TETRA TECH EC, INC.

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January 23, 2012

California Energy Commission
Docket No. 11-AFC-3
1516 9th St.
Sacramento, CA 95814

Cogentrix Quail Brush Generation Project – Docket Number 11-AFC-3

Docket Clerk:

Pursuant to the provisions of Title 20, California Code of Regulation, Quail Brush Genco, LLC, a wholly owned subsidiary of Cogentrix Energy, LLC, hereby submits the *Quail Brush Generation Project Action Item Response Memo*. The Quail Brush Generation Project is a 100 megawatt natural gas fired electric generation peaking facility to be located in the City of San Diego, California.

This action item response memo was compiled in response to action items generated at the CEC's staff site visit and workshop held December 2, 2011 in San Diego, California. This document provides the additional information requested by staff at that time for the following issue areas:

- Traffic and Transportation
- Water Resources/Hydrology
- Air Quality
- Biological Resources
- Waste Management

If you have any questions, please contact Rick Neff at (704) 525-3800 or me at (303) 980-3653.

Sincerely,

Constance C. Farmer

Constance Farmer
Project Manager/Tetra Tech

cc: Eric Solorio /CEC Project Manager

17885 Von Karman Avenue, Suite 500, Irvine, CA 92614
Tel 949.809.5000 Fax 949.809.5004
www.tteci.com

TETRA TECH EC, INC.

Memorandum

To: Eric Solorio, California Energy Commission (CEC)

From: Connie Farmer, Tetra Tech EC, Inc. (Tetra Tech)

Date: January 23, 2011

Project: Cogentrix Quail Brush Generation Project

Subject: 12-2-2011 Workshop Action Items Response

Distribution:
Gary Palo, Cogentrix
Rick Neff, Cogentrix
Mark Chaffee, Cogentrix
Dipak Bhagat, Cogentrix
Lori Ziebart, Cogentrix
Ella Foley-Gannon, Bingham McCutchen LLP
Camarin Madigan, Bingham McCutchen LLP
Barry McDonald, Tetra Tech
Sarah McCall, Tetra Tech
Project File

During the December 2, 2011 Workshop held in San Diego, California, a number of action items were discussed. This memo documents Cogentrix's response to each action item.

Traffic and Transportation Action Items:

1. CEC traffic and transportation staff requested that Tetra Tech docket the traffic study prepared by Linscott, Law & Greenspan.

Response: The traffic study will be docketed at the CEC as Attachment 1 to this response package.

2. CEC traffic and transportation staff requested that Tetra Tech provide data on accidents on Sycamore Landfill Road and the intersection at the landfill entrance.

Response: The requested accident data have been gathered, incorporated into the traffic study, and are summarized below.

According to information provided by Sycamore Landfill, no traffic accidents occurred on Sycamore Landfill Road in the Years 2006 through 2011.

As explained in the traffic study docketed as Attachment 1, accident data for the landfill entrance intersection of Mast Boulevard/Sycamore Landfill Road/W. Hills Parkway were collected for the years 2006 through 2010. This five-year period is the most recent period for which a full calendar year of data are available. These data were collected from the Statewide Integrated Traffic Records System. Data for these years were analyzed and accidents occurring at the intersection or near the intersection were selected from the data set. A total of seven (7) accidents were found to have occurred during this time period. The persons involved in these accidents reported some minor injuries. There were no fatalities.

3. CEC traffic and transportation staff requested that Tetra Tech provide contact information for the person at Miramar Naval Air Station who has been coordinated with regarding the Project and contact information for the appropriate person at Gillespie Field Airport.

Response: Coordination at Marine Corps Air Station Miramar was via a telephone call with Ms. Kristin Camper on August 1, 2011 in the following office.

Laura Thornton, Community Plans & Liaison Officer
Community Plans & Liaison Office
Marine Corps Air Station Miramar
P.O. Box 452001
San Diego, CA 92145-2001
Phone: (858) 577-6603
laura.thornton@usmc.mil

Coordination regarding Gillespie Field occurred on January 17, 2012 via a meeting between Cogentrix and Peter Drinkwater (Director, County Airports) and Eric Nelson, PE (Airport Engineer) of the San Diego County Department of Public Works in the following office.

1579 Osage Street
San Marcos, CA 92078-2504
(760) 510-2440

4. CEC traffic and transportation staff requested that Tetra Tech analyze the plume exit velocity from the stacks to determine the maximum height with a velocity of 4.3 meters per second. Exit velocities below this threshold do not interfere with air traffic. Once plume exit velocity elevation threshold has been determined, then analyze if any aircraft (both fixed wing and helicopter) could fly under this elevation above the stacks.

Response: The plume exit velocity study is currently underway and the results of this work will be provided to the CEC as soon as the report is available.

5. CEC traffic and transportation staff requested that Tetra Tech file the 7460 Forms with the Federal Aviation Administration (FAA) as soon as possible.

Response: Forms 7460 were filed with the FAA on December 19, 2011. Determinations for all stack locations and most pole locations were received on January 5, 2012 and January 18, 2012 and are provided as Attachment 2 to this submittal. The determinations state that the structure in question does not exceed obstruction standards and would not be a hazard to air navigation, if specified conditions are met.

Water Resources/Hydrology Action Items:

1. CEC water resources staff requested that Tetra Tech set up a meeting with City of San Diego, CEC, and Tetra Tech staff to discuss the City's requirements and the necessary submittals regarding the surface water hydrology, stormwater control and best management practices to help ensure that Tetra Tech provides the appropriate documentation.

Response: Connie Farmer, project manager from Tetra Tech is working with Morris Dye, the development project manager for the City of San Diego, to schedule this meeting. Tetra Tech will keep CEC staff informed as to their coordination efforts.

Geology/Paleontology Action Items:

1. CEC geology staff requested that Tetra Tech explain their conclusion that because of the Multi-Habit Planning Area (MHPA) being incompatible with new mining, economic mineral deposits at the proposed project site would not be significantly impacted.

Response: The Application for Certification concluded that the project would not impact a commercial mineral resource because under the MHPA Land Use Guidelines any new or expanded mining operations would be incompatible with MHPA preserve goals.

Currently, the project is within the MHPA, in which according to the City of San Diego General Plan Conservation Element (City of San Diego 2008), existing mining operations are permitted. There are no existing mining operations on the project site and new mining operations within the MHPA are limited as stated in the Conservation Element:

> *[N]ew or expanded mining operations on lands conserved as part of the MHPA are incompatible with MSCP preserve goals for covered species and their habitats, unless otherwise agreed to by the wildlife agencies at the time the parcel is conserved. New operations could be permitted in the MHPA if: 1) impacts have been assessed and conditions incorporated to mitigate biological impacts and restore mined areas; 2) adverse impacts to covered species in the MHPA have been mitigated consistent with the Subarea Plan; and 3) requirements of other City land use policies and regulations have been satisfied. [p. CE-42 – CE-43]*

Cogentrix is proposing to withdraw the property from the MHPA. After the proposed project site is withdrawn, it would be adjacent to the MHPA and according to the MSCP Subarea Plan (City of San Diego 1997),

> *Existing and any newly permitted [mining] operations adjacent to or within the MHPA shall meet noise, air quality and water quality regulation requirements, as identified in*

> *the conditions of any existing or new permit, in order to adequately protect adjacent preserved areas and covered species… [p. 46]*

Therefore, the City of San Diego would need to approve any new mining operations on the project site, as it would be adjacent to the MHPA. The limitations on new mining operations from properties within the MHPA and adjacent to the MHPA are similar and permitting such operations is left to the discretion of the City.

Mining the Stadium Conglomerate for aggregate and sand would require stripping the site. Stadium Conglomerate is located mostly along the ridgelines and high points of the proposed project site. The quantity of aggregate and cementation of the bedrock unit would make it relatively more difficult to mine than favored streambed aggregate deposits within the area. The impact to air, noise and water quality would likely be significant, as would visual impacts. For these reasons, it is highly unlikely that the City of San Diego would permit the extraction of mineral deposits at the proposed project site and therefore economic mineral deposits at the proposed project site would not be significantly impacted.

Accordingly, removal of the project site from the MHPA would have no impact on mineral resources.

Air Quality Action Items:

1. CEC air quality staff requested that Tetra Tech provide a copy of the Prevention of Significant Deterioration (PSD) Application submitted to U.S. Environmental Protection Agency.

Response: A copy of the PSD application is included in this response package as Attachment 3.

2. CEC air quality staff requested that Tetra Tech set up a conference call with CEC, Air Pollution Control District (APCD), Tetra Tech, and Aerowest once the APCD provides the list of potential cumulative projects to be considered for the Project, to discuss them. CEC has different requirements relative to the cumulative analysis than does the APCD. The CEC wants to make sure the analysis addresses the needs of all parties.

Response: A letter (Attachment 4) requesting the list of cumulative projects, among other information, from the APCD was submitted on December 22, 2011. The APCD has not provided a response to date. The call will be organized when the APCD list is provided.

3. CEC air quality staff requested that on the same call, a discussion of nitrogen deposition and plume modeling be included to assure the protocol to be used serves the purposes of all parties.

Response: Please see response to Air Quality action item 2 above.

4. CEC air quality staff requested that Tetra Tech conduct nitrogen deposition modeling and prepare figures that show the potential plume.

Response: Tetra Tech will conduct the necessary air quality modeling to determine the potential for nitrogen deposition per the protocol agreed to by the APCD and CEC. The protocol will be discussed during the call to be organized after the list of cumulative projects is provided (see response to Air Quality action item 2 above) and the modeling will start as soon as the protocol is established.

Biological Resources Action Items:

1. CEC biologists requested that Tetra Tech provide a map showing laydown areas and construction work space with biological resources overlay.

Response: The requested map is provided as Attachment 5.

2. CEC biologists requested that Tetra Tech initiate coordination with U.S. Army Corps of Engineers (USACE) regarding the preliminary jurisdiction delineation and request USACE determination. This is to be done initially via a conference call with CEC, Tetra Tech, and USACE staff.

Response: Scott Crawford, biologist from Michael Brandman Associates, Inc., is working to schedule a call with USACE, but, to date has not been successful in doing so. Tetra Tech will keep CEC staff informed as to their continued efforts.

3. CEC biologists requested that Tetra Tech provide a map showing the proposed mitigation parcels with biological resources overlay.

Response: The City of San Diego Real Estate Assets Department suggests that mitigation parcels for the Project are comprised of the high priority area adjacent to City-owned parcels west of the Sycamore Landfill. Mitigation parcels for the Project have not been finalized. Cogentrix is currently working to secure mitigation parcels and is not restricted to acquiring mitigation land within the City's suggested high priority area if the land pricing is prohibitive or Cogentrix is unable to negotiate reasonable terms with the land owners. The requested map identifying potential mitigation parcels is provided as Attachment 5.

4. Conduct nitrogen deposition modeling and prepare figures that show the potential plume.

Response: See response to Air Quality action item 4 above. Once the modeling has been conducted, Tetra Tech will analyze the potential impact of the plume on the Quino Checkerspot Butterfly.

5. Set up a conference call with City of San Diego, CEC, California Department of Fish and Game, U.S. Fish and Wildlife Service, and Tetra Tech staff to discuss 2012 surveys. The

purpose is to determine which species-specific surveys the agencies require (quino checkerspot butterfly, golden star, etc.), and the protocols to be used during the surveys, so that all agencies' needs are met.

Response: A conference call occurred on January 12 at 3 PM Pacific Standard Time. Notes from the call are provided as Attachment 6.

Waste Management Action Items:

1. CEC waste management staff requested that Cogentrix have a representative at the USACE meeting scheduled for December 13, 2011 at the Visitor's Center at Mission Trails Regional Park. Ellie Hough from CEC will also attend. After the meeting, talk with USACE representatives present to let them know that Cogentrix will be moving forward quickly to implement a unexploded ordnance (UXO) program for the entire Project area that will satisfy Project schedule needs and the company's insurance requirements. Discuss how to best coordinate these activities with the USACE's undertaking in the vicinity.

Response: Rick Neff of Cogentrix and Mark Dollar, Tetra Tech UXO specialist, attended this meeting. During the meeting, the USACE stated that they have previously done an Engineering Evaluation and Cost Analysis similar to a Remedial Investigation/Feasibility Study and a subsurface investigation on the site.

The USACE must conduct biological resource surveys on the site prior to conducting the UXO clearance. There is a potential problem for the USACE to obtain clearance from the USFWS to survey for the California gnatcatcher. It may be difficult and lengthy to obtain the biological clearance and subsequently conduct the UXO clearance. The USACE is planning to begin field work in September 2012 through March 2013; this timing is to avoid key biological windows for breeding and migration. The USACE indicated they have funding approval to meet this schedule. Field work will consist of initial surface geophysics followed by clearance of Munitions and Explosives of Concern (MEC). The Pardee Homes planned residential development will be the first priority for survey and clearance of MEC.

Rick Neff of Cogentrix discussed the Quail Brush Generation Project and schedule with the USACE representatives at the meeting. The USACE did not express any concerns regarding the Project.

Minutes from this meeting will be provided to the CEC upon receipt from the USACE. The USACE plans to develop draft work plans and will schedule another public meeting in the next few months. A representative of Cogentrix will likely attend the next meeting.

References

City of San Diego. 1997. Multiple Species Conservation Program City of San Diego MSCP Subarea Plan. March 1997. Available at http://www.sandiego.gov/planning/mscp/pdf/subareafullversion.pdf. Accessed December 13, 2011.

City of San Diego. 2008. City of San Diego General Plan: Conservation Element. March 2008. Available at http://www.sandiego.gov/planning/genplan/pdf/generalplan/adoptedconserelem1a.pdf. Accessed December 13, 2011.

ATTACHMENT 1

TRAFFIC IMPACT ANALYSIS

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TRAFFIC IMPACT ANALYSIS

QUAIL BRUSH GENERATION PROJECT

City of San Diego, California
January 19, 2012

LLG Ref. 3-11-2075

Prepared by:
KC Yellapu, P.E
Senior Transportation Engineer
&
Charlene Sadiarin
Engineering Technician I

Under the Supervision of:
John Boarman, P.E
Principal

Linscott, Law &
Greenspan, Engineers
4542 Ruffner Street
Suite 100
San Diego, CA 92111
858.300.8800 T
858.300.8810 F
www.llgengineers.com

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QUAIL BRUSH GENERATION PROJECT

San Diego, California
January 19, 2012

1.0 INTRODUCTION

The purpose of this traffic impact analysis is to determine and evaluate the potential traffic impacts associated with construction of the Quail Brush Generation project.

The project site is located south of the Sycamore Landfill and north of State Route 52, immediately west of the City of Santee in the East Elliott planning area of the City of San Diego. ***Figure 1–1*** shows the project vicinity.

The following items are included in this traffic study:

- Project Description
- Existing Conditions Description
- Traffic Analysis Approach and Methodology
- Significance Criteria
- Analysis of Existing Conditions
- Project Traffic Generation/Distribution/Assignment
- Construction Traffic Analysis
- Significance of Impacts and Recommended Mitigation Measures
- Post-Mitigation Analysis

LLG conducted research within the City of San Diego and the City of Santee to determine potential cumulative projects that could add traffic to the study area. Construction associated with the project is expected to conclude in 2014. There are other planned projects in the areas adjacent to the project site, such as the Castlerock, Fanita, and Sycamore Landfill Expansion projects. However, none of these projects are expected to be built and generating traffic within the schedule construction period. Therefore no cumulative projects were included in the analysis.

The analysis focuses on the potential impacts during the construction period. The post-construction operational traffic will be very small.

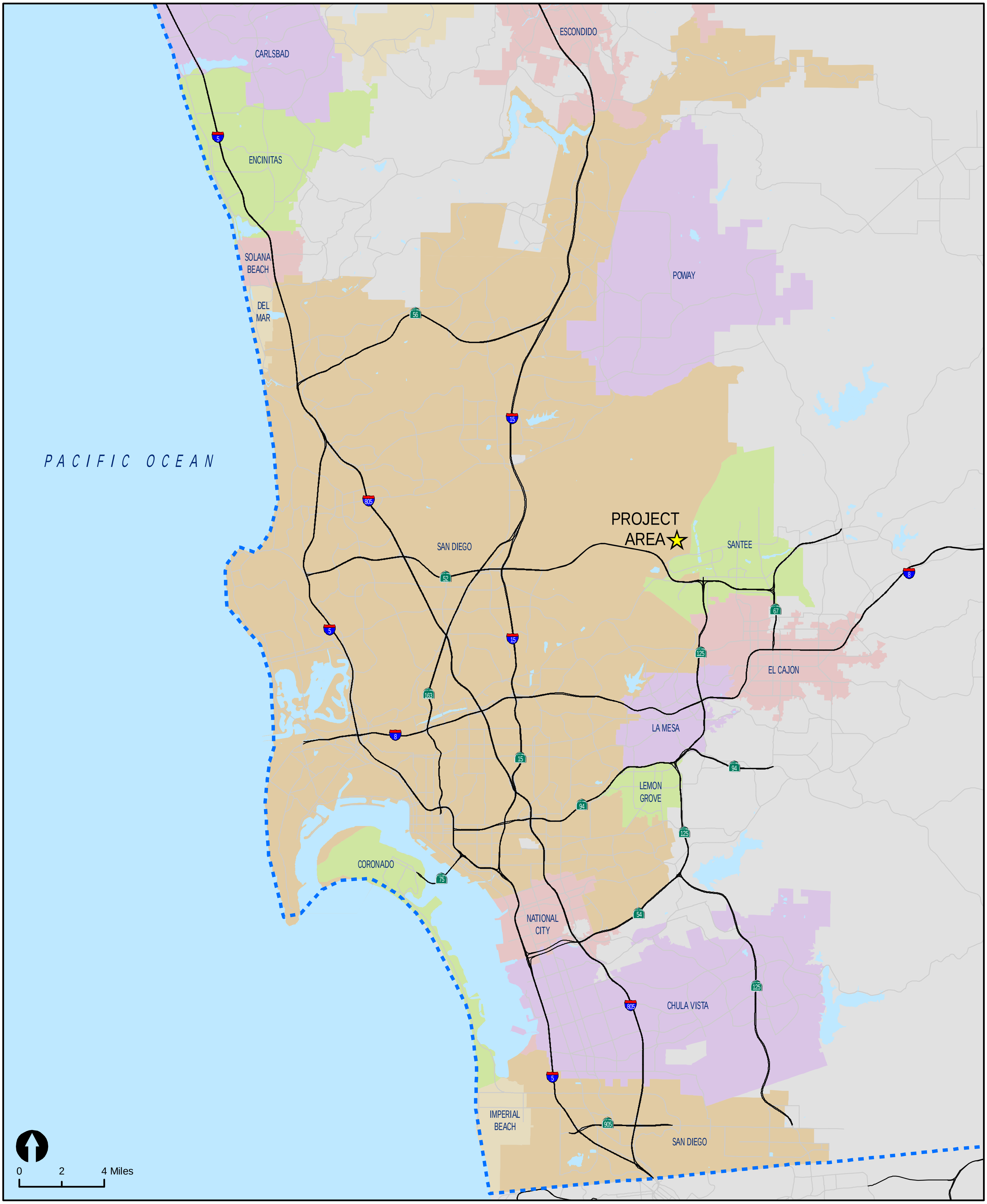

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Figure 1-1

Vicinity Map

Quail Brush Generation

2.0 PROJECT DESCRIPTION

2.1 Project Description

The proposed Quail Brush Generation Project is a 100-megawatt intermediate/peaking load electrical generating facility employing a set of eleven natural gas-fired reciprocating engine generators that provide flexibility in meeting the generation needs of San Diego Gas and Electric (SDG&E). The project will connect to the existing SDG&E natural gas pipeline located near the proposed plant site. The construction of the project is expected to occur for a period of 18 months, from March 2013 until June 2014. An average of 120 construction workers is expected to be onsite each day with a peak of 268 workers possibly occurring during months 11 and 12. An estimated daily average of 20 deliveries and heavy truck traffic is expected to occur with up to a maximum of 40 deliveries and heavy truck traffic per day. Peak heavy truck traffic is expected to occur during months 1 and 2. ***Table 2-1*** summarizes the estimated construction-related daily trips generated by the project during construction.

TABLE 2–1
ESTIMATED PROJECT-GENERATED CONSTRUCTION TRAFFIC

Vehicle Type	Average Daily Trips	Peak Daily Trips
Construction Workers	120	268
Delivery	15	30
Heavy Trucks	5	10
Total	**140**	**308**

2.2 Project Location

The proposed project is located within the East Elliott Community Plan Area of the City of San Diego, approximately one mile northwest of the City of Santee. The proposed temporary construction laydown and parking areas will be located on previously disturbed Sycamore Landfill property located approximately one-half mile from the plan site. While some construction parking will occur onsite, the majority of construction personnel parking will be located offsite at an existing paved parking lot at 7927 Mission Gorge Road in the City of Santee. Shuttle service will be provided to the project site.

Access to the project is provided via Sycamore Landfill Drive, which is the north leg of the Mast Boulevard/West Hills Parkway intersection. Construction is currently scheduled to occur between 7 a.m. to 7 p.m., Monday through Friday, though some activities may continue 24 hours per day, 7 days per week.

Figure 2-1 shows the location of the project area and the offsite parking lot.

