-hour Chronic HI - PMI	0.15	84	382165, 3780317
Acute HI – PMI	0.86	95	382275, 3780141
Acute HI - MEIR	0.48	1261	382260, 3780340
Acute HI – MEIW	0.52	961	382340, 3780160

Appendix C contains detailed results of multipathway cancer risks and non-cancer (chronic and acute) risks at the PMI, MEIR, MEIW, and any sensitive receptors. The results are grouped based on the contributions by substance and emission source.

Appendix C also contains isopleth maps showing the locations of the PMI, MEIR, MEIW, and sensitive receptors for the cancer and non-cancer (chronic and acute risks). The maps also include the cancer risk contours for 1, 10, and 25 in one-million.

5.2.1 Cancer Risk

As shown in Table 5-2, the cancer risks at PMI, MEIR, and MEIW are 277, 186, and 7 in one-million, respectively. Dioxins and furans compounds account for approximately 80% of cancer risk, while Hexavalent chromium accounts for approximately 8% of cancer risk and arsenic accounts for approximately 6% of cancer risk. These substances are emitted from the landfill gas combustion in the boilers, which contributes 97% of the overall cancer risks. Section 6.0 of this report discusses assessment uncertainties related to the quantification of dioxin and furan emissions from landfill gas combustion sources.

5.2.2 Non-Cancer Chronic HI

The non-cancer chronic hazard index (HIC) at MEIR and MEIW are 1.75 and 0.756 respectively. Arsenic contributes approximately 52% of the overall HIC, while dioxins and furans compounds account for approximately 28% of the overall HIC, and nickel accounts for approximately for 18% of the overall HIC. The primary target organ impacted from chronic exposure is the respiratory system.

5.2.3 Non-Cancer 8-Hour Chronic HI

The non-cancer 8-hour chronic hazard index (HIC-8) at PMI is 0.146. Manganese is the primary contributor at 90% to the HIC-8. The primary target organ impacted from 8-hour chronic exposure is the central nervous system.

5.2.4 Acute HI

The non-cancer acute hazard index (HIA) at PMI, MEIR, and MEIW are 0.859, 0.481, and 0.515 respectively. Nickel contributes 99% of the overall HIA. The primary target organ impacted from acute exposure is the immune system.

5.2.5 Schools and Day Care Facilities

In addition to residential homes, there are schools, day care facilities, and hospitals identified within the impact area of this HRA. The type of facilities located within an exposure area with a cancer risk of 10 in one-million or greater are identified.

Sensitive receptors, which include schools, daycares, or hospitals, are identified within the impact area of this HRA. Due to a very large zone of impact, only sensitive receptors within the area with a cancer risk of 10 in one-million or greater are identified for this HRA. Table 5-3 shows the cancer risks, HIC, and HIA at these nearest receptors to these facilities. Figure 5-1 shows the location of the schools and day care facilities.

FIGURE 5-1
MAP OF SCHOOL AND DAY CARE FACILITIES
WITH CANCER RISK OF TEN IN ONE-MILLION OR MORE

TABLE 5-3
ESTIMATED HRA RESULTS FOR SCHOOL AND DAY CARE FACILITIES
WITH CANCER RISK OF TEN IN ONE-MILLION OR MORE

Facility ID	Receptor Description	Closest Receptor No.	Distance Receptor to Facility (meters)	Cancer Risk (in a million)
School #1	Balboa Elementary School	4540	60	12.6
School #2	Mark Keppel Elementary School	3151	29	8.0
School #3	Eleanor J. Toll Middle School	3126	41	5.3

Facility ID	Receptor Description	Closest Receptor No.	Distance Receptor to Facility (meters)	Cancer Risk (in a million)
School #4	Herbert Hoover High School	3180	44	5.3
School #5	Taline Mehrabian Christian Pre-School	3126	61	5.3
School #6	Glendale Sharon Preschool	3067	43	5.6
School #7	Bonnie Academy	3048	53	5.0
School #8	Scholars Armenia School and Art Center	2740	23	32
School #9	Grandview Children's Center	3247	70	14
School #10	Thomas Jefferson Elementary School	4364	105	14
Day Care #1	Gohar Daycare	3205	53	7.8
Day Care #2	Milky Way Child Care & Preschool	3227	49	22

5.2.6 Cancer Burden

Because the cancer risk at MEIR is above one in a million, cancer burden is calculated based on affected residential population within the zone of impact (ZOI), which is the area with a cancer risk of one in one-million or greater, based on seventy years exposure. The maximum distance from the facility to the edge of 70-year ZOI is approximately 23,658 meters. The overall population within the ZOI is approximately 2,250,655 people. Using HARP census tract receptors, overall cancer burden for this HRA is 4.81. Table 5-4 summarizes the cancer burden of this HRA.

TABLE 5-4
CANCER BURDEN

Cancer Risk	Population	Cancer Burden
100 in a million or greater	188	0.02
25 in a million or greater	1,930	0.10
10 in a million or greater	17,313	0.31
1 in a million or greater	2,250,655	4.81

SECTION 6.0

UNCERTAINTIES SURROUNDING HRA RESULTS AND APPLICABILITY TO CURRENT / FUTURE FACILITY OPARATIONS

The risk assessment contained in this report reflects an Air Toxics Inventory Report (ATIR) that GWP prepared for the 2015 operating year. It also reflects analysis methodology that may not be well-suited for the operating characteristics of the Grayson Power Plant. During the preparation of the HRA, several modeling and emissions inventory components were discovered that may affect assessment results and overstate assumed health risks that can be attributed to the operation of Grayson Power Plant.

6.1 Assumed Operating Schedule to Determine Ambient Concentrations of Pollutants

Standard SCAQMD risk assessment methodology calls for the assumption that an emission source can operate 8,760 hours per year. When this extended operating schedule is assumed, the AERMOD model generally predicts higher annual average ambient concentrations of a pollutant. These annual concentrations are then used to estimate potential cancer risk.

Estimated cancer risk attributed to Grayson Power Plant operations in 2015 are predominantly attributed to the combustion of landfill gas. There is not adequate landfill gas production to allow the level of boiler operation that is built into the risk assessment. Although the Grayson Power Plant operates three boilers that are permitted to burn landfill gas, there is only enough landfill gas to accommodate the smallest of the three boilers at approximately 35% annual capacity. Based upon alternative analyses conducted for the facility, it is believed that the SCAQMD method of assuming an 8,760-hour operating year for all three boilers overstates estimated cancer risk by approximately 65% at MEIR and 89% at MEIW.

6.2 Use of Default Emission Factors for Chlorinated Dioxins and Furans in ATIR

Chlorinated Dioxins and Furans account for approximately 80% of the estimated cancer risk that is attributed to the facility. The ATIR, however, does not reflect levels of these pollutants that were actually measured at the Grayson facility. Instead, the ATIR reflects default reference emission factors for landfill gas combustion in boilers. Those factors were provided by SCAQMD.

GWP has initiated several steps in an attempt to validate the reference values or alternatively obtain substitute values. First, GWP surveyed the County Sanitation Districts of Los Angeles County (LACSD) to obtain its opinion of the presence of the subject compounds in the emissions of landfill gas that is combusted in boilers. LACSD provided records of an extensive literature search it conducted in 1998. Based upon that search, LACSD concluded that while chlorinated dioxins and furans do result from waste incineration, they do not generally result from the combustion of landfill gas. LACSD further clarified that it also conducted source emission tests on its own landfill gas boilers for the subject toxic compounds, but laboratory analyses did not detect their presence on any test. The test that showed exceptions was for emission sources that were located at a hazardous materials landfill, rather than municipal solid waste landfills. Landfill gas that has been transported to Grayson Power Plant originated at a municipal solid waste landfill.

GWP has asked SCAQMD to provide details surrounding the genesis of its default emission factors. GWP's goal is to evaluate the results, test methods and landfill characteristics to determine if the default emission factors are applicable to the risk assessment for the Grayson Power Plant. Although SCAQMD default emission factors include chlorinated dioxin and furan emissions from landfill gas boilers, SCAQMD does not suggest similar default values for other landfill gas combustion sources such as flares and internal combustion engines (the majority of landfill gas combustion sources in the region). Per phone conversation, SCAQMD is uncertain of the data source for these emission factors; however, it seems CARB's California Air Toxics Emission Factors (CATEF) presents the same default emission factors. GWP has requested that CARB verify the genesis of these CATEF default emission factors.

While GWP is not easily able to conduct tests on boiler operations at the facility, it is investigating the viability of conducting a gas analysis as a surrogate for estimating chlorinated dioxin and furan emissions.

6.3 Incorrect Ammonia Emissions in ATIR

While preparing this health risk assessment, it became apparent that the ATIR reflects an incorrect higher default emission factor and a double-counting of ammonia emissions. In accordance with SCAQMD policy, all emissions that were reflected in the ATIR, including the double-counted ammonia emissions, were retained in the original risk assessment. The inflated ammonia levels result in slightly inflated acute health risk values.

6.4 Applicability of the Health Risk Assessment to Current and Future Grayson Power Plant Operations

Approximately 97% of the estimated health risk that is reflected in this report is the result of landfill gas combustion at the facility. GWP has discontinued the practice of combusting landfill gas at the facility in 2018. As such the estimated health risks reflected in this report do not reflect a continued risk posed by the facility. In the absence of landfill gas combustion, the ongoing cancer risk attributed to the facility is estimated to be less than ten in one-million.

SECTION 7.0

ALTERNATIVE AND RESIDUAL HEALTH RISK ASSESSMENTS

Due to the uncertainties attributed to the SCAQMD Rule 1402 health risk assessment two alternative health risk assessments have been conducted in an effort to more accurately predict health risks that can be attributed to the facility. These assessments were conducted in accordance with all procedures described in Sections 4.3 and 5.1, with modifications to operating schedules and emission inventories as summarized in this section of the report.

A preliminary residual risk assessment was also conducted to estimate maximum potential health risks that can be attributed to current and future operations at the Grayson Power plant due to the discontinued use of landfill gas in Boilers 3, 4 and 5. The preliminary residual risk assessment also reflects operating restrictions that SCAQMD will place on Boilers 3, 4 and 5, as well as Turbines 8A, 8B and 8C in the year 2024 pursuant to Proposed Amended Rule 1135.

7.1 Alternative Health Risk Assessment No. 1 – Refined 2015 Operating Schedule

As discussed in Section 6.1, the ambient concentration results of AERMOD that were used to estimate peak and annual average ambient off-site pollutant concentrations reflects an annual operating schedule of 8,760 hours for all emission sources at the facility. Actual in utilization of the facility, however, is not at all close to the continuous operation of 8,760 hours per year. Table 7-1 summarizes calendar year 2015 annual operating hours and capacity factors for the Grayson boilers and turbines.

TABLE 7-1
2015 EQUIPMENT OPERATING HOURS

Unit	Fuel Type	Operating Hours	Capacity Factors
Boiler 3	Natural Gas Landfill Gas	1,260	8.18%
Boiler 4	Natural Gas Landfill Gas	1,881	8.92%
Boiler 5	Natural Gas Landfill Gas	5,259	26.27%
Gas Turbine 8A	Natural Gas	902	7.71%
Gas Turbine 8BC	Natural Gas	211	1.72%
Gas Turbine 9	Natural Gas	609	4.24%

The disparity between SCAQMD protocol and Grayson operations is especially notable for Boilers 3, 4 and 5. Overall, landfill gas delivery to Grayson in 2015 was equivalent to approximately 35% of the rated annual capacity of the smallest boiler at the facility and only 7% of the combined rated capacity of the three boilers. In other words, there simply is not enough landfill gas to allow Grayson to operate in the manner reflected in the original health risk analysis.

In an effort to more accurately assess health risks, Alternative HRA No. 1 was conducted using the same emission inventory discussed in Section 4.2 of this report, but the actual calendar year 2015 operating schedules were incorporated into AERMOD to determine peak and average annual off-site ambient pollutant concentrations. Calendar year 2015 meteorological data were singularly used to complement the refined operating schedule.

The results of Alternative HRA No. 1 are contained in Table 7-2. As expected, estimated health risks that are based upon actual operating schedules at the facility are significantly lower than risks that are estimated when considering an 8,760 hours per year operating schedule. The estimated cancer risks summarized in Table 7-2 are approximately 61% at MEIR and 53% at MEIW of those found in Table 5-2 for an 8,760 hour operating schedule. Appendix F contains detailed model input and output data and other supporting documents for Alternative HRA #1.

TABLE 7-2
SUMMARY OF HRA RESULTS
ALTERNATIVE HEALTH RISK ASSESSMENT NO. 1

Exposure Parameters	Result	Receptor No.	Location (UTME, UTMN)
Cancer Risk – PMI	187×10^{-6}	30	382165, 3780317
Cancer Risk – MEIR	113×10^{-6}	108	382180, 3780447
Cancer Risk – MEIW	3.7×10^{-6}	720	382150, 3780450
Cancer Burden	1.77	NA	NA
Chronic HI – MEIR	1.07	108	382180, 3780447
Chronic HI - MEIW	0.42	720	382150, 3780450
8-hour Chronic HI - PMI	0.06	108	382180, 3780447
Acute HI – PMI	1.07	41	382275, 3780141
Acute HI - MEIR	0.77	102	382241, 3780369
Acute HI – MEIW	0.66	664	382200, 3780350

7.2 Alternative Health Risk Assessment No. 2 – Refined 2015 Emissions Inventory

As discussed in Section 6.2, GWP has significant uncertainties regarding default reference value emission factors for dioxins and furans. Based upon the literature search conducted by LACSD, it is likely that dioxin and furan emissions may not exist from the combustion of landfill gas at Grayson.

In an effort to more closely reflect input from LACSD, GWP conducted Alternative HRA No. 2. This alternative assessment reflects SCAQMD's preferred operating schedule of 8,760 hours per year, but reflects conclusions drawn by LACSD that dioxin and furan emissions are not products of municipal solid waste landfill gas combustion in boilers.

Alternative HRA No. 2 also reflects corrections made to revise incorrect ammonia emissions in the HRA. Finally, Alternative HRA No. 2 reflects a site specific arsenic emission factor that is based upon a landfill gas analysis.

The results of Alternative HRA No. 2 are contained in Table 7-3. As expected, estimated health risks that are based upon the elimination of dioxin and furan emissions, as well as adjustments to ammonia and arsenic emissions result in an approximate 80% and 74% decreases in cancer risks at MEIR and MEIW, respectively. Appendix E contains detailed model input and output data and other supporting documents for Alternative HRA #2.

TABLE 7-3
SUMMARY OF HRA RESULTS
ALTERNATIVE HEALTH RISK ASSESSMENT NO. 2

Exposure Parameters	Result	Receptor No.	Location (UTME, UTMN)
Cancer Risk – PMI	41×10^{-6}	83	382153, 3780332
Cancer Risk – MEIR	27×10^{-6}	27	382168, 3780462
Cancer Risk – MEIW	1.8×10^{-6}	1403	382160, 3780420
Cancer Burden	0.12	NA	NA
Chronic HI – MEIR	0.51	27	382167, 3780462
Chronic HI - MEIW	0.46	1403	382160, 3780420
8-hour Chronic HI – PMI	0.09	27	382168, 3780462
Acute HI – PMI	0.86	95	382275, 3780141
Acute HI – MEIR	0.48	1261	382260, 3780340
Acute HI - MEIW	0.49	1260	382240, 3780340

7.3 Future or Residual Health Risk Assessment

GWP has discontinued burning landfill gas at the Grayson Power Plant since the 2015 ATIR was prepared. All non-emergency power generating equipment now solely utilize natural gas. Additionally, SCAQMD is proposing amendments to Rule 1135 that would effectively limit the annual capacity of Boilers 3, 4 and 5 to 1%. Proposed Amended Rule 1135 would also effectively limit the annual capacity factor of Turbines 8A, 8B and 8C to 10%. The proposed limits to capacity factors are expected to become effective on January 1, 2024.

In an effort to estimate potential health risks now that landfill gas is no longer combusted at Grayson, and also to reflect operating limits that SCAMD will place on the facility pursuant to Proposed Amended Rule 1135, GWP conducted a residual risk assessment. This assessment includes an operating schedule of 8,760 hours per year, the discontinued use of landfill gas, existing permitted operating restrictions and planned additional operating restrictions that are expected to become effective on January 1, 2024.

