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APPENDIX B

Modeling Protocol

The application process required the preparation of a modeling protocol, which outlined the types of impact analyses conducted, the methods used, and the support data used for both the PSD modeling analyses.

Prevention of Significant Deterioration

Air Quality Modeling Protocol

Palmdale Energy Project

Palmdale, California

Submitted to

Environmental Protection Agency, Region IX

Submitted by

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INTRODUCTION AND PROJECT DESCRIPTION

Palmdale Energy, LLC proposes to construct, own, and operate the Palmdale Energy Project (PEP or Project). The PEP will consist of a natural gas-fired combined-cycle design to be developed on an approximately 50 acre site in the northern portions of the City of Palmdale (City). The combined-cycle equipment will utilize two (2) Siemens SCC6-5000F natural gas-fired combustion turbine generators (CTG), two heat recovery steam generators (HRSG) with supplemental duct firing, one (1) steam turbine generator (STG), one (1) auxiliary boiler, and support equipment.

The Project is designed to provide flexible capacity within the CAISO and will have a nominal electrical output of 660 megawatts (MW). Commercial operation is planned for the summer of 2019. The design and location of the proposed PEP would serve to complement electrical generation needs for flexible resource support.

The project will utilize state of the art Siemens SCC6-5000F gas turbines which will be operated in a combined cycle mode. These turbines are part of Siemens fast start "Flex" design which allow for quick start and ramp rates which allow for a high plant efficiency design. The proposed project will contain the following equipment:

- Two (2) Siemens SCC6-5000F natural gas fueled combustion turbines
- Two (2) Heat Recovery Steam Generators (HRSGs) with supplemental duct firing
- One (1) emergency diesel fire pump
- One (1) emergency diesel generator
- Auxiliary boiler used as part of the Flex 30 design
- One air cooled condenser (ACC)
- Air pollution control systems utilizing selective catalytic reduction (SCR) and a CO catalyst in order to minimize emissions

The proposed project will incorporate Best Available Control Technology (BACT) in order to limit emissions of criteria pollutants to the following levels:

- NO_x 2.0 ppm through the use of SCR
- CO 2.0 ppm through the use of a CO catalyst
- VOC 1 ppm through the use of a CO catalyst
- PM10/2.5 exclusive use of pipeline quality natural gas
- SO_x exclusive use of pipeline quality natural gas

The Project will be fueled with natural gas delivered via a new natural gas pipeline. The Southern California Gas Company (SCG) will design and construct the approximately 8.7-mile pipeline.

The PEP site location is located on an approximately 50-acre parcel west of the northwest corner of U.S. Air Force Plant 42, and east of the intersection of Sierra Highway and East Avenue M. The existing site is currently on undeveloped land. The UTM NAD83 Zone 11 coordinates are 398,596.6 meters east and 3,833,693.16 meters north. The site elevation is approximately 2,512 feet above mean sea level (amsl). Figures 1 and 2 present the location of the proposed project.

The applicant will submit air quality impact analyses to both the Antelope Valley Air Quality Management District (AVAQMD) and the California Energy Commission (CEC). The modeling analysis will include impact evaluations for criteria and hazardous air pollutants and will include the CEC requirements for evaluation of project air quality impacts. The purpose of this document is to establish the procedure for meeting the AVAQMD and CEC air quality modeling requirements for the proposed project.

The project is expected to result in emissions that will exceed the AVAQMD Rule 1303 Major Facility significance thresholds for oxides of nitrogen (NO_x), carbon monoxide (CO), volatile organic compounds (VOCs), and fine particulate matter (PM10/2.5). Emissions of sulfur dioxide (SO_2) are expected to be less than the major source thresholds.

The project will trigger AVAQMD and CEC modeling requirements. The air quality analysis will be conducted to demonstrate that impacts from NO_x, CO, SO_x, PM10 and PM2.5 will comply with the California and National Ambient Air Quality Standards (CAAQS/NAAQS) for the applicable averaging periods.

The project is expected to trigger the Prevention of Significant Deterioration (PSD) permitting requirements, which would be required for combined cycle design with a facility wide emissions equaling or exceeding 100 tons per year (tpy) for any criteria pollutant. A separate PSD modeling protocol and permit submittal will be prepared for EPA Region 9.

The air quality analysis will be conducted to demonstrate that impacts from NO_x, CO, PM10 and PM2.5 will comply with the National Ambient Air Quality Standards (NAAQS) and PSD Increments (Class I and Class II) for the applicable averaging periods. Additionally, the project will model the potential for impacts to the applicable Air Quality Related Values (AQRVs) for visibility and deposition. Table 1 summarizes the proposed analyses on a pollutant specific basis. The modeling will follow procedures as summarized by the New Mexico Air Quality Bureau Air Dispersion Modeling Guidelines (2014), the United States Environmental Protection Agency (EPA) and Federal Land Managers (FLM) modeling guidelines. Additional guidance procedures are summarized below: U.S. Environmental Protection Agency (USEPA) in its "*Guideline on Air Quality Models*" (including supplements), USEPA Memorandum *"Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard*" (March 2011), USEPA Memorandum *"Clarification on the Use of AERMOD Dispersion Modeling for Demonstrating Compliance with the NO_2 NAAQS"* (September 2014) " USEPA Memorandum *"Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard"* (August 2010), USEPA Memorandum *"Modeling Procedures for Demonstrating Compliance with PM2.5 NAAQS (March 2010),* California Air Pollution Control Officers Association (CAPCOA) "*Modeling Compliance of the Federal 1-Hour NO_2 NAAQS*"(Draft Release 2011), the Federal Land Managers' "*Air Quality Related Values Workgroup (FLAG) Phase I Report-Revised*" (October 2010), and the "*Interagency Workgroup on Air Quality Modeling (IWAQM) Phase II Recommendations*" (1998).

TABLE 1 AIR QUALITY CRITERIA					
	NO_x	PM10	PM2.5	CO	SO_2
PSD Significant Impact Levels for Class I Areas	✓	✓	✓	✓	
Ambient Air Quality Standards	✓	✓	✓	✓	✓
Class I and Class II Visibility and Deposition	✓	✓	✓		
Impacts to Soils and Vegetation	✓	✓	✓	✓	
Class I and Class II Area Increment	✓	✓	✓		
The project will also be major for VOCs and will include an analysis of ozone impacts from emissions of NOx and VOCs. Secondary PM2.5 will also be assessed.					

Table 2 lists the potential to emit from the proposed project. Based upon the emissions listed in Table 2, PSD would be triggered for NO_x, CO, VOC, PM10, PM2.5 and CO_2e.

TABLE 2 POTENTIAL TO EMIT FOR THE CPEC		
Pollutant	**Proposed Facility TPY**	**PSD Major Modification Thresholds TPY**
NO_x	139	**40**
CO	351	**100**
VOC	52	**40**
SO_x	11	**40**
PM10	81	**15**
PM2.5	81	**10**
CO_2	2,117,730	**75,000**

The emission above represent the highest levels based on each of the following scenarios.

Normal Operation Assumptions:

For the highest annual emissions of NO_x, SO_x, PM10/2.5 and CO_2e, up to 7,960 hours of operation at base load, up to 35 warm starts, five (5) cold start, and up to 40 shutdowns per year for a total of 8,000 hours per year with up to 24 hours per day of operation. For this scenario, the auxiliary boiler is expected to operate up to 836 hours per year. (Operational Scenario 1)

For the highest annual emissions of CO and VOC, up to 3,625 hours at base load with up to 360 hot starts, 360 warm starts, five (5) cold starts, and up to 725 shutdowns for a total of 4,320 hours per year with up to 24-hour per day of operation. For this scenario, the auxiliary boiler is expected to operate up to 4,884 hours per year. (Operational Scenario 2)

The third Operational Scenario is based on 4,470hours per year of base load operation, up to 180 hot starts, 360 warm starts, 5 cold starts, and up to 545 shutdowns per year for a total of 5,000 hours per year with up to 24-hours per day of operation. For this scenario, the auxiliary boiler is expected to operate up to 4,136 hours per year. (Operational Scenario 3)

All three emissions scenarios include 1,500 hours per year for the duct burners in the HRSG with up to 24 hours per day of operation, and 50 hours per year for fire pump and 26 hours per year for the emergency generator testing.

Total facility estimated maximum emissions (including turbine SU/SD emissions).

Hourly emissions include the auxiliary boiler for all pollutants. The emergency generator is only included for SO_x and PM10/2.5 hourly as the maximum hour for NOx, CO and VOCs is based on startup (no emergency engine testing). Daily emissions assume two (2) startups and two (2) shutdowns with the remaining hours at full load with duct burners, except for SO_x and PM10/2.5 which is based on 24-hours of full load with duct burners. The auxiliary boiler is assumed to operate two hours for the worst-case day.

PROPOSED AIR QUALITY DISPERSION MODELS

Air Quality Models/Version: The primary United States Environmental Protection Agency (USEPA) dispersion model proposed for use is the AERMOD modeling system (AERMOD version 15181) with the associated meteorological and receptor processing programs AERSURFACE (version 13016), AERMET (version 15181), AERMINUTE (version 14337), and AERMAP (version 11103). AERMOD will be used to quantify pollutant impacts on the surrounding environment based on the emission sources operating parameters and their locations, and will be used for modeling most facility operational impacts in both simple and complex terrain. In addition, the Building Profile Input Program for PRIME (BPIP-PRIME version 04274) will be used for determining building dimensions for downwash calculations in AERMOD and the USEPA-model AERSCREEN (version 15181) is proposed for use to determine inversion-breakup fumigation impacts.

In addition, if AERMOD screening analyses show significant PEP impacts in Class I areas beyond 50 kilometers from the project site, CALPUFF analyses will be performed as described in Appendix A. These models will be used for the following:

- Comparison of facility impacts to significant impact levels (SILs)[1], Significant Monitoring Concentrations (SMCs), and the National Ambient Air Quality Standards (NAAQS) and
- Cumulative impacts analyses in accordance with EPA modeling requirements, if required (PEP impacts greater than SILs), for NAAQS and PSD Class I and Class II increments.

EXISTING METEOROLOGICAL AND AIR QUALITY DATA

Hourly observations of certain meteorological parameters are used to define the area's dispersion characteristics. These data are used in approved air dispersion models for defining a project's impact on air quality. These data must meet certain criteria established by the USEPA and the following discussion details the proposed data and its applicability to this project.

Project Location/Topography: The project location is located in the Antelope Valley, which forms the western tip of the Mohave Desert as shown on Figure 1. The topography of the area is characterized as high desert with very little variation in terrain until the desert abuts the mountain ranges. The project site is located about 10 kilometers (km) northeast of the San Gabriel Mountains, which separate

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[1] Regulatory agencies have traditionally defined "significant impact levels" ("SILs") as de minimis threshold values. Source impacts less than SILs typically do not warrant additional analysis or mitigation. If a source's modeled impacts exceed the relevant SIL, the source owner may need to perform a cumulative air quality modeling analysis that includes other appropriate nearby emissions sources to determine whether or not there is a potential for exceedances of the relevant AAQS and, if so, whether the source's emissions will cause or contribute to the predicted AAQS exceedances.

Antelope Valley from the City of Los Angeles, and 50 km southeast of the Tehachapi Mountains, which separate Antelope Valley from the San Joaquin Valley.

Nearby Surface Meteorological Stations: The proposed project site is located in northern Los Angeles County just north of the Palmdale Airport as shown on Figure 2. The location is in the northern portion of the city of Palmdale and near the southern boundary of the city of Lancaster. The project site is located about 2.5 km west-northwest of the ASOS (Automated Surface Observing System) meteorological monitoring site at the Palmdale Airport as shown on Figure 2. ASOS monitoring sites measure surface meteorological data such as wind speed and direction, temperature, pressure, cloud heights, and sky cover. ASOS surface data are generally selected for processing for AERMOD because ASOS hourly data are routinely recorded and archived, generally meet USEPA data completeness criteria, instruments are located in unobstructed areas meeting USEPA siting criteria, and instrument heights and sensor sensitivities meet USEPA instrument specifications. Also, short-term (1-minute) wind direction and speed data are generally available that can be processed by USEPA programs to eliminate excessive calm observations and to give hourly averages consistent with USEPA modeling requirements. These Palmdale ASOS surface data, when processed with AERMET as described below, result in data recovery greater than 90 percent for every quarter in the five-year period in accordance with USEPA requirements *("Meteorological Monitoring Guidance for Regulatory Modeling Applications,"* EPA-454/R-99-005). Generally, surface data parameters of wind speed, wind direction, and temperature must individually exceed 90% both by quarter and year, as well as wind speed, direction, and stability (turbulence) parameters combined, before any substitutions. These criteria are equaled for all quarterly/annual periods of the surface data selected (the only data substitutions used for any the meteorological data processing were for upper air data in the second quarter of 2010 as described below).

Selection of Surface Meteorological Data: As noted above, the project vicinity and immediate areas of Antelope Valley are relatively flat, an important consideration in the selection of surface meteorological data for use in assessing the projects impacts on regional air quality. Under these circumstances (large expanses of relatively flat terrain), the nearest meteorological data meeting USEPA siting and instrument criteria would be expected to be the most representative of the project location. The ASOS data fulfill both criteria, being located in the immediate project vicinity and meeting USEPA siting and instrument criteria. Thus, the Palmdale Airport ASOS data are proposed as the surface meteorological data for modeling facility emissions. The close proximity of the ASOS station to the project site virtually assures that it could be considered representative, if not the equivalent of onsite data.