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Figure 2-1

Project Area

Quail Brush Generation

3.0 EXISTING CONDITIONS

The study area for this project encompasses roadway facilities of anticipated project related impacts. The specific study area includes the following intersections, street segments, and freeways, based on the anticipated distribution of project traffic and area of potential impact:

Intersections:

1. Mast Boulevard / SR 52 Eastbound Ramps
2. Mast Boulevard / SR 52 Westbound Ramps
3. Mast Boulevard / West Hills Parkway / Sycamore Landfill Road
4. Mast Boulevard / Fanita Parkway
5. Carlton Oaks Drive / West Hills Parkway
6. Mission Gorge Road / West Hills Parkway
7. Mission Gorge Road / SR 125

Street Segments:

Mast Boulevard

- SR 52 to West Hills Parkway/Sycamore Landfill Road
- West Hills Parkway/Sycamore Landfill Road to Fanita Parkway
- Fanita Parkway to Carlton Hills Boulevard

West Hills Parkway

- Mast Boulevard to Mission Gorge Road

Freeways:

- SR 52 west of Mast Boulevard
- SR 52 east of Mast Boulevard

3.1 Existing Street Network

The project site is located in the City of San Diego, adjacent to the City of Santee. Since project traffic will be added to both City of San Diego and City of Santee roadways, the following is a description of both the City of San Diego and the City of Santee roadway design standards.

3.1.1 *City of San Diego Classification*

According to the *City of San Diego Street Design Manual (November 2002)*, **Six-Lane Prime Arterials** should be 98 feet wide in 142 feet of Right of Way (R/W), providing six through lanes, and a raised median/left-turn lane. **Six-Lane Urban Major Streets** should be 112 feet wide in 140-152 feet of Right of Way (R/W), providing six through lanes, a raised median/left-turn lane and curbside parking.

Four-Lane Major Streets should be 76 feet wide in 120 feet of R/W, providing four through lanes, and a raised median/left-turn lane. **Four-Lane Urban Collectors** should be 82 feet wide in 110-122 feet of R/W, providing four through lanes, a raised median/ left-turn lane and curbside parking.

3.1.2 *City of Santee Classifications*

According to the City of Santee Circulation Element, **Freeways** are controlled access facilities with grade separations and interchanges at their crossings and connections with other major circulation streets, **Prime Arterials** are six lanes or larger divided traffic carriers which have restricted access, but may have interchanges or may cross other arterials at grade with signalized intersections, **Major Streets** are four to six lane divided streets with center medians painted to allow left-turn movements, or with raised medians to control turning movements, **Collector Streets** are feeder streets which complement the major street network in circulation, but are of lesser capacity, usually with four lanes and no raised median, **Residential Collectors** are two lane distributor streets, slightly larger than other local residential streets which provide traffic circulation into and out of neighborhood areas, and **Parkways** are unique design applications where standard designs cannot be utilized because of steep terrain, or other special conditions. **Industrial Streets** are slightly larger local roadways to accommodate commercial vehicles safely in areas of industrial development

3.1.3 *Roadway Descriptions*

The following provides a brief description of the street system in the project area. ***Figure 3–1*** illustrates existing conditions in terms of traffic lanes and intersection controls.

State Route (SR) 52 is generally a four to six lane freeway, which has recently been extended to terminate at SR 67 in Lakeside, providing parallel east-west regional circulation for communities north of Interstate 8.

Mast Boulevard is classified as a Major Road. It is a four-lane roadway that is constructed between SR 52 and Los Ranchitos Road near the eastern Santee city limits. Mast Boulevard is expected to connected eastward to Riverford Drive since SR 52 has been extended to SR 67.

Carlton Oaks Drive is classified as a Collector. It is a four-lane roadway that is constructed between West Hills Parkway and Stoyer Drive. The roadway has either a raised median or a center two-way left turn lane along most of its length. Bike lanes and parallel street parking are generally provided.

Mission Gorge Road is classified as a Prime Arterial east of SR 125 and a Major Arterial west of SR 125. It is currently constructed as a four to six-lane divided roadway with a posted speed limit of 40-50 mph. Street parking is generally prohibited. Bus stops and bike lanes are provided.

West Hills Parkway is classified as a Major Arterial from Mast Boulevard to Mission Gorge Road. It consists of a four-lane section with a painted median. The primary purpose of this section of road is to allow access to the 52 Freeway.

Fanita Parkway is a currently an unclassified road which extends from Carlton Oaks to Lake Canyon Road. It is currently constructed as a two-lane roadway with a painted median. Fanita Parkway is reclassified as a Parkway (four-lanes) on the City of Santee General Plan 2020 updated Circulation Element.

State Route (SR) 125 is generally a six to eight lane freeway providing parallel north-south regional circulation for communities east of Interstate 15. It runs from SR 52 in Santee to SR 905 in Otay Mesa.

3.2 Existing Traffic Volumes

AM and PM peak hour intersection turning movement volume counts were conducted in April 2011 and September 2011. Average daily traffic (ADT) volume counts were conducted in March 2011.

Table 3–1 is a summary of the existing ADT volumes in the project area. ***Appendix A*** contains the manual count sheets.

TABLE 3–1
EXISTING TRAFFIC VOLUMES

Street Segment	ADT[a]	Date	Source
Mast Boulevard			
SR 52 to West Hills Parkway/Sycamore Landfill Road	25,045	2011	LLG
West Hills Parkway/Sycamore Landfill Road to Fanita Parkway	18,580	2011	LLG
Fanita Parkway to Carlton Hills Boulevard	16,300	2011	LLG
SR 52			
West of Mast Boulevard	74,000	2011	LLG
East of Mast Boulevard	48,000	2011	LLG
West Hills Parkway			
Mast Boulevard to Mission Gorge Road	12,430	2011	LLG

Footnotes:

a. Average Daily Traffic Volumes.

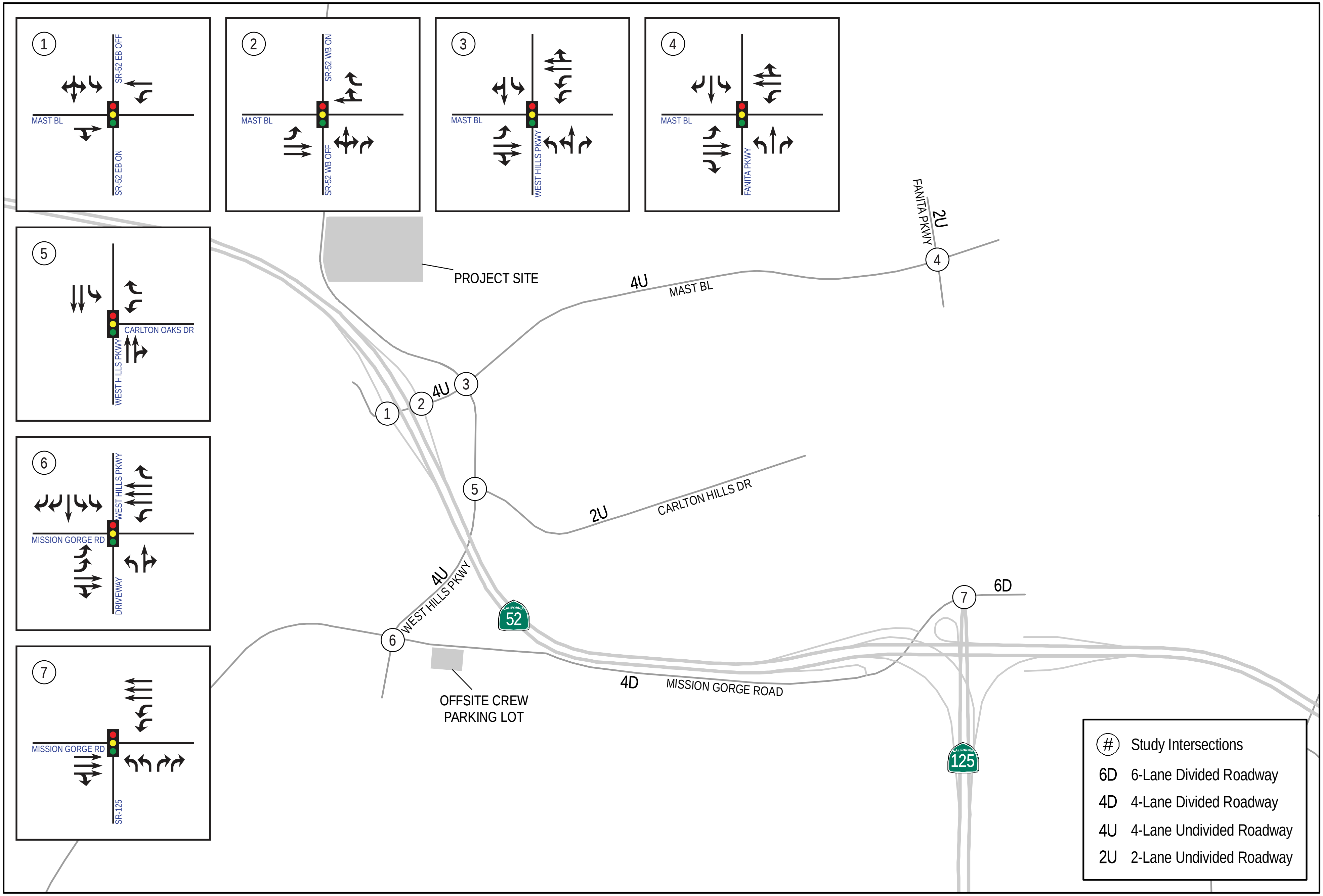

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Figure 3-1

Existing Conditions

Quail Brush Generation

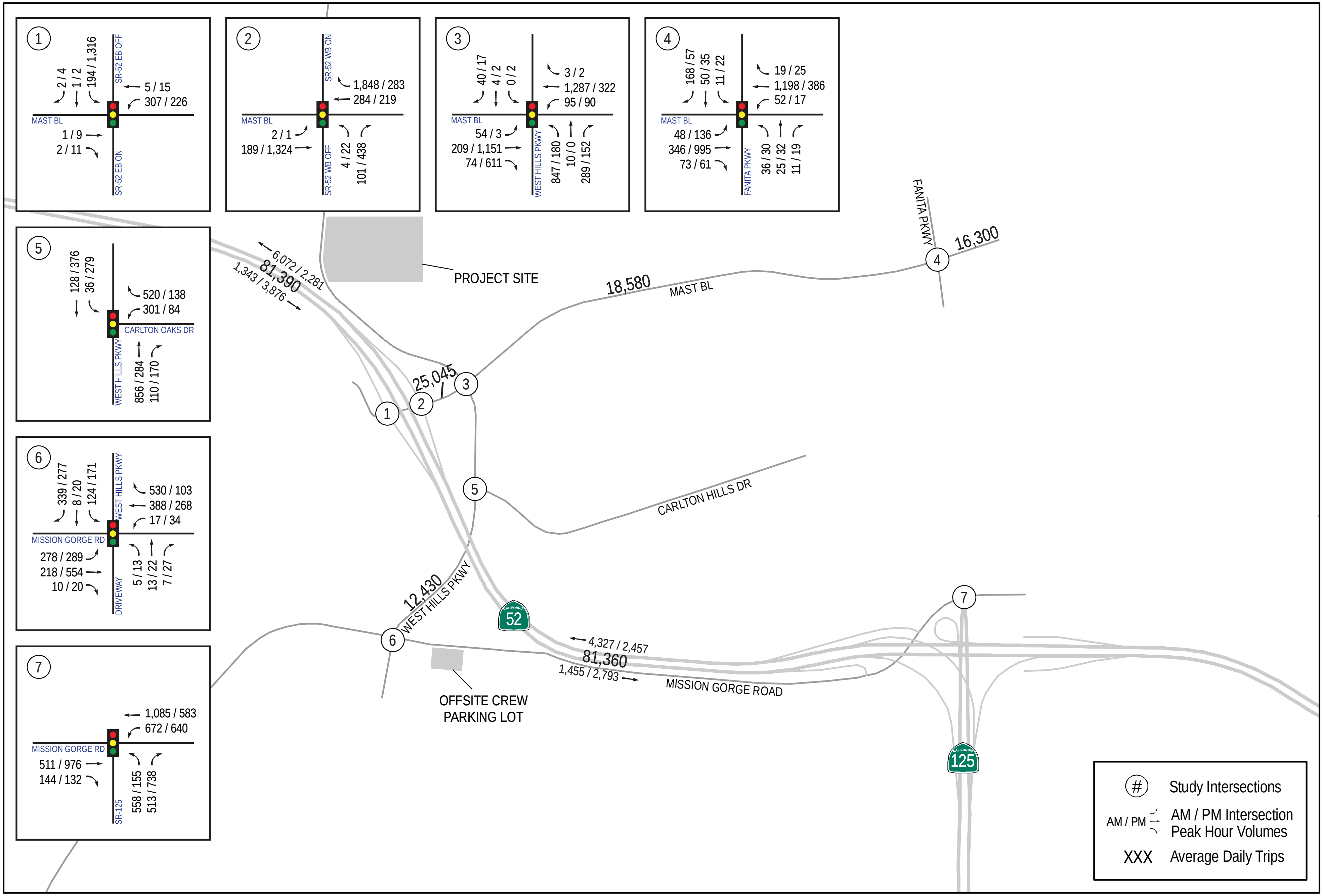

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Figure 3-2

Existing Traffic Volumes

Quail Brush Generation

4.0 ANALYSIS APPROACH AND METHODOLOGY

Level of service (LOS) is the term used to denote the different operating conditions which occur on a given roadway segment under various traffic volume loads. It is a qualitative measure used to describe a quantitative analysis taking into account factors such as roadway geometries, signal phasing, speed, travel delay, freedom to maneuver, and safety. Level of service provides an index to the operational qualities of a roadway segment or an intersection. Level of service designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions. Level of service designation is reported differently for signalized and unsignalized intersections, as well as for roadway segments. No unsignalized intersections are part of the project study area. Therefore, only the signalized and the roadway segment's LOS criteria's were utilized in this study.

4.1 Intersections

Signalized intersections were analyzed under AM and PM peak hour conditions. The ―peak of the street", or the ―commuter" peak hours are the highest hour between 7-9 AM and 4-6 PM. LLG includes site-specific signal timing information such as minimum greens, cycle lengths, splits, etc. obtained from traffic signal timing plans (City of San Diego, City of Santee and Caltrans).

Average vehicle delay was determined utilizing the methodology found in Chapter 16 of the *2000 Highway Capacity Manual (HCM),* with the assistance of the *Synchro* (version 7) computer software. The delay values (represented in seconds) were qualified with a corresponding intersection Level of Service (LOS).

4.2 Street Segments

Street segment analysis is based upon the comparison of daily traffic volumes (ADTs) to the City of San Diego's *Roadway Classification. Level of Service, and ADT Table*. This table provides segment capacities for different street classifications, based on traffic volumes and roadway characteristics. The City of San Diego's *Roadway Classification. Level of Service, and ADT Table* is attached in ***Appendix B***.

4.3 Freeway Segments

Level of Service analysis is based on the procedure developed by CALTRANS District 11 based on methods described in the Highway Capacity Manual. The procedure involves comparing the peak hour volume of the mainline segment to the theoretical capacity of the roadway (V/C). V/C ratios are then compared to V/C thresholds to determine the LOS of each segment. ***Appendix C*** contains the Freeway Calculation Sheets.

The existing and existing + project scenarios are analyzed in the report.

5.0 SIGNIFICANCE CRITERIA

As previously noted, the project site is located in the City of San Diego, but is immediately adjacent to the City of Santee. While the City of Santee does not currently have formal, published significance criteria, it does base its standard of practice on the published *SANTEC/ITE Guidelines for Traffic Impact Studies in the San Diego Region (March 2000)*. Since Santee's standard of practice is similar to the City of San Diego's, the City of San Diego criteria outlined below were utilized for all segments and intersections, regardless of jurisdiction. According to the City of San Diego's *Significance Determination Thresholds* dated January 2011, a project is considered to have a significant impact if project traffic would decrease the operations of surrounding roadways by a defined threshold. The City defined thresholds are shown in ***Table 5–1***.

The impact is designated either a —direct" or —cumulative" impact. According to the City's *Significance Determination Thresholds*,

> *"Direct* traffic impacts are those projected to occur at the time a proposed development becomes operational, including other developments not presently operational but which are anticipated to be operational at that time (near term)."
>
> *"Cumulative* traffic impacts are those projected to occur at some point after a proposed development becomes operational, such as during subsequent phases of a project and when additional proposed developments in the area become operational (short-term cumulative) or when affected community plan area reaches full planned buildout for the purposes of traffic (long-term cumulative)."
>
> It is possible that a project's near term (direct) impacts may be reduced in the long term, as future projects develop and provide additional roadway improvements (for instance, through implementation of traffic phasing plans). In such a case, the project may have direct impacts but not contribute considerably to a cumulative impact."
>
> For intersections and roadway segments affected by a project, level of service (LOS) D or better is considered acceptable under both direct and cumulative conditions."

If the intersection or segment is forecasted to operate at LOS E or F and the thresholds in *Table 5–1* are exceeded, then the project is considered to have a significant —direct" or —cumulative" project impact. A significant impact can also occur if a project causes the Level of Service to degrade from D to E, even if the allowable increases in *Table 5–1* are not exceeded. A feasible mitigation measure will need to be identified to return the impact within the City thresholds, or the impact will be considered significant and unmitigated.

TABLE 5–1
TRAFFIC IMPACT SIGNIFICANT THRESHOLDS

Level of Service with Project[b]	Allowable Increase Due to Project Impacts[a]					
	Freeways		Roadway Segments		Intersections	Ramp Metering
	V/C	Speed (mph)	V/C	Speed (mph)	Delay (sec.)	Delay (min.)
E	0.010	1.0	0.02	1.0	2.0	1.0[c]
F	0.005	0.5	0.01	0.5	1.0	

Footnotes:

a. If a proposed project’s traffic causes the values shown in the table to be exceeded, the impacts are determined to be significant. The project applicant shall then identify feasible improvements (within the Traffic Impact Study) that will restore/and maintain the traffic facility at an acceptable LOS. If the LOS with the proposed project becomes unacceptable (see note b), or if the project adds a significant amount of peak-hour trips to cause any traffic queues to exceed on- or off-ramp storage capacities, the project applicant shall be responsible for mitigating the project’s direct significant and/or cumulatively considerable traffic impacts.

b. All LOS measurements are based upon Highway Capacity Manual procedures for peak-hour conditions. However, V/C ratios for roadway segments are estimated on an ADT/24-hour traffic volume basis (using Table 2 of the City’s Traffic Impact Study Manual). The acceptable LOS for freeways, roadways, and intersections is generally ―D” (―C” for undeveloped locations). For metered freeway ramps, LOS does not apply. However, ramp meter delays above 15 minutes are considered excessive.

c. The impact is only considered significant if the total delay exceeds 15 minutes.

General Notes:

1. Delay = Average control delay per vehicle measured in seconds for intersections, or minutes for ramp meters.
2. LOS = Level of Service
3. V/C = Volume to Capacity Ratio (capacity at LOS E should be used)
4. Speed = Arterial speed measured in miles per hour for Congestion Management Program (CMP) analyses

6.0 ANALYSIS OF EXISTING CONDITIONS

The following is a summary of the roadway operations under existing traffic volume and capacity conditions.

6.1 Peak Hour Intersection Levels of Service

Table 6–1 shows a summary of the existing signalized intersection operations throughout the study area. This table shows that currently, five of the seven study-area intersections operate at LOS D or better during the AM and PM peak hours. The Mast Boulevard/SR 52 WB ramps intersection and the Mast Boulevard/West Hills Parkway/Project Driveway intersections both currently operate at LOS E/LOS F during the AM peak hour.

Appendix D contains the existing intersection analyses calculation worksheets.

6.2 Daily Street Segment Levels of Service

Table 6–2 shows a summary of the existing daily street segment operations throughout the study area. This table shows that currently, all study-area segments operate at LOS C or better on a daily basis.

6.3 Freeway Mainline Operations

Table 6–3 shows the existing freeway mainline operations summary for the segments within the study area. SR 52 currently operates at LOS F in the project vicinity.

- SR 52 west of Mast Boulevard (LOS F[0], WB AM peak hour)
- SR 52 east of Mast Boulevard (LOS F[0], WB AM peak hour)

TABLE 6–1
EXISTING INTERSECTION OPERATIONS

Intersection	Control Type	Peak Hour	Existing	
			Delay[a]	LOS[b]
1. Mast Boulevard / SR 52 EB Ramps	Signal	AM PM	11.7 18.9	B B
2. Mast Boulevard / SR 52 WB Ramps	Signal	AM PM	84.9 19.2	F B
3. Mast Boulevard / W. Hills Parkway	Signal	AM PM	68.9 51.3	E D
4. Mast Boulevard / Fanita Parkway	Signal	AM PM	17.4 11.3	B B
5. Carlton Oaks Drive / W. Hills Parkway	Signal	AM PM	17.9 11.2	B B
6. Mission Gorge Road / W. Hills Parkway	Signal	AM PM	12.3 15.0	B B
7. Mission Gorge Road/ SR 125	Signal	AM PM	16.7 21.5	B C

Footnotes:

a. Average delay expressed in seconds per vehicle.

b. LOS = Level of Service. See table at right for delay thresholds.