The results of preliminary residual HRAs are summarized in Table 7-4. As expected, estimated health risks that are based upon natural gas combustion only result in approximate 98% and 97% decreases in cancer risks at MEIR and MEIW, respectively. Appendix F contains detailed model input and output data and other supporting documents for the preliminary residual HRA.

TABLE 7-4
SUMMARY OF HRA RESULTS
RESIDUAL HEALTH RISK ASSESSMENT

Exposure Parameters	Result	Receptor No.	Location (UTME, UTMN)
Cancer Risk – PMI	5.53×10^{-6}	81	382130, 3780363
Cancer Risk – MEIR	3.02×10^{-6}	29	382142, 3780492
Cancer Risk – MEIW	0.22×10^{-6}	1444	382140, 3780440
Cancer Burden	0.001	NA	NA
Chronic HI – MEIR	0.004	29	382142, 3780492
Chronic HI - MEIW	0.004	1444	382140, 3780440
8-hour Chronic HI – PMI	0.002	83	382153, 3780332
Acute HI – PMI	0.06	83	382153, 3780332
Acute HI – MEIR	0.04	22	382220, 3780401
Acute HI - MEIW	0.04	1403	382160, 3780420

7.4 Grayson Repowering Project

In June, 2017 the City of Glendale submitted SCAQMD applications for permits to construct two combined-cycle gas turbines and two simple-cycle gas turbines. These new turbines will replace the existing boilers and three combined-cycle gas turbines at Grayson Power Plant. The new power generating equipment will only utilize natural gas as its fuel.

Permit applications for the project are currently being evaluated by SCAQMD permitting engineers. An HRA analysis was conducted for the project and shows that the cancer risk at MEIR and MEIW associated with the project is less than one in one-million. The non-cancer chronic and acute HI at MEIR and MEIW are less than one. Detailed information regarding the repower project is contained in SCAQMD engineering files for permit application numbers 595673 through 595684.

SECTION 8.0

REFERENCES

1. Office of Environmental Health Hazard Assessment (OEHHA), Air Toxics Hot Spots Program – Risk Assessment Guidelines: Guidance Manual for Preparation of Health Risk Assessments, February 2015.
   https://oehha.ca.gov/media/downloads/crnr/2015guidancemanual.pdf

2. California Air Resource Board (CARB), Hotspots Analysis and Reporting Program (HARP), Version 18159 (ADMRT); Version 2.1.1 (EIM)
   https://www.arb.ca.gov/toxics/harp/harp.htm

3. South Coast Air Quality Management District (SCAQMD), AB2588 & Rule 1402 Supplemental Guidelines: Supplemental Guideline for Preparing Risk Assessments and Risk Reduction Plan for the Air Toxics "Hot Spots" Information and Assessment Act, dated November 4, 2016
   http://www.aqmd.gov/docs/default-source/planning/risk-assessment/ab2588-supplemental-guidelines.pdf?sfvrsn=9

4. Google Earth
   https://www.google.com/earth/

APPENDIX A

FACILITY MAPS AND DIAGRAMS

GLENDALE CITY, GLENDALE WATER & POWER
800 AIR WAY, GLENDALE, CA 91201

AREA MAP

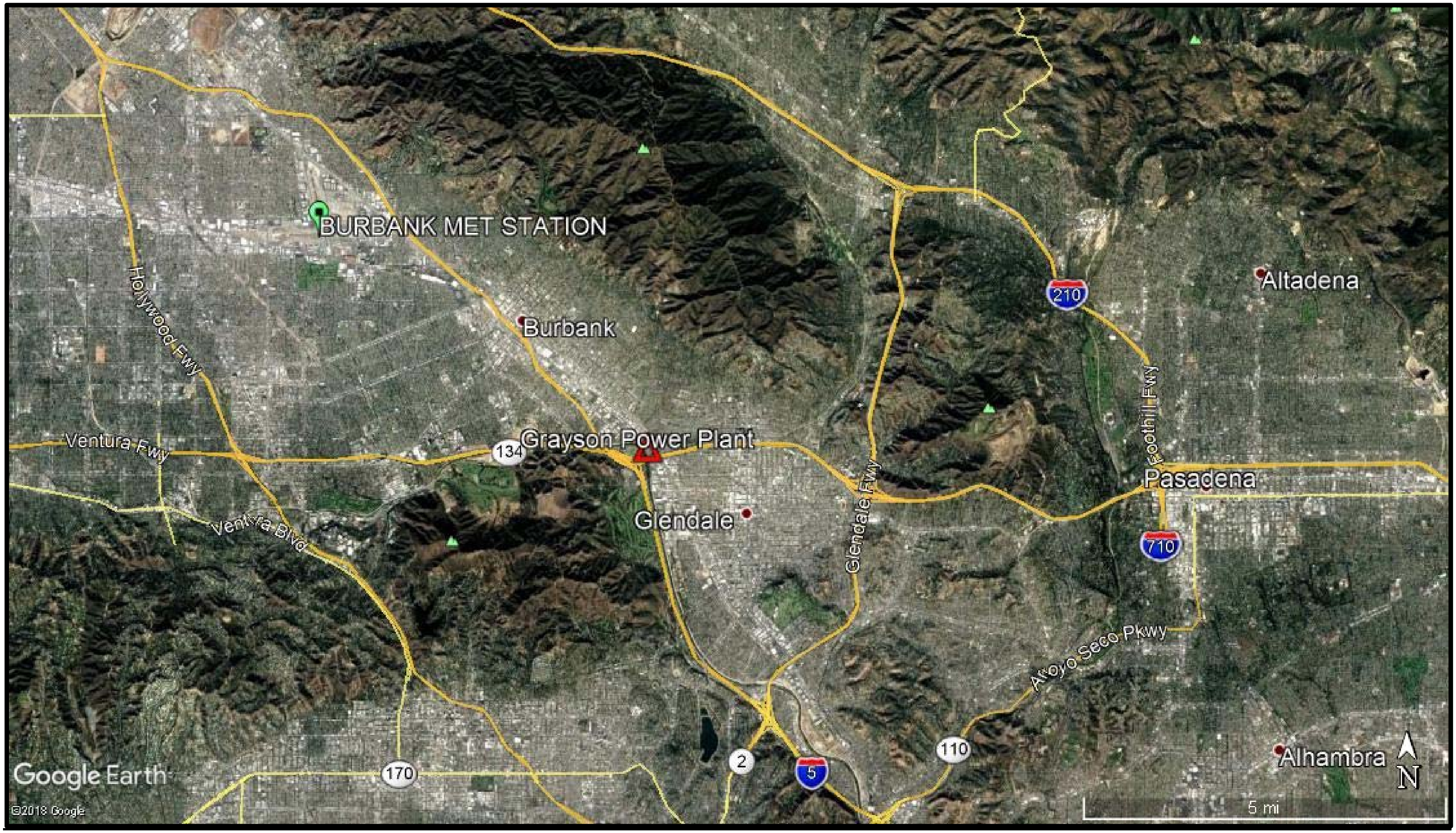
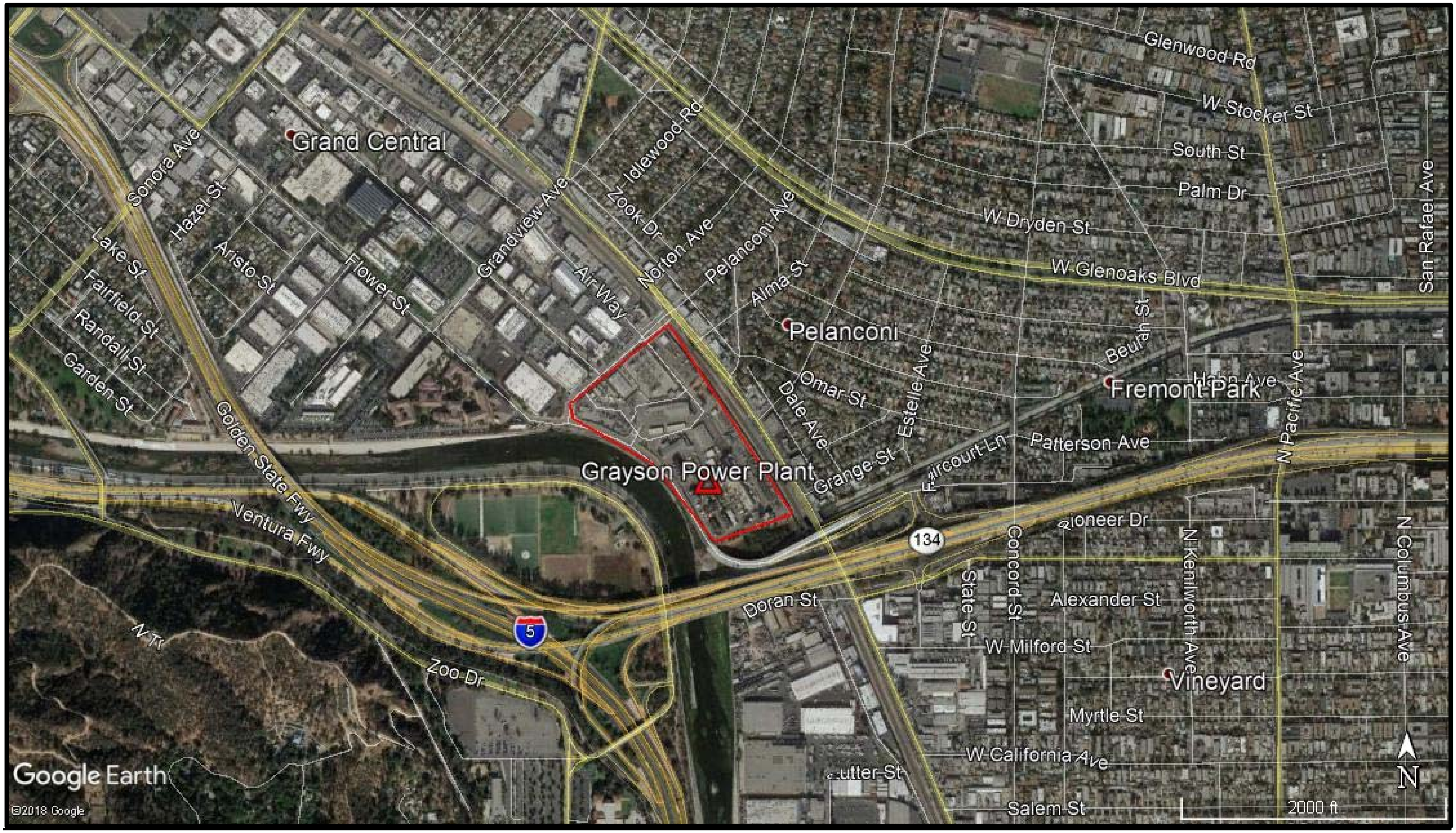


Image courtesy of Google ©2018 (www.google.com)

GLENDALE CITY, GLENDALE WATER & POWER
800 AIR WAY, GLENDALE, CA 91201

SITE MAP



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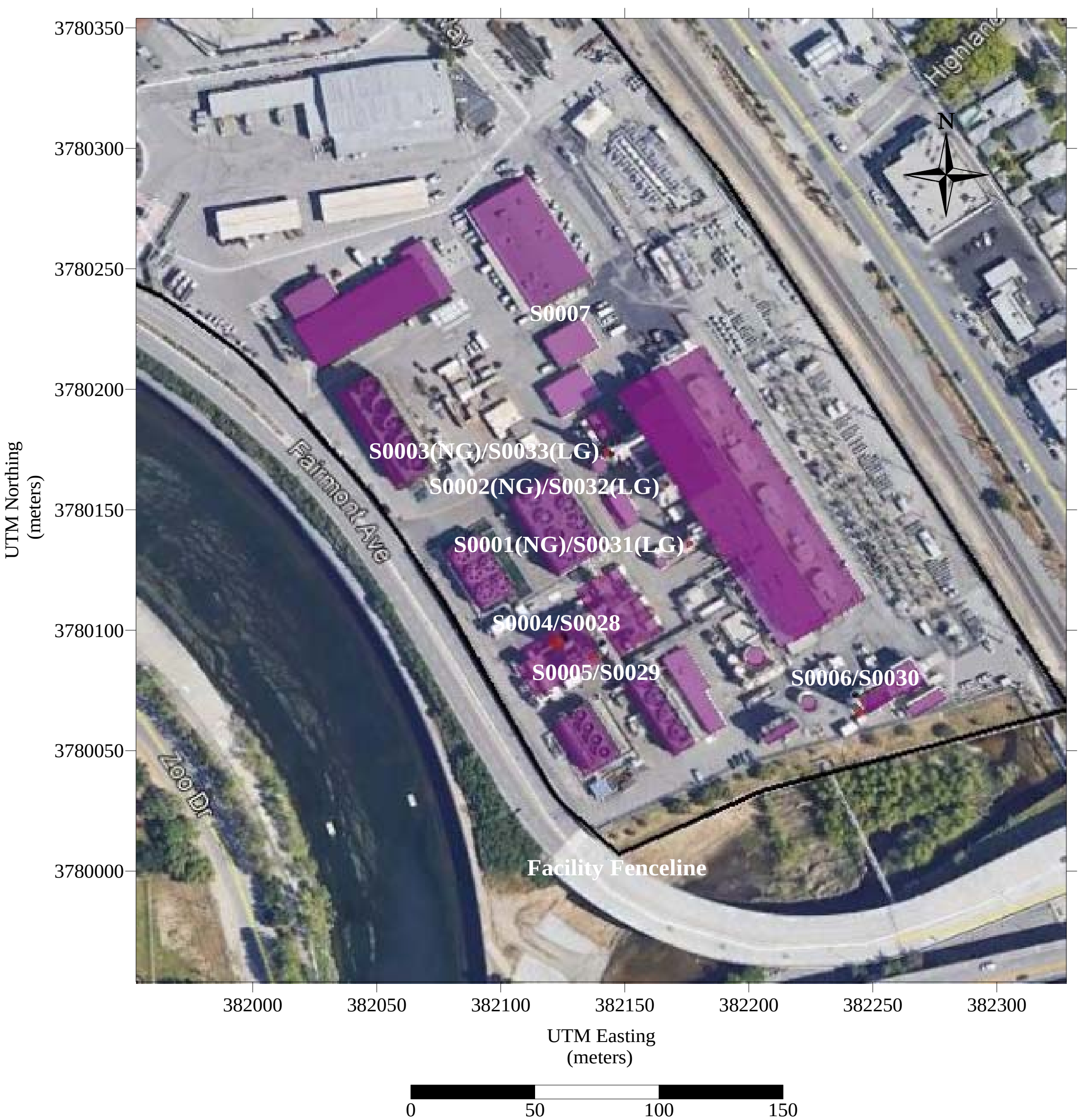
GLENDALE CITY, GLENDALE WATER & POWER
800 AIR WAY, GLENDALE, CA 91201

FACILITY MAP



SOURCE DESCRIPTION

S0001	D1-Unit 4 Boiler (NG)
S0002	D2-Unit 3 Boiler (NG)
S0003	D3-Unit 5 Boiler (NG)
S0004	C51- SCR (Connected to D4 and C52) / Gas Turbine 8A
S0005	C53- SCR (Connected to D5, D6 and C54) / Gas Turbine 8BC
S0006	C61- SCR (connected to C60) / Gas Turbine 9
S0007	D12-Emergency ICE
S0028	Unit 8A-Ammonia Injection Line
S0029	Unit 8BC-Ammonia Injection Line
S0030	Unit 9-Ammonia Injection Line
S0031	D1-Unit 4 Boiler (LG)
S0032	D2-Unit 3 Boiler (LG)
S0033	D3-Unit 5 Boiler (LG)

Image courtesy of Google ©2018 (www.google.com)

APPENDIX B

EMISSION RATE AND SOURCE INFORMATION

DIESEL PM EMISSION RATE CALCULATION

GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
800 AIR WAY, GLENDALE, CA 91201

DIESEL PM EMISSION FROM EMERGENCY ENGINE (S0007)

Diesel PM Emission Factor (g/bhp-hr)	Engine Rating (bhp)	2015 Operating Hours	2015 Emission (lbs/year)
0.3	465	18.2	5.6

Note:
Diesel PM emission factor is based on the manufacturer literature.