Both the ASOS and PEP sites are located in the relatively flat Antelope Valley at nearly identical distances and orientations from the relatively distant mountains which define the valley boundaries. There are no intervening terrain features between the ASOS location and project site to adversely affect the relative synoptic-scale wind patterns at either location (compared to each other). The current ASOS location from the NCDC Historical Observing Metadata Repository (HOMR) was verified and then refined to its exact location based on Google Earth photos (location is shown below). The 1-minute and 1-hour ASOS data for Palmdale Airport were downloaded from the appropriate National Climatic Data Center (NCDC) FTP websites.

Selection of Upper Air Meteorological Data: The representative radiosonde observations nearest to the project site are Edwards Air Force Base and the Yuma Proving Ground. Soundings at military installations like Edwards and Yuma, Arizona are not taken every day. The nearest representative civilian airports with 12Z soundings taken every day are Las Vegas, NV, Phoenix, AZ, and Tucson, AZ – all relatively high desert locations in the Southwest United States. Recent radiosonde measurements at Las Vegas did not begin until December 2010, which would preclude the collection of a complete continuous 5-year period of meteorological data using Las Vegas soundings alone. Phoenix soundings are taken only during the summer months, i.e., June 21st through September 18th for 2010, but the data are relatively complete for the three months with soundings and are more representative of the site than Tucson. Tucson soundings are taken for all of 2010, but many of the second and third quarter soundings are missing the first few levels of data, including the surface level. Therefore, the second quarter Tucson data were supplemented with soundings taken at Edwards (April 8, 10, 12, 14, 16, 17, 19, 20; May 15, 17, 18, 19, 25, 27; and June 2, 14) and Yuma (April 5, 28; May 13; and June 1, 3, 7, 8). Phoenix/Tucson (2010) and Las Vegas (2011-2014) radiosonde data are proposed as the upper air meteorological data for modeling facility emissions. These data were downloaded from the National Oceanic and Atmospheric Administration (NOAA) Earth System Research Laboratory (ESRL) website.

Selection of Meteorological Data Period: The Palmdale Airport ASOS instrumentation has been at its present location with the current configuration of sensors since February 8, 2007 according to HOMR (with available 1-minute data since January 2007). Therefore, the most recent five-year period (2010-2014) was selected.

Meteorological Data Processing/Options: The Palmdale Airport ASOS instrumentation has been at its present location with the current configuration of sensors since February 8, 2007 according to HOMR (with available 1-minute data since January 2007). Therefore, the most recent five-year period (2010-2014) was selected. These 2010-2014 Palmdale ASOS surface data and concurrent Las Vegas/Phoenix/Tucson radiosonde data were processed with the latest versions of AERMET (15181) and AERMINUTE (14337). AERMINUTE/AERMOD default and standard options will be used, including MODIFY for upper air data in Stage 1, the default ±1 hour window for 12 Zulu (Z) sounding data (4 AM Pacific Standard Time) in Stage 3, and a 0.5 m/s threshold wind speed for 1-minute ASOS data in Stage 3.

Meteorological Data Surface Characteristics: AERMET also requires input summaries of the surface characteristics for the area surrounding the Palmdale ASOS monitoring site. These surface characteristics will be calculated with the USEPA-program AERSURFACE (version 13016) based on USEPA guidance. AERSURFACE uses 1992 National Land Cover Data (NLCD) from the United States Geological Survey (USGS) to determine land use based on standardized land cover categories. For this analysis, the Southern California NLCD file from the USGS website referenced in the AERSURFACE User's Manual (http://edcftp.cr.usgs.gov/pub/data/landcover/states/)
will be used. A review of historical Google Earth images shows only minor changes in land use within 1 km of the current ASOS location from the time of the 1992 NLCD to the present time. Therefore, the primary surface characteristics derived from the 1992 data (roughness length) should be representative of current conditions.

AERSURFACE will be executed in accordance with the USEPA guidance documents "*AERMOD Implementation Guide,"* March 19, 2009, and "*AERSURFACE User's Guide*," EPA-454/B-08-001, revised January 16, 2013. AERSURFACE determines the midday albedo, daytime Bowen ratio, and surface roughness length representative of the surface meteorological station. ***Bowen ratio*** is based on a simple unweighted geometric mean while ***albedo*** is based on a simple unweighted arithmetic mean for the 10x10 km square area centered on the selected location (i.e., no direction or distance dependence for either parameter). ***Surface roughness length*** is based on an inverse distance-weighted geometric mean for upwind distances up to the USEPA-recommended one (1) km radius from the selected location. The circular surface roughness length area (1-km radius) can be divided into any number of sectors as appropriate (USEPA guidance recommends that no sector be less than 30º in width).

Only one 360° sector is proposed for calculating roughness lengths due to the homogeneity of the area within the USEPA-recommended radius of 1 km as shown on Figure 3. Months were assigned to seasons as follows: November through April as fall (autumn with un-harvested cropland) and May through October as summer (midsummer with lush vegetation) as has been done for previous projects in the Mojave Desert Air Basin. Other AERSURFACE options will be selected as Airport=YES, continuous snow cover = NO, and arid = YES.

Temporal variations of monthly precipitation must be considered to calculate the albedo for AERMET processing in accordance with USEPA recommendations. Precipitation data should be measured at the nearest representative location to the surface data with the most complete precipitation record, particularly for the years of meteorology being modeled. Historical precipitation data are measured at the both Palmdale and Lancaster Airports, as well as cooperative stations at both cities. Palmdale Airport is obviously the most representative and has the most complete data for the modeling period (2010-2014) as well as a 30-year period (although not continuous since precipitation data weren't measured/recorded from 1974-1998). The monthly precipitation amounts from the Palmdale Airport for the latest 30 years (1960-1973 and 1999-2014) were sorted and compared to the monthly precipitation amounts for the five years of meteorological data to be modeled with AERMOD (2010-2014). The modeled months with precipitation amounts in the range of the driest 9 years by month for the 30-year climatology are given the albedo for DRY conditions. The modeled months (2002-2006) with precipitations amounts in the range of the wettest 9 years by month for the 30-year climatology are given the albedo for WET conditions. The remainder of the modeled months is given the albedo for AVG (average) conditions and represents the middle 22 years by month in the 30-year precipitation climatology (except that any month with 0.05" or less are given the albedo for DRY conditions. The 30-year precipitation climatology is shown in Table 3 and the AERSURFACE inputs/outputs are shown in Table 4.

Table 3 Palmdale Airport 30-year Precipitation Climatology Summary													
SORT	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.69
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.83
3	0.00	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.96
4	0.00	0.02	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.08
5	0.03	0.06	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.21
6	0.03	0.07	0.10	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.44
7	0.03	0.10	0.10	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	2.73
8	0.05	0.18	0.15	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	2.93
9	0.09	0.23	0.15	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.14	3.73
10	0.10	0.32	0.22	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.16	3.74
11	0.14	0.43	0.22	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.17	3.80
12	0.18	0.43	0.25	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.18	3.80
13	0.22	0.50	0.29	0.09	0.00	0.00	0.00	0.00	0.00	0.01	0.27	0.23	3.98
14	0.22	0.54	0.33	0.11	0.00	0.00	0.00	0.00	0.00	0.02	0.34	0.32	4.06
15	0.23	0.69	0.40	0.13	0.00	0.00	0.00	0.00	0.00	0.02	0.34	0.35	4.11
16	0.26	0.81	0.42	0.13	0.00	0.00	0.01	0.00	0.00	0.06	0.43	0.60	4.47
17	0.36	0.82	0.49	0.19	0.01	0.00	0.01	0.00	0.00	0.08	0.45	0.62	5.07
18	0.42	0.97	0.50	0.23	0.02	0.00	0.01	0.00	0.00	0.08	0.51	0.67	5.43
19	0.43	1.23	0.53	0.28	0.03	0.00	0.01	0.01	0.00	0.13	0.73	0.71	5.65
20	0.59	1.39	0.57	0.34	0.03	0.00	0.03	0.04	0.01	0.14	0.73	0.71	5.78
21	0.84	1.44	0.65	0.37	0.07	0.00	0.04	0.04	0.02	0.15	0.87	0.77	5.91
22	0.97	1.93	0.68	0.43	0.13	0.00	0.04	0.04	0.04	0.21	1.00	1.03	6.05
23	1.19	2.17	0.68	0.45	0.15	0.00	0.04	0.05	0.12	0.21	1.00	1.11	6.90
24	1.23	2.33	0.69	0.51	0.16	0.00	0.05	0.09	0.24	0.22	1.15	1.43	7.27
25	1.35	2.72	0.88	0.62	0.18	0.02	0.06	0.12	0.26	0.23	1.18	1.74	7.55
26	1.48	2.87	0.94	0.65	0.18	0.11	0.09	0.12	0.33	0.31	1.60	1.89	8.45
27	1.81	3.33	1.02	0.67	0.24	0.15	0.14	0.14	0.40	1.39	1.86	2.57	9.04
28	2.86	3.60	1.29	0.74	0.25	0.22	0.15	0.32	0.66	1.56	2.40	2.97	9.44
29	3.04	3.75	1.41	1.47	0.32	0.29	0.50	0.36	0.85	2.69	4.01	3.30	10.90
30	3.15	4.57	1.56	1.52	0.96	0.45	0.58	1.76	1.75	2.76	4.89	3.42	12.96
2010	2.86	1.93	0.29	0.65	0.00	0.00	0.04	0.00	0.00	1.56	0.27	3.30	10.90
2011	0.42	0.69	1.41	0.01	0.01	0.00	0.14	0.00	0.85	0.14	0.45	0.35	4.47
2012	0.09	0.43	0.65	0.62	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.18	2.08
2013	0.36	0.10	0.25	0.00	0.15	0.00	0.09	0.04	0.00	0.08	1.86	0.00	2.93
2014	0.00	1.39	0.57	0.13	0.96	0.00	0.00	0.04	0.12	0.00	0.00	2.57	5.78

Sorted Data - The 30-years of climatology were SORTED to determine DRY/AVG/WET months. Generally, the driest and wettest 9 years were used to delineate DRY/WET (AVG was anything in-between). The one exception: months with precipitation ≤ 0.05" were considered DRY.

Table 4 Palmdale Airport Monthly Inputs/Outputs to AERSURFACE												
Month	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUNE**	**JULY**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
Seasonal Assumptions for Surface Roughness (meters) and Albedo												
Season	Fall	Fall	Fall	Fall	Summer	Summer	Summer	Summer	Summer	Summer	Fall	Fall
Arid	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Airport	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Surface Roughness (meters)												
	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119
Noontime Albedo												
	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Bowen Ratio based on the following surface moisture contents												
2010	WET	WET	AVG	WET	DRY	DRY	DRY	DRY	DRY	WET	AVG	WET
2011	AVG	AVG	WET	DRY	DRY	DRY	WET	DRY	WET	AVG	AVG	AVG
2012	DRY	AVG	AVG	WET	DRY	DRY	DRY	DRY	DRY	DRY	DRY	AVG
2013	AVG	DRY	AVG	DRY	WET	DRY	WET	DRY	DRY	AVG	WET	DRY
2014	DRY	AVG	AVG	AVG	WET	DRY	DRY	DRY	WET	DRY	DRY	WET
Bowen Ratio by Year/Month												
2010	0.89	0.89	1.96	0.89	2.98	2.98	2.98	2.98	2.98	0.70	1.96	0.89
2011	1.96	1.96	0.89	4.14	2.98	2.98	0.70	2.98	0.70	1.42	1.96	1.96
2012	4.14	1.96	1.96	0.89	2.98	2.98	2.98	2.98	2.98	2.98	4.14	1.96
2013	1.96	4.14	1.96	4.14	0.70	2.98	0.70	2.98	2.98	1.42	0.89	4.14
2014	4.14	1.96	1.96	1.96	0.70	2.98	2.98	2.98	0.70	2.98	4.14	0.89

Site Urban/Rural Classification: Land use surrounding the facility location has changed little since the 1992 NLCD based on historical Google Earth photos, so AERSURFACE was used to determine urban/rural land uses and percentages for the area within three (3) km of the proposed site location. About 15% of this area around the proposed project site is characterized as urban, consisting of commercial (airport buildings) and transportation (runways) land uses. The other 85% of this area would be characterized as rural, consisting mostly of shrubland (66%), grasslands/pasture/hay (8%), bare rock (7%), and residential (4%) land uses. In accordance with the Auer land use classification methodology (USEPA's "*Guideline on Air Quality Models*"), since the land use within the area circumscribed by a three km radius around the facility is greater than 50 percent rural, the urban dispersion option in AERMOD will not be used in the modeling analyses supporting the permitting of the facility.

Meteorological Data Representativeness: The proposed use of the five (5) years of Palmdale Airport ASOS surface meteorological data would satisfy the definition of on-site data. USEPA defines the term "on-site data" to mean data that would be representative of atmospheric dispersion conditions at the source and at locations where the source may have a significant impact on air quality. Specifically, the meteorological data requirement originates from the Clean Air Act in Section 165(e)(1), which requires an analysis "of the ambient air quality at the facility and in areas which may be affected by emissions from such facility for each pollutant subject to regulation under [the Act] which will be emitted from such facility." This requirement and USEPA's guidance on the use of on-site monitoring data are also outlined in the On-Site Meteorological Program Guidance for Regulatory Modeling Applications (USEPA, 1987). The representativeness of meteorological data is dependent upon: (a) the proximity of the meteorological monitoring site to the area under consideration; (b) the complexity of the topography of the area; (c) the exposure of the meteorological sensors; and (d) the period of time during which the data are collected.