DELAY/LOS THRESHOLDS

Delay	LOS
0.0 ≤ 10.0	A
10.1 to 20.0	B
20.1 to 35.0	C
35.1 to 55.0	D
55.1 to 80.0	E
≥ 80.1	F

TABLE 6–2
EXISTING STREET SEGMENT OPERATIONS

Street Segment	Existing Capacity (LOS E)[a]	Existing		
		ADT [b]	V/C [c]	LOS [d]
Mast Boulevard				
SR 52 to West Hills Parkway/ Project Driveway	40,000	25,045	0.626	C
West Hills Parkway/ Project Driveway to Fanita Parkway	40,000	18,580	0.464	B
Fanita Parkway to Carlton Hills Boulevard	40,000	16,300	0.407	B
West Hills Parkway				
Mast Blvd. to Mission Gorge Road	40,000	12,430	0.310	A

Footnotes:

a. Capacities based on *City of San Diego Roadway Capacity Tables* (See Appendix B).
b. Average Daily Traffic
c. Volume to Capacity ratio
d. Level of Service

TABLE 6–3
EXISTING FREEWAY MAINLINE OPERATIONS

Freeway and Segment	Peak Hour	Direction/ Capacity[a]		Existing		
				PHV[b]	V/C[c]	LOS[d]
SR 52						
North of Mast Boulevard	AM	EB	6,000	1,343	0.224	A
	PM	EB	6,000	3,876	0.646	C
	AM	WB	6,000	6,072	1.012	F(0)
	PM	WB	6,000	2,281	0.380	A
South of Mast Boulevard	AM	EB	4,000	1,455	0.364	A
	PM	EB	4,000	2,793	0.698	C
	AM	WB	4,000	4,327	1.082	F(0)
	PM	WB	4,000	2,457	0.614	B

Footnotes:

a. Capacity based on 2,000 vehicles/hour/lane for mainlines and 1,200 vehicles/hour/lane for auxiliary lanes.
b. PHV = Peak Hour Volumes
c. V/C = Volume/ Capacity
d. LOS = Level of Service

7.0 TRIP GENERATION/DISTRIBUTION/ASSIGNMENT

7.1 Trip Generation

The trip generation for the trucks and crewmembers during the construction phase of the project were based on the estimated construction workforce and schedule prepared by the applicant (see Table 2.3-3, Table 2.3-4, and associated details provided in ***Appendix E***). Based on the estimated construction schedule/analysis, the construction phase of the project is estimated to generate a peak of 268 daily worker commute trips, 30 daily delivery truck trips, and 10 daily heavy truck trips. These roundtrips were multiplied by two to account for one-way incoming and one-way outgoing trips. As noted in Section 2.2, a majority of the construction crew is expected to park in the offsite parking location and then use shuttle buses to enter and exit the project site. The highest volumes during the construction period were chosen to be used in the analysis because they represent the worst-case scenario. However, it should be noted that these volumes are not expected to occur throughout the entire stretch of the 18-month construction period. The volumes vary by each month and it is estimated that only during a five-month span will the number of project-related vehicles surpass a total of 200. It should also be noted that the peak crew traffic will occurred during the 11th and 12th month, and the peak heavy truck traffic will occur during the 1st and the 2nd month. However, to be conservative both peaks are assumed to occur in the same month.

A Passenger Car Equivalent (PCE) factor was applied to the generated truck trips in the analysis. PCE is defined as the number of passenger cars that are displaced by a single heavy vehicle of a particular type under the prevailing traffic conditions. Heavy vehicles have a greater traffic impact than passenger cars since: (1) they are larger than passenger cars, and therefore, occupy more roadway space; and (2) their performance characteristics are generally inferior to passenger cars, leading to the formation of downstream gaps in the traffic stream (especially on upgrades) which cannot always be effectively filled by normal passing maneuvers. Based on the elevation changes in the vicinity of the project site a PCE of 2.0 was applied to each truck trip.

A Vehicle Occupancy Rate (VOR) of 1.0 was applied to the construction worker trips in the analysis. This assumes that there is no carpooling and that each construction worker is driving a separate vehicle to work. This also means that no transit riders were assumed in the analysis. A VOR of 1.0 was utilized because it represents the worst-case scenario. There may be construction workers who will carpool, bike, walk or use transit. However, since the exact number is not known, a conservative VOR of 1.0 was used.

Based on an independent power market analysis performed for the applicant to predict expected hours of operation over the 30-year design life of the facility, the project will generate only a nominal amount of post-construction operational traffic. Therefore, no additional post-construction operational analysis was conducted for this study. See Table 2.3-6 and associated details provided in *Appendix E* for more information regarding the anticipated typical plant operational workforce.

Table 7-1 summarizes the trip generation for the peak construction phase for truck and construction crew traffic. This table states that the worst case trip generation is 616 ADT with 170 trips during the AM peak hour (136 entering and 34 exiting) and 169 trips during the PM peak hour (51 entering and 118 exiting). A 50:50 daily split between incoming and outgoing traffic is assumed.

7.2 Trip Distribution/Assignment

Based on the existing travel patterns, expected construction truck routes and the freeways, a trip distribution was estimated for construction truck traffic and is depicted in ***Figure 7-1***. It is expected that a majority of the construction workers will come from the San Diego metropolitan area. Based on this information and the location of the offsite parking lot, a trip distribution was estimated for construction workers and is depicted in ***Figure 7-2***.

Figure 7-3 shows the construction truck traffic assignment and ***Figure 7-4*** shows the construction employees traffic assignment. ***Figure 7-5*** shows the total construction traffic volumes. ***Figure 7-6*** shows the Existing + Total Construction traffic volumes.

TABLE 7-1
CONSTRUCTION TRAFFIC TRIP GENERATION

Trip Generation Summary (Truck/Equipment only)

Vehicle Type	Trucks Trips [a]	AM Peak Hour					PM Peak Hour				
		% Of ADT	In:Out Split		Volume		% OF ADT	In:Out Split		Volume	
					In	Out				In	Out
Delivery	60	10%	80%	20%	5	1	10%	30%	70%	2	4
Heavy Trucks	20	10%	80%	20%	2	1	10%	30%	70%	1	1

Trip Generation Summary (Crew Vehicles Only)

Vehicle Type	Crew Vehicle Trips [b]	AM Peak Hour					PM Peak Hour				
		% Of ADT	In:Out Split		Volume		% OF ADT	In:Out Split		Volume	
					In	Out				In	Out
Construction Workers	536	30%	80%	20%	129	32	30%	30%	70%	48	113

Trip Generation Summary (Total)

Vehicle Type	Total Vehicle Trips	AM Peak Hour			PM Peak Hour		
			Volume			Volume	
			In	Out		In	Out
Total	616		136	34		51	118

Footnotes:

a. These roundtrips were multiplied by two to account for one-way incoming and one-way outgoing trips. A 50:50 daily split between incoming and outgoing traffic is assumed.

b. These roundtrips were multiplied by two to account for one-way incoming and one-way outgoing trips. A vehicle occupancy rate of 1.0 was utilized.