Exhaust Emission Data Sheet

300DFCB

60 Hz Diesel Generator Set

ENGINE

Model:	Cummins NTA855-G2	Bore:	5.5 in. (140 mm)
Type:	4 Cycle, In-line 6 Cylinder Diesel	Stroke	6 in. (152 mm)
Aspiration:	Turbocharged and Aftercooled	Displacement:	855 cu. in. (14.0 liters)

Compression Ratio: 15.3:1

Emission Control Device: Turbocharger and Aftercooler, with Variable Timing

PERFORMANCE DATA	STANDBY	PRIME
BHP @ 1800 RPM (60 Hz)	465	420
Fuel Consumption (gal/Hr)	23.5	20.9
Exhaust Gas Flow (CFM)	2570	2435
Exhaust Gas Temperature (ºF)	900	870

EXHAUST EMISSION DATA

(All Values are Grams per HP-Hour)

COMPONENT	STANDBY	PRIME
HC (Total Unburned Hydrocarbons)	0.07	0.09
NOx (Oxides of Nitrogen as NO2)	8.87	7.53
CO (Carbon Monoxide)	1.20	1.10
PM (Particulate Matter)	0.30	0.33
SO_2 (Sulfur Dioxide)	0.63	0.62

TEST CONDITIONS

Data was recorded during steady-state rated engine speed (± 25 RPM) with full load (± 2%).
Pressures, temperatures, and emission rates were stablized.

Fuel Specification:	ASTM D975 No. 2-D diesel fuel with 0.03-0.05% sulfur content (by weight), and 40-48 cetane number.
Fuel Temperature:	99 ± 9 º F (at fuel pump inlet)
Intake Air Temperature:	77 ± 9 º F
Barometric Pressure:	29.6 ± 1 in. Hg
Humidity:	NOx measurement corrected to 75 grains H2O/lb dry air
Reference Standard:	ISO 8178

The NOx, HC, CO and PM emission data tabulated here were taken from a single engine under the test conditions shown above. Data for the other components are estimated. These data are subject to instrumentation and engine-to-engine variability. Field emissions test data are not guaranteed to these levels. Actual field test results may vary due to test site conditions, installation,fuel specification, test procedures and instrumentation. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may result in elevated emission levels.

EMISSION SOURCE PARAMETERS

GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
800 AIR WAY, GLENDALE, CA 91201

SOURCE PARAMETERS - POINT SOURCES/STACKS

Source ID No.	Stack Name	UTM Easting	UTM Northing	Stack Height (m)	Stack Diameter (m)	Stack Temp. (K)	Stack Flow Rate (ACFM)	Stack Exit Velocity (m/s)	Elevation (m)
S0001	D1-Unit 4 Boiler (NG)	382173	3780131	27.13	2.44	585.93	158,151	15.651	142.0385
S0002	D2-Unit 3 Boiler (NG)	382164	3780156	21.95	1.81	437.04	100,773	18.485	142.0385
S0003	D3-Unit 5 Boiler (NG)	382142	3780169	27.13	2.41	378.09	154,547	15.615	142.0385
S0004	D4 – Unit 8A (NG)	382135.8	3780085.6	30.48	3.34	482.04	361,522	19.426	142.0385
S0005	D5, D6 – Unit 8BC (NG)	382122	3780092	30.48	5.31	485.09	807,953	17.619	142.0385
S0006	D58 – Unit 9 (NG)	382238.2	3780061.8	25.91	3.05	694.54	616,089	40.51	142.0385
S0007	D12-Emergency ICE	382120	3780234	3.35	0.20	755.37	2,570	37.021	142.0385
S0028	Unit 8A-NH3 Injection Line	382135.8	3780085.6	30.48	3.34	482.04	361,522	19.426	142.0385
S0029	Unit 8BC-NH3 Injection Line	382122	3780092	30.48	5.31	485.09	807,953	17.619	142.0385
S0030	Unit 9-NH3 Injection Line	382238.2	3780061.8	25.91	3.05	694.54	616,089	40.51	142.0385
S0031	D1-Unit 4 Boiler (LG)	382173	3780131	27.13	2.44	411.48	64,096	6.344	142.0385
S0032	D2-Unit 3 Boiler (LG)	382164	3780156	21.95	1.81	428.15	77,993	14.307	142.0385
S0033	D3-Unit 5 Boiler (LG)	382142	3780169	27.13	2.41	386.04	166,142	16.784	142.0385

EMISSION RATE BY SOURCE

GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
800 AIR WAY, GLENDALE, CA 91201

EMISSION RATE BY SUBSTANCE AND SOURCE

Source	Source Name	Compounds	CAS	1-Hour Maximum (lbs/hr)	1-Hour Maximum (g/s)	Annual Average (lbs/yr)	Annual Average (g/s)
S0001	D1 - Unit 4 Boiler (NG)	Acetaldehyde	75070	2.22E-05	2.80E-06	1.55E-01	1.95E-02
S0001	D1 - Unit 4 Boiler (NG)	Acrolein	107028	1.97E-05	2.49E-06	1.38E-01	1.74E-02
S0001	D1 - Unit 4 Boiler (NG)	Benzene	71432	4.19E-05	5.28E-06	2.93E-01	3.69E-02
S0001	D1 - Unit 4 Boiler (NG)	Ethyl Benzene	100414	4.93E-05	6.22E-06	3.45E-01	4.34E-02
S0001	D1 - Unit 4 Boiler (NG)	Formaldehyde	50000	8.88E-05	1.12E-05	6.21E-01	7.82E-02
S0001	D1 - Unit 4 Boiler (NG)	Hexane	110543	3.21E-05	4.04E-06	2.24E-01	2.82E-02
S0001	D1 - Unit 4 Boiler (NG)	Naphthalene	91203	7.40E-06	9.32E-07	5.17E-02	6.52E-03
S0001	D1 - Unit 4 Boiler (NG)	NH3	7664417	4.44E-01	5.59E-02	3.10E+03	3.91E+02
S0001	D1 - Unit 4 Boiler (NG)	PAHs-w/o	1151	2.47E-06	3.11E-07	1.72E-02	2.17E-03
S0001	D1 - Unit 4 Boiler (NG)	Toluene	108883	1.92E-04	2.42E-05	1.34E+00	1.69E-01
S0001	D1 - Unit 4 Boiler (NG)	Xylenes	1330207	1.43E-04	1.80E-05	1.00E+00	1.26E-01
S0002	D2 - Unit 3 Boiler (NG)	Acetaldehyde	75070	1.04E-05	1.32E-06	7.30E-02	9.20E-03
S0002	D2 - Unit 3 Boiler (NG)	Acrolein	107028	9.29E-06	1.17E-06	6.49E-02	8.18E-03
S0002	D2 - Unit 3 Boiler (NG)	Benzene	71432	1.97E-05	2.49E-06	1.38E-01	1.74E-02
S0002	D2 - Unit 3 Boiler (NG)	Ethyl Benzene	100414	2.32E-05	2.92E-06	1.62E-01	2.04E-02
S0002	D2 - Unit 3 Boiler (NG)	Formaldehyde	50000	4.18E-05	5.26E-06	2.92E-01	3.68E-02
S0002	D2 - Unit 3 Boiler (NG)	Hexane	110543	1.51E-05	1.90E-06	1.05E-01	1.33E-02
S0002	D2 - Unit 3 Boiler (NG)	Naphthalene	91203	3.48E-06	4.39E-07	2.43E-02	3.07E-03
S0002	D2 - Unit 3 Boiler (NG)	NH3	7664417	2.09E-01	2.63E-02	1.46E+03	1.84E+02
S0002	D2 - Unit 3 Boiler (NG)	PAHs-w/o	1151	1.16E-06	1.46E-07	8.11E-03	1.02E-03
S0002	D2 - Unit 3 Boiler (NG)	Toluene	108883	9.05E-05	1.14E-05	6.33E-01	7.97E-02
S0002	D2 - Unit 3 Boiler (NG)	Xylenes	1330207	6.73E-05	8.48E-06	4.70E-01	5.93E-02
S0003	D3 - Unit 5 Boiler (NG)	Acetaldehyde	75070	8.92E-05	1.12E-05	6.23E-01	7.85E-02
S0003	D3 - Unit 5 Boiler (NG)	Acrolein	107028	7.93E-05	9.99E-06	5.54E-01	6.98E-02
S0003	D3 - Unit 5 Boiler (NG)	Benzene	71432	1.68E-04	2.12E-05	1.18E+00	1.48E-01
S0003	D3 - Unit 5 Boiler (NG)	Ethyl Benzene	100414	1.98E-04	2.50E-05	1.39E+00	1.75E-01
S0003	D3 - Unit 5 Boiler (NG)	Formaldehyde	50000	3.57E-04	4.50E-05	2.49E+00	3.14E-01
S0003	D3 - Unit 5 Boiler (NG)	Hexane	110543	1.29E-04	1.62E-05	9.00E-01	1.13E-01
S0003	D3 - Unit 5 Boiler (NG)	Naphthalene	91203	2.97E-05	3.75E-06	2.08E-01	2.62E-02
S0003	D3 - Unit 5 Boiler (NG)	NH3	7664417	1.78E+00	2.25E-01	1.25E+04	1.57E+03
S0003	D3 - Unit 5 Boiler (NG)	PAHs-w/o	1151	9.91E-06	1.25E-06	6.93E-02	8.73E-03
S0003	D3 - Unit 5 Boiler (NG)	Toluene	108883	7.73E-04	9.74E-05	5.40E+00	6.81E-01
S0003	D3 - Unit 5 Boiler (NG)	Xylenes	1330207	5.75E-04	7.24E-05	4.02E+00	5.06E-01
S0004	Gas Turbine 8A	1,3-Butadiene	106990	1.43E-05	1.81E-06	1.00E-01	1.26E-02
S0004	Gas Turbine 8A	Acetaldehyde	75070	1.33E-03	1.68E-04	9.31E+00	1.17E+00
S0004	Gas Turbine 8A	Acrolein	107028	2.13E-04	2.69E-05	1.49E+00	1.88E-01
S0004	Gas Turbine 8A	Benzene	71432	3.98E-04	5.02E-05	2.78E+00	3.51E-01
S0004	Gas Turbine 8A	Ethyl Benzene	100414	1.06E-03	1.34E-04	7.44E+00	9.37E-01
S0004	Gas Turbine 8A	Formaldehyde	50000	2.36E-02	2.98E-03	1.65E+02	2.08E+01
S0004	Gas Turbine 8A	Naphthalene	91203	4.34E-05	5.47E-06	3.03E-01	3.82E-02
S0004	Gas Turbine 8A	NH3	7664417	5.88E-01	7.40E-02	4.11E+03	5.17E+02
S0004	Gas Turbine 8A	PAHs-w/o	1151	3.00E-05	3.78E-06	2.09E-01	2.64E-02
S0004	Gas Turbine 8A	Propylene Oxide	75569	9.66E-04	1.22E-04	6.75E+00	8.51E-01
S0004	Gas Turbine 8A	Toluene	108883	4.34E-03	5.47E-04	3.03E+01	3.82E+00
S0004	Gas Turbine 8A	Xylenes	1330207	2.13E-03	2.69E-04	1.49E+01	1.88E+00
S0005	Gas Turbine 8B	1,3-Butadiene	106990	3.20E-06	4.03E-07	2.24E-02	2.82E-03
S0005	Gas Turbine 8C	1,3-Butadiene	106990	3.20E-06	4.03E-07	2.24E-02	2.82E-03
S0005	Gas Turbine 8B	Acetaldehyde	75070	2.97E-04	3.75E-05	2.08E+00	2.62E-01
S0005	Gas Turbine 8C	Acetaldehyde	75070	2.97E-04	3.75E-05	2.08E+00	2.62E-01
S0005	Gas Turbine 8B	Acrolein	107028	4.76E-05	6.00E-06	3.33E-01	4.19E-02
S0005	Gas Turbine 8C	Acrolein	107028	4.76E-05	6.00E-06	3.33E-01	4.19E-02
S0005	Gas Turbine 8B	Benzene	71432	8.89E-05	1.12E-05	6.21E-01	7.83E-02
S0005	Gas Turbine 8C	Benzene	71432	8.89E-05	1.12E-05	6.21E-01	7.83E-02
S0005	Gas Turbine 8B	Ethyl Benzene	100414	2.38E-04	2.99E-05	1.66E+00	2.09E-01
S0005	Gas Turbine 8C	Ethyl Benzene	100414	2.38E-04	2.99E-05	1.66E+00	2.09E-01
S0005	Gas Turbine 8B	Formaldehyde	50000	5.28E-03	6.65E-04	3.69E+01	4.65E+00
S0005	Gas Turbine 8C	Formaldehyde	50000	5.28E-03	6.65E-04	3.69E+01	4.65E+00
S0005	Gas Turbine 8B	Naphthalene	91203	9.69E-06	1.22E-06	6.78E-02	8.54E-03
S0005	Gas Turbine 8C	Naphthalene	91203	9.69E-06	1.22E-06	6.78E-02	8.54E-03

GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
800 AIR WAY, GLENDALE, CA 91201