First, the Palmdale Airport meteorological monitoring site is the closest ASOS site and located in very close proximity to the facility location, about 2.5 kilometers to the east-southeast, with nearly identical elevations above mean sea level (amsl). Second, both locations are located in the same area of the broad and relatively flat Antelope Valley. Third, the ASOS monitoring location at the airport was selected to be far enough from wind flow perturbations caused by buildings and other features, which can be seen on the earlier figures. Fourth, the period of meteorological data selected at the time of the modeling analyses (2010-2014) would be expected to be the most representative of current conditions, with the same general land uses surrounding the current ASOS location and airport as well as the proposed project site. In fact, a review of historical and current Google Earth photoaerials, shows that nearby land uses now at both locations are similar to the land uses reflected in the 1992 NLCD. These data meet the USEPA data recovery requirements for air quality modeling as described above.

At noted above, the surface characteristics of land uses, roughness lengths, Bowen ratios, and albedos are very similar for the two locations. AERSURFACE results for both the ASOS location and proposed project site for the areas circumscribed by a 1 km radius around each location are shown on Table 5.

Table 5
Surface Characteristics for Palmdale ASOS Location
and Proposed PEP Site

Standardized Land Use Category (for area within a 1km radius)	**ASOS Location**	**PEP Site**
Low Intensity Residential:	0.3%	0.7%
Commercial/Industrial/Transportation:	32.1%	10.3%
Bare Rock/Sand/Clay:	1.0%	5.1%
Shrubland:	54.0%	80.6%
Grasslands/Herbaceous:	11.7%	3.3%
Pasture/Hay:	0.8%	-
Row Crops:	0.1%	-

Most of the land use in the general region consists of shrubland or agricultural classifications. The larger percentage of commercial land use for ASOS location is due to the airport runways as shown in earlier figures. Transportation land use has smaller roughness lengths than commercial/industrial land uses and would be similar to the roughness lengths for shrubland and grasslands that predominate the project site. Therefore, land use categories at the two site locations are very similar with transportation/shrublands/grasslands comprising 90% or more of the total land use types within 1 km of both locations.

Representativeness is defined in the document "Workshop on the Representativeness of Meteorological Observations" (Nappo et. al., 1982) as "the extent to which a set of measurements taken in a space-time domain reflects the actual conditions in the same or different space-time domain taken on a scale appropriate for a specific application." Judgments of representativeness should be made only when sites are climatologically similar, as is the case with the meteorological monitoring site and the proposed project location. In determining the representativeness of the meteorological data set for use in the dispersion models at the project site, the consideration of the correlation of terrain features to prevailing meteorological conditions, as discussed earlier, would be nearly identical to both locations since the orientation and aspect of terrain at the proposed project location correlates well with the prevailing wind fields as measured by and contained in the meteorological dataset. In other words, the same mesoscale and localized geographic and topographic features that influence wind flow patterns at the meteorological monitoring site also influence the wind flow patterns at the proposed project site.

For these reasons, the Palmdale Airport meteorological data selected for use in modeling emissions from the proposed project are expected to satisfy the definition of representative meteorological data and are similar to the dispersion conditions at the project site and to the regional area. An annual wind rose for the five-year modeling period is shown in Figure 4.

Existing Baseline Air Quality Data: The nearest representative air quality monitoring station is the Lancaster Division Street site. The monitoring station is 2.5 miles north from the PEP in the city of Lancaster, which has an approximate population of 160,000 and is near the Sierra Highway (110 meters), the Antelope Valley Freeway (SR-14) (4 kilometers), Division Street (50 meters), and the Southern Pacific Railway (80 meters). This monitoring station collects NO_2, CO, PM10, PM2.5 and O_3 data. Based on the siting of this station in a very urban setting, along with its close proximity to roadways, it would provide a conservative estimate of background air quality. This site also satisfies the EPA requirements for sitting NO_2 and O_3 monitoring stations near well-traveled roadways. The nearest monitoring station for SO_2 is located in Victorville, which has a population of 127,000. This urban location would also be considered conservative for background data.

The Lancaster monitoring station's objective is for measuring background air quality to support compliance with the Ambient Air Quality Standards. The spatial scale of the monitoring station is middle scale for gaseous pollutants (ozone, CO, and NO_2) and neighborhood scale for particulate matter (PM10 and PM2.5). Based on these two spatial scales, the overall objective of the monitoring station is population oriented. Ambient monitoring data for these sites for the most recent three-year period (2012-2014) are summarized in Table 6. Data from these sites is estimated to present a reasonable representation of background air quality for the project site and impact area.

TABLE 6 MEASURED BASELINE AIR QUALITY DATA					
Pollutant	**Site**	**Averaging Time**	**2012**	**2013**	**2014**
Ozone, ppm	Lancaster	8 Hr 4th High	0.095	0.094	0.087
PM2.5, µg/m^3	Lancaster	24 Hr 98th%	14	11	28
		Annual Mean	5.4	5.8	7.2
PM10, µg/m^3	Lancaster	24 Hr H2H*	38	74	80
TSP, µg/m^3	Lancaster	All Averaging Times	No longer monitored		
CO, ppm	Lancaster	1 Hr Max*	2.3	1.9	1.9
		8 Hr Max*	1.3	1.4	1.2
NO_2, ppb	Lancaster	1 Hr 98th%	46	44	40
		Annual Mean	9	8	8
SO_2, ppb	Victorville	1 Hr 99th%	5	4	4

***For 1-hour and 8-hour CO, the maximum measured background concentration was conservatively used for the NAAQS assessment. Normally, the NAAQS assessments are based on lesser concentrations such as the second-highest measured concentration each year for 1-hour and 8-hour CO. Additionally, 2014 data was missing, so for CO, background based on 2011-2013.**

Source: USEPA AirData website (www.epa.gov/airdata).

Based on the data presented in Table 6, background values were selected as appropriate for the standard as shown in Table 7. Generally the highest baseline concentration for any of the most recent three years is used for comparison to many of the NAAQS. Some of the NAAQS are based on 3-year averages of the values shown in Table 6, and are noted as such below in Table 7.

Table 7 Estimated Background Air Quality Values		
Pollutant and Averaging Time	**Background Value**	National AAQS
Ozone – 8-Hour	0.095 ppm (187.5 μg/m^3)	**0.075 ppm (147 μg/m^3)**
PM10 – 24-Hour	80 μg/m^3	**150 μg/m^3**
PM2.5 – 24-Hour 3-year Average 98th%	18 μg/m^3	**35 μg/m^3**
PM2.5 – Annual NAAQS 3-year Average	6.1 μg/m^3	**12.0 μg/m^3**
NO_2 – 1-Hour NAAQS 3-year Average 98th%	0.043 ppm (81.0 μg/m^3)*	**0.100 ppm (188 μg/m^3)**
NO_2 – Annual	0.008 ppm (15.1 μg/m^3)	**0.053 ppm (100 μg/m^3)**
CO – 1-Hour	1.9 ppm (2,176 μg/m^3)	**35 ppm (40,000 μg/m^3)**
CO – 8-Hour	1.4 ppm (1,603 μg/m^3)	**9 ppm (10,000 μg/m^3)**
SO_2 – 1-Hour NAAQS 3-year Average 99th%	0.004 ppm (10.0 μg/m^3)	**0.075 ppm (196 μg/m^3)**
SO_2 – 3-Hour Set Equal to 1-Hour Max	0.006 ppm (16.0 μg/m^3)	**0.5 ppm (1300 μg/m^3)**

***Concurrent hourly NO_2 concentrations may be used in the 1-hour NO_2 CAAQS modeling analyses. The 3rd highest seasonal NO_2 concentration for each hour, averaged over the past three years, may be used in the 1-hour NO_2 NAAQS analyses.**

For conversion from the ppm measurements to μg/m^3 concentrations typically required for the modeling analyses, used: μg/m^3 = ppm x 40.9 x MW where MW = 48, 28, 46, and 64 for ozone, CO, NO_2, and SO_2, respectively.

The attainment status of the proposed project site is designated for the NAAQS as follows in Table 8.

Table 8 NAAQS Attainment Status Listing	
Pollutant	**NAAQS Status**
8-Hour Ozone	Nonattainment
PM10	Unclassified (Attainment)
PM2.5	Unclassified/Attainment

NO_2	Unclassified/Attainment
CO	Unclassified/Attainment
SO_2	Unclassified (Attainment)
Attainment status according to maps at EPA Region 9 website.	

Pre-Construction Monitoring Requirements: EPA's PSD regulations also require an applicant to provide preconstruction monitoring data for purposes of use in the Source Impacts Analysis. However, a source is exempt from this requirement if its modeled impact in any area is less than pollutant-specific SMC, which EPA has generally established as five times the lowest detectable concentration of a pollutant that could be measured by available instrumentation.

Even if a source's potential impacts exceeds the corresponding SMC, and the applicant must therefore provide preconstruction monitoring data as part of its Source Impact Analysis, that does not necessarily mean the applicant must install and operate a new monitor at the project site. Rather, according to EPA guidance, an applicant may satisfy the preconstruction monitoring obligation in one of two ways: (i) Where existing ambient monitoring data is available from representative monitoring sites, the permitting agency may deem it acceptable for use in the Source Impacts Analysis; or (ii) where existing, representative data are not available, then the applicant must obtain site-specific data.

As a general matter, the permitting agency has substantial discretion "to allow representative data submissions (as opposed to conducting new monitoring) on a case-by-case basis." In determining whether existing data are representative, EPA guidance has emphasized consideration of three factors:

1. Monitor location
2. Data quality
3. Age of the data.

The permitting agency also may approve use of data from a representative "regional" monitoring site for purposes of the NAAQS compliance demonstration. The EPA allows exemptions to PSD preconstruction modeling based on the EPA guidelines if:

- The modeled concentrations from the new project are less than the applicable SMC levels
- If existing air monitoring data is considered representative.

The maximum modeled offsite impacts will be below the NO_2, PM10 and CO SMCs, thus for these pollutants, the applicant will request an exemption of the preconstruction monitoring requirements.

For O_3, the close proximity, data age and representative conditions to the project site of the existing Lancaster monitoring station would satisfy the EPA requirements for waiving the preconstruction monitoring requirements for this pollutant.

Accordingly, the project will propose utilizing the nearby urban based monitoring data from Lancaster (NO_2, PM10, CO and O_3) and utilize the Victorville monitor SO_2 background as conservative estimates of background concentrations in order to further satisfy the preconstruction monitoring requirements for these pollutants. Thus, no pre-construction ambient air quality monitoring is proposed for these pollutants.

As the SMC for PM2.5 was vacated, preconstruction monitoring of PM2.5 cannot be exempted based on modeling results. But if existing monitoring data can be determined to be representative, then the use of the existing data would satisfy the need to collect additional data PM2.5. Based on the close location of the Lancaster Division Street PM2.5 monitoring site (2.5 miles north of the project location) and the age and data quality of the PM2.5 monitoring data, preconstruction monitoring for this pollutant is proposed.

Based on the above analyses, the requirements for waiving preconstruction monitoring would be satisfied. The existing ambient monitoring data, collected by the within the project region would be sufficient to meet the needs of any pre-construction monitoring program and are proposed for use in place of collecting pre-construction monitoring data.

AIR QUALITY MODELING PROCEDURES

Several dispersion models are proposed for use to quantify pollutant impacts on the surrounding environment based on the emission sources and operating parameters. AERMOD will be used to determine facility impacts on Class II areas in the immediate project vicinity in simple, intermediate, and complex terrain areas during project operations. AERMOD will be the primary model used for comparison of project impacts to SILs and demonstration of compliance with AAQS. Modeling of operational impacts are described below.

For modeling the project's operational impacts under normal and startup, shutdown, or malfunction conditions due to emissions from the proposed sources on nearby simple and complex terrain, the AERMOD model will be used with the entire hourly meteorological data (described above).

AERMOD Model, Options, and Procedures: AERMOD is a steady-state plume dispersion model that simulates transport and dispersion from multiple point, area, or volume sources based on updated characterizations of the atmospheric boundary layer. AERMOD uses Gaussian distributions in the vertical and horizontal for stable conditions, and in the horizontal for convective conditions; the vertical distribution for convective conditions is based on a bi-Gaussian probability density function of the vertical velocity. For elevated terrain AERMOD incorporates the concept of the critical dividing streamline height, in which flow below this height remains horizontal, and flow above this height tends to rise up and over terrain. AERMOD also uses the advanced PRIME algorithm to account for building wake effects. AERMOD input data options would follow USEPA modeling guidance documents.

Flagpole receptors are not proposed to be used (ground level concentrations will be calculated). AERMAP will be used to calculate receptor elevations and hill height scales for all receptors from NED data in accordance with USEPA guidance. Selection of the receptor grids is discussed below.

Screening Analysis: Operational characteristics of the combustion turbines, such as emission rate, exit velocity, and exit temperature vary by operating loads and ambient temperatures. The PEP turbines will be operated over a variety of temperature and load conditions from 40% to 100%, with and without duct-firing and evaporative cooling systems. In addition, the auxiliary boiler, which allows the project to have fast start capability, will be in utilized when the turbines are not operational. Thus, an air quality screening analysis will be performed that considers these effects.

For the turbines, a range of operational characteristics over a variety of ambient temperatures will be assessed using AERMOD and all five years of hourly meteorology (year 2010-2014). This will include various turbine loads and duct firing and evaporative cooling conditions for four ambient temperatures: 23°F (a cold day), 64°F (annual average conditions), 98°F (a hot day), and 108°F (maximum high temperature day). The combustion turbine operating condition that resulted in the highest modeled concentration in the screening analysis for each pollutant and for averaging periods of 24 hours or less will be used in the refined impact analyses. The 64°F condition was assumed to represent annual average conditions. As such, no screening analyses will be performed for annual average concentrations (the annual refined analyses were modeled with the stack parameters for the 64°F case at 100 percent load without duct firing, which is the majority case duct firing will only occur for 1,500 hours per year).