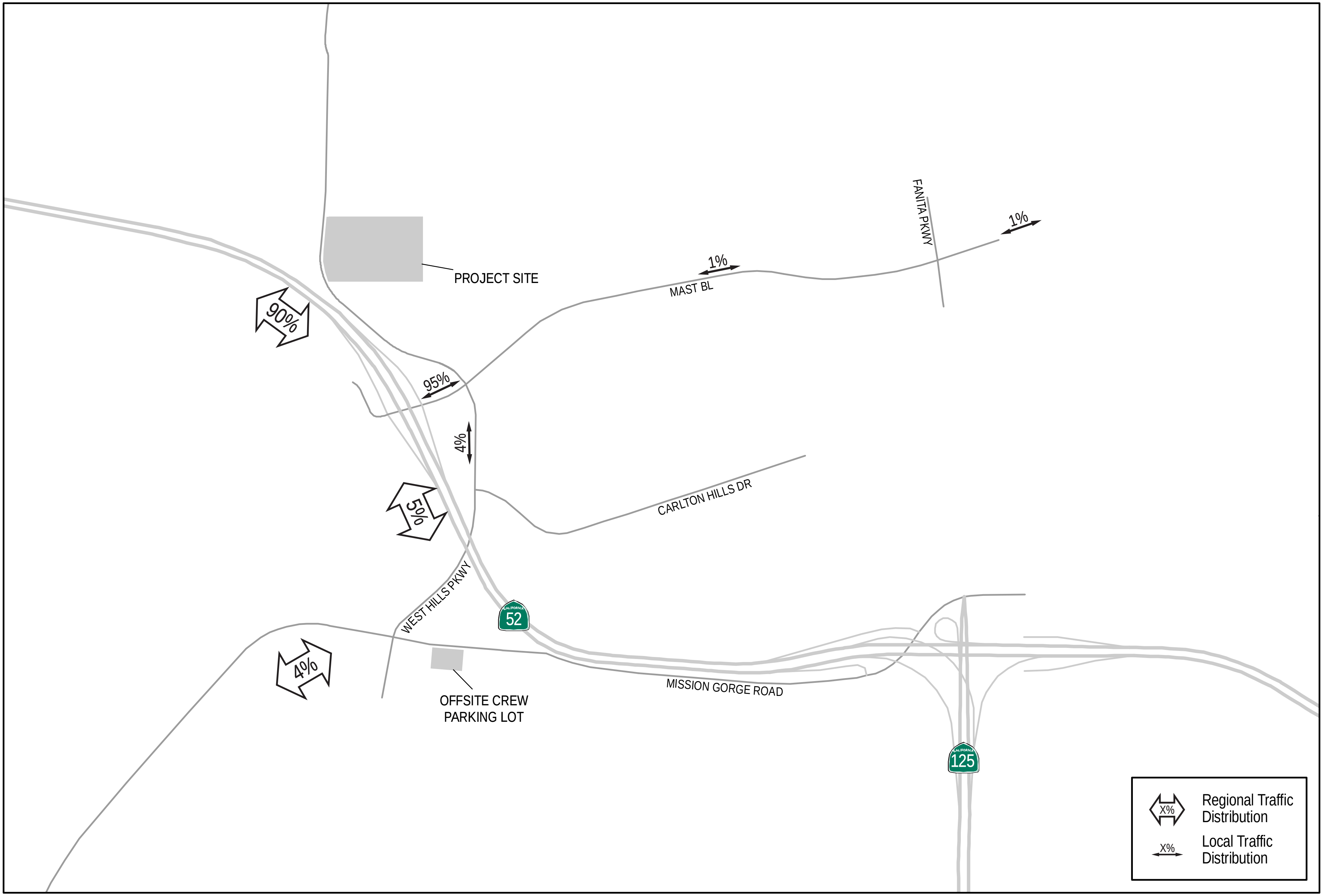

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Figure 7-1

Construction Traffic Distribution - Construction Truck Traffic

Quail Brush Generation

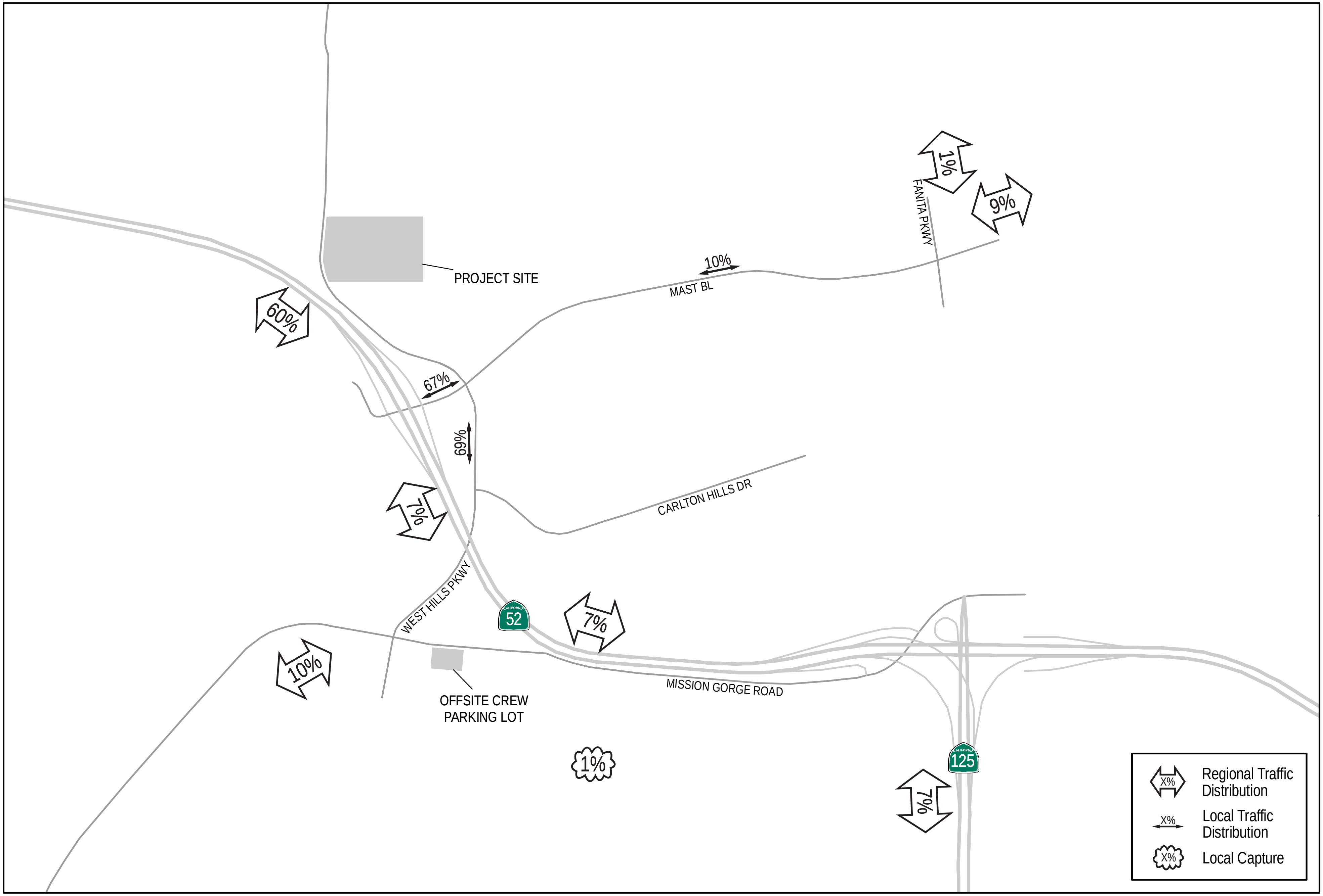

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Figure 7-2

Construction Traffic Distribution - Employee Traffic

Quail Brush Generation

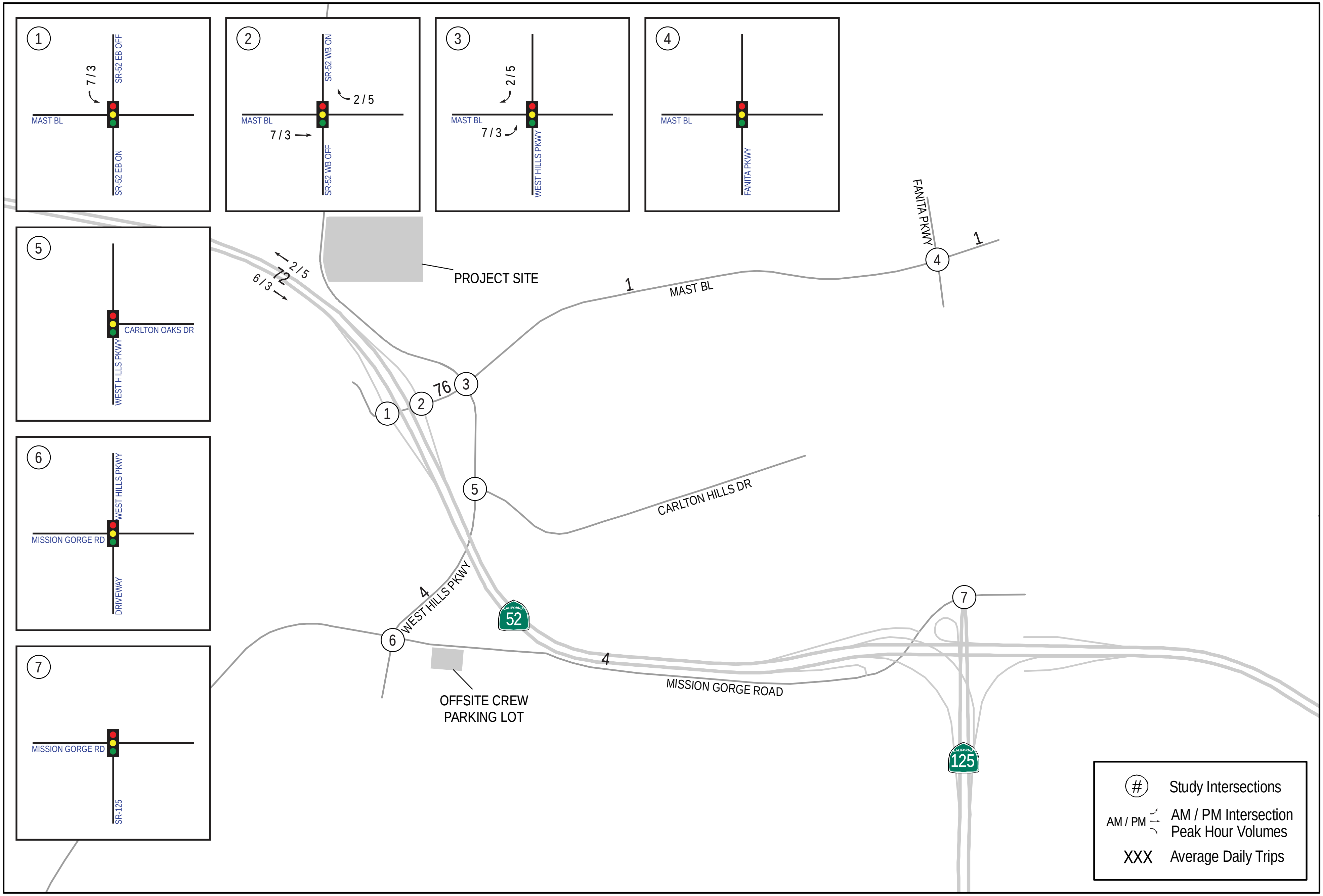

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Figure 7-3

Truck Traffic Volumes

Quail Brush Generation

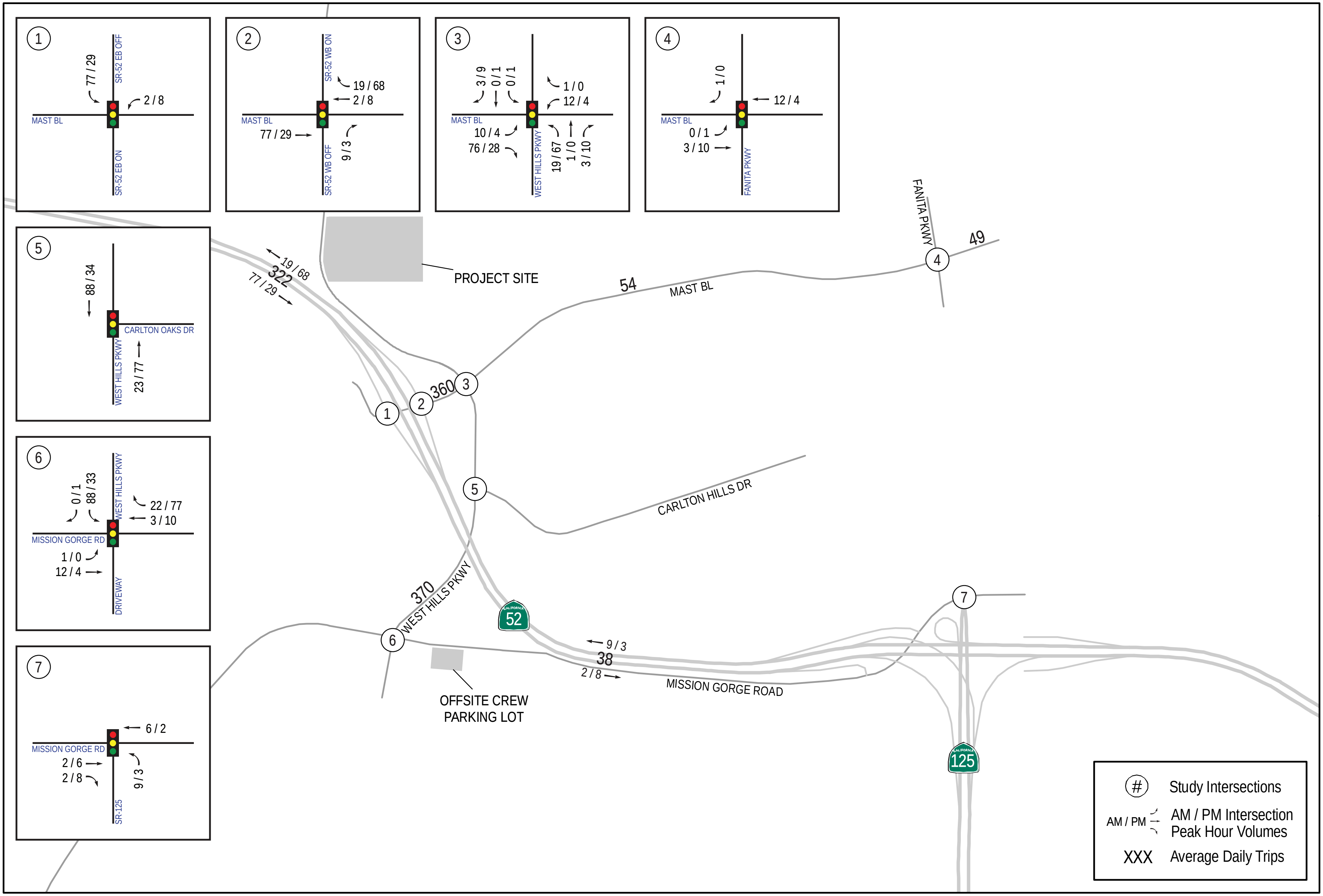

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Figure 7-4

Employee Traffic Volumes

Quail Brush Generation

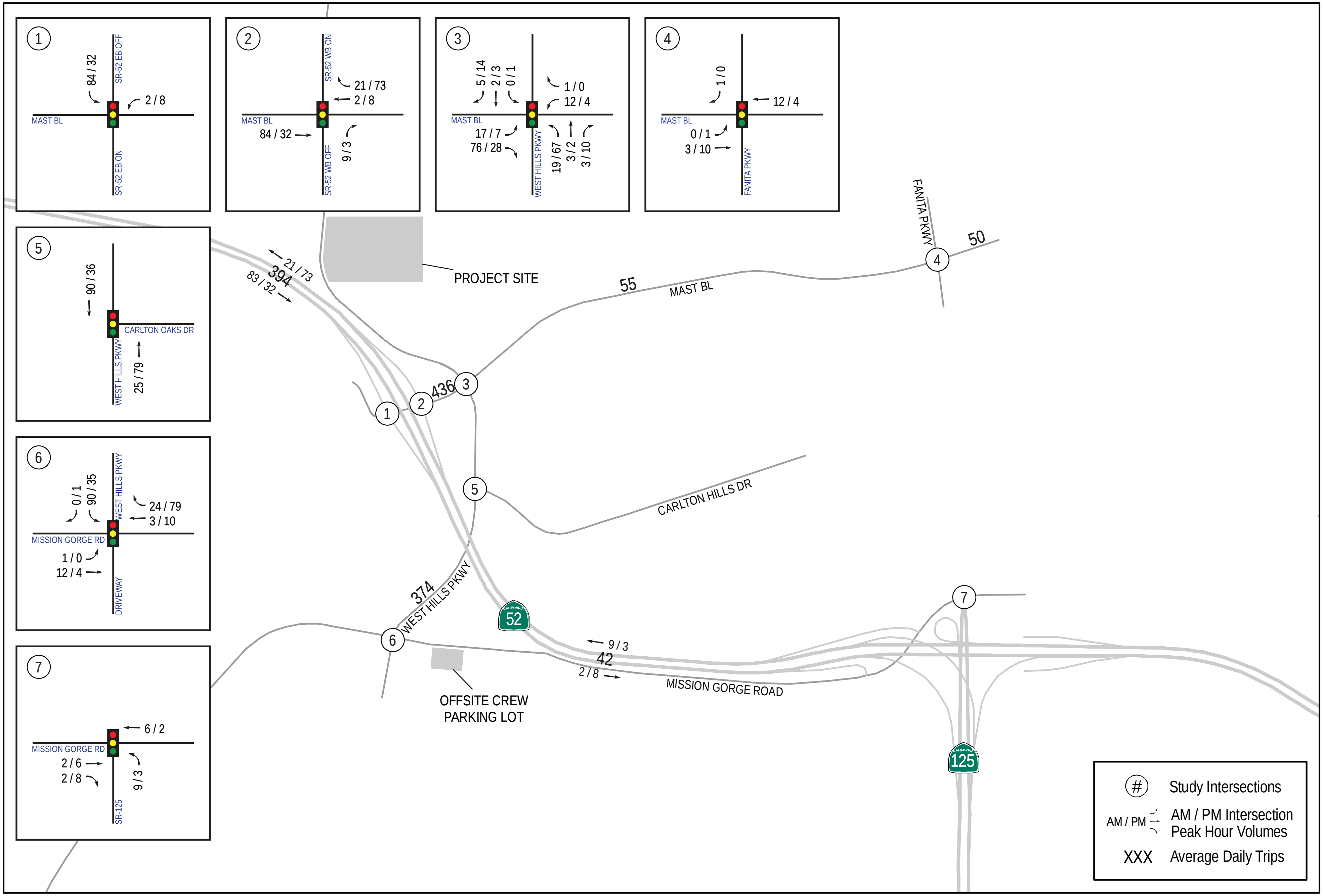

Figure 7-5

Total Construction Traffic Volumes

Quail Brush Generation

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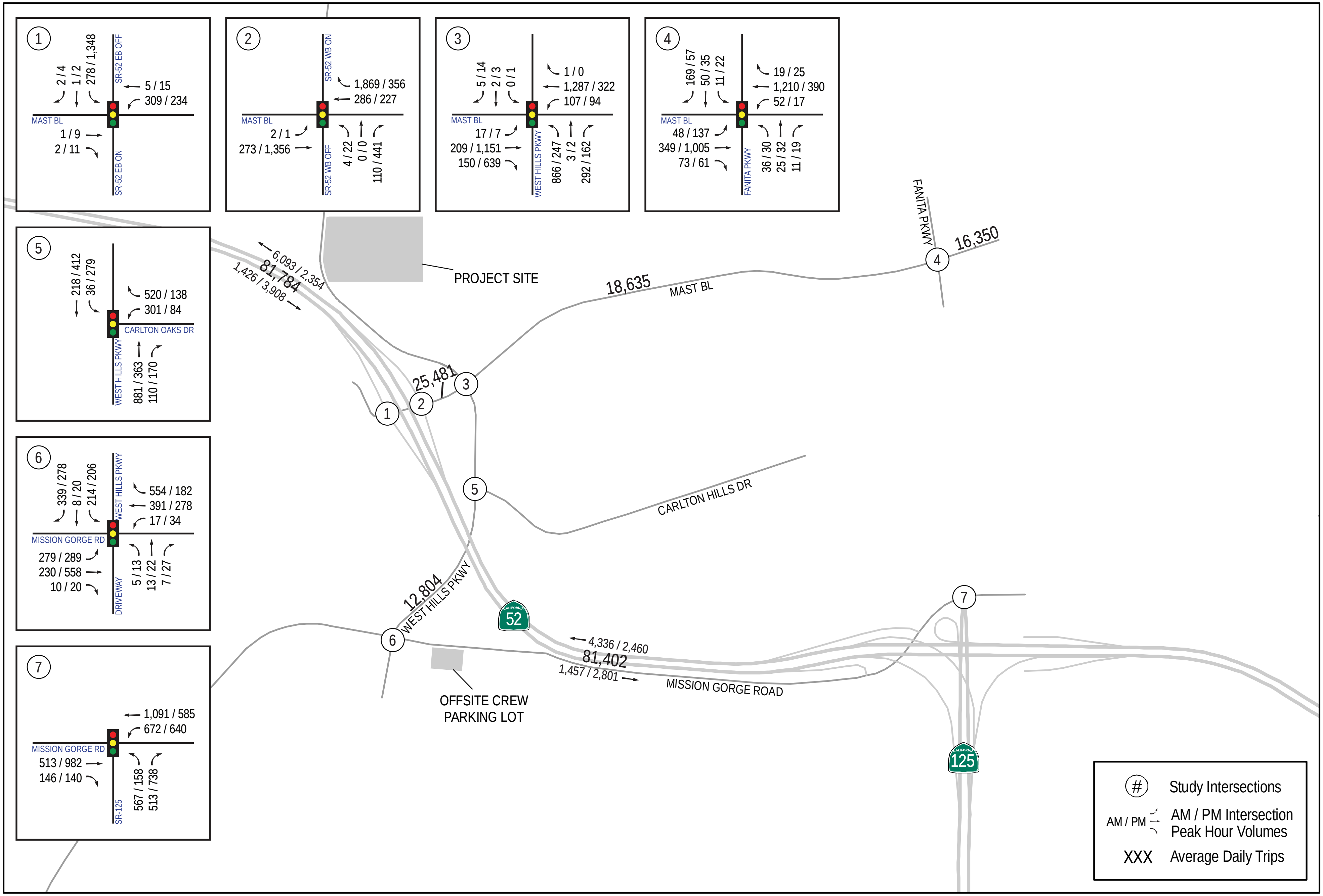

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Figure 7-6

Existing + Construction Traffic Volumes

Quail Brush Generation

8.0 ANALYSIS OF NEAR-TERM SCENARIOS

8.1 Existing + Construction

8.1.1 *Intersection Analysis*

Table 8-1 shows the HCM intersection analyses for the Existing + Construction traffic volumes. This table shows that all the signalized intersections in the study area are expected to operate at LOS D or better with the following exceptions:

- Mast Boulevard / SR 52 WB Ramps (LOS F during the AM peak hours); and
- Mast Boulevard / West Hills Parkway (LOS E during the AM hour).

Appendix F contains the Existing + Project peak hour intersection analyses worksheets.

8.1.2 *Segment Operations*

Table 8–2 shows the volume/capacity street segment analyses for the Existing + Construction traffic volumes. This table shows that all street segments in the study area are expected to operate at LOS C or better.

8.1.3 *Freeway Mainline Operations*

Table 8–3 shows the volume/capacity freeway segment analyses for the Existing + Construction traffic volumes. This table shows that all the following freeway segments are expected to continue to operate at LOS F:

- SR 52 north of Mast Boulevard (LOS F[0], WB AM peak hour)
- SR 52 south of Mast Boulevard (LOS F[0], WB AM peak hour)

TABLE 8–1
NEAR-TERM INTERSECTION OPERATIONS

Intersection	Control Type	Peak Hour	Existing		Existing + Construction		Δ[c]
			Delay[a]	LOS[b]	Delay	LOS	
1. Mast Boulevard / SR 52 EB Ramps	Signal	AM	11.7	B	12.8	B	1.1
		PM	18.9	B	19.8	B	0.9
2. Mast Boulevard / SR 52 WB Ramps	Signal	AM	84.9	F	85.8	F	0.9
		PM	19.2	B	19.4	B	0.2
3. Mast Boulevard / W. Hills Parkway	Signal	AM	**68.9**	**E**	**72.0**	**E**	**3.1**
		PM	51.3	D	54.1	D	2.8
4. Mast Boulevard / Fanita Parkway	Signal	AM	17.4	B	17.7	B	0.3
		PM	11.3	B	12.8	B	1.5
5. Carlton Oaks Drive / W. Hills Parkway	Signal	AM	17.9	B	17.9	B	0.0
		PM	11.2	B	11.2	B	0.0
6. Mission Gorge Road / W. Hills Parkway	Signal	AM	12.3	B	13.1	B	0.8
		PM	15.0	B	15.6	B	0.6
7. Mission Gorge Road / SR 125	Signal	AM	16.7	B	17.4	B	0.7
		PM	21.5	C	21.7	C	0.2

Footnotes:

a. Average delay expressed in seconds per vehicle.
b. LOS = Level of Service. See table at right for delay thresholds.
c. Δ denotes an increase in the Delay between the Existing and Construction.

General Notes:

1. BOLD and SHADED—represents a significant impact based on delta values for LOS ―E” presented in Table 5-1.
2. All project related trips include PCE adjustments, as explained in Section 7.1.

DELAY/LOS THRESHOLDS

Delay	LOS
0.0 ≤ 10.0	A
10.1 to 20.0	B
20.1 to 35.0	C
35.1 to 55.0	D
55.1 to 80.0	E
≥ 80.1	F

TABLE 8–2
NEAR-TERM STREET SEGMENT OPERATIONS

Street Segment	Existing Capacity (LOS E)[a]	Existing			Existing + Construction			Δ[e]
		ADT [b]	V/C [c]	LOS [d]	ADT	V/C	LOS	
Mast Boulevard								
SR 52 to West Hills Parkway/ Project Driveway	40,000	25,045	0.626	C	25,557	0.638	C	0.012
West Hills Parkway/ Project Driveway to Fanita Parkway	40,000	18,580	0.464	B	18,636	0.465	B	0.001
Fanita Parkway to Carlton Hills Boulevard	40,000	16,300	0.407	B	16,351	0.408	B	0.001
West Hills Parkway								
Mast Blvd. to Mission Gorge Road	40,000	12,430	0.310	A	12,807	0.320	A	0.010

Footnotes:

a. Capacities based on *City of San Diego Roadway Capacity Tables* (See Appendix B).
b. Average Daily Traffic
c. Volume to Capacity ratio
d. Level of Service
e. Δ denotes an increase in the Volume to Capacity ratio between the Existing and Construction.

General Notes:

1. All project related trips include PCE adjustments, as explained in Section 7.1.

TABLE 8–3
NEAR-TERM FREEWAY MAINLINE OPERATIONS

Freeway and Segment	Peak Hour	Direction/ Capacity[a]		Existing			Existing + Construction			Δ[e]
				PHV[b]	V/C[c]	LOS[d]	PHV	V/C	LOS	
SR 52										
West of Mast Boulevard	AM	EB	6,000	1,343	0.224	A	1,432	0.239	A	0.015
	PM	EB	6,000	3,876	0.646	C	3,910	0.652	C	0.006
	AM	WB	6,000	6,072	1.012	F(0)	6,094	1.016	F(0)	0.004
	PM	WB	6,000	2,281	0.380	A	2,358	0.393	A	0.013
East of Mast Boulevard	AM	EB	4,000	1,455	0.364	A	1,457	0.364	A	0.000
	PM	EB	4,000	2,793	0.698	C	2,802	0.701	C	0.003
	AM	WB	4,000	4,327	1.082	F(0)	4,337	1.084	F(0)	0.002
	PM	WB	4,000	2,457	0.614	B	2,460	0.615	B	0.001

Footnotes:

a. Capacity based on 2,000 vehicles/hour/lane for mainlines and 1,200 vehicles/hour/lane for auxiliary lanes.

b. PHV = Peak Hour Volumes

c. V/C = Volume/ Capacity

d. LOS = Level of Service

e. Δ = Denotes an increase in the V/C between the Existing and Construction.

General Notes:

1. All project trips include PCE adjustments, as explained in Section 7.1.

9.0 ACCIDENT ANALYSIS

9.1 Methodology

Traffic accidents are a function of various factors, including driver behavior (experience, carelessness), speed, weather conditions, time of day, visibility, and roadway conditions. A given intersection is categorized under a particular rate group based on the type of terrain (for example: rural, urban or suburban), representing an expected accident distribution. This expected accident rate is compared to the actual calculated accident rate at the given intersection. The following formula is used to calculate an intersection accident rate.

Intersection Accident Rate = (No. of Accidents) * 1,000,000 / (No. of Year) * 365 *(ADT entering)

Accident data for the Mast Boulevard/Sycamore Landfill Road/W. Hills Parkway intersection was collected from 2006 through 2010. This five year period is the most recent period for which a full calendar year of data is available. The data was collected from the Statewide Integrated Traffic Records System (SWITRS).

9.2 Analysis

Data from 2006 through 2010 was analyzed and accidents occurring at the intersection or near the intersection were selected from the data set. A total of seven (7) accidents were found to have occurred during this time period. The persons involved in these accidents reported some minor injuries. There were no fatalities. Recent traffic counts indicate 25,320 ADT enter the intersection on a typical day. Using the formula above, the actual calculated accident rate is 0.132. The ―expected" accident rate at this intersection based on statewide averages is 0.58. Table A shows a summary of the intersection accident data.

TABLE 9-1
INTERSECTION ACCIDENT ASSESSMENT
MAST BOULEVARD / SYCAMORE LANDFILL ROAD / W. HILLS PARKWAY

Intersection	# of Accidents[a]	Calculated Accident Rate[b]	Expected Rate[c] Assuming ("Suburban Intersection")
Mast Boulevard @ Sycamore Landfill Road/W.Hills Parkway	7	0.132	0.58

Footnotes:

a. Obtained from SWITRS and City of San Diego – Year 2006-2010

b. Calculated using the formula found in *"2004 Collision Data on California State Highways" (per million vehicle miles entering)*

c. Expected Rate is the statewide rate for Urban Intersection obtained from Caltrans *"2004 Collision Data on California State Highways" (per million vehicle miles entering)*

It should also be noted that the Sycamore Landfill has not had any traffic accidents on Sycamore Landfill Road in the Year 2006-2010 time frame.

9.3 Accident Analysis Conclusion

Based on the analysis, the calculated accident rate is less than the expected rate for the subject intersection based on statewide averages. Also, based on the minimal increase in traffic due to construction and day-to-day operations, and the fact that most of that traffic will occur during off peak hours, the accident rate at the intersection is not expected to increase noticeably and should remain well below statewide averages during both the construction and operations stages of the project.

10.0 SIGNIFICANCE OF IMPACTS AND MITIGATION MEASURES

Based on the analysis and the established significance criteria, the following significant impact was determined.

a. Mast Boulevard / W. Hills Parkway

10.1 Mitigation Measures

The following mitigation measure will mitigate the significant impact at the intersection of Mast Boulevard and West Hills Parkway.

a. Between the hours of 7am to 9am:
   - Do not begin any crew construction shift
   - Limit the number of trucks entering the project site to 3 trucks (plus 2 shuttle buses)

10.2 Post Mitigation Operations

Table 10-1 summarizes the mitigated intersection operation for the future scenarios. As indicated in the table, the impact is mitigated to a level below significance with the recommended measure. ***Appendix G*** contains the mitigated intersection analysis worksheets.

TABLE 10-1
MITIGATED INTERSECTION OPERATIONS

Intersection	Peak Period	Existing		Existing + Project		Existing + Project with Mitigation	
		Delay[b]	LOS[c]	Delay	LOS	Delay	LOS
3) Mast Boulevard / W. Hills Parkway	AM	**68.9**	**E**	**71.4**	**E**	69.4	E

Footnotes:

a. Delay – measured in seconds.

b. LOS – Level of Service.

10.3 Conclusion

As determined in Section 8, the majority of the roads, ramps, streets, and intersections within the project study area continue to operate at LOS D or better with the addition of construction traffic. Only significant impact is at the Mast Boulevard and West Hills Parkway intersection. When mitigated as discussed in Section 10.1, the delta for this intersection decreases to less than 1 second as shown in Table 10.1, and therefore is no longer considered significant.

It should also be noted that no improvements (such as additional lanes) are recommended, since it is not considered practical given that these significant traffic impacts from the proposed construction would only occur ***temporarily*** during the 18-month construction period only, and the project would not have any impacts to this intersection after completion of construction. Also as indicated in the project description, the majority of construction personnel parking will be located offsite at an existing paved parking lot at 7927 Mission Gorge Road in the City of Santee and the construction crew will be shuttled to the project site.

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TECHNICAL APPENDICES

QUAIL BRUSH GENERATION PROJECT

City of San Diego, California
October 17, 2011

LLG Ref. 3-11-2075

Prepared by:

KC Yellapu, P.E
Senior Transportation Engineer
&
Charlene Sadiarin
Engineering Technician I

Under the Supervision of:

John Boarman, P.E
Principal

Linscott, Law &
Greenspan, Engineers
4542 Ruffner Street
Suite 100
San Diego, CA 92111
858.300.8800 T
858.300.8810 F
www.llgengineers.com

APPENDIX A

PEAK HOUR INTERSECTION/DAILY STREET SEGMENT COUNT SHEETS

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True Count

4401 Twain Ave, Suite 27
San Diego, CA 92120

File Name : 1134.01.SR-52 EB RAMPS.MAST BLVD
Site Code : 00000000
Start Date : 4/5/2011
Page No : 1

Groups Printed- Vehicles

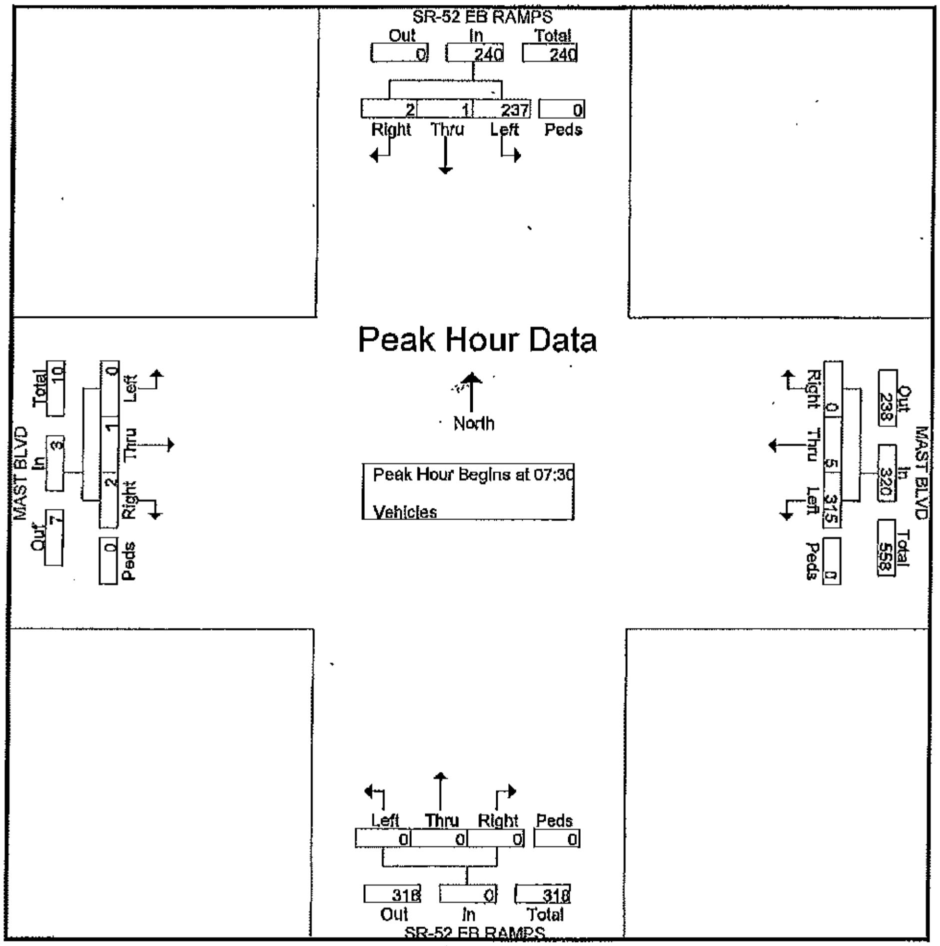
	SR-52 EB RAMPS Southbound				MAST BLVD Westbound				SR-52 EB RAMPS Northbound				MAST BLVD Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00	52	0	1	1	61	3	0	0	0	0	0	0	0	1	0	0	119
07:15	56	0	0	0	70	0	0	0	0	0	0	0	0	1	0	0	127
07:30	63	0	0	0	73	2	0	0	0	0	0	0	0	0	0	0	138
07:45	57	1	1	0	68	0	0	0	0	0	0	0	0	0	1	0	128
Total	228	1	2	1	272	5	0	0	0	0	0	0	0	2	1	0	512
08:00	57	0	1	0	83	0	0	0	0	0	0	0	0	0	1	0	142
08:15	60	0	0	0	91	3	0	0	0	0	0	0	0	1	0	0	155
08:30	53	0	2	0	67	4	0	0	0	0	0	0	0	3	1	0	130
08:45	67	0	0	0	48	3	0	0	0	0	0	0	0	2	0	1	121
Total	237	0	3	0	289	10	0	0	0	0	0	0	0	6	2	1	548
*** BREAK ***																	
16:00	280	1	3	1	45	5	0	0	0	0	0	12	0	4	4	2	357
16:15	278	0	1	0	43	4	0	0	0	0	0	6	0	0	2	0	334
16:30	284	0	1	0	75	4	0	0	0	0	0	6	0	1	0	0	371
16:45	276	2	2	1	66	6	0	0	0	0	0	0	0	3	0	0	356
Total	1118	3	7	2	229	19	0	0	0	0	0	24	0	8	6	2	1418
17:00	294	0	1	1	64	4	0	0	0	0	0	0	0	2	2	0	368
17:15	342	1	0	0	53	3	0	0	0	0	0	0	0	1	2	0	402
17:30	363	0	1	0	47	4	0	0	0	0	0	1	0	4	3	0	423
17:45	319	1	2	0	65	4	0	0	0	0	0	0	0	2	4	0	397
Total	1318	2	4	1	229	15	0	0	0	0	0	1	0	9	11	0	1590
Grand Total	2901	6	16	4	1019	49	0	0	0	0	0	25	0	25	20	3	4068
Apprch %	99.1	0.2	0.5	0.1	95.4	4.6	0	0	0	0	0	100	0	52.1	41.7	6.2	
Total %	71.3	0.1	0.4	0.1	25	1.2	0	0	0	0	0	0.6	0	0.6	0.5	0.1	