EMISSION RATE BY SUBSTANCE AND SOURCE

Source	Source Name	Compounds	CAS	1-Hour Maximum (lbs/hr)	1-Hour Maximum (g/s)	Annual Average (lbs/yr)	Annual Average (g/s)
S0005	Gas Turbine 8B	NH3	7664417	1.31E-01	1.65E-02	9.17E+02	1.16E+02
S0005	Gas Turbine 8C	NH3	7664417	1.31E-01	1.65E-02	9.17E+02	1.16E+02
S0005	Gas Turbine 8B	PAHs-w/o	1151	6.69E-06	8.43E-07	4.68E-02	5.89E-03
S0005	Gas Turbine 8C	PAHs-w/o	1151	6.69E-06	8.43E-07	4.68E-02	5.89E-03
S0005	Gas Turbine 8B	Propylene Oxide	75569	2.16E-04	2.72E-05	1.51E+00	1.90E-01
S0005	Gas Turbine 8C	Propylene Oxide	75569	2.16E-04	2.72E-05	1.51E+00	1.90E-01
S0005	Gas Turbine 8B	Toluene	108883	9.69E-04	1.22E-04	6.78E+00	8.54E-01
S0005	Gas Turbine 8C	Toluene	108883	9.69E-04	1.22E-04	6.78E+00	8.54E-01
S0005	Gas Turbine 8B	Xylenes	1330207	4.76E-04	6.00E-05	3.33E+00	4.19E-01
S0005	Gas Turbine 8C	Xylenes	1330207	4.76E-04	6.00E-05	3.33E+00	4.19E-01
S0006	Gas Turbine 9	1,3-Butadiene	106990	1.06E-05	1.33E-06	7.39E-02	9.32E-03
S0006	Gas Turbine 9	Acetaldehyde	75070	9.83E-04	1.24E-04	6.87E+00	8.66E-01
S0006	Gas Turbine 9	Acrolein	107028	1.57E-04	1.98E-05	1.10E+00	1.39E-01
S0006	Gas Turbine 9	Benzene	71432	2.94E-04	3.70E-05	2.05E+00	2.59E-01
S0006	Gas Turbine 9	Ethyl Benzene	100414	7.86E-04	9.90E-05	5.49E+00	6.92E-01
S0006	Gas Turbine 9	Formaldehyde	50000	1.74E-02	2.20E-03	1.22E+02	1.54E+01
S0006	Gas Turbine 9	Naphthalene	91203	3.20E-05	4.04E-06	2.24E-01	2.82E-02
S0006	Gas Turbine 9	NH3	7664417	4.34E-01	5.47E-02	3.03E+03	3.82E+02
S0006	Gas Turbine 9	PAHs-w/o	1151	2.21E-05	2.79E-06	1.55E-01	1.95E-02
S0006	Gas Turbine 9	Propylene Oxide	75569	7.13E-04	8.99E-05	4.98E+00	6.28E-01
S0006	Gas Turbine 9	Toluene	108883	3.20E-03	4.04E-04	2.24E+01	2.82E+00
S0006	Gas Turbine 9	Xylenes	1330207	1.57E-03	1.98E-04	1.10E+01	1.39E+00
S0007	D12 - Emergency ICE	1,3-Butadiene	106990	1.21E-05	1.53E-06	8.47E-02	1.07E-02
S0007	D12 - Emergency ICE	Acetaldehyde	75070	4.37E-05	5.50E-06	3.05E-01	3.85E-02
S0007	D12 - Emergency ICE	Acrolein	107028	1.89E-06	2.38E-07	1.32E-02	1.66E-03
S0007	D12 - Emergency ICE	Arsenic	7440382	8.92E-08	1.12E-08	6.24E-04	7.86E-05
S0007	D12 - Emergency ICE	Benzene	71432	1.04E-05	1.31E-06	7.26E-02	9.15E-03
S0007	D12 - Emergency ICE	Cadmium	7440439	8.37E-08	1.05E-08	5.85E-04	7.37E-05
S0007	D12 - Emergency ICE	Copper	7440508	2.29E-07	2.88E-08	1.60E-03	2.01E-04
S0007	D12 - Emergency ICE	Cr(VI)	18540299	5.58E-09	7.03E-10	3.90E-05	4.91E-06
S0007	D12 - Emergency ICE	Diesel PM	9901	5.49E-02	6.92E-03	5.60E+00	7.05E-01
S0007	D12 - Emergency ICE	Ethyl Benzene	100414	6.08E-07	7.66E-08	4.25E-03	5.35E-04
S0007	D12 - Emergency ICE	Formaldehyde	50000	9.63E-05	1.21E-05	6.73E-01	8.48E-02
S0007	D12 - Emergency ICE	HCl	7647010	1.04E-05	1.31E-06	7.26E-02	9.15E-03
S0007	D12 - Emergency ICE	Hexane	110543	1.50E-06	1.89E-07	1.05E-02	1.32E-03
S0007	D12 - Emergency ICE	Lead	7439921	4.63E-07	5.83E-08	3.24E-03	4.08E-04
S0007	D12 - Emergency ICE	Manganese	7439965	1.73E-07	2.18E-08	1.21E-03	1.52E-04
S0007	D12 - Emergency ICE	Mercury	7439976	1.12E-07	1.41E-08	7.80E-04	9.82E-05
S0007	D12 - Emergency ICE	Naphthalene	91203	1.10E-06	1.38E-07	7.68E-03	9.68E-04
S0007	D12 - Emergency ICE	NH3	7664417	1.62E-04	2.04E-05	1.13E+00	1.42E-01
S0007	D12 - Emergency ICE	Nickel	7440020	2.18E-07	2.74E-08	1.52E-03	1.92E-04
S0007	D12 - Emergency ICE	PAHs-w/o	1151	2.02E-06	2.54E-07	1.41E-02	1.78E-03
S0007	D12 - Emergency ICE	Selenium	7782492	1.23E-07	1.55E-08	8.58E-04	1.08E-04
S0007	D12 - Emergency ICE	Toluene	108883	5.88E-06	7.41E-07	4.11E-02	5.18E-03
S0007	D12 - Emergency ICE	Xylenes	1330207	2.36E-06	2.98E-07	1.65E-02	2.08E-03
S0028	Unit 8A - NH3 Injection Line	NH3	7664417	7.00E-02	8.82E-03	5.94E+01	7.48E+00
S0029	Unit 8BC - NH3 Injection Line	NH3	7664417	1.80E-01	2.27E-02	3.39E+01	4.27E+00
S0030	Unit 9 - NH3 Injection Line	NH3	7664417	1.62E+00	2.04E-01	9.51E+02	1.20E+02
S0031	D1 - Unit 4 Boiler (LG)	1-3,6-8HxCDD	57653857	6.76E-08	8.52E-09	4.73E-04	5.95E-05
S0031	D1 - Unit 4 Boiler (LG)	1-3,6-8HxCDF	57117449	6.76E-08	8.52E-09	4.73E-04	5.95E-05
S0031	D1 - Unit 4 Boiler (LG)	1-3,7,8PeCDD	40321764	6.76E-08	8.52E-09	4.73E-04	5.95E-05
S0031	D1 - Unit 4 Boiler (LG)	1-3,7,8PeCDF	57117416	6.76E-08	8.52E-09	4.73E-04	5.95E-05
S0031	D1 - Unit 4 Boiler (LG)	1-4,6-8HpCDD	35822469	1.35E-07	1.70E-08	9.42E-04	1.19E-04
S0031	D1 - Unit 4 Boiler (LG)	1-4,6-8HpCDF	67562394	1.35E-07	1.70E-08	9.42E-04	1.19E-04
S0031	D1 - Unit 4 Boiler (LG)	1-8OctaCDD	3268879	1.35E-07	1.70E-08	9.42E-04	1.19E-04
S0031	D1 - Unit 4 Boiler (LG)	1-8OctaCDF	39001020	1.35E-07	1.70E-08	9.42E-04	1.19E-04
S0031	D1 - Unit 4 Boiler (LG)	2,3,7,8-TCDD	1746016	6.76E-08	8.52E-09	4.73E-04	5.95E-05
S0031	D1 - Unit 4 Boiler (LG)	2,3,7,8-TCDF	51207319	6.76E-08	8.52E-09	4.73E-04	5.95E-05
S0031	D1 - Unit 4 Boiler (LG)	Acenaphthene	83329	3.90E-05	4.91E-06	2.72E-01	3.43E-02

GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
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EMISSION RATE BY SUBSTANCE AND SOURCE

Source	Source Name	Compounds	CAS	1-Hour Maximum (lbs/hr)	1-Hour Maximum (g/s)	Annual Average (lbs/yr)	Annual Average (g/s)
S0031	D1 - Unit 4 Boiler (LG)	Acenaphthylene	208968	3.90E-05	4.91E-06	2.72E-01	3.43E-02
S0031	D1 - Unit 4 Boiler (LG)	Anthracene	120127	3.90E-05	4.91E-06	2.72E-01	3.43E-02
S0031	D1 - Unit 4 Boiler (LG)	Arsenic	7440382	3.66E-04	4.62E-05	2.56E+00	3.23E-01
S0031	D1 - Unit 4 Boiler (LG)	B[a]anthracene	56553	3.90E-05	4.91E-06	2.72E-01	3.43E-02
S0031	D1 - Unit 4 Boiler (LG)	B[a]P	50328	3.90E-05	4.91E-06	2.72E-01	3.43E-02
S0031	D1 - Unit 4 Boiler (LG)	B[b]fluoranthen	205992	3.90E-05	4.91E-06	2.72E-01	3.43E-02
S0031	D1 - Unit 4 Boiler (LG)	B[g,h,i]perylen	191242	3.90E-05	4.91E-06	2.72E-01	3.43E-02
S0031	D1 - Unit 4 Boiler (LG)	B[k]fluoranthen	207089	3.90E-05	4.91E-06	2.72E-01	3.43E-02
S0031	D1 - Unit 4 Boiler (LG)	Beryllium	7440417	1.02E-04	1.29E-05	7.15E-01	9.01E-02
S0031	D1 - Unit 4 Boiler (LG)	Cadmium	7440439	6.23E-04	7.85E-05	4.35E+00	5.49E-01
S0031	D1 - Unit 4 Boiler (LG)	Chrysene	218019	3.90E-05	4.91E-06	2.72E-01	3.43E-02
S0031	D1 - Unit 4 Boiler (LG)	Copper	7440508	1.03E-03	1.30E-04	7.21E+00	9.09E-01
S0031	D1 - Unit 4 Boiler (LG)	Cr(VI)	18540299	6.64E-05	8.37E-06	4.64E-01	5.85E-02
S0031	D1 - Unit 4 Boiler (LG)	D[a,h]anthracen	53703	3.90E-05	4.91E-06	2.72E-01	3.43E-02
S0031	D1 - Unit 4 Boiler (LG)	Fluoranthene	206440	3.90E-05	4.91E-06	2.72E-01	3.43E-02
S0031	D1 - Unit 4 Boiler (LG)	Fluorene	86737	3.90E-05	4.91E-06	2.72E-01	3.43E-02
S0031	D1 - Unit 4 Boiler (LG)	Formaldehyde	50000	1.25E-02	1.57E-03	8.71E+01	1.10E+01
S0031	D1 - Unit 4 Boiler (LG)	In[1,2,3-cd]pyr	193395	3.90E-05	4.91E-06	2.72E-01	3.43E-02
S0031	D1 - Unit 4 Boiler (LG)	Lead	7439921	6.37E-04	8.03E-05	4.45E+00	5.61E-01
S0031	D1 - Unit 4 Boiler (LG)	Manganese	7439965	3.52E-02	4.44E-03	2.46E+02	3.10E+01
S0031	D1 - Unit 4 Boiler (LG)	Mercury	7439976	7.31E-06	9.21E-07	5.11E-02	6.44E-03
S0031	D1 - Unit 4 Boiler (LG)	Naphthalene	91203	2.41E-02	3.03E-03	1.68E+02	2.12E+01
S0031	D1 - Unit 4 Boiler (LG)	NH3	7664417	2.19E-01	2.75E-02	1.53E+03	1.92E+02
S0031	D1 - Unit 4 Boiler (LG)	Nickel	7440020	1.07E-02	1.35E-03	7.47E+01	9.42E+00
S0031	D1 - Unit 4 Boiler (LG)	Phenanthrene	85018	3.90E-05	4.91E-06	2.72E-01	3.43E-02
S0031	D1 - Unit 4 Boiler (LG)	Pyrene	129000	3.90E-05	4.91E-06	2.72E-01	3.43E-02
S0031	D1 - Unit 4 Boiler (LG)	Selenium	7782492	4.72E-05	5.95E-06	3.30E-01	4.16E-02
S0032	D2 - Unit 3 Boiler (LG)	1-3,6-8HxCDD	57653857	3.35E-08	4.23E-09	2.34E-04	2.95E-05
S0032	D2 - Unit 3 Boiler (LG)	1-3,6-8HxCDF	57117449	3.35E-08	4.23E-09	2.34E-04	2.95E-05
S0032	D2 - Unit 3 Boiler (LG)	1-3,7,8PeCDD	40321764	3.35E-08	4.23E-09	2.34E-04	2.95E-05
S0032	D2 - Unit 3 Boiler (LG)	1-3,7,8PeCDF	57117416	3.35E-08	4.23E-09	2.34E-04	2.95E-05
S0032	D2 - Unit 3 Boiler (LG)	1-4,6-8HpCDD	35822469	6.69E-08	8.43E-09	4.68E-04	5.89E-05
S0032	D2 - Unit 3 Boiler (LG)	1-4,6-8HpCDF	67562394	6.69E-08	8.43E-09	4.68E-04	5.89E-05
S0032	D2 - Unit 3 Boiler (LG)	1-8OctaCDD	3268879	6.69E-08	8.43E-09	4.68E-04	5.89E-05
S0032	D2 - Unit 3 Boiler (LG)	1-8OctaCDF	39001020	6.69E-08	8.43E-09	4.68E-04	5.89E-05
S0032	D2 - Unit 3 Boiler (LG)	2,3,7,8-TCDD	1746016	3.35E-08	4.23E-09	2.34E-04	2.95E-05
S0032	D2 - Unit 3 Boiler (LG)	2,3,7,8-TCDF	51207319	3.35E-08	4.23E-09	2.34E-04	2.95E-05
S0032	D2 - Unit 3 Boiler (LG)	Acenaphthene	83329	1.93E-05	2.44E-06	1.35E-01	1.70E-02
S0032	D2 - Unit 3 Boiler (LG)	Acenaphthylene	208968	1.93E-05	2.44E-06	1.35E-01	1.70E-02
S0032	D2 - Unit 3 Boiler (LG)	Anthracene	120127	1.93E-05	2.44E-06	1.35E-01	1.70E-02
S0032	D2 - Unit 3 Boiler (LG)	Arsenic	7440382	1.82E-04	2.29E-05	1.27E+00	1.60E-01
S0032	D2 - Unit 3 Boiler (LG)	B[a]anthracene	56553	1.93E-05	2.44E-06	1.35E-01	1.70E-02
S0032	D2 - Unit 3 Boiler (LG)	B[a]P	50328	1.93E-05	2.44E-06	1.35E-01	1.70E-02
S0032	D2 - Unit 3 Boiler (LG)	B[b]fluoranthen	205992	1.93E-05	2.44E-06	1.35E-01	1.70E-02
S0032	D2 - Unit 3 Boiler (LG)	B[g,h,i]perylen	191242	1.93E-05	2.44E-06	1.35E-01	1.70E-02
S0032	D2 - Unit 3 Boiler (LG)	B[k]fluoranthen	207089	1.93E-05	2.44E-06	1.35E-01	1.70E-02
S0032	D2 - Unit 3 Boiler (LG)	Beryllium	7440417	5.07E-05	6.39E-06	3.55E-01	4.47E-02
S0032	D2 - Unit 3 Boiler (LG)	Cadmium	7440439	3.09E-04	3.89E-05	2.16E+00	2.72E-01
S0032	D2 - Unit 3 Boiler (LG)	Chrysene	218019	1.93E-05	2.44E-06	1.35E-01	1.70E-02
S0032	D2 - Unit 3 Boiler (LG)	Copper	7440508	5.12E-04	6.45E-05	3.58E+00	4.51E-01
S0032	D2 - Unit 3 Boiler (LG)	Cr(VI)	18540299	3.29E-05	4.15E-06	2.30E-01	2.90E-02
S0032	D2 - Unit 3 Boiler (LG)	D[a,h]anthracen	53703	1.93E-05	2.44E-06	1.35E-01	1.70E-02
S0032	D2 - Unit 3 Boiler (LG)	Fluoranthene	206440	1.93E-05	2.44E-06	1.35E-01	1.70E-02
S0032	D2 - Unit 3 Boiler (LG)	Fluorene	86737	1.93E-05	2.44E-06	1.35E-01	1.70E-02
S0032	D2 - Unit 3 Boiler (LG)	Formaldehyde	50000	6.18E-03	7.79E-04	4.32E+01	5.44E+00
S0032	D2 - Unit 3 Boiler (LG)	In[1,2,3-cd]pyr	193395	1.93E-05	2.44E-06	1.35E-01	1.70E-02
S0032	D2 - Unit 3 Boiler (LG)	Lead	7439921	3.16E-04	3.98E-05	2.21E+00	2.78E-01
S0032	D2 - Unit 3 Boiler (LG)	Manganese	7439965	1.75E-02	2.20E-03	1.22E+02	1.54E+01
S0032	D2 - Unit 3 Boiler (LG)	Mercury	7439976	3.63E-06	4.57E-07	2.53E-02	3.19E-03

GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
800 AIR WAY, GLENDALE, CA 91201