<u>NO_2 Modeling Procedures</u>: Project only NO_2 impacts will be assessed using a conservative Tier 2 analysis, using the Ambient Ratio Method (ARM), adopted in the *Guideline on Air Quality Models*. The Guideline allows a nationwide default conversion rate of 75% for annual NO_2/NO_x ratios and 80% for 1-hour NO_2/NO_x ratios (not to be confused with the proposed ARM2 methodology). ARM may be performed either by using the ARM model option or by multiplying the modeled NO_x concentrations by the appropriate ratios. The Tier 2 analyses can be performed without justification to, or prior approval of, the permitting authority.

A Tier 3 analysis will be used to assess cumulative 1-hour NO_2 impacts which will be mostly based (as discussed below) on the Lockheed and Northrup multisource inventories. The Tier 3 analysis will use the ozone limiting method (OLM). The OLM analysis uses ambient hourly background ozone measured at the Lancaster monitoring station for the modeled years of 2010-2014. The Lancaster monitoring data has been shown above to be a conservative representation of the project site.

The ozone data has been first processed to remove missing data similar to procedures outlined in the CAPCOA guidance document *"Modeling Compliance of The Federal 1-Hour NO_2 NAAQS"* (October 27, 2011). This was accomplished by interpolating ozone concentrations for periods with one to three missing hours (nightly calibrations usually result in 1-2 hours of missing data at the same time for all days), substituting ozone concentrations from periods with up to 24 missing hours with the maximum ozone concentration form the hour before/after to missing period, and the same hour for the days before/after the missing period. The few remaining extended periods of missing data (probably requiring extensive analyzer repairs) were replaced with the maximum ozone concentrations for the same hour for the four days before/after the missing hour.

Compliance with the 1-hour NAAQS for the cumulative modeling analyses will include using the 3^{rd} highest seasonal NO_2 concentration for each hour from the Lancaster monitoring station, averaged over the three years, for determining the background NO_2 concentration, as outlined in USEPA guidance documents (March 1, 2011 USEPA memorandum *"Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour $N0_2$ National Ambient Air Quality Standard"*). The three year NO_2 background data will be for the period of December 2010 through November 2013. This data period was used in order to keep seasonal periods consistent across years of data, per the CAPCOA NO_2 modeling guidance (December-February must be contiguous). Also, calendar year 2014 was not used since there were a large number of extended periods of missing NO_2 data. Missing periods of NO_2 data were replaced using similar procedures to those used for ozone.

In support of the Tier 3 OLM NAAQS analysis, the modeling methods will also assume:

- In-stack NO_2/NOx ratios (ISR) for all PEP modeled sources (turbines, auxiliary boiler, emergency generator, and firepump) were based on the national default of 0.5.
- For the cumulative background sources (i.e., Lockheed and Northrup), the default NO_2/NO_x ISR of 0.2 will be used per recent USEPA guidance (September 30, 2014 USEPA memorandum "*Clarification on the Use of AERMOD Dispersion Modeling for Demonstrating Compliance with the*

NO_2 National Ambient Air Quality Standard"). The use of the default 0.2 ISR was selected as per the Guidance for the background sources that are at distances greater than one to three kilometers from the project site. This value was used in the EPA analysis for the PHPP project.

- AERMOD-default ambient equilibrium NO_2/NOx ratio of 0.9 will be used.
- The option OLMGROUP ALL will be used.

In addition to the above methodologies, for modeling the 1-hour NO_2 SIL (using the USEPA SIL of 7.5 μg/m3), the five-year average of the annual maximum OLM 1-hour NO_2 impacts (without background) will be used.

Justification for Tier 3 NO_2 Analyses: The use of OLM as a Tier 3 analysis requires approval by the permitting authority. This justification is described in detail below. As summarized in the USEPA Policy Memorandum, OLM is proposed based on five selected criteria:

1. **The model has received a scientific peer review:**

   As noted in the USEPA's June 2010 guidance document, because AERMOD is the preferred model for dispersion for a wide range of applications, the alternative model demonstration for use of the OLM options within AERMOD focuses on the treatment of NOX chemistry within the model, and does not need to address basic dispersion algorithms within AERMOD. The chemistry for OLM has been peer-reviewed, as noted by the documents posted on the USEPA's Support Center for Regulatory Air Modeling web site. The posted documents include *Sensitivity Analysis of PVMRM and OLM in AERMOD* (MACTEC, 2004) and *Evaluation of Bias in AERMOD-PVMRM* (MACTEC, 2005). Both documents indicate that the models appear to perform as expected.

2. **The model can be demonstrated to be applicable to the problem on a theoretical basis:**

   As noted in the document entitled "Sensitivity Analysis of PVMRM and OLM In AERMOD" prepared by Roger W. Brode "This report presents results of a sensitivity analysis of the PVMRM and OLM options for NOx to NO_2 conversion in the AERMOD dispersion model. Several single source scenarios were examined as well as a multiple-source scenario. The average conversion ratios of NO_2/NOx for the PVMRM option tend to be lower than for the OLM option and for the Tier 2 option or the Ambient Ratio Method which has a default value of 0.75 for the annual average. The sensitivity of the PVMRM and OLM options to emission rate, source parameters and modeling options appear to be reasonable and are as expected based on the formulations of the two methods. For a given NOx emission rate and ambient ozone concentration, the NO_2/NOx conversion ratio for PVMRM is primarily controlled by the volume of the plume, whereas the conversion ratio for OLM is primarily controlled by the ground-level NOx concentration.

   Overall the PVMRM option appears to provide a more realistic treatment of the conversion of NOx to NO_2 as a function of distance downwind from the source than OLM or the other NO_2 screening options (Hanrahan, 1999a; Hanrahan, 1999b). No anomalous behavior of the PVMRM or OLM options was identified as a result of these sensitivity tests."

   Based on this report for both OLM appear to be applicable to the problem of NO_2 formation and as noted by the author provides a better estimation of NO_2 impacts compared to other screening options (Tier 1 and 2).

3. **The databases which are necessary to perform the analysis are available and adequate:**

   The data needed to conduct an OLM run with hourly (either concurrent or seasonal) background NO_2 data are hourly meteorological data, hourly ozone data, hourly NO_2 data, and in-stack NO_2/NOx ratios. The hourly ozone and meteorological data exist for the same time period in the immediate project vicinity (ASOS meteorological stations and Lancaster air quality monitoring site).

   Both the ASOS meteorological and Lancaster air quality monitoring sites are located relatively close to the proposed project location and would be expected to be representative with respect to ambient concentrations and meteorology. Since ozone is a regional photochemical pollutant, the Lancaster air quality monitoring site would be expected to be representative of the modeling area where reactive photochemistry will occur most extensively.

4. **Appropriate performance evaluations of the model have shown that the model is not biased toward underestimates:**

   As noted in *Evaluation of Bias in AERMOD-PVMRM* (MACTEC, 2005), which was prepared by Roger W. Brode, PVMRM has been judged to provide unbiased estimates based on criteria that are comparable to, or more rigorous than, evaluations performed for other dispersion models. At the present time no assessment of bias has been conducted for the OLM algorithm. It has been shown in the sensitivity analysis that OLM provides similar, but slightly more conservative, results than PVMRM. Therefore it is assumed that OLM would also provide an unbiased estimate of the modeled concentrations.

5. **A protocol on methods and procedures to be followed has been established.**
   The methods and procedures outlined in this protocol are proposed for implementation.

GEP Stack Height and Downwash: Stack locations and heights and building locations and dimensions will be input to BPIP-PRIME. The first part of BPIP-PRIME determines and reports on whether a stack is being subjected to wake effects from a structure or structures. The second part calculates direction-dependent “equivalent building dimensions” if a stack is being influenced by structure wake effects. The BPIP-PRIME output is formatted for use in AERMOD input files.

Receptor Selection: Receptor and source base elevations will be determined from United States Geological Survey (USGS) National Elevation Dataset (NED) data. The NED data will be processed with the USEPA-model AERMAP for the receptor locations selected. All coordinates (both sources and receptors) will be referenced to UTM North American Datum 1983 (NAD83, Zone 11). AERMAP is capable of interpolating the elevation data in the NED data for both receptor elevations and hill height scales.

The NED data are available in 1/3-arcsecond (about 10 meter) and 1-arcsecond (about 30 meter) grid node spacing. Areas that contain receptor grids with 100 meter spacing or less between adjacent receptors will use 10 meter NED data. Other areas that contain only receptor grids of greater than 100 meter spacing may utilize 30 meter NED data. For purposes of determining hill height scales, the NED datasets used will extend 5-km past the outside of the coarse receptor grid described below for 30-meter NED data and 2-km past the outside of the intermediate/downwash receptor grids described below for 10-meter NED data.

Cartesian coordinate receptor grids will be used to provide adequate spatial coverage surrounding the project area for assessing ground-level pollution concentrations, to identify the extent of significant impacts, and to identify maximum impact locations. For the full impact analyses, a nested grid will be developed to fully represent the initial location and extent of significance area(s) and maximum impact area(s). The nested grid will be comprised of the following:

- Receptors will be placed along the proposed project fenceline with a spacing of about 10 meters or less between adjacent receptors.
- The downwash receptor grid with a receptor spacing of 20 meters will extend from the project fence line out to 500 meters from the project.
- An intermediate receptor grid with 100-meter receptor spacing will extend from the downwash receptor grid out to 1000 meters from the project.
- The first coarse receptor grid with 200 meter receptor spacing will extend from the intermediate receptor grid outwards to five (5) kilometers (km) from the project in all directions.
- The second coarse grid with 500 meter receptor spacing will extend out ten (10) km from the project in all directions.
- When maximum impacts occur in areas outside the 20 meter spaced receptor grid, additional refined receptor grids with 20 meter resolution will be placed around the maximum impacts and extended as necessary to determine maximum impacts.

Ambient concentrations within the facility fence line will not be calculated.

Refined AERMOD Modeling Analyses: The facility operating conditions producing the worst-case operational impacts in the screening analysis will be further assessed in the refined AERMOD modeling analyses for each pollutant and averaging time of regulatory concern. The purpose of the refined modeling analysis will be to demonstrate that air emissions from the project will not cause or contribute to a NAAQS exceedance and will not cause a significant health risk impact. The refined AERMOD modeling analyses are described in detail in the following sections.

Ambient Air Quality Impact Analyses: In evaluating the impacts of the proposed project on ambient air quality, the ambient impacts of the project will be added to background concentrations and compared to the state and national ambient standards for SO_2, NO_2, PM_{10}, $PM_{2.5}$, and CO. The project impacts will also be compared to the EPA modeling significance impact levels (SILs). The NAAQS and USEPA SILs are shown in Table 9. In accordance with USEPA guidance (40 CFR part 51, Appendix W, Sections 11.2.3.2 and 11.2.3.3), the highest modeled concentration will be used for comparison with the short-term CO, 3-hour SO_2, 24-hour PM10, and most annual SILs. Based on the statistical form of some of the NAAQS, comparison to the 1-hour NO_2, 1-hour SO_2, 24-hour PM2.5, and annual PM2.5 SILs will be based on the five-year average of the maximum annual short-term or annual average impacts. The maximum modeled short-term CO, 3-hour SO_2, 24-hour PM10, annual PM10, and annual NO_2 impacts will be used to assess compliance for these NAAQS (after including the background concentrations shown above). This is conservative for these short-term NAAQS since compliance is normally based on the highest, second-high modeled impact over five years. Based on the statistical form of the other AAQS, the five-year averages of (1) the 98^{th} percentile daily maximum annual 1-hour impacts for NO_2, (2) the 99^{th} percentile daily maximum annual 1-hour impacts for SO_2, (3) the 98^{th} percentile annual 24-hour impacts for PM10, and (4) the annual-averaged PM2.5 impacts will be used for these NAAQS assessments.

Table 9 SILS and NAAQS		
Pollutant and Averaging Time	**USEPA SILs**	**NAAQS**
PM10 – 24-Hour	5 μg/m^3	**150 μg/m^3**
PM10 – Annual	1 μg/m^3	-
PM2.5 – 24-Hour	1.2 μg/m^3 Average of Ann Maximums*	**35 μg/m^3** **Average of Ann.98th%s**
PM2.5 – Annual NAAQS	0.3 μg/m^3 Average of Annual Impacts*	**12.0 μg/m^3** **Average of Annual Impacts**
NO_2 – 1-Hour NAAQS	7.5 μg/m^3 Average of Ann.Maxs	**188 μg/m^3** **Average of Ann.98th%s**
NO_2 – Annual	1 μg/m^3	**100 μg/m^3**
CO – 1-Hour	2000 μg/m^3	**40,000 μg/m^3**
CO – 8-Hour	500 μg/m^3	**10,000 μg/m^3**
SO_2 – 1-Hour NAAQS	7.8 μg/m^3 Average of Ann.Maxs	**196 μg/m^3** **Average of Ann.99th%s**
SO_2 – 3-Hour	25 μg/m^3	**1300 μg/m^3**
SO_2 – 24-Hour	5 μg/m^3	-

Overall maximum impacts will generally be used for pollutants and averaging times where other types of statistical averages are not specified.