True Count

4401 Twain Ave, Suite 27
San Diego, CA 92120

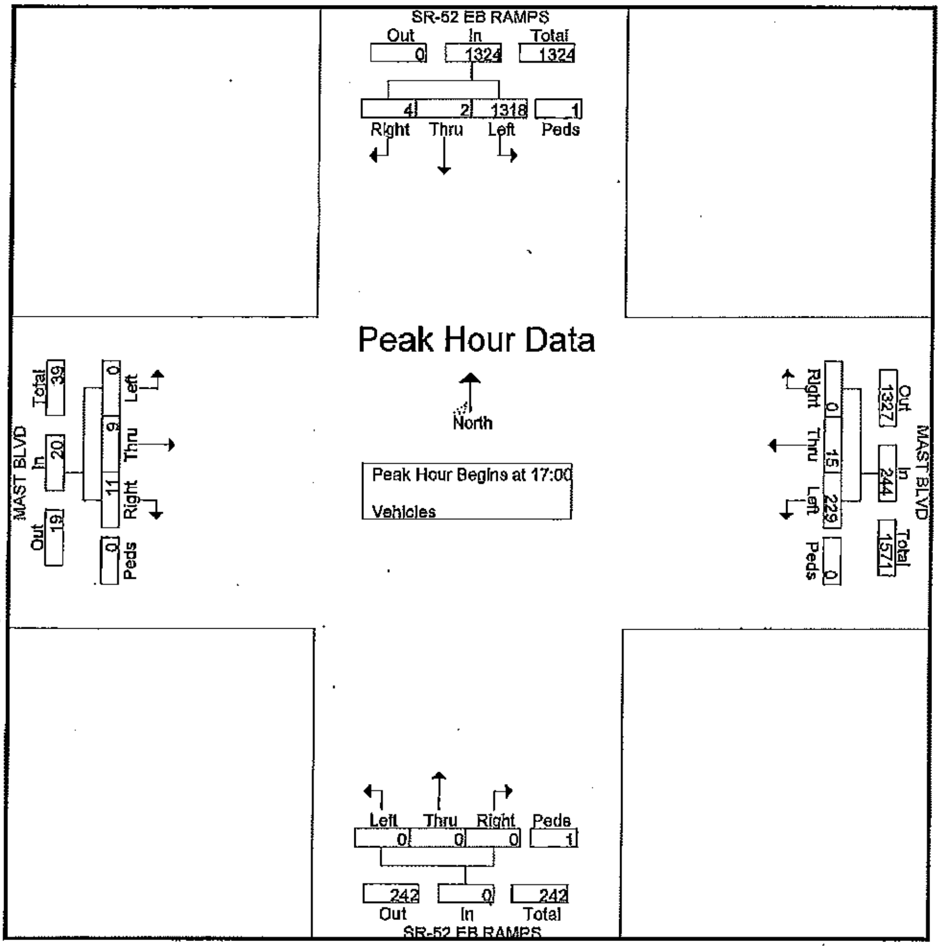
File Name : 1134.01.SR-52 EB RAMPS.MAST BLVD
Site Code : 00000000
Start Date : 4/5/2011
Page No : 2

	SR-52 EB RAMPS Southbound					MAST BLVD Westbound					SR-52 EB RAMPS Northbound					MAST BLVD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 11:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30																					
07:30	63	0	0	0	63	73	2	0	0	75	0	0	0	0	0	0	0	0	0	0	138
07:45	57	1	1	0	59	68	0	0	0	68	0	0	0	0	0	0	0	1	0	1	128
08:00	57	0	1	0	58	83	0	0	0	83	0	0	0	0	0	0	0	1	0	1	142
08:15	60	0	0	0	60	91	3	0	0	94	0	0	0	0	0	0	1	0	0	1	155
Total Volume	237	1	2	0	240	315	5	0	0	320	0	0	0	0	0	0	1	2	0	3	563
% App. Total	98.8	0.4	0.8	0		98.4	1.6	0	0		0	0	0	0		0	33.3	66.7	0		
PHF	.940	.250	.500	.000	.952	.865	.417	.000	.000	.851	.000	.000	.000	.000	.000	.000	.250	.500	.000	.750	.908



File Name : 1134.01.SR-52 EB RAMPS.MAST BLVD
Site Code : 00000000
Start Date : 4/5/2011
Page No : 3

	SR-52 EB RAMPS Southbound					MAST BLVD Westbound					SR-52 EB RAMPS Northbound					MAST BLVD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 to 17:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 17:00																					
17:00	294	0	1	1	296	64	4	0	0	68	0	0	0	0	0	0	2	2	0	4	368
17:15	342	1	0	0	343	53	3	0	0	56	0	0	0	0	0	0	1	2	0	3	402
17:30	363	0	1	0	364	47	4	0	0	51	0	0	0	1	1	0	4	3	0	7	423
17:45	319	1	2	0	322	65	4	0	0	69	0	0	0	0	0	0	2	4	0	6	397
Total Volume	1318	2	4	1	1325	229	15	0	0	244	0	0	0	1	1	0	9	11	0	20	1590
% App. Total	99.5	0.2	0.3	0.1		93.9	6.1	0	0		0	0	0	100		0	45	55	0		
PHF	.908	.500	.500	.250	.910	.881	.938	.000	.000	.884	.000	.000	.000	.250	.250	.000	.563	.688	.000	.714	.940



True Count

4401 Twain Ave, Suite 27
San Diego, CA 92120

File Name : 1134.02.SR-52 WB RAMPS.MAST BLVD
Site Code : 00000000
Start Date : 4/5/2011
Page No : 1

Groups Printed- Vehicles

	SR-52 WB RAMPS Southbound				MAST BLVD Westbound				SR-52 WB RAMPS Northbound				MAST BLVD Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00	0	0	0	0	0	62	428	0	2	1	55	0	1	52	0	0	601
07:15	0	0	0	0	0	69	587	2	1	0	14	0	0	57	0	0	730
07:30	0	0	0	0	0	74	482	0	1	0	14	0	0	63	0	0	634
07:45	0	0	0	0	0	67	405	0	1	0	27	0	2	55	0	0	557
Total	0	0	0	0	0	272	1902	2	5	1	110	0	3	227	0	0	2522
08:00	0	0	0	0	0	82	406	0	1	0	57	0	0	57	0	0	603
08:15	0	0	0	0	0	88	317	0	6	0	41	0	1	60	0	0	513
08:30	0	0	0	0	0	68	262	0	3	0	39	0	0	56	0	0	428
08:45	0	0	0	0	0	49	196	0	2	1	42	0	2	67	0	0	359
Total	0	0	0	0	0	287	1181	0	12	1	179	0	3	240	0	0	1903
*** BREAK ***																	
16:00	0	0	0	1	0	45	78	0	5	0	101	12	3	281	0	0	526
16:15	0	0	0	0	0	45	75	10	2	0	109	6	0	278	0	0	525
16:30	0	0	0	0	0	75	86	0	4	1	80	8	2	283	0	0	539
16:45	0	0	0	2	0	64	72	0	8	1	92	0	1	278	0	0	518
Total	0	0	0	3	0	229	311	10	19	2	382	26	6	1120	0	0	2108
17:00	0	0	0	1	0	58	78	0	10	0	96	0	1	295	0	0	539
17:15	0	0	0	0	0	51	80	0	5	0	125	0	0	343	0	0	604
17:30	0	0	0	1	0	48	70	1	3	0	113	1	0	367	0	0	604
17:45	0	0	0	0	0	65	69	1	4	0	105	0	0	321	0	0	565
Total	0	0	0	2	0	222	297	2	22	0	439	1	1	1326	0	0	2312
Grand Total	0	0	0	5	0	1010	3691	14	58	4	1110	27	13	2913	0	0	8845
Apprch %	0	0	0	100	0	21.4	78.3	0.3	4.8	0.3	92.6	2.3	0.4	99.6	0	0	
Total %	0	0	0	0.1	0	11.4	41.7	0.2	0.7	0	12.5	0.3	0.1	32.9	0	0	

True Count

4401 Twain Ave, Suite 27
San Diego, CA 92120

File Name : 1134.02.SR-52 WB RAMPS.MAST BLVD
Site Code : 00000000
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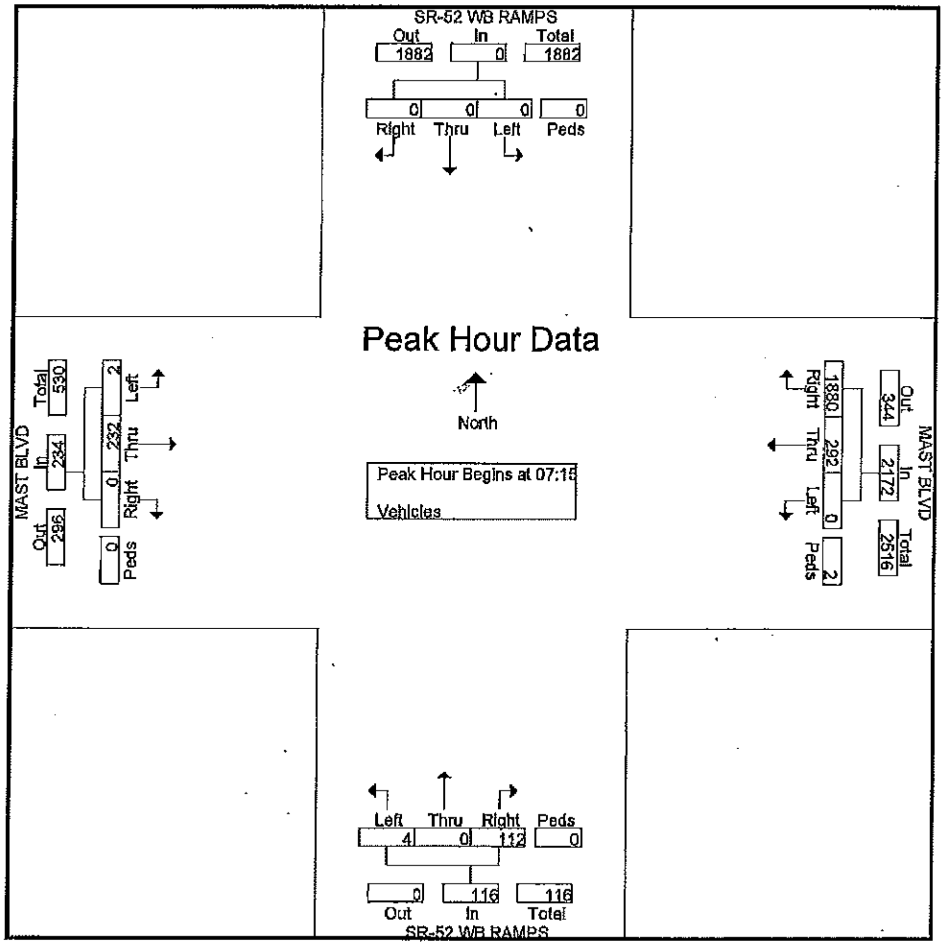
Peak Hour Analysis From 07:00 to 11:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 07:15

	SR-52 WB RAMPS Southbound					MAST BLVD Westbound					SR-52 WB RAMPS Northbound					MAST BLVD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:15	0	0	0	0	0	0	69	587	2	658	1	0	14	0	15	0	57	0	0	57	730
07:30	0	0	0	0	0	0	74	482	0	556	1	0	14	0	15	0	63	0	0	63	634
07:45	0	0	0	0	0	0	67	405	0	472	1	0	27	0	28	2	55	0	0	57	557
08:00	0	0	0	0	0	0	82	406	0	488	1	0	57	0	58	0	57	0	0	57	603
Total Volume	0	0	0	0	0	0	292	1880	2	2174	4	0	112	0	116	2	232	0	0	234	2524
% App. Total	0	0	0	0		0	13.4	86.5	0.1		3.4	0	96.6	0		0.9	99.1	0	0		
PHF	.000	.000	.000	.000	.000	.000	.890	.801	.250	.826	1.00	.000	.491	.000	.500	.250	.921	.000	.000	.929	.864

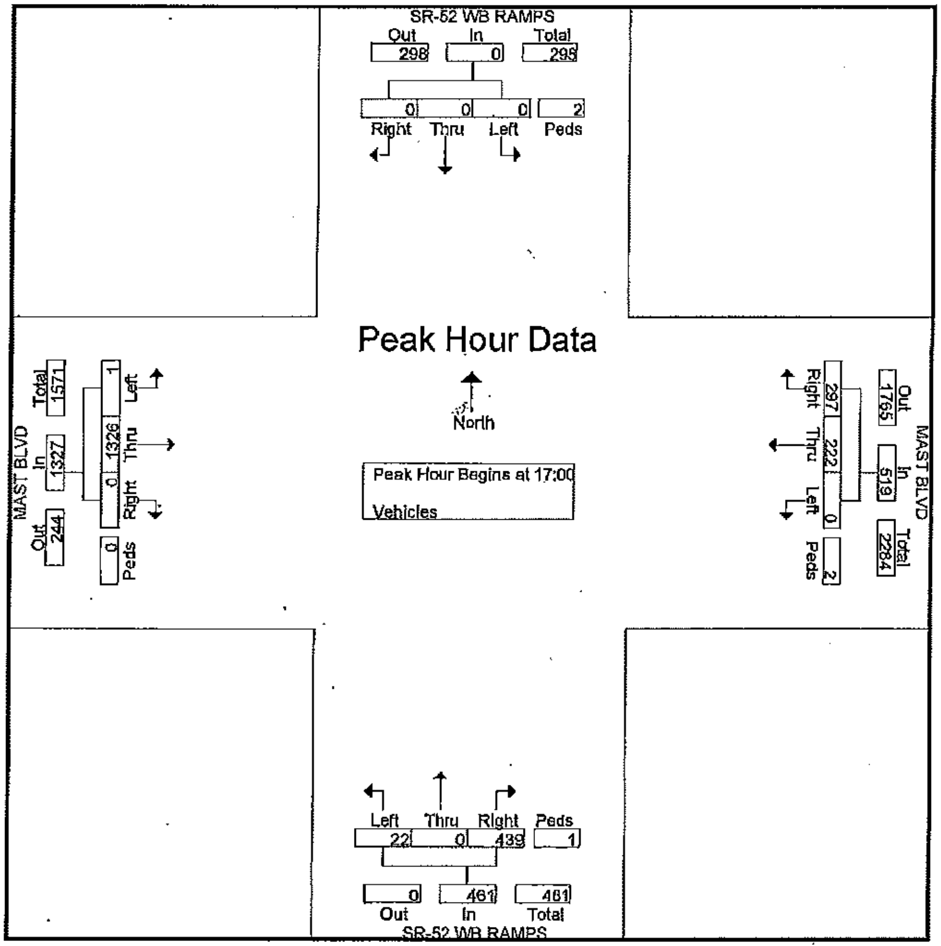


True Count

4401 Twain Ave, Suite 27
San Diego, CA 92120

File Name : 1134.02.SR-52 WB RAMPS.MAST BLVD
Site Code : 00000000
Start Date : 4/5/2011
Page No : 3

	SR-52 WB RAMPS Southbound					MAST BLVD Westbound					SR-52 WB RAMPS Northbound					MAST BLVD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 to 17:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 17:00																					
17:00	0	0	0	1	1	0	58	78	0	136	10	0	96	0	106	1	295	0	0	296	539
17:15	0	0	0	0	0	0	51	80	0	131	5	0	125	0	130	0	343	0	0	343	604
17:30	0	0	0	1	1	0	48	70	1	119	3	0	113	1	117	0	367	0	0	367	604
17:45	0	0	0	0	0	0	65	69	1	135	4	0	105	0	109	0	321	0	0	321	565
Total Volume	0	0	0	2	2	0	222	297	2	521	22	0	439	1	462	1	1326	0	0	1327	2312
% App. Total	0	0	0	100		0	42.6	57	0.4		4.8	0	95	0.2		0.1	99.9	0	0		
PHF	.000	.000	.000	.500	.500	.000	.854	.928	.500	.958	.550	.000	.878	.250	.888	.250	.903	.000	.000	.904	.957



True Count

4401 Twain Ave, Suite 27
San Diego, CA 92120

File Name : 1134.03.WESTHILLS PARKWAY.MAST BLVD
Site Code : 00000000
Start Date : 4/5/2011
Page No : 1

Groups Printed- Vehicles

	SYCAMORE,LANDFILL RD Southbound				MAST BLVD Westbound				W HILLS PKWY Northbound				MAST BLVD Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00	0	0	8	0	21	289	0	0	193	1	129	0	14	79	14	0	748
07:15	0	2	7	0	23	411	1	0	238	1	26	0	8	44	19	0	780
07:30	0	0	14	0	22	314	1	0	228	5	41	0	12	44	21	0	702
07:45	0	2	11	0	29	273	1	0	188	3	93	1	20	42	20	0	683
Total	0	4	40	0	95	1287	3	0	847	10	289	1	54	209	74	0	2913
08:00	0	0	7	0	36	313	0	0	168	1	91	0	20	59	35	0	730
08:15	3	2	19	0	29	234	1	0	152	1	14	0	21	45	35	0	556
08:30	0	1	21	0	18	177	2	0	132	2	4	0	19	47	29	0	452
08:45	1	3	17	0	21	125	2	0	103	2	8	0	16	64	29	0	391
Total	4	6	64	0	104	849	5	0	555	6	117	0	76	215	128	0	2129
*** BREAK ***																	
16:00	1	1	17	1	18	66	1	0	40	3	34	9	8	230	144	0	573
16:15	1	1	9	0	22	67	0	0	44	1	29	7	10	238	139	0	568
16:30	0	3	21	0	17	92	0	1	48	1	29	8	0	255	108	0	583
16:45	0	0	9	2	18	73	0	3	54	0	42	0	1	251	118	0	571
Total	2	5	56	3	75	298	1	4	186	5	134	24	19	974	509	0	2295
17:00	1	1	9	3	22	86	1	0	41	0	36	0	1	262	128	0	591
17:15	0	0	3	0	22	74	1	0	54	0	47	0	1	303	164	0	669
17:30	0	0	3	1	23	72	0	0	43	0	35	2	0	321	159	0	659
17:45	1	1	2	0	23	90	0	0	42	0	34	0	1	265	160	0	619
Total	2	2	17	4	90	322	2	0	180	0	152	2	3	1151	611	0	2538
Grand Total	8	17	177	7	364	2756	11	4	1768	21	692	27	152	2549	1322	0	9875
Apprch %	3.8	8.1	84.7	3.3	11.6	87.9	0.4	0.1	70.5	0.8	27.6	1.1	3.8	63.4	32.9	0	
Total %	0.1	0.2	1.8	0.1	3.7	27.9	0.1	0	17.9	0.2	7	0.3	1.5	25.8	13.4	0	