EMISSION RATE BY SUBSTANCE AND SOURCE

Source	Source Name	Compounds	CAS	1-Hour Maximum (lbs/hr)	1-Hour Maximum (g/s)	Annual Average (lbs/yr)	Annual Average (g/s)
S0032	D2 - Unit 3 Boiler (LG)	Naphthalene	91203	1.19E-02	1.51E-03	8.35E+01	1.05E+01
S0032	D2 - Unit 3 Boiler (LG)	NH3	7664417	1.08E-01	1.37E-02	7.58E+02	9.55E+01
S0032	D2 - Unit 3 Boiler (LG)	Nickel	7440020	5.31E-03	6.68E-04	3.71E+01	4.67E+00
S0032	D2 - Unit 3 Boiler (LG)	Phenanthrene	85018	1.93E-05	2.44E-06	1.35E-01	1.70E-02
S0032	D2 - Unit 3 Boiler (LG)	Pyrene	129000	1.93E-05	2.44E-06	1.35E-01	1.70E-02
S0032	D2 - Unit 3 Boiler (LG)	Selenium	7782492	2.34E-05	2.95E-06	1.64E-01	2.06E-02
S0033	D3 - Unit 5 Boiler (LG)	1-3,6-8HxCDD	57653857	1.63E-07	2.05E-08	1.14E-03	1.43E-04
S0033	D3 - Unit 5 Boiler (LG)	1-3,6-8HxCDF	57117449	1.63E-07	2.05E-08	1.14E-03	1.43E-04
S0033	D3 - Unit 5 Boiler (LG)	1-3,7,8PeCDD	40321764	1.63E-07	2.05E-08	1.14E-03	1.43E-04
S0033	D3 - Unit 5 Boiler (LG)	1-3,7,8PeCDF	57117416	1.63E-07	2.05E-08	1.14E-03	1.43E-04
S0033	D3 - Unit 5 Boiler (LG)	1-4,6-8HpCDD	35822469	3.25E-07	4.09E-08	2.27E-03	2.86E-04
S0033	D3 - Unit 5 Boiler (LG)	1-4,6-8HpCDF	67562394	3.25E-07	4.09E-08	2.27E-03	2.86E-04
S0033	D3 - Unit 5 Boiler (LG)	1-8OctaCDD	3268879	3.25E-07	4.09E-08	2.27E-03	2.86E-04
S0033	D3 - Unit 5 Boiler (LG)	1-8OctaCDF	39001020	3.25E-07	4.09E-08	2.27E-03	2.86E-04
S0033	D3 - Unit 5 Boiler (LG)	2,3,7,8-TCDD	1746016	1.63E-07	2.05E-08	1.14E-03	1.43E-04
S0033	D3 - Unit 5 Boiler (LG)	2,3,7,8-TCDF	51207319	1.63E-07	2.05E-08	1.14E-03	1.43E-04
S0033	D3 - Unit 5 Boiler (LG)	Acenaphthene	83329	9.38E-05	1.18E-05	6.56E-01	8.26E-02
S0033	D3 - Unit 5 Boiler (LG)	Acenaphthylene	208968	9.38E-05	1.18E-05	6.56E-01	8.26E-02
S0033	D3 - Unit 5 Boiler (LG)	Anthracene	120127	9.38E-05	1.18E-05	6.56E-01	8.26E-02
S0033	D3 - Unit 5 Boiler (LG)	Arsenic	7440382	8.82E-04	1.11E-04	6.16E+00	7.77E-01
S0033	D3 - Unit 5 Boiler (LG)	B[a]anthracene	56553	9.38E-05	1.18E-05	6.56E-01	8.26E-02
S0033	D3 - Unit 5 Boiler (LG)	B[a]P	50328	9.38E-05	1.18E-05	6.56E-01	8.26E-02
S0033	D3 - Unit 5 Boiler (LG)	B[b]fluoranthen	205992	9.38E-05	1.18E-05	6.56E-01	8.26E-02
S0033	D3 - Unit 5 Boiler (LG)	B[g,h,i]perylen	191242	9.38E-05	1.18E-05	6.56E-01	8.26E-02
S0033	D3 - Unit 5 Boiler (LG)	B[k]fluoranthen	207089	9.38E-05	1.18E-05	6.56E-01	8.26E-02
S0033	D3 - Unit 5 Boiler (LG)	Beryllium	7440417	2.46E-04	3.10E-05	1.72E+00	2.17E-01
S0033	D3 - Unit 5 Boiler (LG)	Cadmium	7440439	1.50E-03	1.89E-04	1.05E+01	1.32E+00
S0033	D3 - Unit 5 Boiler (LG)	Chrysene	218019	9.38E-05	1.18E-05	6.56E-01	8.26E-02
S0033	D3 - Unit 5 Boiler (LG)	Copper	7440508	2.49E-03	3.13E-04	1.74E+01	2.19E+00
S0033	D3 - Unit 5 Boiler (LG)	Cr(VI)	18540299	1.60E-04	2.01E-05	1.12E+00	1.41E-01
S0033	D3 - Unit 5 Boiler (LG)	D[a,h]anthracen	53703	9.38E-05	1.18E-05	6.56E-01	8.26E-02
S0033	D3 - Unit 5 Boiler (LG)	Fluoranthene	206440	9.38E-05	1.18E-05	6.56E-01	8.26E-02
S0033	D3 - Unit 5 Boiler (LG)	Fluorene	86737	9.38E-05	1.18E-05	6.56E-01	8.26E-02
S0033	D3 - Unit 5 Boiler (LG)	Formaldehyde	50000	3.00E-02	3.78E-03	2.10E+02	2.64E+01
S0033	D3 - Unit 5 Boiler (LG)	In[1,2,3-cd]pyr	193395	9.38E-05	1.18E-05	6.56E-01	8.26E-02
S0033	D3 - Unit 5 Boiler (LG)	Lead	7439921	1.53E-03	1.93E-04	1.07E+01	1.35E+00
S0033	D3 - Unit 5 Boiler (LG)	Manganese	7439965	8.48E-02	1.07E-02	5.93E+02	7.47E+01
S0033	D3 - Unit 5 Boiler (LG)	Mercury	7439976	1.76E-05	2.22E-06	1.23E-01	1.55E-02
S0033	D3 - Unit 5 Boiler (LG)	Naphthalene	91203	5.80E-02	7.31E-03	4.05E+02	5.11E+01
S0033	D3 - Unit 5 Boiler (LG)	NH3	7664417	5.26E-01	6.63E-02	3.68E+03	4.63E+02
S0033	D3 - Unit 5 Boiler (LG)	Nickel	7440020	2.57E-02	3.24E-03	1.80E+02	2.27E+01
S0033	D3 - Unit 5 Boiler (LG)	Phenanthrene	85018	9.38E-05	1.18E-05	6.56E-01	8.26E-02
S0033	D3 - Unit 5 Boiler (LG)	Pyrene	129000	9.38E-05	1.18E-05	6.56E-01	8.26E-02
S0033	D3 - Unit 5 Boiler (LG)	Selenium	7782492	1.14E-04	1.43E-05	7.95E-01	1.00E-01

EMISSION RATE BY SUBSTANCE

GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
800 AIR WAY, GLENDALE, CA 91201

EMISSION RATE BY SUBSTANCE

Compounds	CAS	1-Hour Maximum (lbs/hr)	1-Hour Maximum (g/s)	Annual Average (lbs/yr)	Annual Average (g/s)
1,3-Butadiene	106990	4.34E-05	5.47E-06	3.04E-01	3.82E-02
1-3,6-8HxCDD	57653857	2.64E-07	3.33E-08	1.84E-03	2.32E-04
1-3,6-8HxCDF	57117449	2.64E-07	3.33E-08	1.84E-03	2.32E-04
1-3,7,8PeCDD	40321764	2.64E-07	3.33E-08	1.84E-03	2.32E-04
1-3,7,8PeCDF	57117416	2.64E-07	3.33E-08	1.84E-03	2.32E-04
1-4,6-8HpCDD	35822469	5.26E-07	6.63E-08	3.68E-03	4.63E-04
1-4,6-8HpCDF	67562394	5.26E-07	6.63E-08	3.68E-03	4.63E-04
1-8OctaCDD	3268879	5.26E-07	6.63E-08	3.68E-03	4.63E-04
1-8OctaCDF	39001020	5.26E-07	6.63E-08	3.68E-03	4.63E-04
2,3,7,8-TCDD	1746016	2.64E-07	3.33E-08	1.84E-03	2.32E-04
2,3,7,8-TCDF	51207319	2.64E-07	3.33E-08	1.84E-03	2.32E-04
Acenaphthene	83329	1.52E-04	1.92E-05	1.06E+00	1.34E-01
Acenaphthylene	208968	1.52E-04	1.92E-05	1.06E+00	1.34E-01
Acetaldehyde	75070	3.08E-03	3.87E-04	2.15E+01	2.71E+00
Acrolein	107028	5.76E-04	7.26E-05	4.02E+00	5.07E-01
Anthracene	120127	1.52E-04	1.92E-05	1.06E+00	1.34E-01
Arsenic	7440382	1.43E-03	1.80E-04	1.00E+01	1.26E+00
B[a]anthracene	56553	1.52E-04	1.92E-05	1.06E+00	1.34E-01
B[a]P	50328	1.52E-04	1.92E-05	1.06E+00	1.34E-01
B[b]fluoranthen	205992	1.52E-04	1.92E-05	1.06E+00	1.34E-01
B[g,h,i]perylen	191242	1.52E-04	1.92E-05	1.06E+00	1.34E-01
B[k]fluoranthen	207089	1.52E-04	1.92E-05	1.06E+00	1.34E-01
Benzene	71432	1.11E-03	1.40E-04	7.76E+00	9.78E-01
Beryllium	7440417	3.99E-04	5.03E-05	2.79E+00	3.52E-01
Cadmium	7440439	2.43E-03	3.06E-04	1.70E+01	2.14E+00
Chrysene	218019	1.52E-04	1.92E-05	1.06E+00	1.34E-01
Copper	7440508	4.03E-03	5.08E-04	2.82E+01	3.55E+00
Cr(VI)	18540299	2.59E-04	3.27E-05	1.81E+00	2.28E-01
D[a,h]anthracen	53703	1.52E-04	1.92E-05	1.06E+00	1.34E-01
Diesel PM	9901	5.49E-02	6.92E-03	5.60E+00	7.05E-01
Ethyl Benzene	100414	2.60E-03	3.27E-04	1.81E+01	2.29E+00
Fluoranthene	206440	1.52E-04	1.92E-05	1.06E+00	1.34E-01
Fluorene	86737	1.52E-04	1.92E-05	1.06E+00	1.34E-01
Formaldehyde	50000	1.01E-01	1.27E-02	7.05E+02	8.88E+01
HCl	7647010	1.04E-05	1.31E-06	7.26E-02	9.15E-03
Hexane	110543	1.77E-04	2.24E-05	1.24E+00	1.56E-01
In[1,2,3-cd]pyr	193395	1.52E-04	1.92E-05	1.06E+00	1.34E-01
Lead	7439921	2.49E-03	3.13E-04	1.74E+01	2.19E+00

GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
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EMISSION RATE BY SUBSTANCE

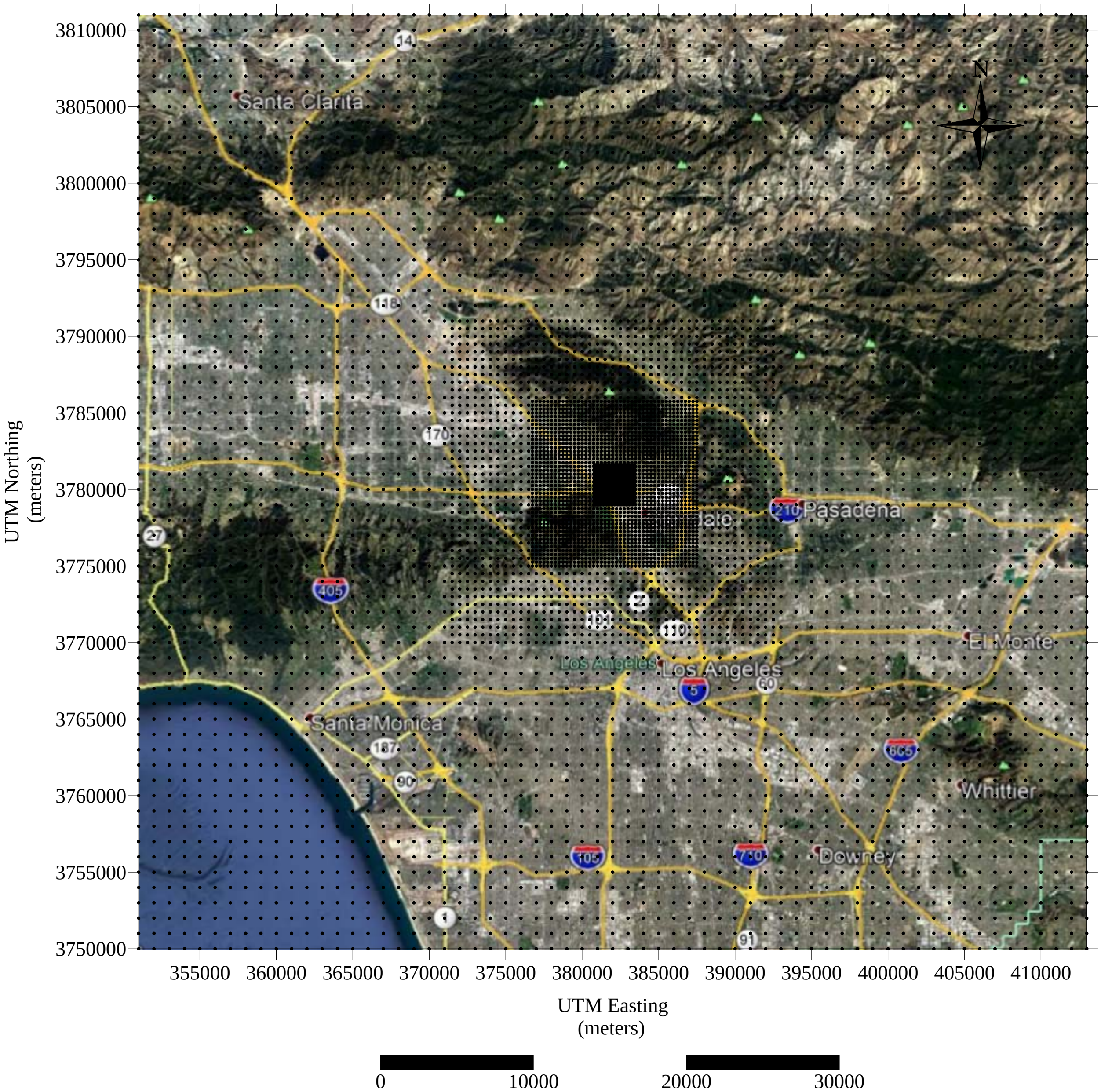
Compounds	CAS	1-Hour Maximum (lbs/hr)	1-Hour Maximum (g/s)	Annual Average (lbs/yr)	Annual Average (g/s)
Manganese	7439965	1.38E-01	1.73E-02	9.62E+02	1.21E+02
Mercury	7439976	2.86E-05	3.61E-06	2.00E-01	2.52E-02
Naphthalene	91203	9.42E-02	1.19E-02	6.58E+02	8.29E+01
NH3	7664417	6.44E+00	8.12E-01	3.30E+04	4.16E+03
Nickel	7440020	4.17E-02	5.26E-03	2.92E+02	3.68E+01
PAHs-w/o	1151	8.10E-05	1.02E-05	5.66E-01	7.13E-02
Phenanthrene	85018	1.52E-04	1.92E-05	1.06E+00	1.34E-01
Propylene Oxide	75569	2.11E-03	2.66E-04	1.48E+01	1.86E+00
Pyrene	129000	1.52E-04	1.92E-05	1.06E+00	1.34E-01
Selenium	7782492	1.85E-04	2.33E-05	1.29E+00	1.62E-01
Toluene	108883	1.05E-02	1.33E-03	7.37E+01	9.29E+00
Xylenes	1330207	5.44E-03	6.86E-04	3.80E+01	4.79E+00