*Proposed PM2.5 SIls

Significant Impact Areas: The Antelope Valley Air Quality Management District (AVAQMD) Air Permit Application contained detailed air quality modeling analyses of the proposed Palmdale Energy Project (PEP) for both National Ambient Air Quality Standards (NAAQS) and California State Ambient Air Quality Standards (CAAQS). Offsite significant PEP impacts were used to determine the extent of the Significant Impact Areas (SIAs, which are circular areas with radii equal to the distance of the furthest significant receptor from the PEP) for the NAAQS. Based on the modeling results, the project will be significant for 1-hour NO2, 24-hour PM10 and PM2.5 (utilizing a proposed PM2.5 SIL of 1.2 ug/m3) and annual PM2.5 (using a proposed SIL of 0.3 ug/m3). The extent of the SIA's are as follows and are shown in Figures 5 through 9:

- 18.9 kilometers (km) for the 1-hour NO_2 NAAQS based on the 5-year average of the maximum 1-hour concentrations each year at each receptor due to normal facility operations using the Ambient Ratio Method (ARM), the USEPA-default NO_2/NOx ratio of 0.8 (80%), and a Significant Impact Level (SIL) of 7.5 μg/m^3;
- 1.76 km for the 24-hour PM2.5 NAAQS based on the 5-year average of the maximum 24-hour concentrations each year at each receptor and a SIL of 1.2 μg/m^3;
- 1.18 km for the annual PM2.5 NAAQS based on the 5-year average of the annual concentrations each year at each receptor and a SIL of 0.3 μg/m^3; and
- 0.65 km for the 24-hour PM10 NAAQS based on the over maximum 24-hour concentration during any of the five at each receptors and a SIL of 5.0 μg/m^3.

The attached figures show these SIAs and the areal extent of receptors with PEP impacts greater than the respective SILs, which generally extend to the northeast of the PEP fenceline for PM2.5/PM10. For NO_2, the area with significant PEP impacts based on normal facility operations encompasses larger areas to the north and south of the PEP fenceline and an area along the nearest flank of the San Gabriel Mountains at an elevation of around 3000' above mean sea level (amsl).

The proposed Class I and Class II PM2.5 SILs for this project are identical to the EPA established SILs, which were vacated by the courts. With respect to reliance on the PM2.5 SILs, EPA cautioned that reliance on the SILs alone to demonstrate that a source will not cause or contribute to a violation of the PM2.5 NAAQS is inadequate. However, EPA stated that permitting authorities have the discretion to select and utilize a PM2.5 SIL value if there is sufficient justification for the selected SIL value and justification in the manner in which it will be used. The SIL values for PM2.5 in EPA regulations can also continue to be used if the permitting authority also takes background concentrations of PM2.5 into account. For this project, the difference between the PM2.5 NAAQS and the monitored PM2.5 background concentrations in the area is greater than the SILs. Based on the data in Table 7, over half of the available standard is still available. Thus, given the amount of available PM2.5 standard in the project region, the applicant proposes to use the previously vacated PM2.5 SILs for both Class I and Class II modeling assessment, for both the NAAQS. If any of the modeling demonstrates an existing violation to the NAAQS, it is proposed that the applicant may continue to show that the proposed source does not contribute to an existing violation of the PM2.5 NAAQS by demonstrating that the proposed source's PM2.5 impact does not significantly contribute to an existing violation of the PM2.5 NAAQS. Comparison to the SILs for PSD Class I and Class II increments will be based on the maximum short-term or annual project impacts. For these analyses, the USEPA SILs for PM2.5 of 1.2 and 0.3 $\mu g/m^3$ for PSD Class II areas and 0.07 and 0.06 $\mu g/m^3$ for PSD Class I areas are proposed for evaluating PEP impacts for 24-hour and annual averaging times, respectively.

NAAQS/Increment Multisource Inventory Request: Based on the PSD analyses performed for the PHPP project at this location and for those pollutants above the applicable SILs, a request of a multisource inventory of all facilities with either PM10, PM2.5 or NO_x emissions greater than 20 tons per year (tpy) within 60 km of the project site (398600m, 3833650m in UTM Zone 12 in NAD83 coordinates). We will also requesting that the PSD-increment sources be identified. The 20 tpy value reflects the value determined in the previous PSD Permit/Application to reflect a facility that has a potential to cause a significant concentration gradient in the project SIA. The 60 km value reflects a distance that is 50 kilometers beyond the area that is 10 km in radius around PEP, since recent USEPA guidance suggests that most 1-hour NO_2 modeling analyses should primarily focus on this area around a proposed PSD source. This 10-km area is also the same area that was reviewed by the AVAQMD to prepare the cumulative source inventory, which consisted of the Lockheed-Martin and Northrop-Grumman stationary sources at Air Force Palmdale Plant 42. Finally, the 60-km PSD-CIA area is also more than 50 kilometers beyond the PM10/PM2.5 SIAs, which will satisfy current USEPA guidance for PM2.5 and PSD cumulative modeling analyses.

NAAQS and Increment Modeling Procedures: Per EPA guidance, Appendix W and the *Draft NSR Workshop Manual* require that the cumulative and increment impacts analysis to include "nearby sources", which includes "[a]ll sources expected to cause a ***significant concentration gradient*** in the vicinity of the source or sources under consideration." This is performed for sources within the SIA plus the 50 km screening area beyond the maximum radial distance of the SIA. Appendix W further instructs that the "impact of nearby sources should be examined at locations where interactions between the plume of the point source under consideration and those of nearby sources (plus natural background) can occur". Emphasizing that "[t]he number of sources is expected to be small except in unusual situations". Thus, only sources with a significant concentration gradient in the vicinity of the source need to be included.

To limit the total number of sources used in the cumulative NAAQS analysis, a Q/D assessment will be made. The existing facilities in the NAAQS cumulative multisource inventory will be screened with a the Q/D analysis[2], where Q is the equivalent ton/year emission rate (appropriately accounting for emergency equipment) and D is the shortest distance in km from the multisource facility to the nearest SIA boundary for PM2.5/PM10 and the 10-km area that is the focus of the NO_2 analyses. Those facilities with a Q/D value greater than 20 tpy/km will be included in the cumulative NAAQS and will the Lockheed-Martin and Northrop-Grumman sources (expected to each have a Q/D in excess of 20 tpy/km).

Additional background sources may also include the Granite Rock Construction and Roberson's ready Mix. Kern County APCD, South Coast AQMD and the San Joaquin Valley APCD will be contacted as well to identify any additional sources that should be included.

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[2] North Carolina Department of Environment and Natural Resources - Air Permit Unit, 1985: A Screening Method for PSD, July 22, 1985. Memo from Eldewins Haynes to Lewis Nagler, EPA Region IV. This method was originally approved by EPA Region IV in a September 5, 1985 letter from Bruce Miller to Eldewins Haynes.

It is also expected that, based on the use of the Lancaster monitoring station data for use as background, it is expected that the monitoring data would conservatively represent all background sources within 10 kilometers of the project site.

For assessing the 1-hour NO_2 NAAQS, as in the previous PHPP analysis, the same receptors will be used (i.e., the facility downwash, intermediate, and coarse receptor grids that extend 10-km from PEP in all directions but which exclude receptors on the Lockheed-Martin and Northrop-Grumman properties at Air Force Palmdale Plant 42). All five years of Palmdale ASOS meteorological data will be analyzed. In addition, the 1-hour NO_2 analysis will use the USEPA Ozone Limiting Method (OLM) with concurrent ozone data from the Lancaster air quality monitoring site and hourly seasonal background NO_2 data averaged over the past 3 years as described in USEPA NO_2 guidance documents. The Plant 42 sources will be modeled with an NO_2/NO_x ISR ratio of 0.2 with a project based ISR of 0.5.

For assessing increment, all major increment consuming sources will be identified and used in the analysis for which baseline has been triggered. This includes both PM10 and PM2.5, although this proposed project will be the only increment consuming source for PM2.5.

<u>Secondary PM2.5 Formation:</u> Formation of secondary PM2.5 from the emissions of precursor pollutants such as NO_2 and SO_2 can occur at downwind distances over time periods of hours or days. The creation of secondary PM2.5 can increase the total concentration of the total PM2.5 impacts by adding to the direct PM2.5 emissions from the project. EPA has published draft guidance on how to account for secondary PM2.5 from the precursors of NO_2 and SO_2 (*EPA Guidance for PM2.5 Permit Modeling, March 2014*). Within this guidance, EPA has developed two assessment cases from which secondary impacts should be addressed. For the CPEC project, where direct emissions of PM2.5 and NO_x will exceed the significant emission rates, the EPA allows a qualitative or a hybrid/qualitative/quantitative approach for assessing the secondary air quality impacts.

The project impacts are expected to be below the SILs for annual NO_2 and SO_2, which would likely limit the pollutants from impacting secondary formation significantly enough to result in a violation of the PM2.5 standards. But it is possible that some transformation will occur, although given the time for the transformation to occur, secondary PM2.5 impacts are expected to occur at distances much farther downwind than the SIA of 1.8 km. However, to assess secondary formation, a hybrid/qualitative assessment will be made using Appendix D of the EPA *Guidance for PM2.5 Permit Modeling* (May 2014). Here, the formation of secondary PM2.5 is accounted for by dividing the projected emissions by a region average offset ratio. The national ratio for SO_2 is 40 and for NO_x is 100.Total PM2.5 emission are calculated by multiplying the primary PM2.5 modeled concentration by the ratio obtained from the secondary equivalent calculation.

For the PEP project, this results in the following:

- Total Equivalent PM2.5 = Primary 2.5 + (SO_2/40) + (NO_x/100) =

  81.01 + (11.39/40) + (139/100) = 82.68 tpy

- Total Equivalent PM2.5/Primary 2.5 = 1.02

Thus, all molded impacts of PM2.5 will be increased by a factor of 1.02 to account for the secondary formation for sources emitting significant amounts of secondary precursor emissions (note, SO_2 emissions from PEP are not expected to be significant, but are included for conservatism).

PSD Class I AQRV Analyses: This facility will be a major source for criteria pollutant emissions and is therefore automatically subject to PSD permitting requirements. PSD Class I Air Quality Related Value (AQRV) analyses, including visibility and nitrogen deposition may also be required. The nearest Class I area is the San Gabriel Wilderness, located approximately 36 km to the southeast. Fourteen additional Class I areas are located within 300 km of the facility. The range of distances to each Class I area is listed in Table 10 below.

Following the most recent FLAG Workshop procedures (June 2010), the use of the Screening Procedure (Q/D) to determine if the project could screen out of a formal AQRV assessment for visibility and nitrogen deposition was made. Following the screening procedures in FLAG, Q is calculated as the sum (in tons/year) of emissions of NO_x, SO_x, PM10/2.5, and H_2SO_4 based on the worst-case hour on the worst-case day and adjusted to reflect 365 days of operation. The screening calculation takes the form of:

> **Q = sum(NO_x+PM+SOx+H_2SO_4) in maximum lbs/hr (for 24-hours) for the worst-case day * 365 days/year**

The worst-case day Q/D scenario of 327.3 is based on one (1) warm start, one (1) hot start, two (2) shutdowns and 22.1 hours of base load with duct firing (assuming a very cold day). Three Q/D scenarios are presented based on the proposed worst-case day operational scenarios.

It should be noted that this case is the hypothetical worst-case day and would only occur on an infrequent basis. The distance is the nearest distance to the applicable Class I area in kilometers (km).

If Q/D is less than 10, then no AQRV analysis is required, as shown above for the nearest Class I area. Based on the ratio of Q/D, none of the Class I areas have a Q/D of greater than 10 for any of the three cases, as summarized in Table 8. Therefore, it is proposed that no further analyses of AQRVs for visibility or nitrogen deposition are required for those areas. The applicant will coordinate with the FLM's on the Q/D results as well as providing a copy of this modeling protocol. Nearby PSD Class I areas to the proposed PEP project site are shown in Table 10.

TABLE 10

NEARBY CLASS I AREAS AND Q/D SCREENING RESULTS

Class I Areas	Minimum Distance (km)	Maximum Distance (km)	Q/D (Worst Case)
San Gabriel	35.5	48.1	9.22
Cucamonga	61.2	67.8	5.35
San Gorgonio	118.3	147.0	2.77
Domeland	119.4	154.2	2.74
San Rafael	140.6	187.2	2.33
San Jacinto	149.1	174.0	2.20
Agua Tibia	164.8	176.3	1.99
Joshua Tree NP	164.9	276.2	1.99

Sequoia NP	188.2	233.1	1.74
John Muir	204.2	338.5	1.60
Kings Canyon	220.5	294.1	1.49
Kaiser	306.1	314.0	1.07
Ansel Adams	310.0	378.4	1.06
Ventana	333.9	388.1	0.98
Pinnacles	341.5	353.4	0.96
***Q/D based on worst case day of 1 warm start, 1 hot start, 2 shutdowns, and 22.1 hours of base load with duct burning.**			

PSD Class I AERMOD Screening Analyses: The AQRV exemption does not apply to modeling compliance with the Class I increments or NAAQS, which are based solely on the Class I SILs. Therefore, Class I SILs modeling will be assessed for the Class I areas listed in Table 10. Modeling will first be performed for the proposed PEP project emissions only and then compared to the applicable Class I SILs. The Class I receptor grid and elevations given by the National Park Service Air Resources Division on the webpage will be used:

http://www.nature.nps.gov/air/Maps/Receptors/index.cfm

These receptors will be converted to UTM NAD83 coordinates by the US Army Corps of Engineers CORPSCON program for Class I areas within 50 km of the PEP project site.