True Count

4401 Twain Ave, Suite 27
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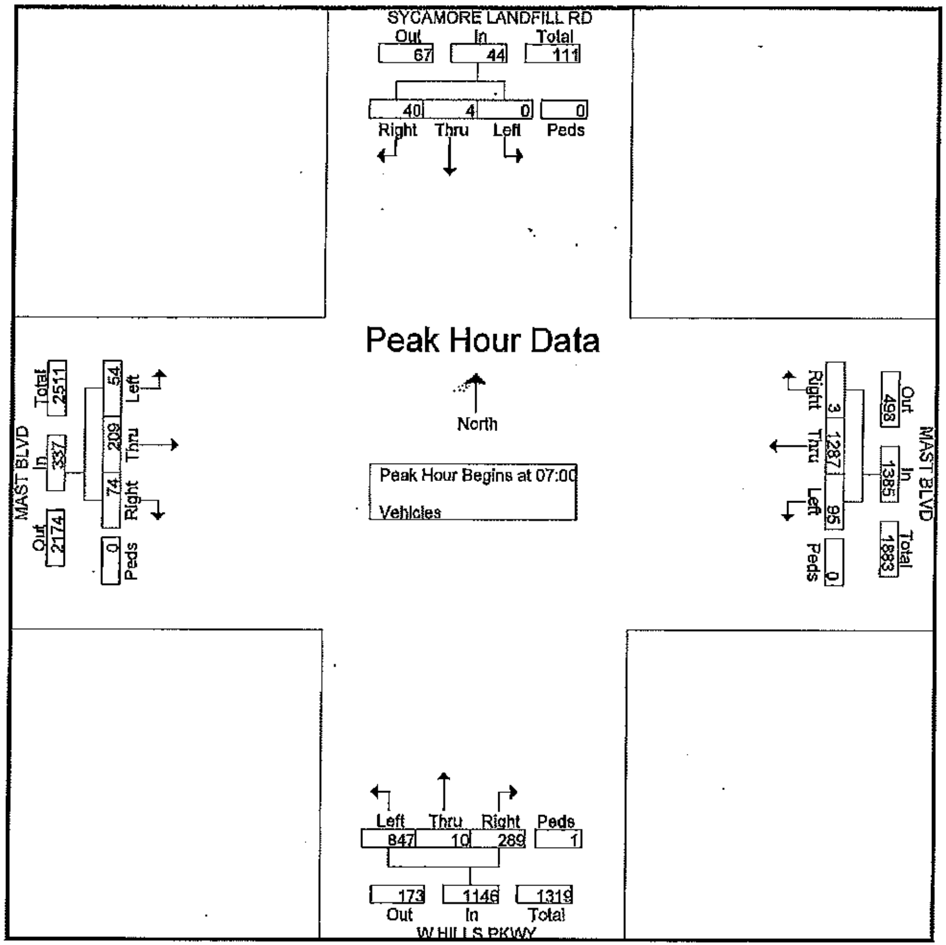
File Name : 1134.03.WESTHILLS PARKWAY.MAST BLVD
Site Code : 00000000
Start Date : 4/5/2011
Page No : 2

	SYCAMORE LANDFILL RD Southbound					MAST BLVD Westbound					W HILLS PKWY Northbound					MAST BLVD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 11:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00																					
07:00	0	0	8	0	8	21	289	0	0	310	193	1	129	0	323	14	79	14	0	107	748
07:15	0	2	7	0	9	23	411	1	0	435	238	1	26	0	265	8	44	19	0	71	780
07:30	0	0	14	0	14	22	314	1	0	337	228	5	41	0	274	12	44	21	0	77	702
07:45	0	2	11	0	13	29	273	1	0	303	188	3	93	1	285	20	42	20	0	82	683
Total Volume	0	4	40	0	44	95	1287	3	0	1385	847	10	289	1	1147	54	209	74	0	337	2913
% App. Total	0	9.1	90.9	0		6.9	92.9	0.2	0		73.8	0.9	25.2	0.1		16	62	22	0	.	
PHF	.000	.500	.714	.000	.786	.819	.783	.750	.000	.796	.890	.500	.560	.250	.888	.675	.661	.881	.000	.787	.934

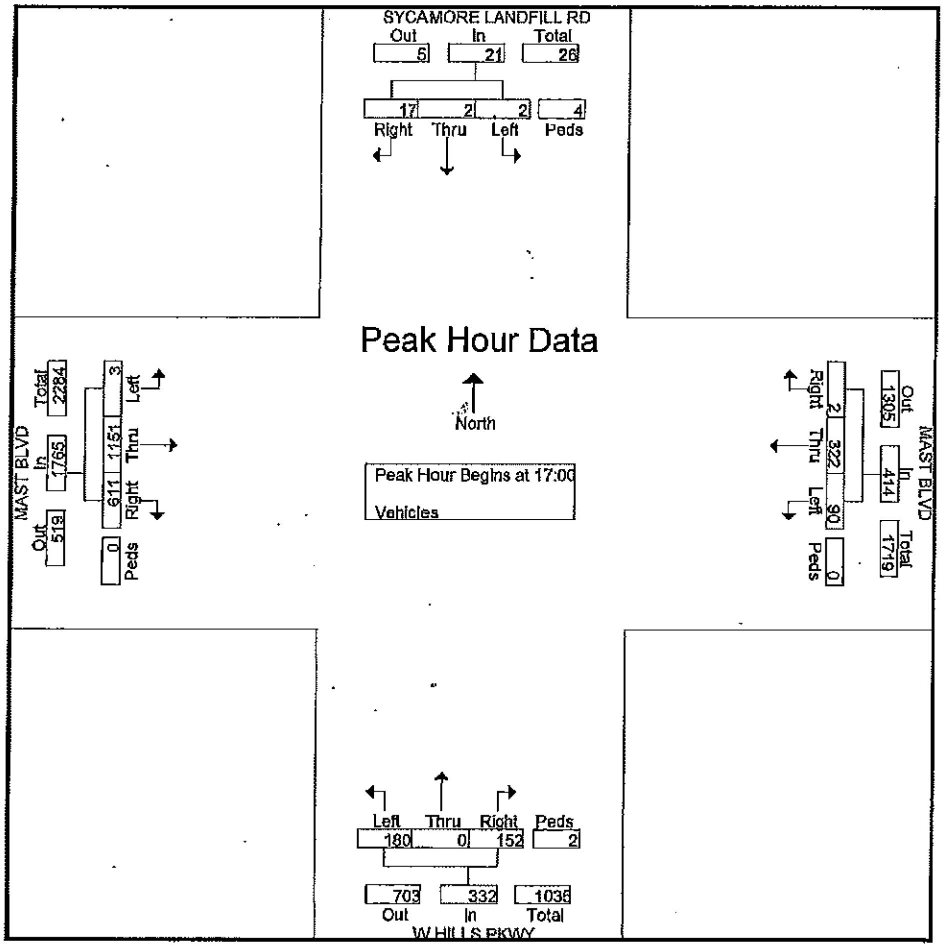


True Count

4401 Twain Ave, Suite 27
San Diego, CA 92120

File Name : 1134.03.WESTHILLS PARKWAY.MAST BLVD
Site Code : 00000000
Start Date : 4/5/2011
Page No : 3

	SYCAMORE LANDFILL RD Southbound					MAST BLVD Westbound					W HILLS PKWY Northbound					MAST BLVD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 to 17:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 17:00																					
17:00	1	1	9	3	14	22	86	1	0	109	41	0	36	0	77	1	262	128	0	391	591
17:15	0	0	3	0	3	22	74	1	0	97	54	0	47	0	101	1	303	164	0	468	669
17:30	0	0	3	1	4	23	72	0	0	95	43	0	35	2	80	0	321	159	0	480	659
17:45	1	1	2	0	4	23	90	0	0	113	42	0	34	0	76	1	265	160	0	426	619
Total Volume	2	2	17	4	25	90	322	2	0	414	180	0	152	2	334	3	1151	611	0	1765	2538
% App. Total	8	8	68	16		21.7	77.8	0.5	0		53.9	0	45.5	0.6		0.2	65.2	34.6	0		
PHF	.500	.500	.472	.333	.446	.978	.894	.500	.000	.916	.833	.000	.809	.250	.827	.750	.896	.931	.000	.919	.948



True Count

4401 Twain Ave, Suite 27
San Diego, CA 92120

File Name : 1134.04.FANITA PARKWAY.MAST BLVD
Site Code : 00000000
Start Date : 4/5/2011
Page No : 1

Groups Printed- Vehicles

	FANITA PKWY Southbound				MAST BLVD Westbound				FANITA PKWY Northbound				MAST BLVD Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00	2	11	46	3	15	356	1	3	13	2	6	1	8	109	25	0	601
07:15	0	16	39	3	15	300	1	0	6	2	2	0	9	57	7	0	457
07:30	1	15	44	3	10	281	4	0	9	3	3	6	11	49	12	0	451
07:45	5	5	47	3	8	294	6	0	13	14	2	10	15	92	21	0	535
Total	8	47	176	12	48	1231	12	3	41	21	13	17	43	307	65	0	2044
08:00	5	14	38	1	19	323	8	2	8	6	4	1	13	148	33	0	623
08:15	3	21	33	0	13	204	4	0	0	6	6	0	15	80	8	0	393
08:30	8	11	25	1	2	164	2	1	3	4	3	1	10	61	3	0	299
08:45	5	3	15	0	8	113	2	0	4	4	4	1	7	54	8	0	228
Total	21	49	111	2	42	804	16	3	15	20	17	3	45	343	52	0	1543
*** BREAK ***																	
16:00	2	5	14	2	10	67	3	0	11	10	6	2	32	191	10	0	365
16:15	3	3	15	4	5	81	6	5	10	7	10	6	34	192	7	0	388
16:30	5	3	17	2	5	102	5	0	9	12	5	1	31	220	11	2	430
16:45	3	6	20	1	6	92	3	1	7	3	7	2	27	215	13	0	406
Total	13	17	66	9	26	342	17	6	37	32	28	11	124	818	41	2	1589
17:00	6	8	16	5	2	95	7	2	7	8	5	0	34	228	10	0	433
17:15	8	9	14	2	5	99	7	3	11	8	7	1	31	247	16	0	468
17:30	4	9	16	2	5	82	5	2	7	7	3	6	38	272	18	0	476
17:45	4	9	11	2	5	110	6	3	5	9	4	3	33	248	17	0	469
Total	22	35	57	11	17	386	25	10	30	32	19	10	136	995	61	0	1846
Grand Total	64	148	410	34	133	2763	70	22	123	105	77	41	348	2463	219	2	7022
Apprch %	9.8	22.6	62.5	5.2	4.5	92.5	2.3	0.7	35.5	30.3	22.3	11.8	11.5	81.2	7.2	0.1	
Total %	0.9	2.1	5.8	0.5	1.9	39.3	1	0.3	1.8	1.5	1.1	0.6	5	35.1	3.1	0	

True Count

4401 Twain Ave, Suite 27
San Diego, CA 92120

File Name : 1134.04.FANITA PARKWAY.MAST BLVD
Site Code : 00000000
Start Date : 4/5/2011
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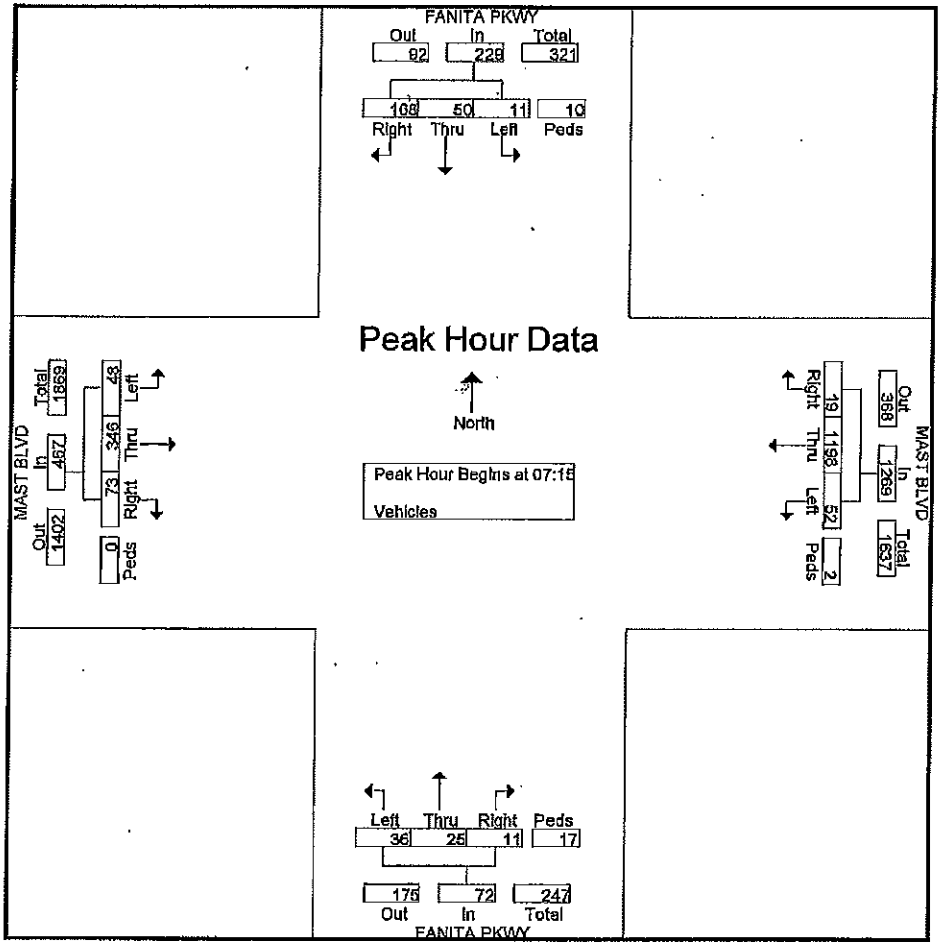
	FANITA PKWY Southbound					MAST BLVD Westbound					FANITA PKWY Northbound					MAST BLVD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 11:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15																					
07:15	0	16	39	3	58	15	300	1	0	316	6	2	2	0	10	9	57	7	0	73	457
07:30	1	15	44	3	63	10	281	4	0	295	9	3	3	6	21	11	49	12	0	72	451
07:45	5	5	47	3	60	8	294	6	0	308	13	14	2	10	39	15	92	21	0	128	535
08:00	5	14	38	1	58	19	323	8	2	352	8	6	4	1	19	13	148	33	0	194	623
Total Volume	11	50	168	10	239	52	119 8	19	2	1271	36	25	11	17	89	48	346	73	0	467	2066
% App. Total	4.6	20.9	70.3	4.2		4.1	94.3	1.5	0.2		40.4	28.1	12.4	19.1		10.3	74.1	15.6	0		
PHF	.550	.781	.894	.833	.948	.684	.927	.594	.250	.903	.692	.446	.688	.425	.571	.800	.584	.553	.000	.602	.829

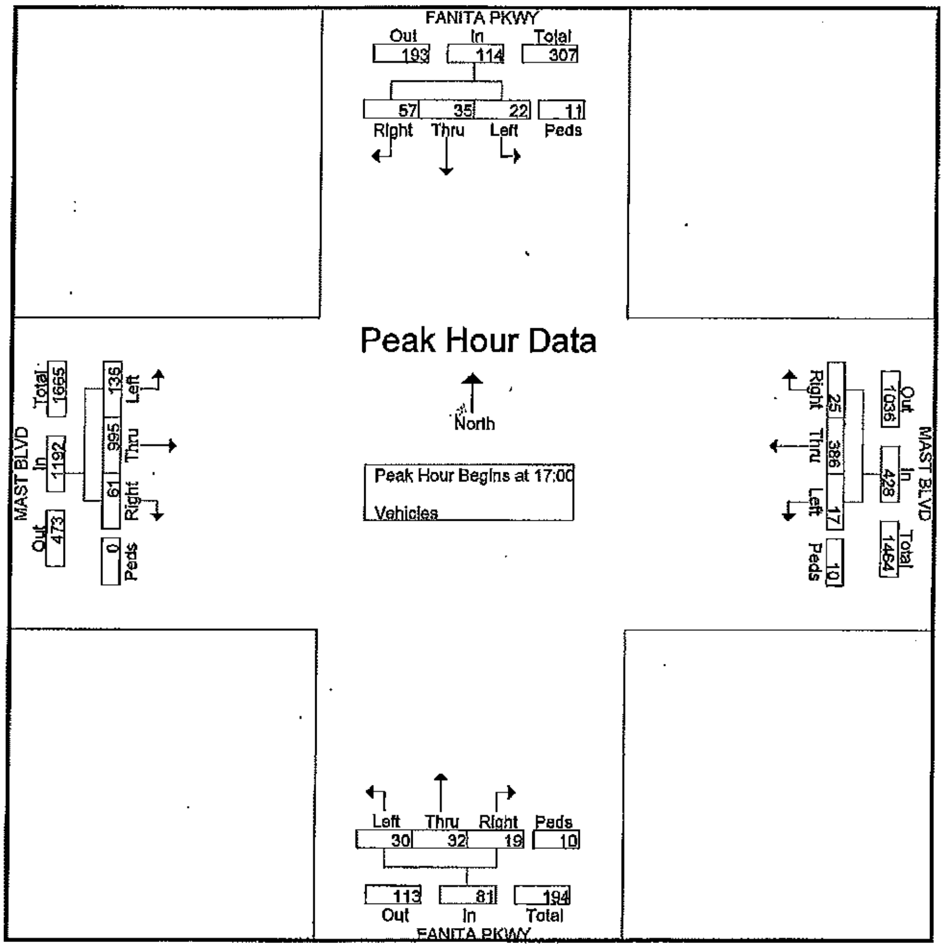


True Count

4401 Twain Ave, Suite 27
San Diego, CA 92120

File Name : 1134.04.FANITA PARKWAY.MAST BLVD
Site Code : 00000000
Start Date : 4/5/2011
Page No : 3

	FANITA PKWY Southbound					MAST BLVD Westbound					FANITA PKWY Northbound					MAST BLVD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 to 17:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 17:00																					
17:00	6	8	16	5	35	2	95	7	2	106	7	8	5	0	20	34	228	10	0	272	433
17:15	8	9	14	2	33	5	99	7	3	114	11	8	7	1	27	31	247	16	0	294	468
17:30	4	9	16	2	31	5	82	5	2	94	7	7	3	6	23	38	272	18	0	328	476
17:45	4	9	11	2	26	5	110	6	3	124	5	9	4	3	21	33	248	17	0	298	469
Total Volume	22	35	57	11	125	17	386	25	10	438	30	32	19	10	91	136	995	61	0	1192	1846
% App. Total	17.6	28	45.6	8.8		3.9	88.1	5.7	2.3		33	35.2	20.9	11		11.4	83.5	5.1	0		
PHF	.688	.972	.891	.550	.893	.850	.877	.893	.833	.883	.682	.889	.679	.417	.843	.895	.915	.847	.000	.909	.970

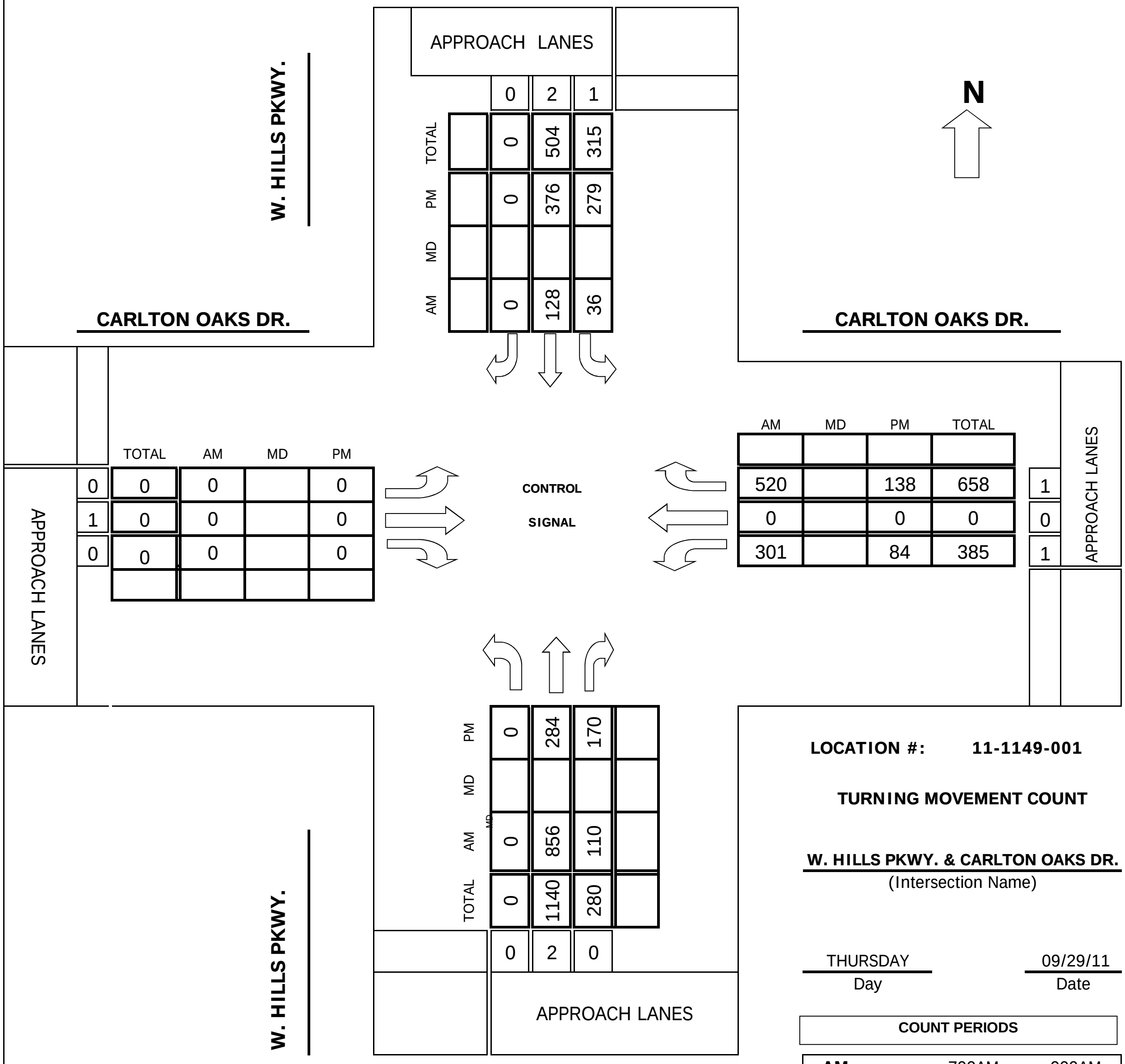


Intersection Turning Movement
Prepared by:

Field Data Services of Arizona, Inc.
520.316.6745

Project #: 11-1149-001

TMC SUMMARY OF W. HILLS PKWY. & CARLTON OAKS DR.