APPENDIX C

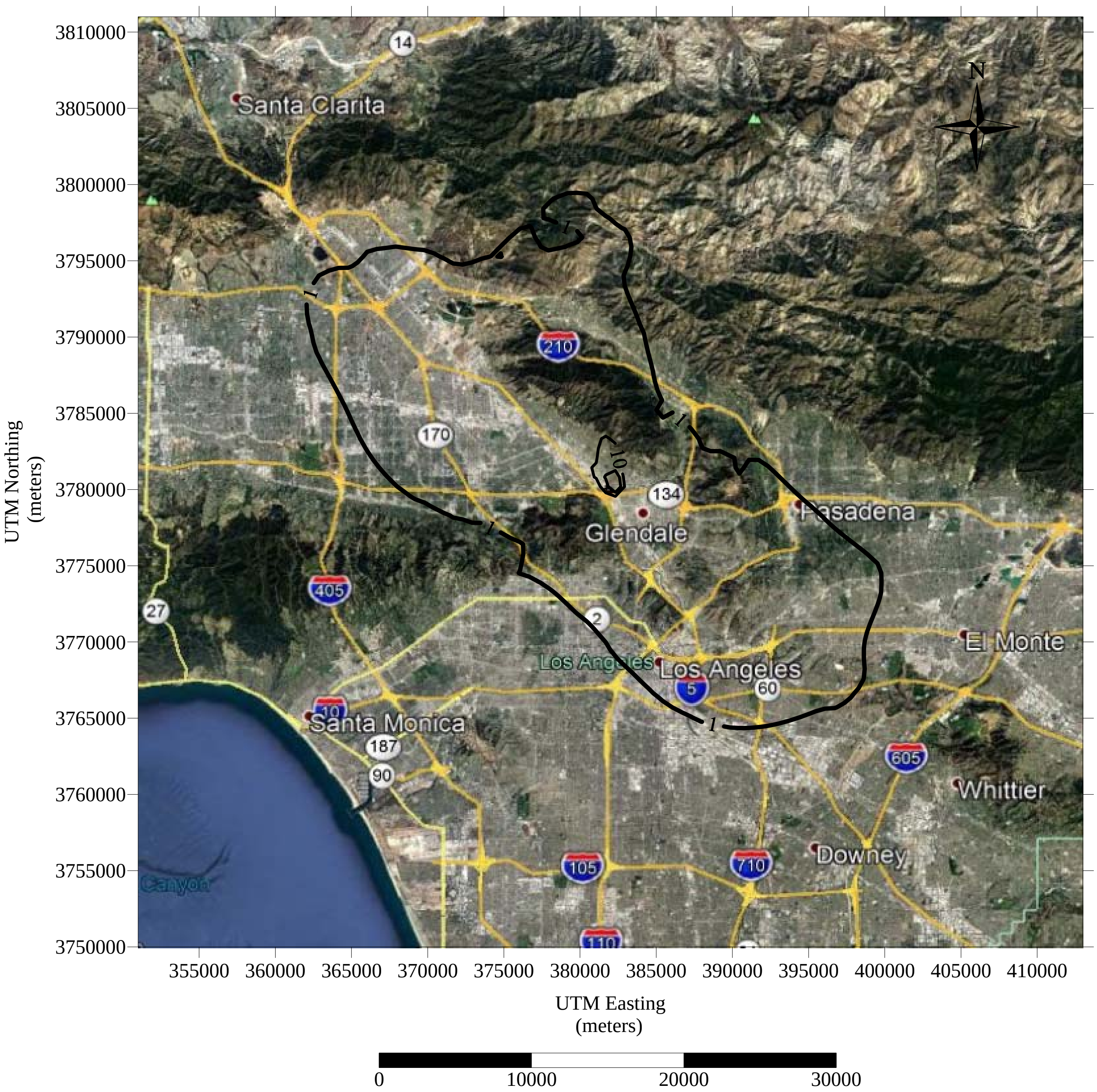
HRA RESULTS

MAPS SHOWING HRA RESULTS
AT PMI, MEIR, AND MEIW

RECEPTOR GRID AREA MAP

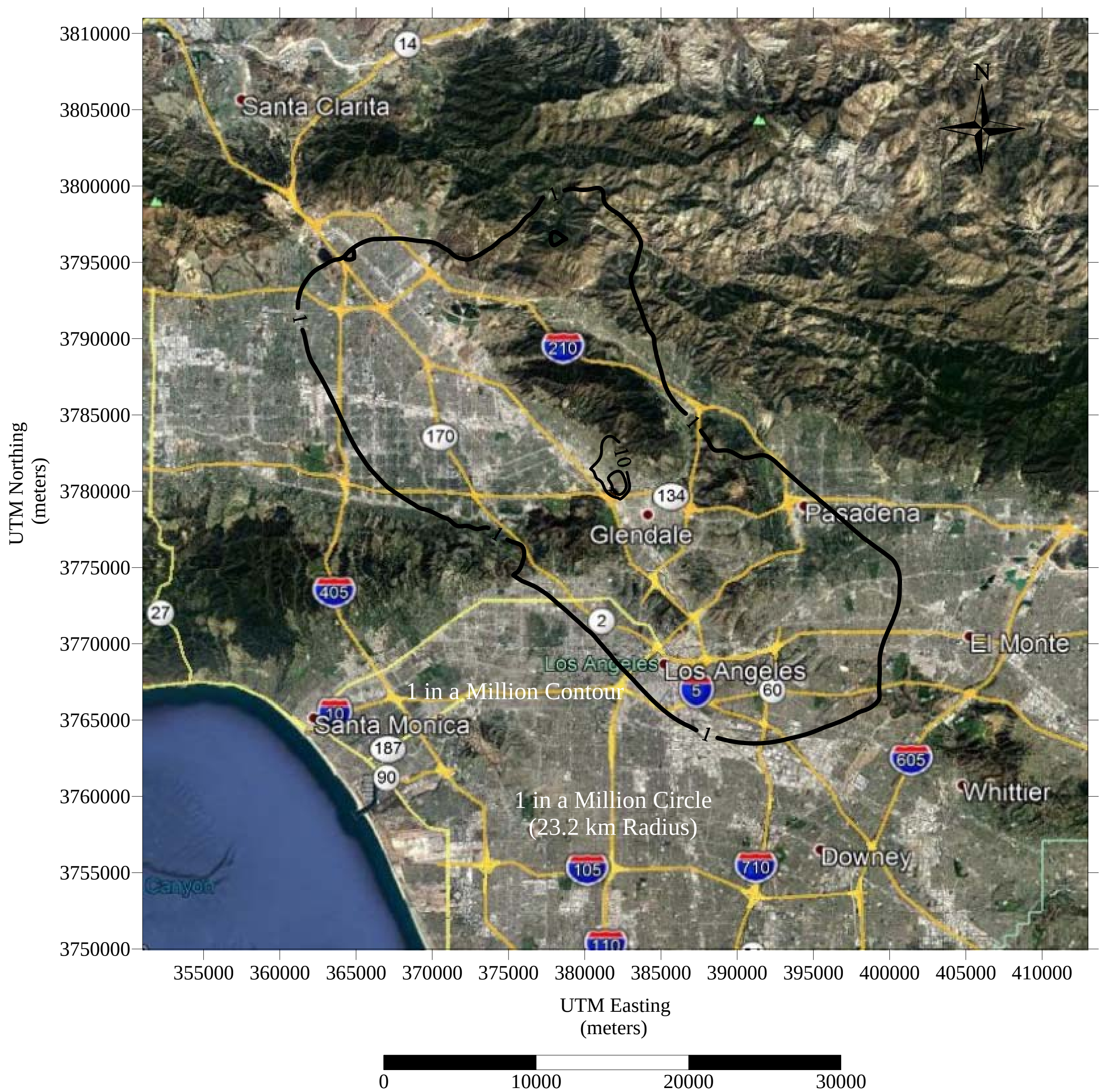


MAP SHOWING ZONE OF IMPACT OF
CANCER RISK OF 1 IN 1 MILLION OR GREATER (30 YEAR EXPOSURE)
(THE CANCER CONTOUR RISK VALUES SHOWN ON THE MAP IS BASED ON 1 IN 1 MILLION)



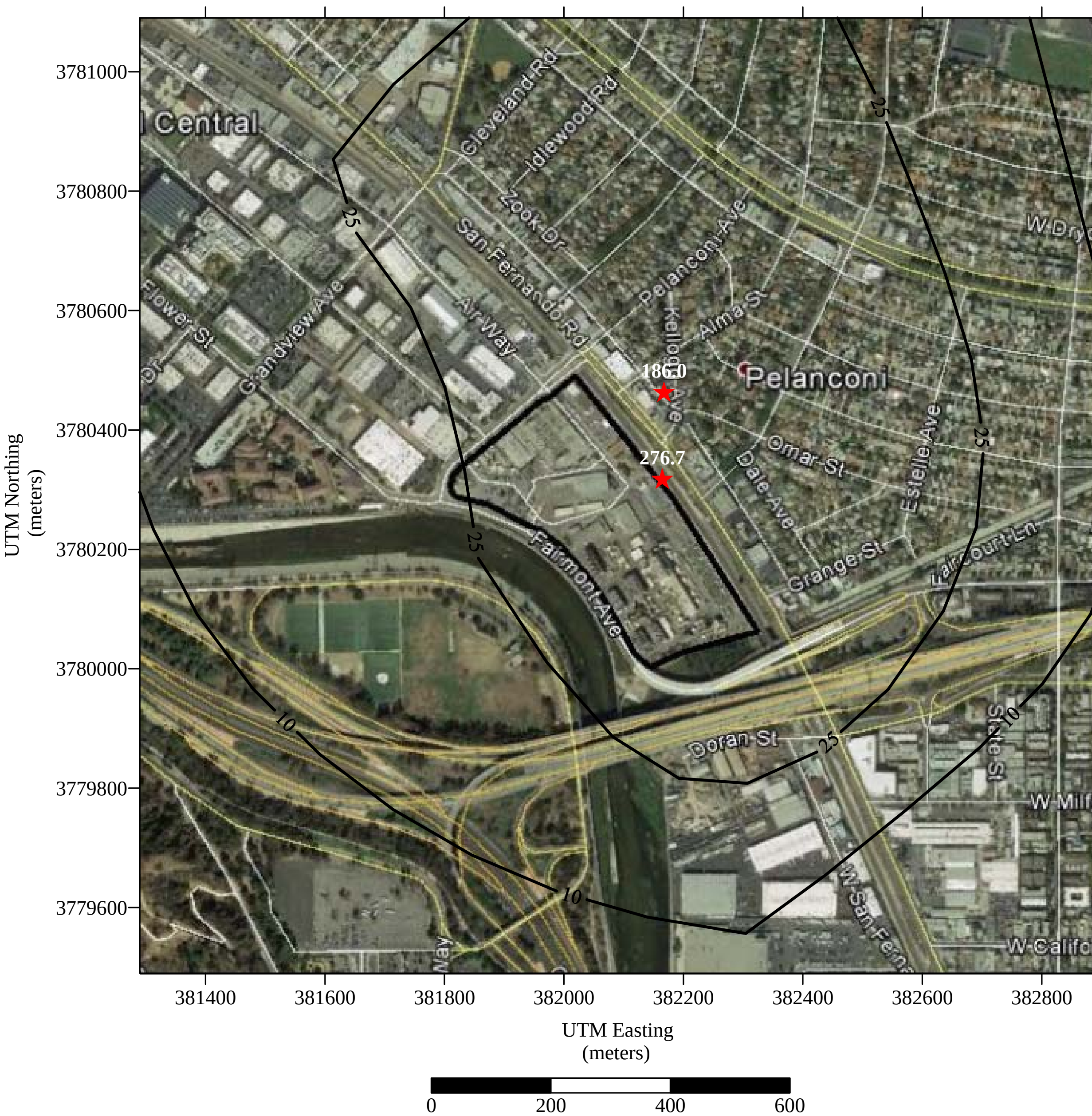
MAP SHOWING ZONE OF IMPACT OF
CANCER RISK OF 1 IN 1 MILLION OR GREATER (70 YEAR EXPOSURE)

(THE CANCER CONTOUR RISK VALUES SHOWN ON THE MAP IS BASED ON 1 IN 1 MILLION)



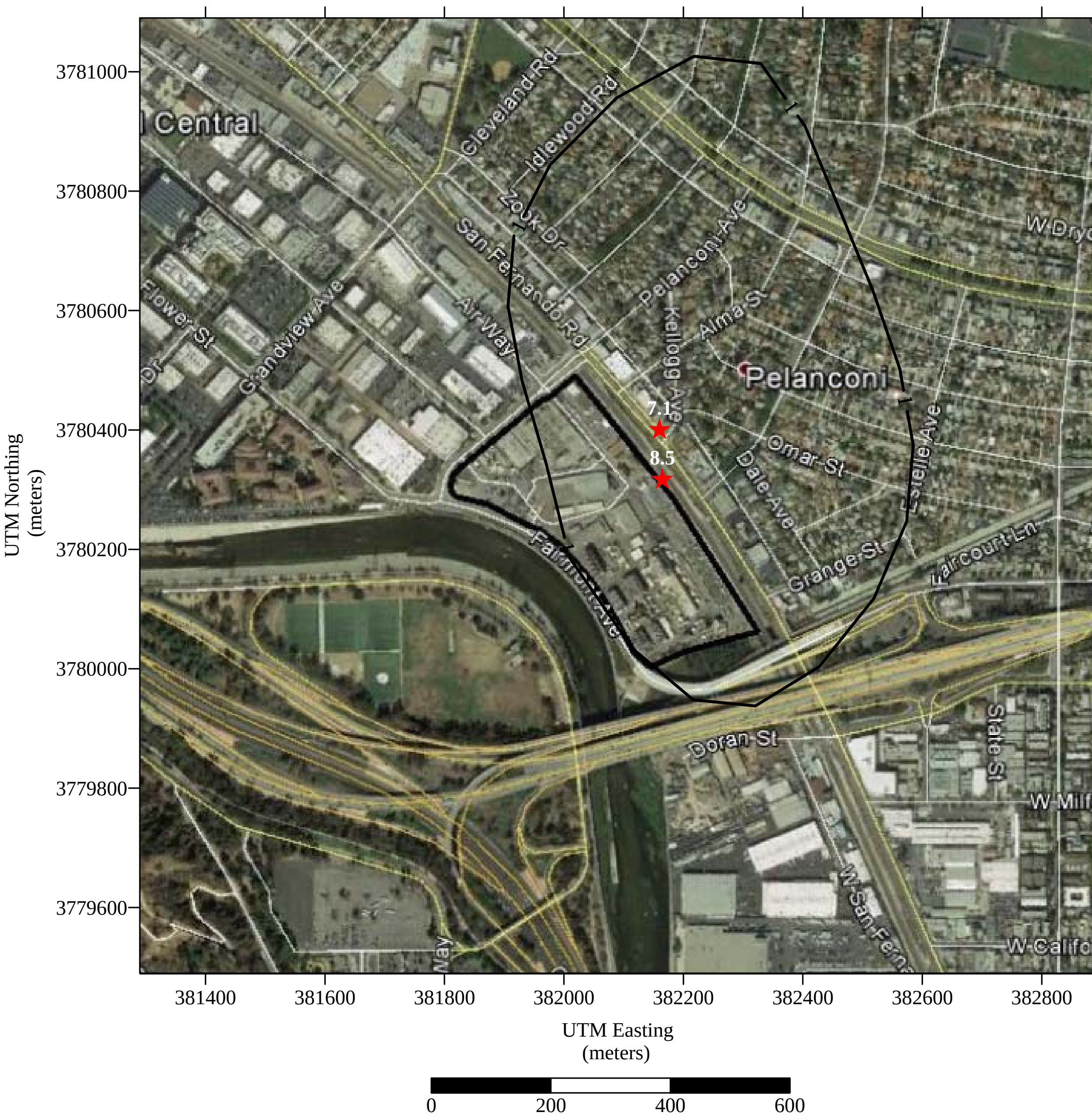
MAP OF PMI AND MEIR CANCER RISK - 30 YEAR EXPOSURE

(THE CANCER RISK VALUES SHOWN ON THE MAP IS BASED ON 1 IN 1 MILLION)



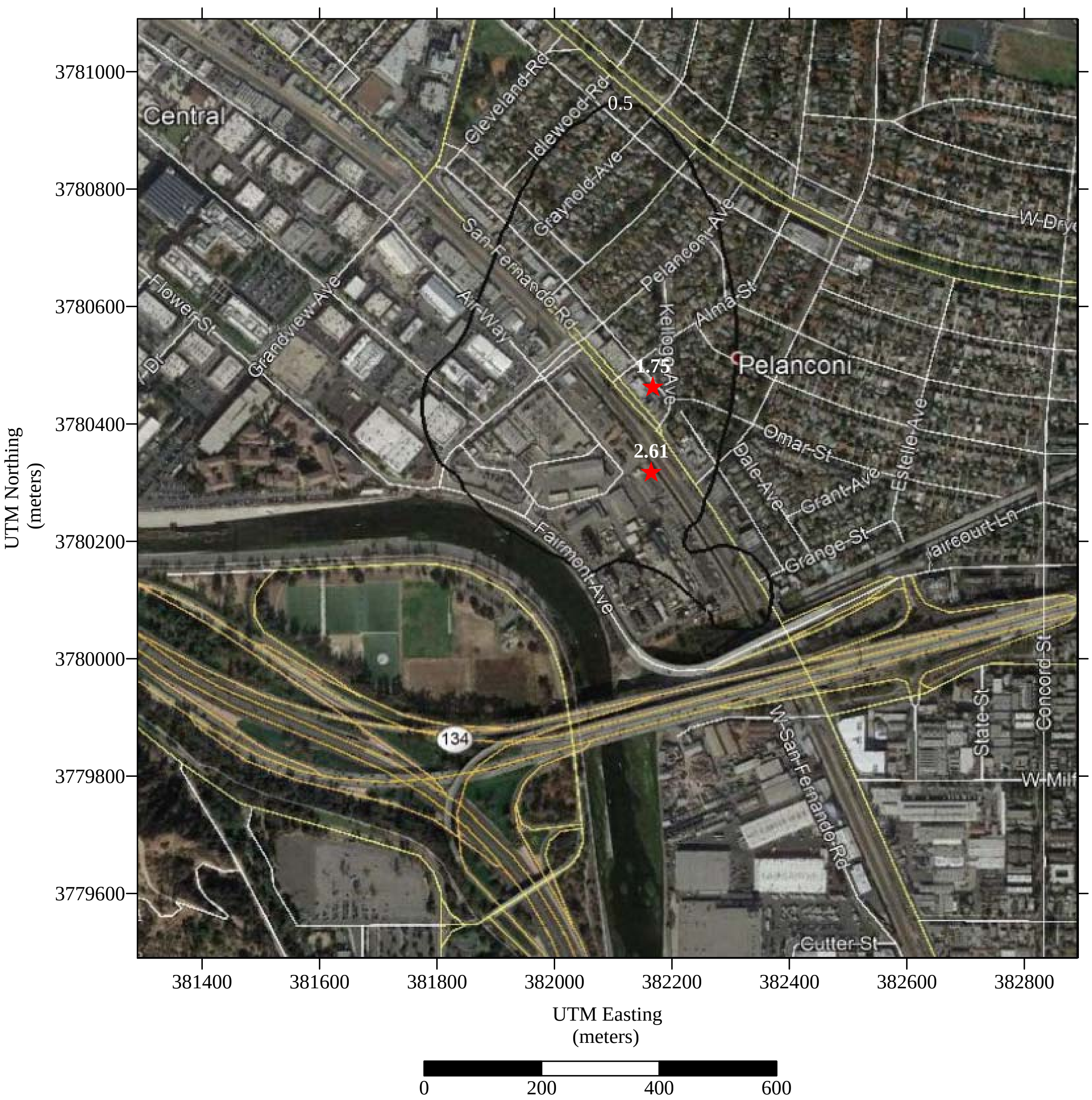
MAP OF PMI AND MEIW CANCER RISK - 25 YEAR EXPOSURE