The USEPA Modeling Guidelines suggest that the use of AERMOD be limited to distances of less than approximately 50 km, beyond which the CALPUFF dispersion model is typically used to assess the long-range transport of pollutants. Since the requirement to assess AQRVs for each of these areas may not be required, based on the Q/D results, an alternative modeling approach with AERMOD is proposed for assessing Class I SILs for each Class I area that is located at a distance greater than 50 kilometers. The proposed approach would utilize a ring of receptors at 50 km distance from the PEP project, with receptors placed at two (2) degree intervals over the entire 360 degree circle of receptors. For each of these receptors, the receptor heights would be based on the lowest elevation to the maximum elevation for each of the 15 Class I areas, at 100 meter elevation intervals. Using this grid, the Class I SILs would be assessed. If any of the Class I areas have impacts that exceed the SILs, then the CALPUFF modeling will be used to reassess these SILs and, if needed, would also be used to assess PSD Class I area increments and NAAQS.

For San Gabriel Wilderness, which is located just inside the 50 kilometer distance at its closest distance, AERMOD would be used for all park receptors as the maximum distance from the PEP is within 50 km (48.1 km).

Coherent Plume VISCREEN Analysis: As the San Gabriel Wilderness is located approximately 36 kilometers distance, a plume blight analysis will be conducted based on emissions from the proposed Project. The VISCREEN model (version 1.01) will be used to conduct the plume blight analysis with a 98th percentile background visual range as recommended by the FLM Guidance.

As all other Class I areas are beyond the recommended distances for using VISCREEN and based on the Q/D analysis, no coherent plume assessments will be made for the other areas.

A coherent plume analysis with VISCREEN will also be made for assessing impacts to Class II visibility.

Additional Impact Assessments: Additional impact assessments will be made with regards to socioeconomics and biology. The impacts to sensitive species and plants will be included with regards to pollutant concentrations and possible depositional effects. The PSD permit application package will include these additional studies.

FINAL MODELING SUBMITTAL

As part of the final modeling analyses, EPA Region 9 will be supplied with the following materials:

- Figure of the local site area taken from nearby US Geological Survey (USGS) 7½' (1:24,000) map(s) showing the facility, property fenceline, and nearby receptors;
- Figure of the regional area taken from USGS maps showing the outline of all receptor grids modeled;
- All modeling inputs/outputs (including BPIP and meteorological files) on CD-ROM disc, together with a description of all filenames;
- Support data for emissions and project operating parameters; and
- Additional figures and plot plans needed for agency review.

FIGURE 1

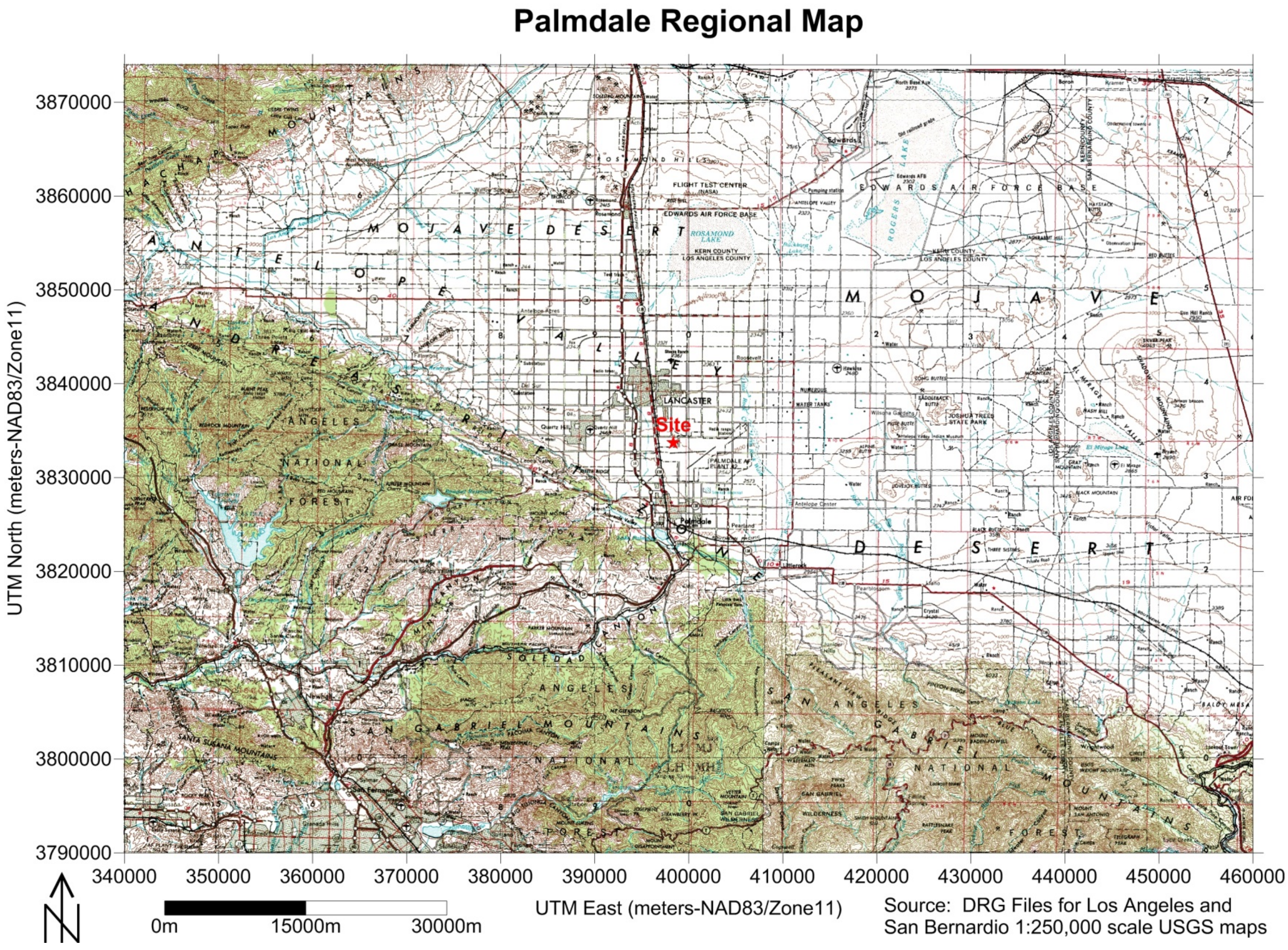

Palmdale Regional Map
UTM North (meters-NAD83/Zone11)
UTM East (meters-NAD83/Zone11)
Site
0m 15000m 30000m
Source: DRG Files for Los Angeles and San Bernardio 1:250,000 scale USGS maps

FIGURE 2

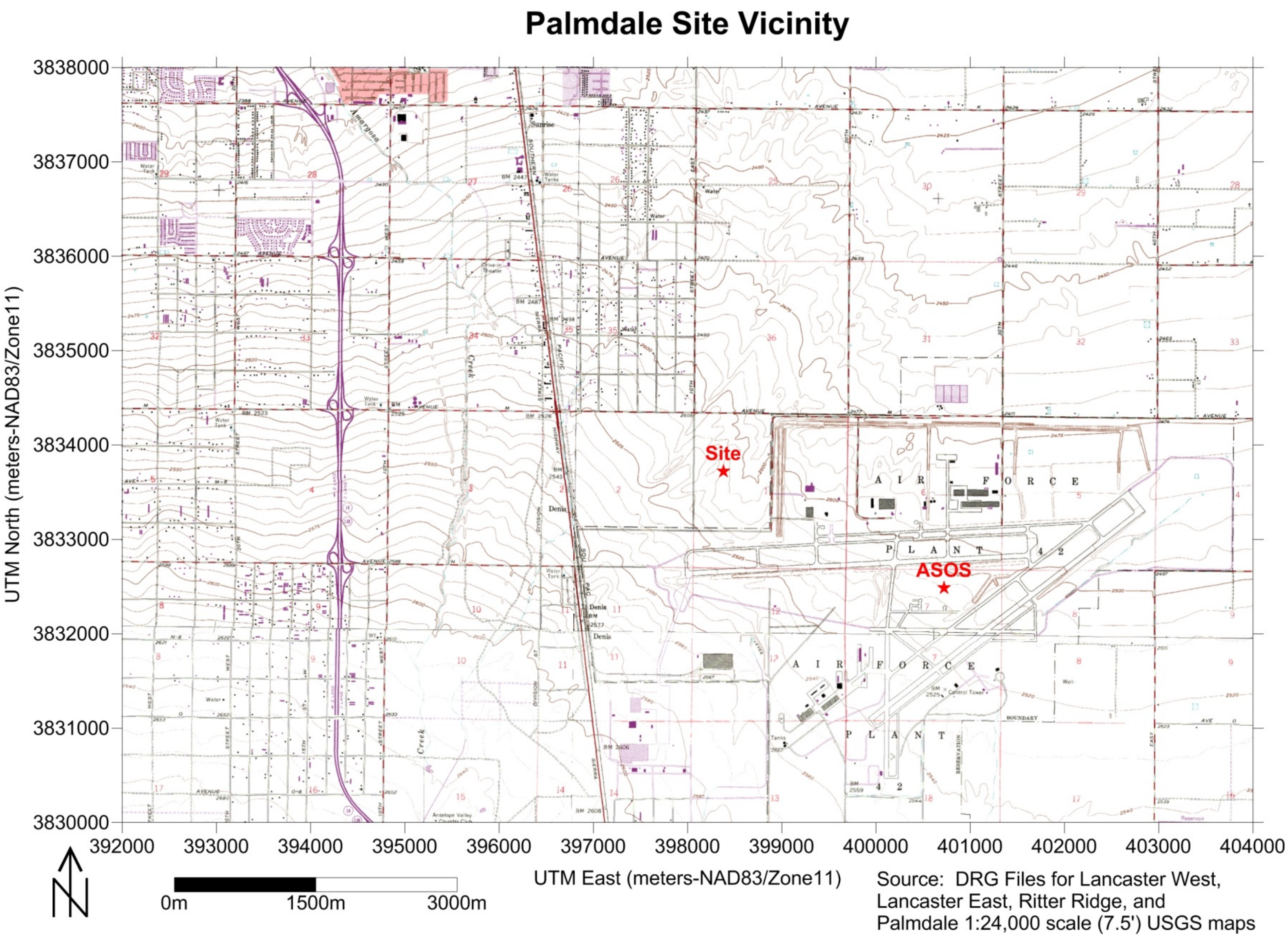

Palmdale Site Vicinity
UTM North (meters-NAD83/Zone11)
3838000
3837000
3836000
3835000
3834000
3833000
3832000
3831000
3830000
392000
393000
394000
395000
396000
397000
398000
399000
400000
401000
402000
403000
404000
UTM East (meters-NAD83/Zone11)
Site
ASOS
0m
1500m
3000m
Source: DRG Files for Lancaster West, Lancaster East, Ritter Ridge, and Palmdale 1:24,000 scale (7.5') USGS maps

FIGURE 3

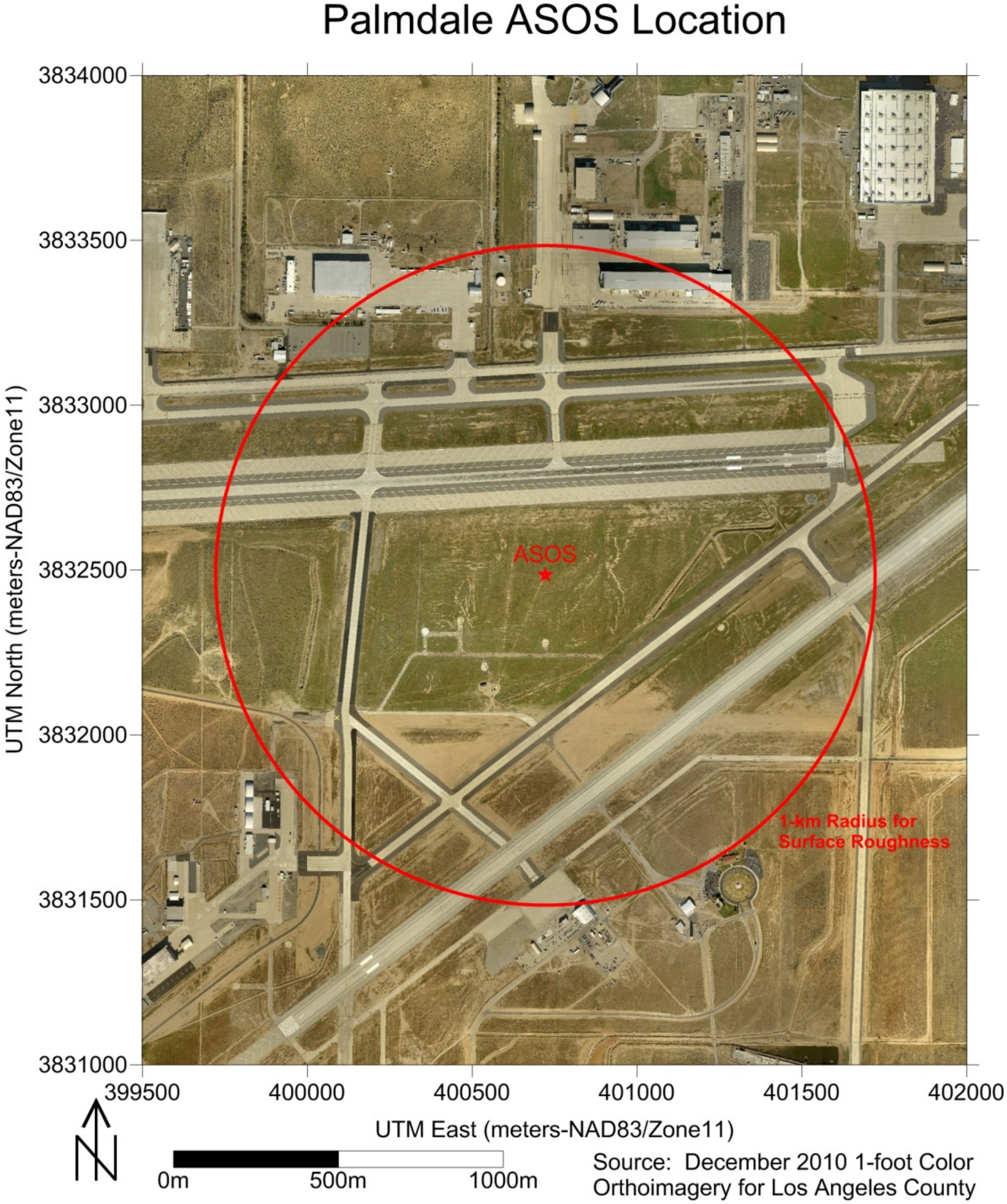

Palmdale ASOS Location
3834000
3833500
3833000
3832500
3832000
3831500
3831000
UTM North (meters-NAD83/Zone11)
399500
400000
400500
401000
401500
402000
UTM East (meters-NAD83/Zone11)
ASOS
1-km Radius for
Surface Roughness
N
0m
500m
1000m
Source: December 2010 1-foot Color
Orthoimagery for Los Angeles County