APPROACH LANES		0	2	1
TOTAL		0	504	315
PM		0	376	279
MD				
AM		0	128	36

AM	MD	PM	TOTAL	APPROACH LANES
520		138	658	1
0		0	0	0
301		84	385	1

APPROACH LANES	TOTAL	AM	MD	PM
0	0	0		0
1	0	0		0
0	0	0		0

PM	0	284	170	
MD				
AM	0	856	110	
TOTAL	0	1140	280	
APPROACH LANES	0	2	0	

LOCATION #: 11-1149-001

TURNING MOVEMENT COUNT

W. HILLS PKWY. & CARLTON OAKS DR.
(Intersection Name)

THURSDAY
Day

09/29/11
Date

COUNT PERIODS

AM	700AM	-	900AM
NOON		-	
PM	400PM	-	600PM

AM PEAK HOUR 700 AM

NOON PEAK HOUR

PM PEAK HOUR 430 PM

True Count

4401 Twain Ave, Suite 27
San Diego, CA 92120

File Name : 1134.07.MISSION GORGE ROAD.WESTHILLS PARKWAY
Site Code : 00000000
Start Date : 3/31/2011
Page No : 1

Groups Printed- Vehicles

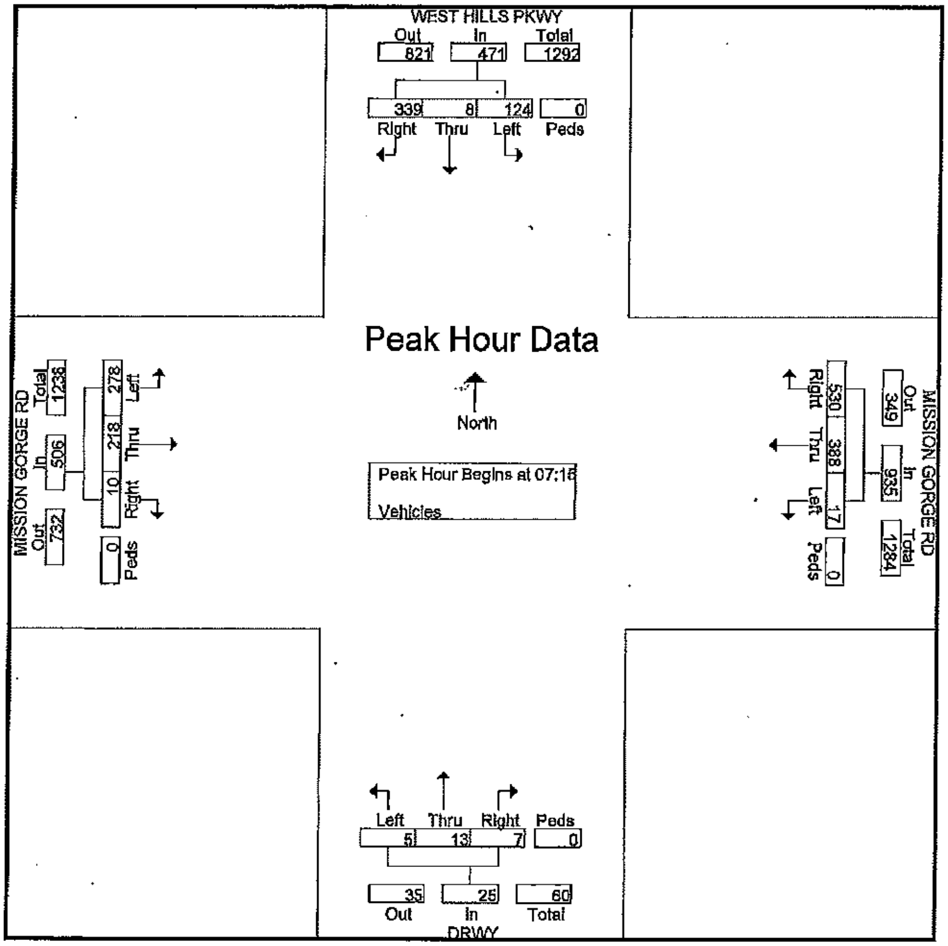
	WEST HILLS PKWY Southbound				MISSION GORGE RD Westbound				DRWY Northbound				MISSION GORGE RD Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00	21	0	84	0	2	85	127	0	1	0	0	0	74	40	0	0	434
07:15	49	2	87	0	4	72	115	0	1	5	1	0	64	50	1	0	451
07:30	30	4	82	0	3	108	128	0	3	1	4	0	84	57	2	0	506
07:45	19	1	85	0	9	111	156	0	0	3	1	0	64	63	4	0	516
Total	119	7	338	0	18	376	526	0	5	9	6	0	286	210	7	0	1907
08:00	26	1	85	0	1	97	131	0	1	4	1	0	66	48	3	0	464
08:15	29	3	56	0	7	66	53	0	2	3	1	0	56	55	4	0	335
08:30	30	5	58	0	3	88	35	0	2	2	1	0	49	61	3	0	337
08:45	10	3	53	0	7	50	28	0	1	2	4	0	28	46	3	0	235
Total	95	12	252	0	18	301	247	0	6	11	7	0	199	210	13	0	1371
*** BREAK ***																	
16:00	39	1	61	0	13	72	21	0	1	2	5	0	85	105	2	0	407
16:15	39	4	61	0	4	86	27	0	5	2	5	0	79	113	2	0	427
16:30	48	4	68	0	15	55	21	0	3	4	6	0	58	106	7	0	395
16:45	40	6	67	0	12	62	15	0	2	5	7	0	78	134	8	0	436
Total	166	15	257	0	44	275	84	0	11	13	23	0	300	458	19	0	1665
17:00	47	3	74	0	9	70	42	0	3	6	7	0	81	145	6	0	493
17:15	46	4	65	1	8	68	26	0	5	5	7	0	82	154	1	0	472
17:30	38	7	71	0	5	68	20	0	3	6	6	0	48	121	5	0	398
17:45	36	5	52	0	5	61	25	0	4	2	9	0	50	97	1	0	347
Total	167	19	262	1	27	267	113	0	15	19	29	0	261	517	13	0	1710
Grand Total	547	53	1109	1	107	1219	970	0	37	52	65	0	1046	1395	52	0	6653
Apprch %	32	3.1	64.9	0.1	4.7	53.1	42.2	0	24	33.8	42.2	0	42	56	2.1	0	
Total %	8.2	0.8	16.7	0	1.6	18.3	14.6	0	0.6	0.8	1	0	15.7	21	0.8	0	

True Count

4401 Twain Ave, Suite 27
San Diego, CA 92120

File Name : 1134.07.MISSION GORGE ROAD.WESTHILLS PARKWAY
Site Code : 00000000
Start Date : 3/31/2011
Page No : 2

	WEST HILLS PKWY Southbound					MISSION GORGE RD Westbound					DRWY Northbound					MISSION GORGE RD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 11:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15																					
07:15	49	2	87	0	138	4	72	115	0	191	1	5	1	0	7	64	50	1	0	115	451
07:30	30	4	82	0	116	3	108	128	0	239	3	1	4	0	8	84	57	2	0	143	506
07:45	19	1	85	0	105	9	111	156	0	276	0	3	1	0	4	64	63	4	0	131	516
08:00	26	1	85	0	112	1	97	131	0	229	1	4	1	0	6	66	48	3	0	117	464
Total Volume	124	8	339	0	471	17	388	530	0	935	5	13	7	0	25	278	218	10	0	506	1937
% App. Total	26.3	1.7	72	0		1.8	41.5	56.7	0		20	52	28	0		54.9	43.1	2	0		
PHF	.633	.500	.974	.000	.853	.472	.874	.849	.000	.847	.417	.650	.438	.000	.781	.827	.865	.625	.000	.885	.938

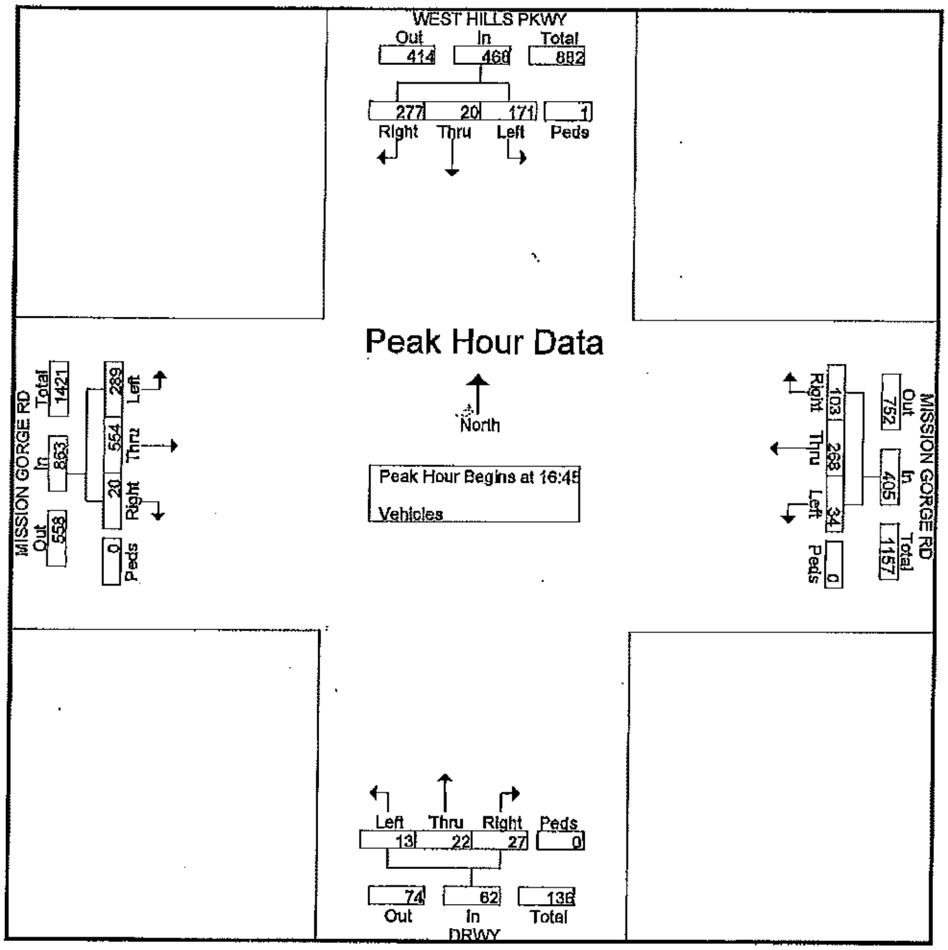


True Count

4401 Twain Ave, Suite 27
San Diego, CA 92120

File Name : 1134.07.MISSION GORGE ROAD.WESTHILLS PARKWAY
Site Code : 00000000
Start Date : 3/31/2011
Page No : 3

	WEST HILLS PKWY Southbound					MISSION GORGE RD Westbound					DRWY Northbound					MISSION GORGE RD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 to 17:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 16:45																					
16:45	40	6	67	0	113	12	62	15	0	89	2	5	7	0	14	78	134	8	0	220	436
17:00	47	3	74	0	124	9	70	42	0	121	3	6	7	0	16	81	145	6	0	232	493
17:15	46	4	65	1	116	8	68	26	0	102	5	5	7	0	17	82	154	1	0	237	472
17:30	38	7	71	0	116	5	68	20	0	93	3	6	6	0	15	48	121	5	0	174	398
Total Volume	171	20	277	1	469	34	268	103	0	405	13	22	27	0	62	289	554	20	0	863	1799
% App. Total	36.5	4.3	59.1	0.2		8.4	66.2	25.4	0		21	35.5	43.5	0		33.5	64.2	2.3	0		
PHF	.910	.714	.936	.250	.946	.708	.957	.613	.000	.837	.650	.917	.964	.000	.912	.881	.899	.625	.000	.910	.912

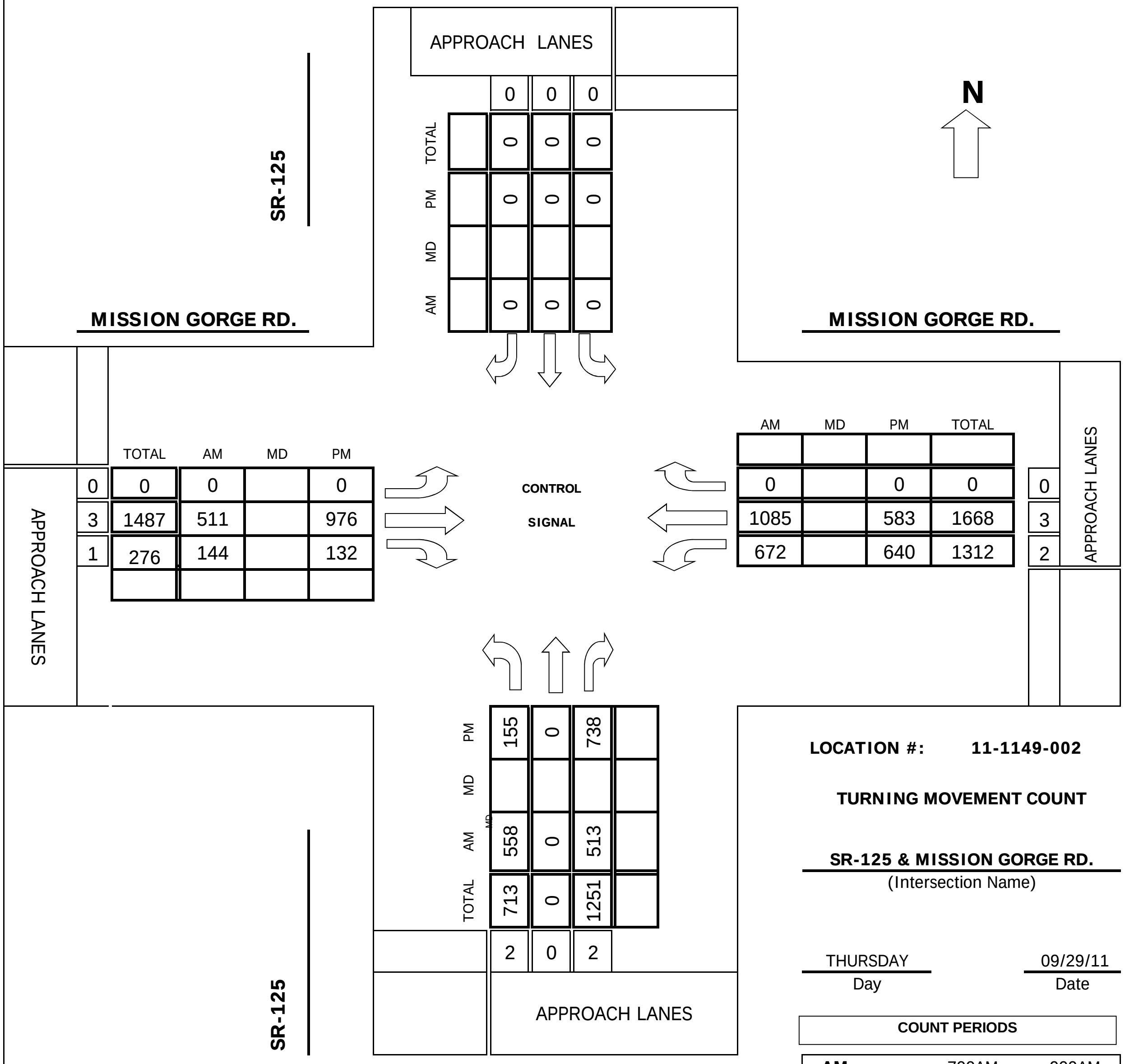


Intersection Turning Movement
Prepared by:

FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745

Project #: 11-1149-002

TMC SUMMARY OF SR-125 & MISSION GORGE RD.



APPROACH LANES	0	0	0
TOTAL	0	0	0
PM	0	0	0
MD			
AM	0	0	0

APPROACH LANES	TOTAL	AM	MD	PM
0	0	0		0
3	1487	511		976
1	276	144		132

AM	MD	PM	TOTAL	APPROACH LANES
0		0	0	0
1085		583	1668	3
672		640	1312	2

PM	155	0	738	
MD				
AM	558	0	513	
TOTAL	713	0	1251	
APPROACH LANES	2	0	2	

LOCATION #: 11-1149-002

TURNING MOVEMENT COUNT

SR-125 & MISSION GORGE RD.
(Intersection Name)

THURSDAY 09/29/11
Day Date

COUNT PERIODS

AM	700AM	-	900AM
NOON		-	
PM	400PM	-	600PM

AM PEAK HOUR 715 AM

NOON PEAK HOUR

PM PEAK HOUR 445 PM

MetroCount Traffic Executive
Event Counts

783 -- English (ENU)

Datasets:

Site: [1134.01] MAST BLVD (SR-52 WB RAMPS-WESTHILLS PKWY) WESTBOUND
Input A: 4 - West bound. - Lane= 0, Added to totals. (/2.000)
Input B: 0 - Unused or unknown. - Lane= 0, Excluded from totals.
Survey Duration: 15:40 Wednesday, March 30, 2011 => 11:11 Friday, April 01, 2011
File: 1134.01.W01Apr2011.EC0 (Base)
Data type: Axle sensors - Separate (Count)

Profile:
Filter time: **0:00 Thursday, March 31, 2011 => 0:00 Friday, April 01, 2011**
In profile: Events = 13700 / 16655 (82.26%)

* **Thursday, March 31, 2011=13700, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
26	19	19	61	191	673	1452	2150	1472	785	676	675	666	661	657	711	651	577	501	382	261	244	121	72
7	5	2	9	26	128	286	562	467	205	146	183	174	153	173	197	166	165	112	110	66	73	40	23
7	6	4	13	29	158	332	561	380	215	153	158	183	164	147	189	167	150	131	105	76	56	40	11
5	5	7	20	50	207	396	551	372	185	197	169	164	165	150	173	175	130	145	84	73	61	24	24
7	3	6	19	87	181	438	476	254	181	181	165	148	180	188	152	143	133	114	83	46	55	17	14

AM Peak 0700 - 0800 (2150), AM PHF=0.96

MetroCount Traffic Executive
Event Counts

782 -- English (ENU)

Datasets:

Site: **[1134.01] MAST BLVD (SR-52 WB RAMPS-WESTHILLS PKWY) EASTBOUND**
Input A: 2 - East bound. - Lane= 0, Added to totals. (/2.000)
Input B: 0 - Unused or unknown. - Lane= 0, Excluded from totals.
Survey Duration: 15:42 Wednesday, March 30, 2011 => 11:10 Friday, April 01, 2011
File: 1134.01.E01Apr2011.EC0 (Base)
Data type: Axle sensors - Separate (Count)

Profile:

Filter time: **0:00 Thursday, March 31, 2011 => 0:00 Friday, April 01, 2011**
In profile: Events = 13126 / 20253 (64.81%)

*** Thursday, March 31, 2011=13126, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
100	**47**	**29**	**27**	**42**	**101**	**285**	**429**	**428**	**450**	**492**	**534**	**647**	**701**	**1056**	**1414**	**1522**	**1571**	**1165**	**747**	**536**	**383**	**279**	**144**	
26	14	10	9	8	23	37	134	114	118	107	121	147	143	221	316	360	392	354	191	128	106	80	41	-
21	13	5	6	8	22	63	76	98	119	98	116	167	160	215	374	365	450	335	217	153	100	69	42	-
26	11	8	7	13	19	51	97	106	110	133	168	169	193	274	350	396	377	257	175	128	98	63	37	-
27	9	6	5	13	39	134	122	110	104	156	131	165	205	347	375	402	352	219	165	128	80	67	24	-

AM Peak 1145 - 1245 (613), AM PHF=0.91

MetroCount Traffic Executive
Event Counts

780 -- English (ENU)

Datasets:
Site: **[1134.02] MAST BLVD (EAST OF WESTHILLS PKWY) WESTBOUND**
Input A: 4 - West bound. - Lane= 0, Added to totals. (/2.000)
Input B: 2 - East bound. - Lane= 0, Excluded from totals.
Survey Duration: 16:44 Wednesday, March 30, 2011 => 11:01 Friday, April 01, 2011
File: 1134.0201Apr2011.EC0 (Regular)
Data type: Axle sensors - Separate (Count)

Profile:
Filter time: **0:00 Thursday, March 31, 2011 => 0:00 Friday, April 01, 2011**
In profile: Events = 18057 / 23573 (76.60%)

*** Thursday, March 31, 2011=9092, 15 minute drops**

```
 0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300
   22   15   14   57  138  487 1016 1337  994  473  361  371  432  404  460  461  407  400  389  302  213  200   92   52
   10    5    2    9   19   72  195  369  353  141   75   98  108   90  112  138  104  101   86   72   52   64   25   16   -
    5    1    2   11   24  112  237  339  237  125   76   91  131   89  102  112  101  106   94   97   52   50   30    9   -
    4    6    7   17   34  165  300  329  229  116  110   91  105   79   94  121  112   98  118   66   64   52   20   15   -
    3    3    3   20   62  138  285  301  175   92  101   92   90  147  153   91   90   95   92   67   45   35   18   12   -
```

AM Peak 0700 - 0800 (1337), AM PHF=0.91

MetroCount Traffic Executive
Event Counts

781 – English (ENU)

Datasets:

Site:	**[1134.02] MAST BLVD (EAST OF WESTHILLS PKWY) EASTBOUND**
Input A:	4 - West bound. - Lane= 0, Excluded from totals.
Input B:	2 - East bound. - Lane= 0, Added to totals. (/2.000)
Survey Duration:	16:44 Wednesday, March 30, 2011 => 11:01 Friday, April 01, 2011
File:	1134.0201Apr2011.EC0 (Regular)
Data type:	Axle sensors - Separate (Count)

Profile:

Filter time:	**0:00 Thursday, March 31, 2011 => 0:00 Friday, April 01, 2011**
In profile:	Events = 18057 / 23573 (76.60%)