(THE CANCER RISK VALUES SHOWN ON THE MAP IS BASED ON 1 IN 1 MILLION)



MAP OF PMI AND MEIR CHRONIC HAZARD INDEX

(THE CHRONIC HAZARD INDEX VALUES SHOWN ON THE MAP)

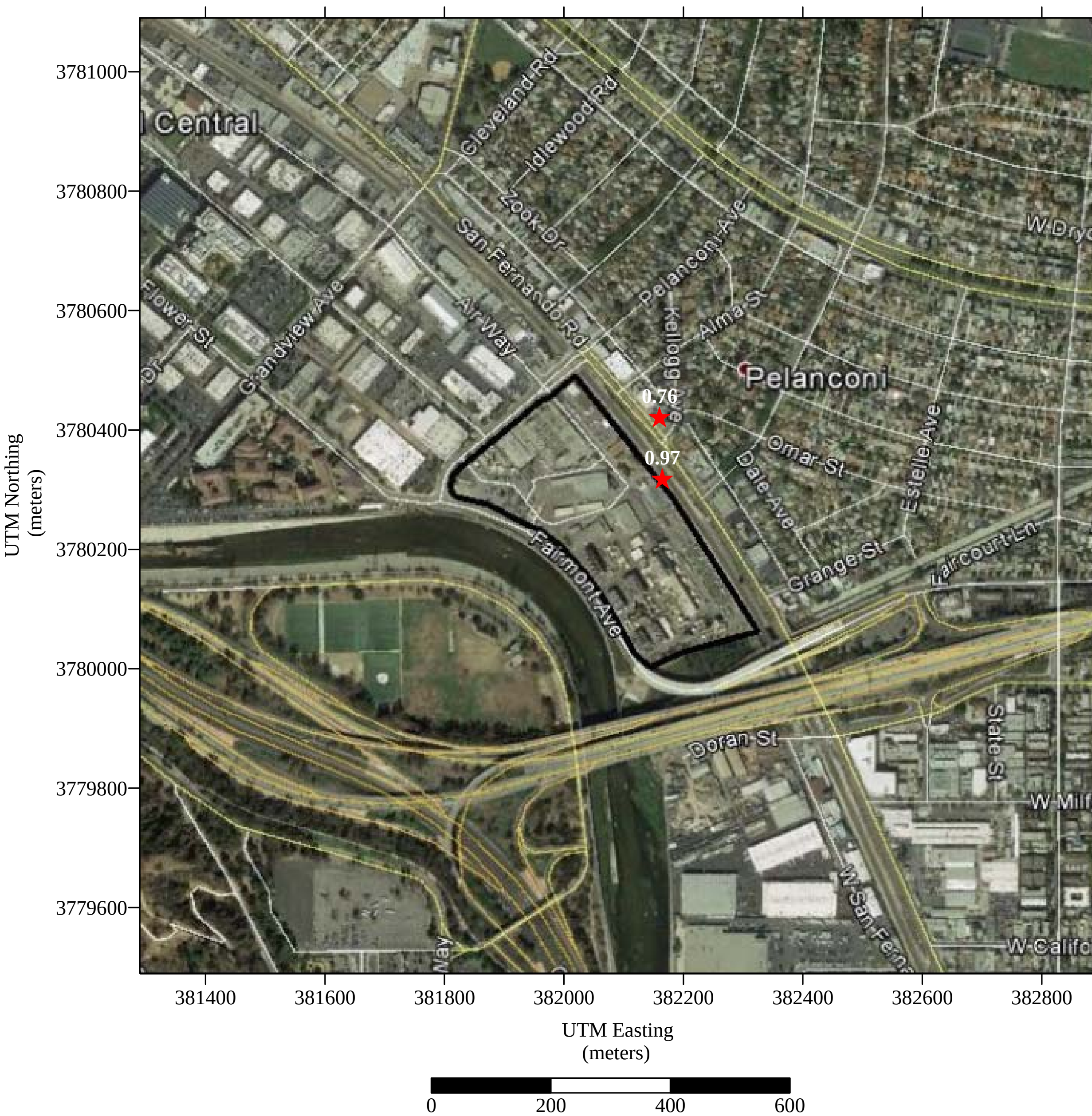


MAP OF PMI AND MEIR 8-HOUR CHRONIC HAZARD INDEX

(THE CHRONIC 8-HOUR HAZARD INDEX VALUES SHOWN ON THE MAP)

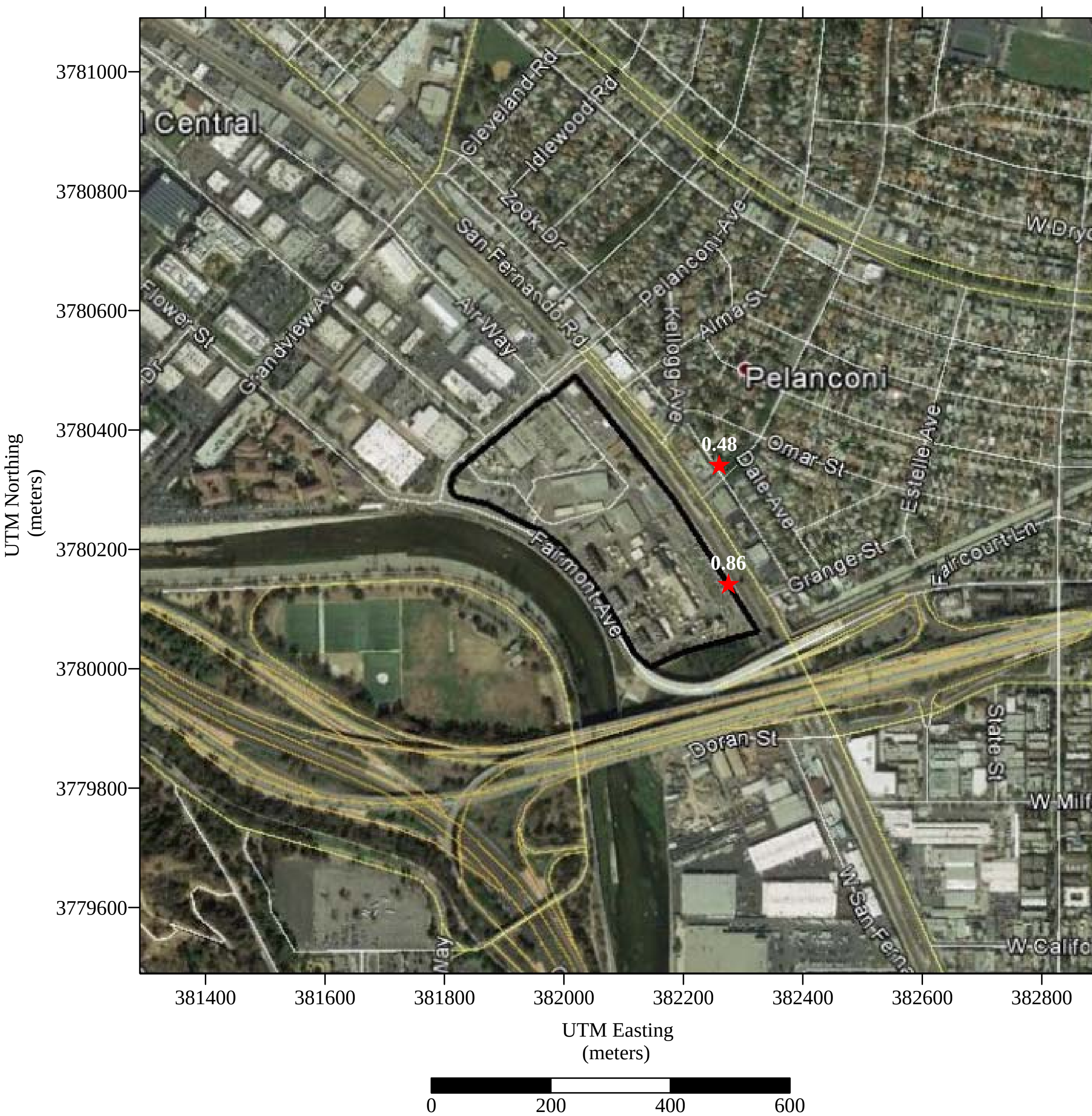
MAP OF PMI AND MEIW CHRONIC HAZARD INDEX

(THE CHRONIC HAZARD INDEX VALUES SHOWN ON THE MAP)



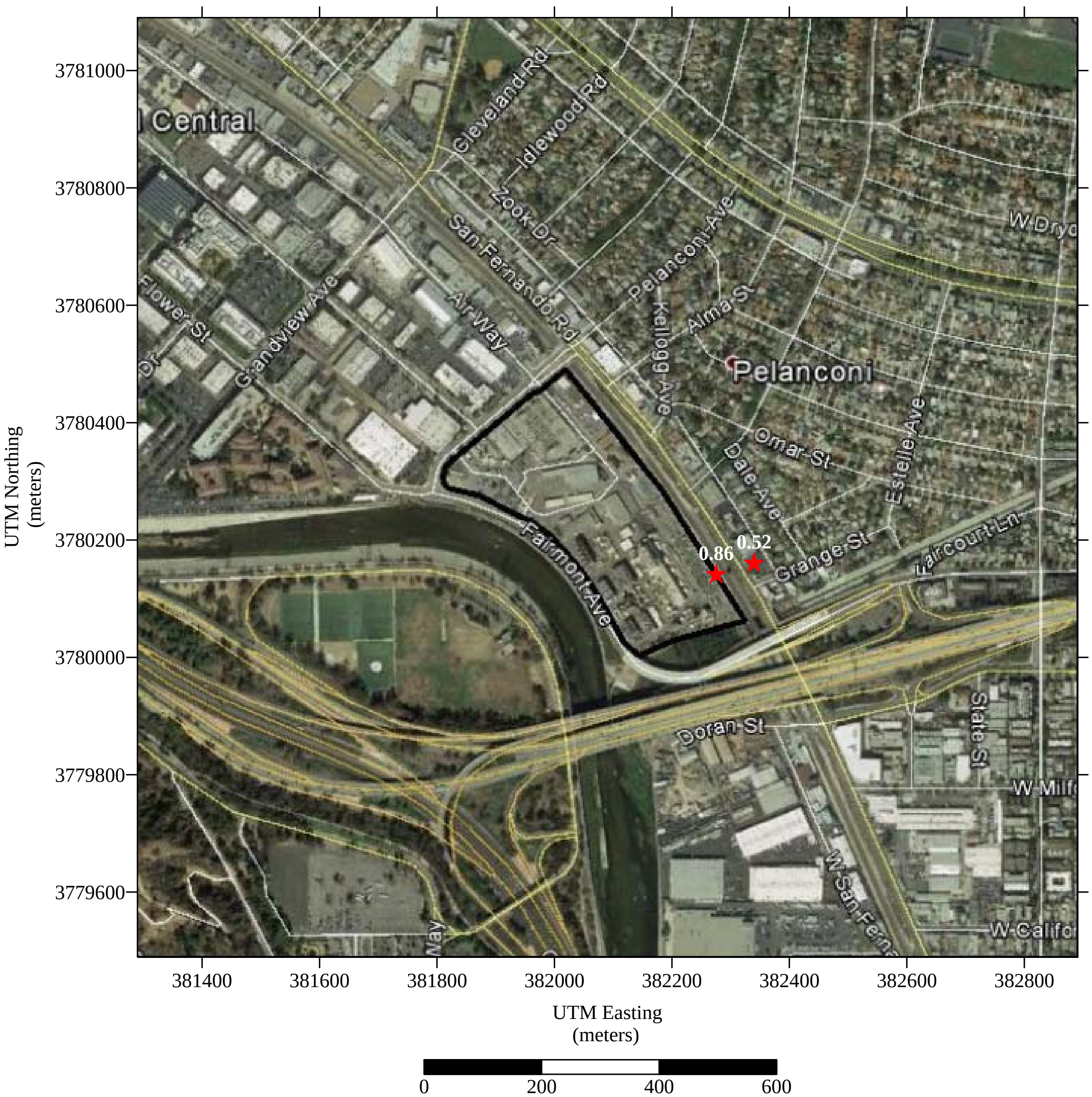
MAP OF PMI AND MEIR ACUTE HAZARD INDEX

(THE ACUTE HAZARD INDEX VALUES SHOWN ON THE MAP)



MAP OF PMI AND MEIW ACUTE HAZARD INDEX

(THE ACUTE HAZARD INDEX VALUES SHOWN ON THE MAP)



HRA RESULTS AT PMI, MEIR, AND MEIW
BY EMISSION SOURCE

GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
800 AIR WAY, GLENDALE, CA 91201

CANCER RISK BY EMISSION SOURCES

SOURCE ID NO.	SOURCE DESCRIPTION	PMI (REC #84)	MEIR (REC #27)	MEIW (REC #1363)
S0001	D1-Unit 4 Boiler (NG)	5.51E-09	6.26E-09	1.66E-10
S0002	D2-Unit 3 Boiler (NG)	2.70E-08	1.28E-08	4.56E-10
S0003	D3-Unit 5 Boiler (NG)	6.88E-08	5.78E-08	1.73E-09
S0004	D4 – Unit 8A (NG)	3.96E-08	4.71E-08	1.64E-09
S0005	D5, D6 – Unit 8BC (NG)	7.62E-09	1.01E-08	3.39E-10
S0006	D58 – Unit 9 (NG)	1.80E-08	1.94E-08	6.57E-10
S0007	D12-Emergency ICE	1.16E-06	7.69E-07	8.37E-08
S0028	Unit 8A-NH3 Injection Line	0.00E+00	0.00E+00	0.00E+00
S0029	Unit 8BC-NH3 Injection Line	0.00E+00	0.00E+00	0.00E+00
S0030	Unit 9-NH3 Injection Line	0.00E+00	0.00E+00	0.00E+00
S0031	D1-Unit 4 Boiler (LG)	7.16E-05	5.01E-05	1.87E-06
S0032	D2-Unit 3 Boiler (LG)	1.03E-04	4.64E-05	1.99E-06
S0033	D3-Unit 5 Boiler (LG)	1.00E-04	8.86E-05	3.10E-06

GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
800 AIR WAY, GLENDALE, CA 91201