FIGURE 4

Annual Palmdale Wind Rose (2010-2014)

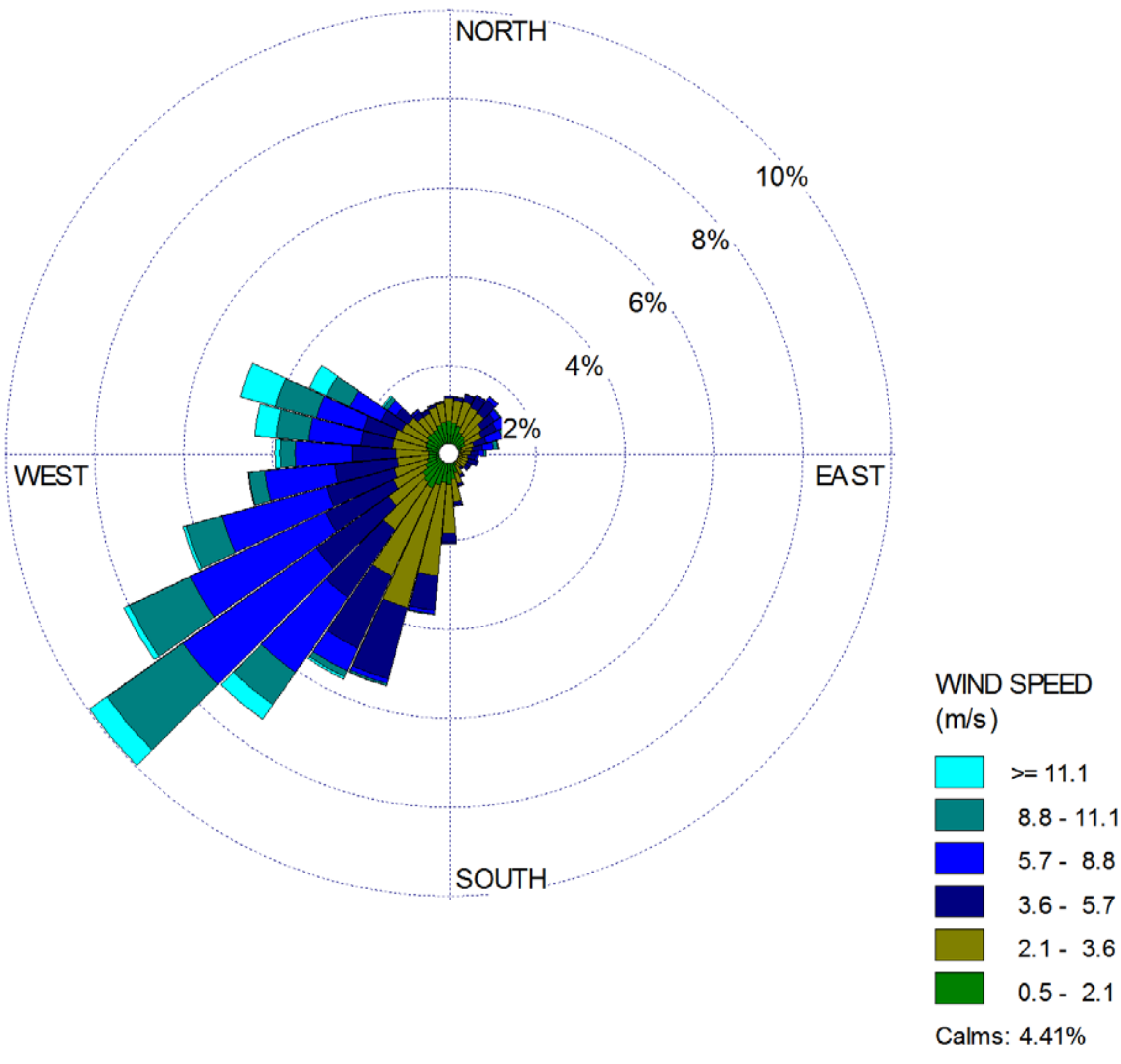


Figure 5

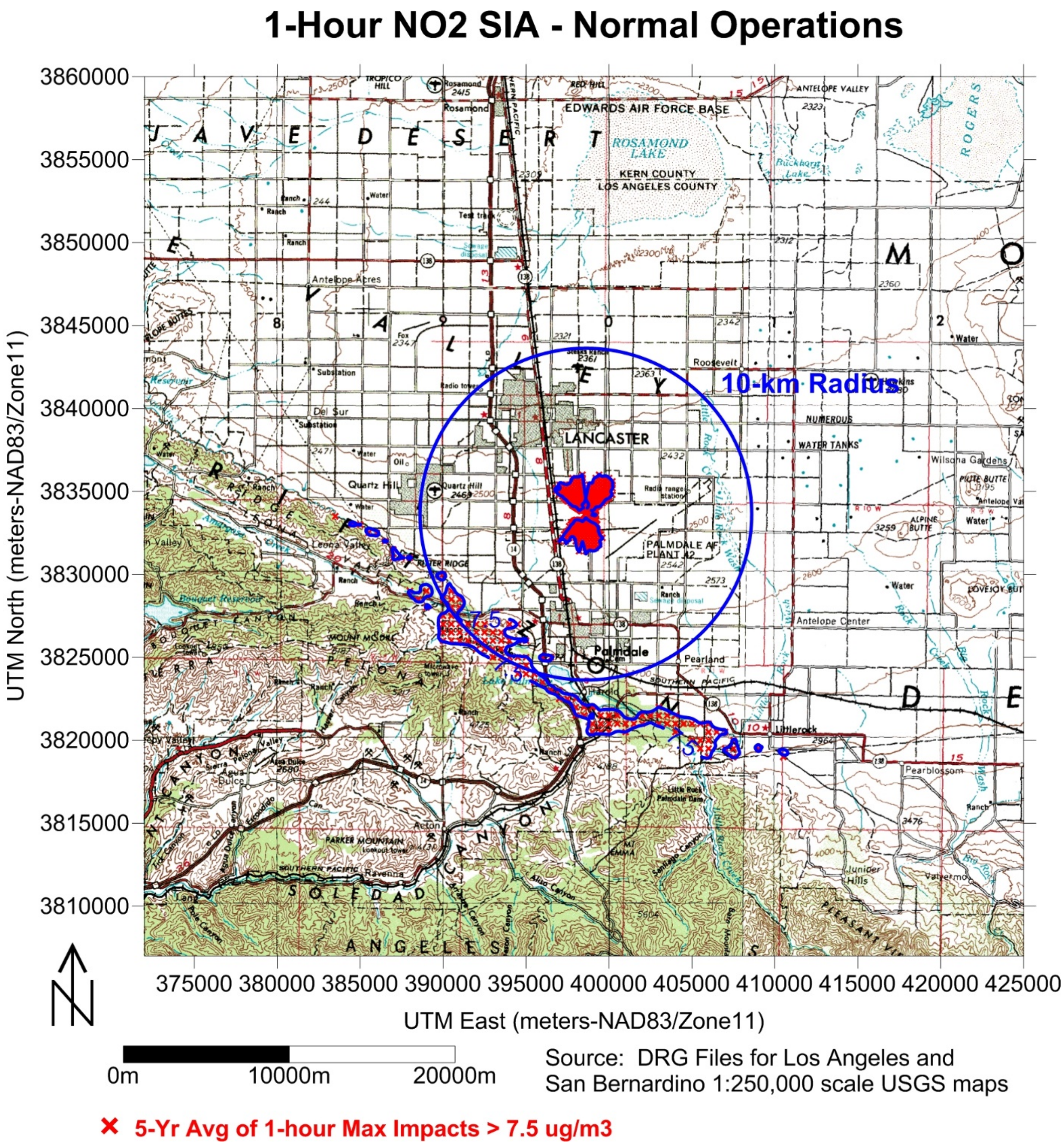
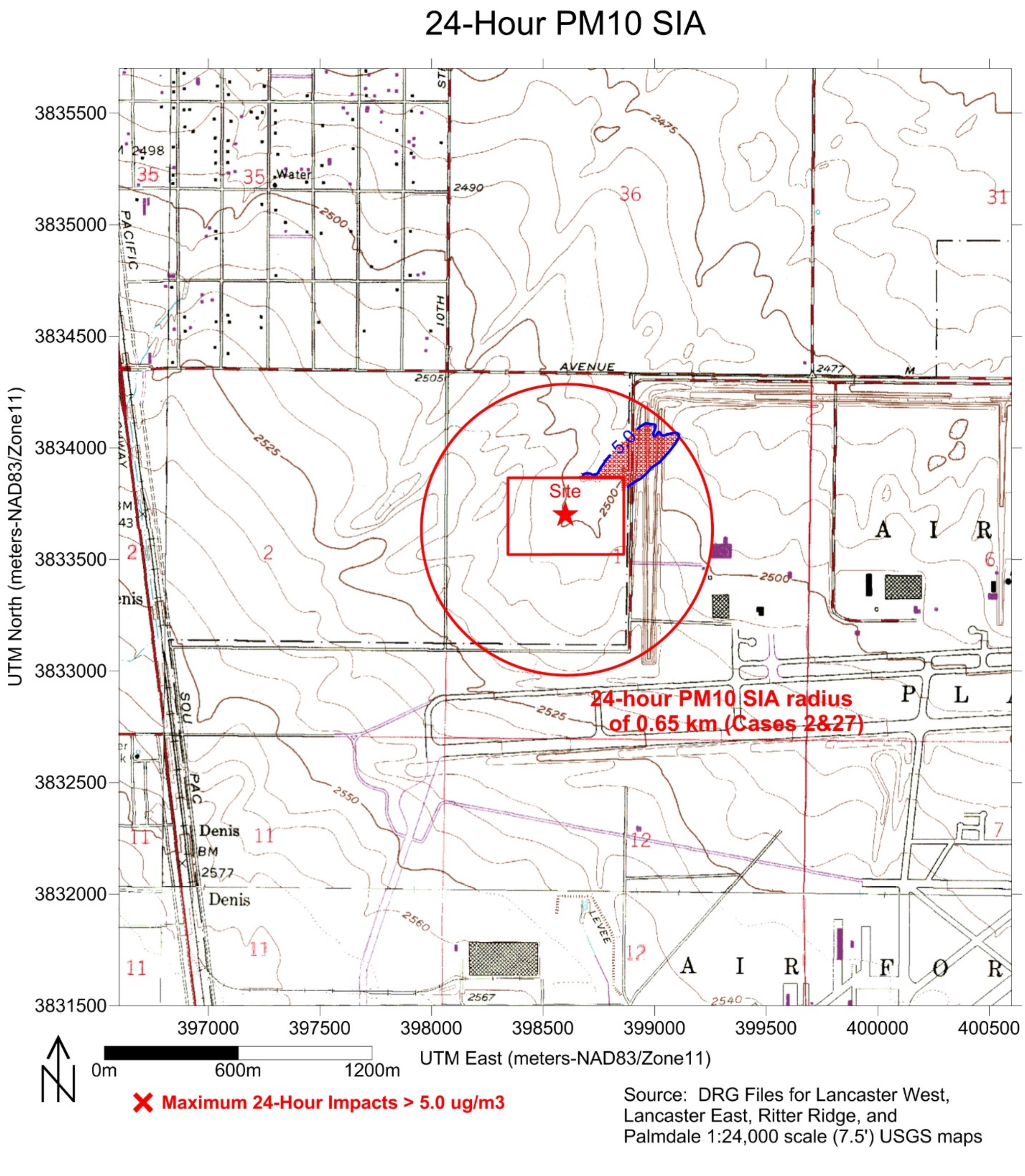

1-Hour NO2 SIA - Normal Operations
3860000
3855000
3850000
3845000
3840000
3835000
3830000
3825000
3820000
3815000
3810000
UTM North (meters-NAD83/Zone11)
375000 380000 385000 390000 395000 400000 405000 410000 415000 420000 425000
UTM East (meters-NAD83/Zone11)
10-km Radius
EDWARDS AIR FORCE BASE
ROSAMOND LAKE
KERN COUNTY
LOS ANGELES COUNTY
LANCASTER
Quartz Hill
PALMDALE AF PLANT 42
Palmdale
Pearland
Littlerock
Pearblossom
Antelope Acres
Antelope Center
Wilsona Gardens
0m
10000m
20000m
Source: DRG Files for Los Angeles and
San Bernardino 1:250,000 scale USGS maps
× 5-Yr Avg of 1-hour Max Impacts > 7.5 ug/m3

Figure 6



Source: DRG Files for Lancaster West, Lancaster East, Ritter Ridge, and Palmdale 1:24,000 scale (7.5') USGS maps

Figure 7

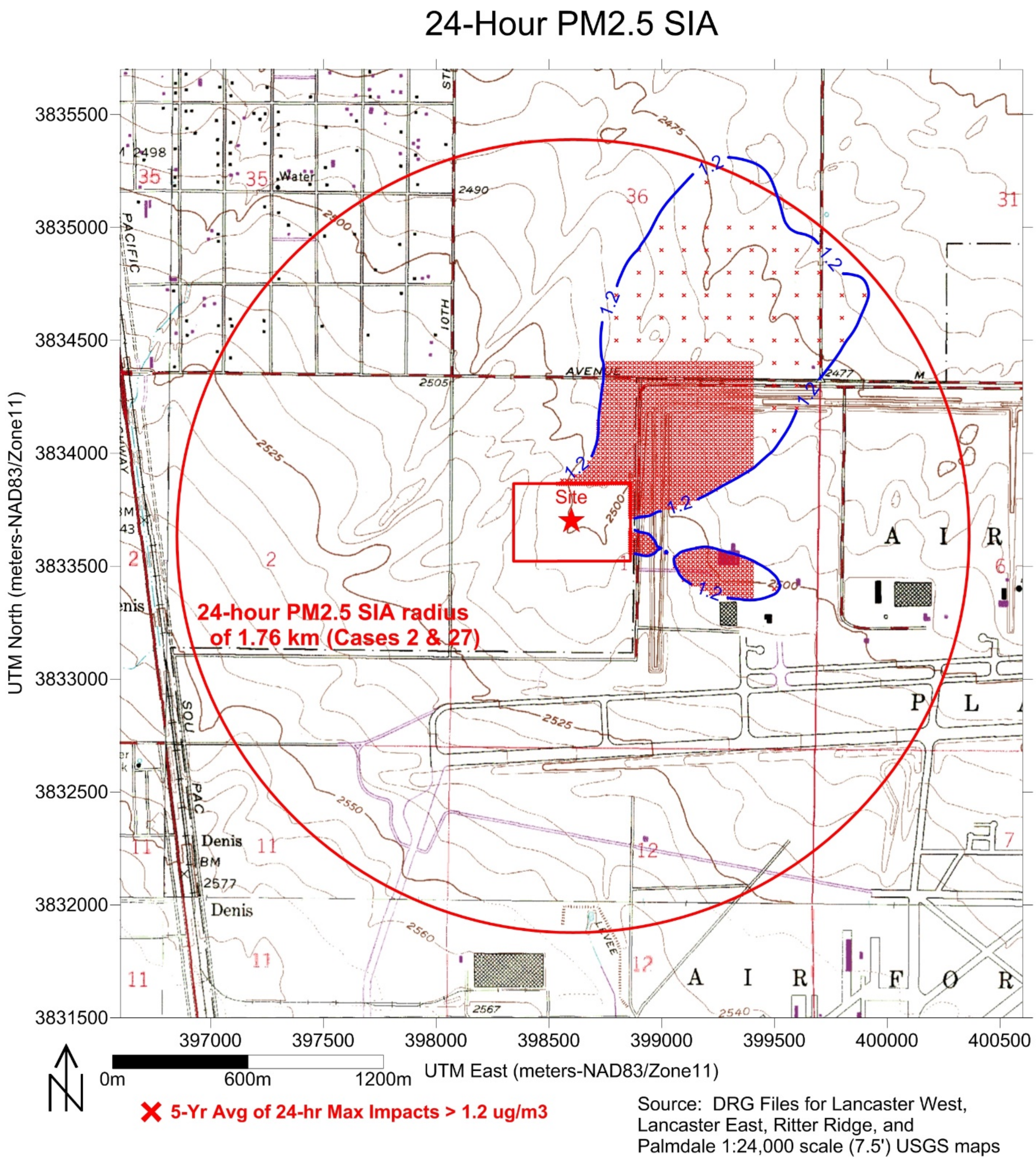

24-Hour PM2.5 SIA
UTM North (meters-NAD83/Zone11)
UTM East (meters-NAD83/Zone11)
3835500
3835000
3834500
3834000
3833500
3833000
3832500
3832000
3831500
397000
397500
398000
398500
399000
399500
400000
400500
Site
24-hour PM2.5 SIA radius
of 1.76 km (Cases 2 & 27)
1.2
0m
600m
1200m
5-Yr Avg of 24-hr Max Impacts > 1.2 ug/m3
Source: DRG Files for Lancaster West,
Lancaster East, Ritter Ridge, and
Palmdale 1:24,000 scale (7.5') USGS maps

Figure 8

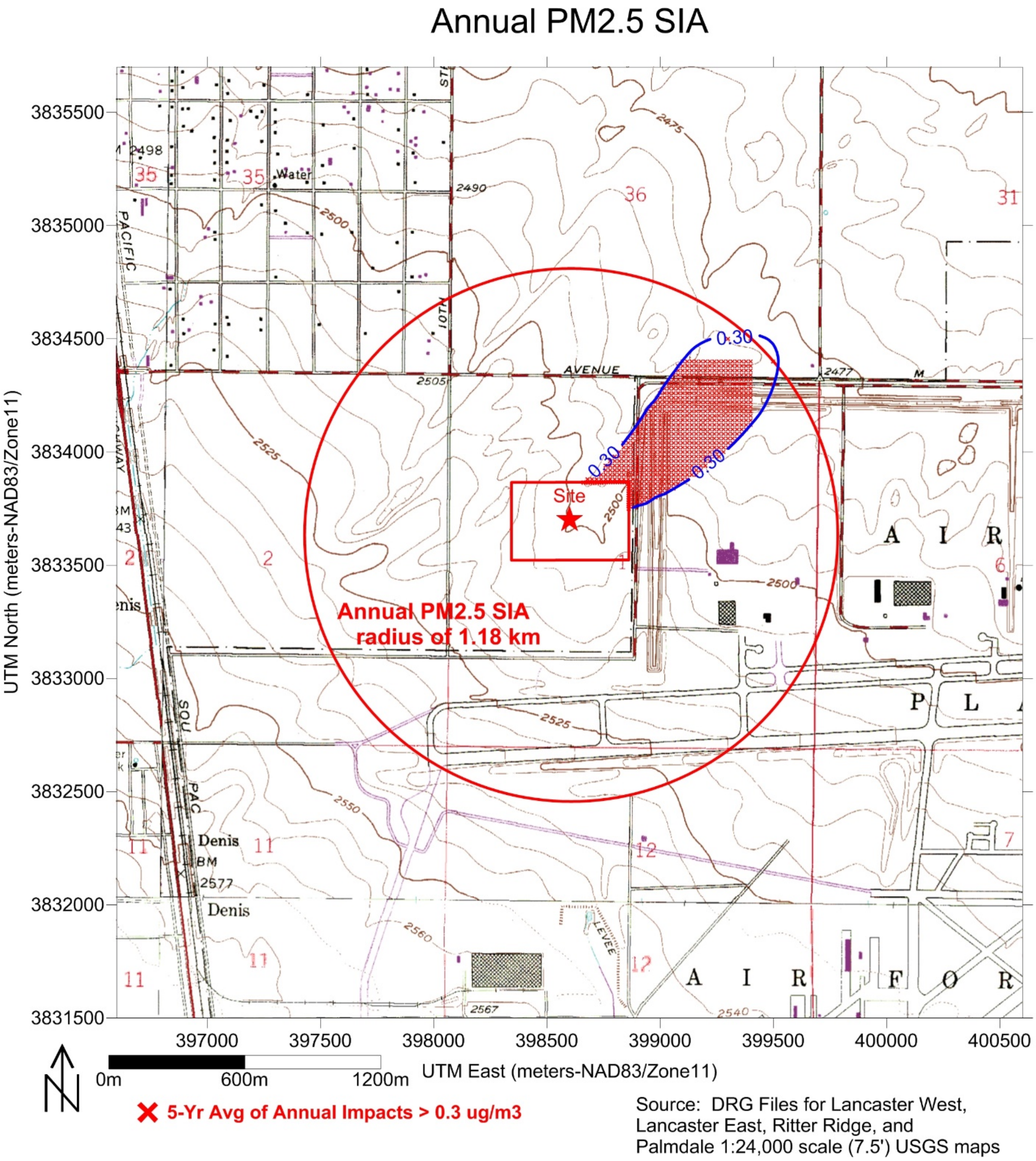
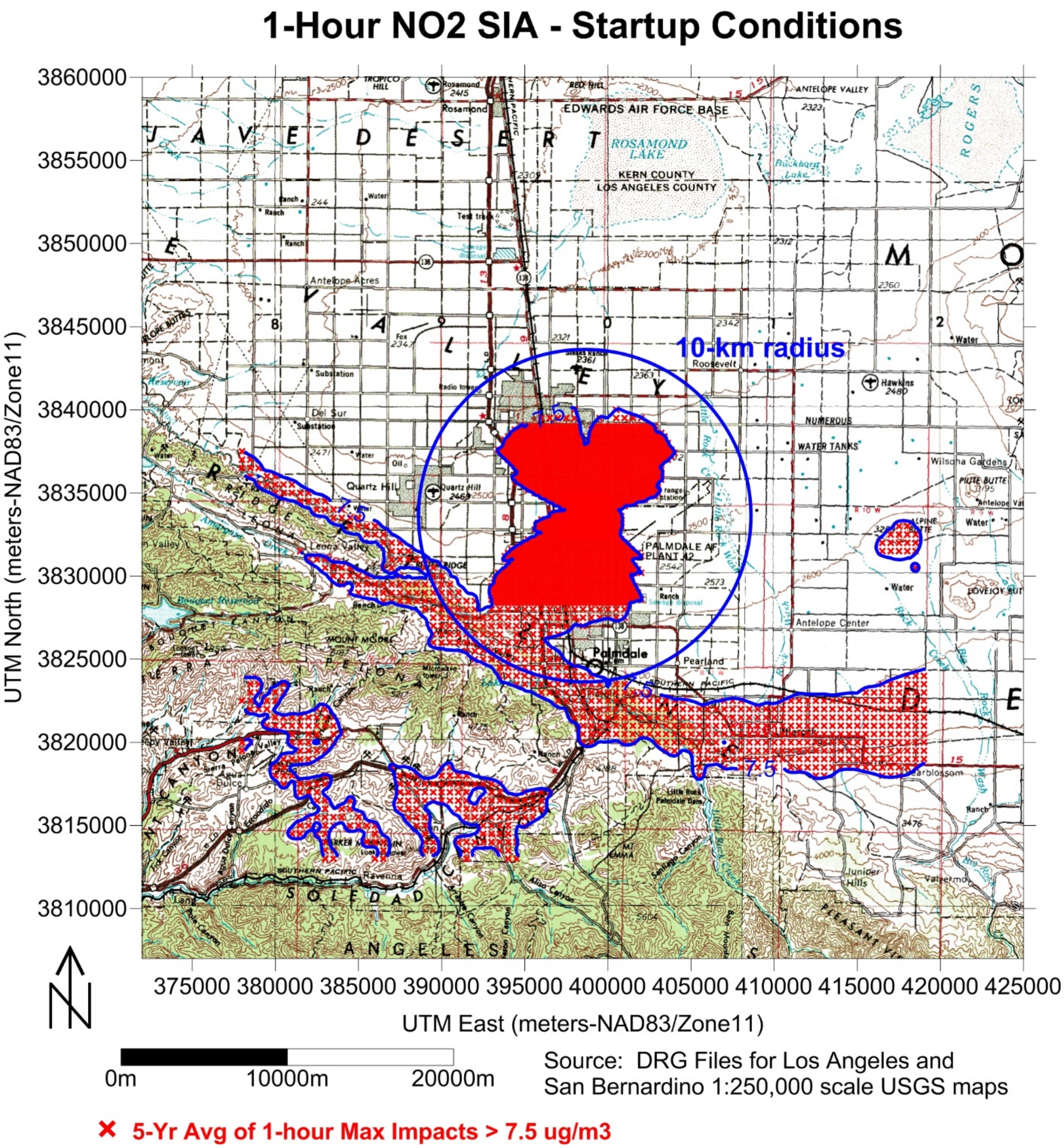

Annual PM2.5 SIA
UTM North (meters-NAD83/Zone11)
UTM East (meters-NAD83/Zone11)
Site
0.30
Annual PM2.5 SIA
radius of 1.18 km
0m
600m
1200m
5-Yr Avg of Annual Impacts > 0.3 ug/m3
Source: DRG Files for Lancaster West, Lancaster East, Ritter Ridge, and Palmdale 1:24,000 scale (7.5') USGS maps

Figure 9


1-Hour NO2 SIA - Startup Conditions
10-km radius
UTM North (meters-NAD83/Zone11)
UTM East (meters-NAD83/Zone11)
3860000
3855000
3850000
3845000
3840000
3835000
3830000
3825000
3820000
3815000
3810000
375000 380000 385000 390000 395000 400000 405000 410000 415000 420000 425000
EDWARDS AIR FORCE BASE
ROSAMOND LAKE
KERN COUNTY
LOS ANGELES COUNTY
Quartz Hill
PALMDALE AF PLANT 42
Palmdale
Pearland
Antelope Center
Antelope Acres
Del Sur
Leona Valley
7.5
0m
10000m
20000m
Source: DRG Files for Los Angeles and San Bernardino 1:250,000 scale USGS maps
× 5-Yr Avg of 1-hour Max Impacts > 7.5 ug/m3