NON-CANCER CHRONIC RISK BY EMISSION SOURCES

SOURCE ID NO.	SOURCE DESCRIPTION	PMI (REC #84) (RESPIRATORY SYSTEM)	MEIR (REC #27) (RESPIRATORY SYSTEM)	MEIW (REC #1403) (RESPIRATORY SYSTEM)
S0001	D1-Unit 4 Boiler (NG)	8.10E-05	9.21E-05	9.50E-05
S0002	D2-Unit 3 Boiler (NG)	3.98E-04	1.89E-04	2.36E-04
S0003	D3-Unit 5 Boiler (NG)	1.01E-03	8.50E-04	9.52E-04
S0004	D4 – Unit 8A (NG)	1.11E-04	1.32E-04	1.35E-04
S0005	D5, D6 – Unit 8BC (NG)	2.14E-05	2.83E-05	2.84E-05
S0006	D58 – Unit 9 (NG)	5.04E-05	5.43E-05	5.39E-05
S0007	D12-Emergency ICE	1.14E-03	7.52E-04	5.27E-04
S0028	Unit 8A-NH3 Injection Line	7.57E-07	9.00E-07	9.22E-07
S0029	Unit 8BC-NH3 Injection Line	1.86E-07	2.46E-07	2.47E-07
S0030	Unit 9-NH3 Injection Line	7.45E-06	8.02E-06	7.96E-06
S0031	D1-Unit 4 Boiler (LG)	6.78E-01	4.73E-01	2.03E-01
S0032	D2-Unit 3 Boiler (LG)	9.76E-01	4.39E-01	2.06E-01
S0033	D3-Unit 5 Boiler (LG)	9.51E-01	8.38E-01	3.46E-01

GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
800 AIR WAY, GLENDALE, CA 91201

NON-CANCER ACUTE RISK BY EMISSION SOURCES

SOURCE ID NO.	SOURCE DESCRIPTION	PMI (REC #95) (IMMUNE SYSTEM)	MEIR (REC #1261) (IMMUNE SYSTEM)	MEIW (REC #961) (IMMUNE SYSTEM)
S0001	D1-Unit 4 Boiler (NG)	8.34E-04	9.43E-05	3.56E-06
S0002	D2-Unit 3 Boiler (NG)	2.33E-04	2.20E-04	2.18E-06
S0003	D3-Unit 5 Boiler (NG)	1.04E-03	1.32E-03	1.06E-05
S0004	D4 – Unit 8A (NG)	2.29E-04	1.83E-04	4.51E-06
S0005	D5, D6 – Unit 8BC (NG)	4.13E-05	4.16E-05	1.11E-06
S0006	D58 – Unit 9 (NG)	4.18E-05	9.78E-05	1.16E-06
S0007	D12-Emergency ICE	3.10E-05	5.99E-05	1.27E-05
S0028	Unit 8A-NH3 Injection Line	7.12E-06	5.70E-06	0.00E+00
S0029	Unit 8BC-NH3 Injection Line	7.41E-06	7.47E-06	0.00E+00
S0030	Unit 9-NH3 Injection Line	4.08E-05	9.56E-05	0.00E+00
S0031	D1-Unit 4 Boiler (LG)	5.51E-01	1.18E-01	2.20E-01
S0032	D2-Unit 3 Boiler (LG)	1.01E-01	9.43E-02	8.95E-02
S0033	D3-Unit 5 Boiler (LG)	2.07E-01	2.69E-01	2.06E-01

HRA RESULTS AT PMI, MEIR, AND MEIW
BY SUBSTANCE

GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
800 AIR WAY, GLENDALE, CA 91201

CANCER RISK BY SUBSTANCE

TAC	CAS	PMI (REC #84)	MEIR (REC #27)	MEIW (REC #1363)
1,3-Butadiene	106990	7.93E-09	5.33E-09	6.55E-10
1-3,6-8HxCDD	57653857	9.64E-06	6.48E-06	1.95E-07
1-3,6-8HxCDF	57117449	6.82E-06	4.58E-06	1.95E-07
1-3,7,8PeCDD	40321764	9.64E-05	6.48E-05	1.95E-06
1-3,7,8PeCDF	57117416	2.04E-06	1.37E-06	5.86E-08
1-4,6-8HpCDD	35822469	1.92E-06	1.29E-06	3.90E-08
1-4,6-8HpCDF	67562394	1.36E-06	9.14E-07	3.90E-08
1-8OctaCDD	3268879	5.77E-08	3.88E-08	1.17E-09
1-8OctaCDF	39001020	4.08E-08	2.74E-08	1.17E-09
2,3,7,8-TCDD	1746016	9.64E-05	6.48E-05	1.95E-06
2,3,7,8-TCDF	51207319	6.82E-06	4.58E-06	1.95E-07
Acenaphthene	83329	0.00E+00	0.00E+00	0.00E+00
Acenaphthylene	208968	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	75070	8.28E-10	6.92E-10	7.15E-11
Acrolein	107028	0.00E+00	0.00E+00	0.00E+00
Anthracene	120127	0.00E+00	0.00E+00	0.00E+00
Arsenic	7440382	1.82E-05	1.22E-05	5.83E-07
B[a]anthracene	56553	1.50E-07	1.01E-07	2.95E-09
B[a]P	50328	1.50E-06	1.01E-06	2.95E-08
B[b]fluoranthen	205992	1.50E-07	1.01E-07	2.95E-09
B[g,h,i]perylen	191242	0.00E+00	0.00E+00	0.00E+00
B[k]fluoranthen	207089	1.50E-07	1.01E-07	2.95E-09
Benzene	71432	3.75E-09	3.06E-09	3.07E-10
Beryllium	7440417	3.66E-07	2.46E-07	2.52E-08
Cadmium	7440439	3.99E-06	2.68E-06	2.74E-07
Chrysene	218019	1.50E-08	1.01E-08	2.95E-10
Copper	7440508	0.00E+00	0.00E+00	0.00E+00
Cr(VI)	18540299	2.31E-05	1.55E-05	1.02E-06
D[a,h]anthracen	53703	5.44E-07	3.66E-07	1.16E-08
DieselExhPM	9901	9.41E-07	6.21E-07	7.74E-08
Ethyl Benzene	100414	3.78E-10	3.63E-10	3.26E-11
Fluoranthene	206440	0.00E+00	0.00E+00	0.00E+00
Fluorene	86737	0.00E+00	0.00E+00	0.00E+00
Formaldehyde	50000	1.24E-07	8.86E-08	8.87E-09
HCl	7647010	0.00E+00	0.00E+00	0.00E+00
Hexane	110543	0.00E+00	0.00E+00	0.00E+00
In[1,2,3-cd]pyr	193395	1.50E-07	1.01E-07	2.95E-09
Lead	7439921	1.30E-07	8.77E-08	4.58E-09
Manganese	7439965	0.00E+00	0.00E+00	0.00E+00

GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
800 AIR WAY, GLENDALE, CA 91201

CANCER RISK BY SUBSTANCE

TAC	CAS	PMI (REC #84)	MEIR (REC #27)	MEIW (REC #1363)
Mercury	7439976	0.00E+00	0.00E+00	0.00E+00
Naphthalene	91203	1.23E-06	8.29E-07	8.48E-08
NH3	7664417	0.00E+00	0.00E+00	0.00E+00
Nickel	7440020	4.15E-06	2.79E-06	2.85E-07
PAHs-w/o	1151	3.46E-07	2.66E-07	8.17E-09
Phenanthrene	85018	0.00E+00	0.00E+00	0.00E+00
Propylene Oxide	75569	2.49E-10	2.93E-10	2.43E-11
Pyrene	129000	0.00E+00	0.00E+00	0.00E+00
Selenium	7782492	0.00E+00	0.00E+00	0.00E+00
Toluene	108883	0.00E+00	0.00E+00	0.00E+00
Xylenes	1330207	0.00E+00	0.00E+00	0.00E+00

GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
800 AIR WAY, GLENDALE, CA 91201

NON-CANCER CHRONIC RISK BY SUBSTANCE

TAC	CAS	PMI (REC #84) (RESPIRATORY SYSTEM)	MEIR (REC #27) (RESPIRATORY SYSTEM)	MEIW (REC #1403) (RESPIRATORY SYSTEM)
1,3-Butadiene	106990	0.00E+00	0.00E+00	0.00E+00
1-3,6-8HxCDD	57653857	3.28E-02	2.20E-02	5.59E-04
1-3,6-8HxCDF	57117449	1.65E-02	1.11E-02	5.59E-04
1-3,7,8PeCDD	40321764	3.28E-01	2.20E-01	5.59E-03
1-3,7,8PeCDF	57117416	5.00E-03	3.36E-03	1.70E-04
1-4,6-8HpCDD	35822469	6.53E-03	4.39E-03	1.11E-04
1-4,6-8HpCDF	67562394	3.29E-03	2.21E-03	1.11E-04
1-8OctaCDD	3268879	1.98E-04	1.33E-04	3.38E-06
1-8OctaCDF	39001020	9.98E-05	6.71E-05	3.38E-06
2,3,7,8-TCDD	1746016	3.28E-01	2.20E-01	5.59E-03
2,3,7,8-TCDF	51207319	1.65E-02	1.11E-02	5.59E-04
Acenaphthene	83329	0.00E+00	0.00E+00	0.00E+00
Acenaphthylene	208968	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	75070	8.74E-07	7.31E-07	8.68E-07
Acrolein	107028	6.31E-05	5.45E-05	6.06E-05
Anthracene	120127	0.00E+00	0.00E+00	0.00E+00
Arsenic	7440382	1.36E+00	9.11E-01	3.41E-01
B[a]anthracene	56553	0.00E+00	0.00E+00	0.00E+00
B[a]P	50328	0.00E+00	0.00E+00	0.00E+00
B[b]fluoranthen	205992	0.00E+00	0.00E+00	0.00E+00
B[g,h,i]perylen	191242	0.00E+00	0.00E+00	0.00E+00
B[k]fluoranthen	207089	0.00E+00	0.00E+00	0.00E+00
Benzene	71432	0.00E+00	0.00E+00	0.00E+00
Beryllium	7440417	9.21E-03	6.19E-03	7.18E-03
Cadmium	7440439	1.96E-02	1.32E-02	1.53E-02
Chrysene	218019	0.00E+00	0.00E+00	0.00E+00
Copper	7440508	0.00E+00	0.00E+00	0.00E+00
Cr(VI)	18540299	2.09E-04	1.41E-04	1.63E-04
D[a,h]anthracen	53703	0.00E+00	0.00E+00	0.00E+00
DieselExhPM	9901	2.53E-04	1.67E-04	2.30E-04
Ethyl Benzene	100414	0.00E+00	0.00E+00	0.00E+00
Fluoranthene	206440	0.00E+00	0.00E+00	0.00E+00
Fluorene	86737	0.00E+00	0.00E+00	0.00E+00
Formaldehyde	50000	9.73E-04	6.93E-04	7.93E-04
HCl	7647010	1.82E-06	1.20E-06	1.66E-06
Hexane	110543	0.00E+00	0.00E+00	0.00E+00
In[1,2,3-cd]pyr	193395	0.00E+00	0.00E+00	0.00E+00
Lead	7439921	0.00E+00	0.00E+00	0.00E+00

GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
800 AIR WAY, GLENDALE, CA 91201

NON-CANCER CHRONIC RISK BY SUBSTANCE

TAC	CAS	PMI (REC #84) (RESPIRATORY SYSTEM)	MEIR (REC #27) (RESPIRATORY SYSTEM)	MEIW (REC #1403) (RESPIRATORY SYSTEM)
Manganese	7439965	0.00E+00	0.00E+00	0.00E+00
Mercury	7439976	0.00E+00	0.00E+00	0.00E+00
Naphthalene	91203	1.69E-03	1.13E-03	1.32E-03
NH3	7664417	2.23E-03	1.67E-03	1.89E-03
Nickel	7440020	4.81E-01	3.24E-01	3.75E-01
PAHs-w/o	1151	0.00E+00	0.00E+00	0.00E+00
Phenanthrene	85018	0.00E+00	0.00E+00	0.00E+00
Propylene Oxide	75569	9.44E-07	1.11E-06	1.12E-06
Pyrene	129000	0.00E+00	0.00E+00	0.00E+00
Selenium	7782492	0.00E+00	0.00E+00	0.00E+00
Toluene	108883	8.73E-07	8.36E-07	8.93E-07
Xylenes	1330207	2.28E-07	2.09E-07	2.26E-07

GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
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NON-CANCER ACUTE RISK BY SUBSTANCE

TAC	CAS	PMI (REC #95) (IMMUNE SYSTEM)	MEIR (REC #1261) (IMMUNE SYSTEM)	MEIW (REC #961) (IMMUNE SYSTEM)
1,3-Butadiene	106990	0.00E+00	0.00E+00	0.00E+00
1-3,6-8HxCDD	57653857	0.00E+00	0.00E+00	0.00E+00
1-3,6-8HxCDF	57117449	0.00E+00	0.00E+00	0.00E+00
1-3,7,8PeCDD	40321764	0.00E+00	0.00E+00	0.00E+00
1-3,7,8PeCDF	57117416	0.00E+00	0.00E+00	0.00E+00
1-4,6-8HpCDD	35822469	0.00E+00	0.00E+00	0.00E+00
1-4,6-8HpCDF	67562394	0.00E+00	0.00E+00	0.00E+00
1-8OctaCDD	3268879	0.00E+00	0.00E+00	0.00E+00
1-8OctaCDF	39001020	0.00E+00	0.00E+00	0.00E+00
2,3,7,8-TCDD	1746016	0.00E+00	0.00E+00	0.00E+00
2,3,7,8-TCDF	51207319	0.00E+00	0.00E+00	0.00E+00
Acenaphthene	83329	0.00E+00	0.00E+00	0.00E+00
Acenaphthylene	208968	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	75070	0.00E+00	0.00E+00	0.00E+00
Acrolein	107028	0.00E+00	0.00E+00	0.00E+00
Anthracene	120127	0.00E+00	0.00E+00	0.00E+00
Arsenic	7440382	0.00E+00	0.00E+00	0.00E+00
B[a]anthracene	56553	0.00E+00	0.00E+00	0.00E+00
B[a]P	50328	0.00E+00	0.00E+00	0.00E+00
B[b]fluoranthen	205992	0.00E+00	0.00E+00	0.00E+00
B[g,h,i]perylen	191242	0.00E+00	0.00E+00	0.00E+00
B[k]fluoranthen	207089	0.00E+00	0.00E+00	0.00E+00
Benzene	71432	3.31E-05	3.26E-05	2.64E-05
Beryllium	7440417	0.00E+00	0.00E+00	0.00E+00
Cadmium	7440439	0.00E+00	0.00E+00	0.00E+00
Chrysene	218019	0.00E+00	0.00E+00	0.00E+00
Copper	7440508	0.00E+00	0.00E+00	0.00E+00
Cr(VI)	18540299	0.00E+00	0.00E+00	0.00E+00
D[a,h]anthracen	53703	0.00E+00	0.00E+00	0.00E+00
DieselExhPM	9901	0.00E+00	0.00E+00	0.00E+00
Ethyl Benzene	100414	0.00E+00	0.00E+00	0.00E+00
Fluoranthene	206440	0.00E+00	0.00E+00	0.00E+00
Fluorene	86737	0.00E+00	0.00E+00	0.00E+00
Formaldehyde	50000	0.00E+00	0.00E+00	0.00E+00
HCl	7647010	0.00E+00	0.00E+00	0.00E+00
Hexane	110543	0.00E+00	0.00E+00	0.00E+00
In[1,2,3-cd]pyr	193395	0.00E+00	0.00E+00	0.00E+00
Lead	7439921	0.00E+00	0.00E+00	0.00E+00
Manganese	7439965	0.00E+00	0.00E+00	0.00E+00

GLENDALE CITY, GLENDALE WATER & POWER (FID 162556)
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NON-CANCER ACUTE RISK BY SUBSTANCE

TAC	CAS	PMI (REC #95) (IMMUNE SYSTEM)	MEIR (REC #1261) (IMMUNE SYSTEM)	MEIW (REC #961) (IMMUNE SYSTEM)
Mercury	7439976	0.00E+00	0.00E+00	0.00E+00
Naphthalene	91203	0.00E+00	0.00E+00	0.00E+00
NH3	7664417	0.00E+00	0.00E+00	0.00E+00
Nickel	7440020	8.59E-01	4.81E-01	5.15E-01
PAHs-w/o	1151	0.00E+00	0.00E+00	0.00E+00
Phenanthrene	85018	0.00E+00	0.00E+00	0.00E+00
Propylene Oxide	75569	0.00E+00	0.00E+00	0.00E+00
Pyrene	129000	0.00E+00	0.00E+00	0.00E+00
Selenium	7782492	0.00E+00	0.00E+00	0.00E+00
Toluene	108883	0.00E+00	0.00E+00	0.00E+00
Xylenes	1330207	0.00E+00	0.00E+00	0.00E+00

APPENDIX D

COMPUTER FILES (AERMOD & HARP2)

APPENDIX E

ALTERNATE HRA

(To be subsequently submitted.)

APPENDIX F

FUTURE HRA

(To be subsequently submitted.)