*** Thursday, March 31, 2011=8966, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
71	**29**	**18**	**15**	**24**	**36**	**252**	**557**	**365**	**239**	**253**	**316**	**377**	**442**	**733**	**952**	**1050**	**1094**	**745**	**486**	**362**	**260**	**197**	**99**
19	10	6	6	4	8	21	**224**	174	75	54	63	80	88	118	212	254	250	225	121	103	78	53	25
12	7	2	4	3	6	30	**72**	57	57	59	78	115	99	161	217	250	304	217	137	97	69	53	33
21	6	6	3	6	8	38	**106**	59	49	63	97	80	120	186	255	269	270	160	120	79	61	40	22
19	6	4	2	11	14	**163**	156	76	59	79	79	102	136	269	268	278	270	143	108	84	54	51	19

AM Peak 0646 - 0745 (564), AM PHF=0.63

MetroCount Traffic Executive
Event Counts

785 -- English (ENU)

Datasets:
Site: **[1134.03] MAST BLVD (WEST OF FANITA PKWY) WESTBOUND**
Input A: 4 - West bound. - Lane= 0, Added to totals. (/2.000)
Input B: 0 - Unused or unknown. - Lane= 0, Excluded from totals.
Survey Duration: 17:21 Wednesday, March 30, 2011 => 11:41 Friday, April 01, 2011
File: 1134.03.W01Apr2011.EC0 (Base)
Data type: Axle sensors - Separate (Count)

Profile:
Filter time: **0:00 Thursday, March 31, 2011 => 0:00 Friday, April 01, 2011**
In profile: Events = 9325 / 10900 (85.55%)

*** Thursday, March 31, 2011=9325, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
24	**14**	**15**	**54**	**127**	**447**	**1098**	**1394**	**970**	**454**	**373**	**346**	**398**	**427**	**509**	**498**	**489**	**413**	**365**	**323**	**245**	**186**	**102**	**57**	
10	5	2	8	18	69	186	410	345	132	77	94	107	86	106	133	124	103	100	99	73	74	28	18	-
5	2	2	11	23	106	227	314	234	138	89	87	111	100	99	111	118	119	94	65	70	44	36	12	-
6	3	6	17	33	151	312	305	213	110	110	75	92	102	143	126	136	86	82	79	55	39	21	11	-
3	4	5	18	53	122	373	367	178	75	99	91	88	140	161	128	112	105	89	81	48	30	17	16	-

AM Peak 0630 - 0730 (1408), AM PHF=0.86

MetroCount Traffic Executive
Event Counts

784 -- English (ENU)

Datasets:
Site: **[1134.03] MAST BLVD (WEST OF FANITA PKWY) EASTBOUND**
Input A: 2 - East bound. - Lane= 0, Added to totals. (/2.000)
Input B: 0 - Unused or unknown. - Lane= 0, Excluded from totals.
Survey Duration: 17:19 Wednesday, March 30, 2011 => 10:56 Friday, April 01, 2011
File: 1134.03.E01Apr2011.EC0 (Base)
Data type: Axle sensors - Separate (Count)

Profile:
Filter time: **0:00 Thursday, March 31, 2011 => 0:00 Friday, April 01, 2011**
In profile: Events = 9250 / 12453 (74.28%)

*** Thursday, March 31, 2011=9250, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
62	**31**	**16**	**18**	**28**	**34**	**144**	**468**	**450**	**255**	**269**	**329**	**509**	**548**	**753**	**930**	**1005**	**1053**	**791**	**555**	**434**	**279**	**196**	**97**
19	11	3	8	5	8	20	149	198	80	58	65	88	100	152	231	242	224	218	139	118	73	58	27
13	5	5	4	4	6	30	94	93	65	57	76	176	115	144	255	239	275	214	166	121	86	49	32
14	7	5	2	8	6	23	95	92	52	72	101	116	123	144	202	245	267	211	142	105	65	40	21
16	8	3	4	11	14	71	130	68	58	83	88	130	211	314	242	279	288	149	109	92	56	49	17

AM Peak 0715 - 0815 (517), AM PHF=0.65

MetroCount Traffic Executive
Event Counts

786 -- English (ENU)

Datasets:

Site:	**[1134.04] WESTHILLS PKWY (SOUTH OF MAST BLVD) NORTHBOUND**
Input A:	1 - North bound. - Lane= 0, Added to totals. (/2.000)
Input B:	0 - Unused or unknown. - Lane= 0, Excluded from totals.
Survey Duration:	16:02 Wednesday, March 30, 2011 => 11:10 Friday, April 01, 2011
File:	1134.04.N01Apr2011.EC0 (Base)
Data type:	Axle sensors - Separate (Count)

Profile:

Filter time:	**0:00 Thursday, March 31, 2011 => 0:00 Friday, April 01, 2011**
In profile:	Events = 6550 / 8178 (80.09%)

*** Thursday, March 31, 2011=6550, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
17	**9**	**7**	**9**	**72**	**232**	**523**	**1172**	**665**	**346**	**337**	**293**	**288**	**318**	**352**	**355**	**373**	**384**	**253**	**194**	**140**	**115**	**62**	**37**
1	2	0	0	9	53	82	336	284	92	77	72	77	71	76	81	98	113	60	48	48	30	22	10
4	5	2	3	8	52	101	259	157	81	78	71	66	91	80	94	94	110	65	44	39	25	16	9
6	1	2	5	19	57	115	294	143	81	92	81	80	86	94	85	94	80	66	58	29	27	15	12
6	1	3	1	36	70	226	284	82	92	90	70	66	71	102	95	88	81	63	44	24	33	9	6

AM Peak 0700 - 0800 (1172), AM PHF=0.87

MetroCount Traffic Executive
Event Counts

787 – English (ENU)

Datasets:
Site: **[1134.04] WESTHILLS PKWY (SOUTH OF MAST BLVD) SOUTHBOUND**
Input A: 3 - South bound. - Lane= 0, Added to totals. (/2.000)
Input B: 0 - Unused or unknown. - Lane= 0, Excluded from totals.
Survey Duration: 16:04 Wednesday, March 30, 2011 => 11:11 Friday, April 01, 2011
File: 1134.04.S01Apr2011.EC0 (Base)
Data type: Vehicle sensors - Separate (Count)

Profile:
Filter time: **0:00 Thursday, March 31, 2011 => 0:00 Friday, April 01, 2011**
In profile: Events = 5873 / 8777 (66.91%)

*** Thursday, March 31, 2011=5873, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
43	**23**	**13**	**15**	**30**	**53**	**117**	**210**	**262**	**242**	**221**	**257**	**317**	**313**	**470**	**526**	**592**	**616**	**547**	**379**	**258**	**190**	**117**	**65**	
10	5	3	3	6	12	13	52	66	54	55	57	74	63	116	129	124	155	154	87	52	46	34	21	-
13	7	4	3	7	15	28	49	65	58	48	59	66	83	103	139	155	178	155	109	76	51	24	14	–
9	7	3	5	8	13	35	51	73	71	56	68	99	67	106	123	155	154	122	99	62	51	35	21	–
11	4	3	4	9	13	42	59	59	59	63	73	79	101	146	135	158	130	117	84	68	42	24	9	–

AM Peak 1145 - 1245 (311), AM PHF=0.79

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APPENDIX B

CITY OF SAN DIEGO ROAD CLASSIFICATION TABLE

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TABLE 2
Roadway Classifications, Levels of Service (LOS) and Average Daily Traffic (ADT)

			LEVEL OF SERVICE				
STREET CLASSIFICATION	LANES	CROSS SECTIONS	A	B	C	D	E
Freeway	8 lanes		60,000	84,000	120,000	140,000	150,000
Freeway	6 lanes		45,000	63,000	90,000	110,000	120,000
Freeway	4 lanes		30,000	42,000	60,000	70,000	80,000
Expressway	6 lanes	102/122	30,000	42,000	60,000	70,000	80,000
Primary Arterial	6 lanes	102/122	25,000	35,000	50,000	55,000	60,000
Major Arterial	6 lanes	102/122	20,000	28,000	40,000	45,000	50,000
Major Arterial	4 lanes	78/98	15,000	21,000	30,000	35,000	40,000
Collector	4 lanes	72/92	10,000	14,000	20,000	25,000	30,000
Collector (no center lane) continuous left-turn lane)	4 lanes 2 lanes	64/84 50/70	5,000	7,000	10,000	13,000	15,000
Collector (no fronting property)	2 lanes	40/60	4,000	5,500	7,500	9,000	10,000
Collector (commercial-industrial fronting)	2 lanes	50/70	2,500	3,500	5,000	6,500	8,000
Collector (multifamily)	2 lanes	40/60	2,500	3,500	5,000	6,500	8,000
Sub-Collector (single-family)	2 lanes	36/56	—	—	2,200	—	—

<u>LEGEND</u>:

XXX/XXX = Curb to curb width (feet)/right-of-way width (feet): based on the City of San Diego Street Design. Manual

XX/XXX= Approximate recommended ADT based on the City of San Diego Street Design Manual.

<u>NOTES</u>:

1. The volumes and the average daily level of service listed above are only intended as a general planning guideline.
2. Levels of service are not applied to residential streets since their primary purpose is to serve abutting lots, not carry through traffic. Levels of service normally apply to roads carrying through traffic between major trip generators and attractors.

APPENDIX C

FREEWAY CALCULATION SHEETS

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SR 52 WEST of Mast Boulevard		
ADT	AM Pk	PM Pk
81,386	7,489	6,172

April 1–19, 2011

Eastbound

Day	Flow	# Lane Points	% Observed
4/5/2011	32548	576	96
4/6/2011	32841	576	93
4/7/2011	33821	576	100
4/12/2011	33466	576	100
4/13/2011	33908	576	100
4/14/2011	33010	576	100
Average:	***33,266***		

AM Peak	Flow	# Lane Points	% Observed
4/5/2011 7:00	1313	24	100
4/5/2011 8:00	1313	24	100
4/6/2011 7:00	1334	24	100
4/6/2011 8:00	1216	24	100
4/7/2011 7:00	1454	24	100
4/7/2011 8:00	1258	24	100
4/12/2011 7:00	1379	24	100
4/12/2011 8:00	1310	24	100
4/13/2011 7:00	1367	24	100
4/13/2011 8:00	1297	24	100
4/14/2011 7:00	1466	24	100
4/14/2011 8:00	1330	24	100
Average:	***1,386***		

PM Peak	Flow	# Lane Points	% Observed
4/5/2011 16:00	3889	24	100
4/5/2011 17:00	3848	24	100
4/6/2011 16:00	3814	24	100
4/6/2011 17:00	3827	24	100
4/7/2011 16:00	4154	24	100
4/7/2011 17:00	4045	24	100
4/12/2011 16:00	3979	24	100
4/12/2011 17:00	3867	24	100
4/13/2011 16:00	3998	24	100
4/13/2011 17:00	3574	24	100
4/14/2011 16:00	3259	24	100
4/14/2011 17:00	3420	24	100
Average:	***3,878***		

Westbound

Day	Flow	# Lane Points	% Observed
4/5/2011	47244	864	97
4/6/2011	47396	864	93
4/7/2011	48203	864	100
4/12/2011	48172	864	100
4/13/2011	48890	864	99
4/14/2011	48818	864	100
Average:	***48,121***		

AM Peak	Flow	# Lane Points	% Observed
4/5/2011 7:00	6017	36	100
4/5/2011 8:00	5241	36	100
4/6/2011 7:00	6009	36	100
4/6/2011 8:00	5166	36	100
4/7/2011 7:00	5962	36	100
4/7/2011 8:00	5035	36	100
4/12/2011 7:00	6250	36	100
4/12/2011 8:00	5235	36	100
4/13/2011 7:00	6281	36	100
4/13/2011 8:00	5362	36	100
4/14/2011 7:00	6102	36	100
4/14/2011 8:00	5162	36	100
Average:	***6,104***		

PM Peak	Flow	# Lane Points	% Observed
4/5/2011 16:00	2,139	36	100
4/5/2011 17:00	2,086	36	100
4/6/2011 16:00	2,314	36	100
4/6/2011 17:00	2,106	36	100
4/7/2011 16:00	2,347	36	100
4/7/2011 17:00	2,265	36	100
4/12/2011 16:00	2,231	36	100
4/12/2011 17:00	2,160	36	100
4/13/2011 16:00	2,403	36	100
4/13/2011 17:00	2,193	36	100
4/14/2011 16:00	2,173	36	100
4/14/2011 17:00	2,333	36	100
Average:	***2,295***		

1. Data collected from PeMs on 4/18/11. Data includes volumes from Tuesdays, Wednesdays, and Thursdays .

April 1–19, 2011

SR 52 EAST of Mast Boulevard		
ADT	AM Pk	PM Pk
81,360	5,503	6,878

Eastbound

Day	Flow	# Lane Points	% Observed
4/5/2011	41649	576	97
4/6/2011	41139	576	93
4/7/2011	41820	576	99
4/12/2011	41865	576	100
4/13/2011	42013	576	99
4/14/2011	41525	576	100
Average:	***41,669***		

AM Peak	Flow	# Lane Points	% Observed
4/5/2011 7:00	1874	24	100
4/5/2011 8:00	1828	24	100
4/6/2011 7:00	1867	24	100
4/6/2011 8:00	1756	24	100
4/7/2011 7:00	1974	24	100
4/7/2011 8:00	1757	24	100
4/12/2011 7:00	1913	24	100
4/12/2011 8:00	1798	24	100
4/13/2011 7:00	1933	24	100
4/13/2011 8:00	1781	24	100
4/14/2011 7:00	1963	24	100
4/14/2011 8:00	1818	24	100
Average:	***1,921***		

PM Peak	Flow	# Lane Points	% Observed
4/5/2011 16:00	4704	24	100
4/5/2011 17:00	4609	24	100
4/6/2011 16:00	4461	24	100
4/6/2011 17:00	4629	24	100
4/7/2011 16:00	4841	24	100
4/7/2011 17:00	4706	24	100
4/12/2011 16:00	4717	24	100
4/12/2011 17:00	4727	24	100
4/13/2011 16:00	4721	24	100
4/13/2011 17:00	4144	24	100
4/14/2011 16:00	4080	24	100
4/14/2011 17:00	4111	24	100
Average:	***4,622***		

Westbound

Day	Flow	# Lane Points	% Observed
4/5/2011	39239	576	97
4/6/2011	39855	576	93
4/7/2011	40388	576	100
4/12/2011	39201	576	100
4/13/2011	40373	576	95
4/14/2011	39090	576	100
Average:	***39,691***		

AM Peak	Flow	# Lane Points	% Observed
4/5/2011 7:00	3485	24	100
4/5/2011 8:00	3512	24	100
4/6/2011 7:00	3714	24	100
4/6/2011 8:00	3737	24	100
4/7/2011 7:00	3533	24	100
4/7/2011 8:00	3517	24	100
4/12/2011 7:00	3463	24	100
4/12/2011 8:00	3655	24	100
4/13/2011 7:00	3592	24	100
4/13/2011 8:00	3577	24	100
4/14/2011 7:00	3027	24	100
4/14/2011 8:00	3463	24	100
Average:	***3,582***		

PM Peak	Flow	# Lane Points	% Observed
4/5/2011 16:00	2131	24	100
4/5/2011 17:00	2143	24	100
4/6/2011 16:00	2289	24	100
4/6/2011 17:00	2090	24	100
4/7/2011 16:00	2254	24	100
4/7/2011 17:00	2164	24	100
4/12/2011 16:00	2222	24	100
4/12/2011 17:00	2169	24	100
4/13/2011 16:00	2384	24	100
4/13/2011 17:00	2142	24	100
4/14/2011 16:00	2242	24	100
4/14/2011 17:00	2094	24	100
Average:	***2,256***		

1. Data collected from PeMs on 4/18/11. Data includes volumes from Tuesdays, Wednesdays, and Thursdays .

APPENDIX D

EXISTING PEAK HOUR INTERSECTION ANALYSIS WORKSHEETS

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↱		↰	↑					↰	✥	
Volume (vph)	0	1	2	315	5	0	0	0	0	237	1	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.6		4.6	4.6					5.3	5.3	
Lane Util. Factor		1.00		1.00	1.00					0.95	0.95	
Frt		0.91		1.00	1.00					1.00	1.00	
Flt Protected		1.00		0.95	1.00					0.95	0.95	
Satd. Flow (prot)		1695		1770	1863					1681	1683	
Flt Permitted		1.00		0.95	1.00					0.95	0.95	
Satd. Flow (perm)		1695		1770	1863					1681	1683	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1	2	342	5	0	0	0	0	258	1	2
RTOR Reduction (vph)	0	2	0	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	1	0	342	5	0	0	0	0	132	128	0
Turn Type				Split						Split		
Protected Phases		4		8	8					6	6	
Permitted Phases												
Actuated Green, G (s)		0.9		18.8	18.8					8.6	8.6	
Effective Green, g (s)		0.9		18.8	18.8					8.6	8.6	
Actuated g/C Ratio		0.02		0.44	0.44					0.20	0.20	
Clearance Time (s)		4.6		4.6	4.6					5.3	5.3	
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	
Lane Grp Cap (vph)		36		777	818					338	338	
v/s Ratio Prot		c0.00		c0.19	0.00					c0.08	0.08	
v/s Ratio Perm												
v/c Ratio		0.03		0.44	0.01					0.39	0.38	
Uniform Delay, d1		20.5		8.3	6.7					14.8	14.8	
Progression Factor		1.00		1.00	1.00					1.00	1.00	
Incremental Delay, d2		0.3		0.4	0.0					0.7	0.7	
Delay (s)		20.8		8.7	6.8					15.6	15.5	
Level of Service		C		A	A					B	B	
Approach Delay (s)		20.8			8.7			0.0			15.5	
Approach LOS		C			A			A			B	

Intersection Summary			
HCM Average Control Delay	11.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	42.8	Sum of lost time (s)	14.5
Intersection Capacity Utilization	102.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑			↱	↱		✥	↱			
Volume (vph)	2	232	0	0	292	1880	4	0	112	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	14	12	12	12	12	12	12
Total Lost time (s)	4.2	4.6			4.6	4.6		5.6	5.6			
Lane Util. Factor	1.00	0.95			0.95	0.95		0.95	0.95			
Frt	1.00	1.00			0.89	0.85		0.86	0.85			
Flt Protected	0.95	1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)	1770	3539			1575	1604		1516	1504			
Flt Permitted	0.95	1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)	1770	3539			1575	1604		1516	1504			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	252	0	0	317	2043	4	0	122	0	0	0
RTOR Reduction (vph)	0	0	0	0	62	484	0	42	43	0	0	0
Lane Group Flow (vph)	2	252	0	0	1133	681	0	22	19	0	0	0
Bus Blockages (#/hr)	0	0	0	0	0	0	3	0	0	0	0	0
Turn Type	Prot					Perm	Split		Perm			
Protected Phases	7	4			8		2	2				
Permitted Phases						8			2			
Actuated Green, G (s)	1.1	65.4			60.1	60.1		33.0	33.0			
Effective Green, g (s)	1.1	65.4			60.1	60.1		33.0	33.0			
Actuated g/C Ratio	0.01	0.60			0.55	0.55		0.30	0.30			
Clearance Time (s)	4.2	4.6			4.6	4.6		5.6	5.6			
Vehicle Extension (s)	3.0	3.0			3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)	18	2131			872	888		461	457			
v/s Ratio Prot	0.00	c0.07			c0.72			c0.01				
v/s Ratio Perm						0.42			0.01			
v/c Ratio	0.11	0.12			1.30	0.77		0.05	0.04			
Uniform Delay, d1	53.3	9.3			24.2	18.8		26.7	26.6			
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00			
Incremental Delay, d2	2.7	0.0			143.3	4.0		0.2	0.2			
Delay (s)	56.0	9.3			167.6	22.8		26.9	26.8			
Level of Service	E	A			F	C		C	C			
Approach Delay (s)		9.6			96.1			26.9			0.0	
Approach LOS		A			F			C			A	

Intersection Summary			
HCM Average Control Delay	84.9	HCM Level of Service	F
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	108.6	Sum of lost time (s)	14.8
Intersection Capacity Utilization	102.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰↰	↑↱		↰	↰	↱		↰	↱
Volume (vph)	54	209	74	95	1287	3	847	10	289	0	4	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.4	5.0		4.4	5.5		4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.95		0.97	0.95		0.95	0.95	1.00		1.00	1.00
Frt	1.00	0.96		1.00	1.00		1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	0.95	1.00		1.00	1.00
Satd. Flow (prot)	1770	3401		3433	3538		1681	1687	1583		1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	0.95	1.00		1.00	1.00
Satd. Flow (perm)	1770	3401		3433	3538		1681	1687	1583		1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	59	227	80	103	1399	3	921	11	314	0	4	43
RTOR Reduction (vph)	0	34	0	0	0	0	0	0	203	0	0	39
Lane Group Flow (vph)	59	273	0	103	1402	0	470	462	111	0	4	4
Turn Type	Prot			Prot			Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases		4							2			6
Actuated Green, G (s)	7.0	20.9		19.3	32.7		26.0	26.0	26.0		8.4	8.4
Effective Green, g (s)	7.0	20.9		19.3	32.7		26.0	26.0	26.0		8.4	8.4
Actuated g/C Ratio	0.08	0.23		0.21	0.36		0.28	0.28	0.28		0.09	0.09
Clearance Time (s)	4.4	5.0		4.4	5.5		4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.4		2.0	4.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	135	773		720	1258		475	477	447		170	145
v/s Ratio Prot	0.03	c0.08		0.03	c0.40		c0.28	0.27			0.00	
v/s Ratio Perm									0.07			c0.00
v/c Ratio	0.44	0.35		0.14	1.11		0.99	0.97	0.25		0.02	0.03
Uniform Delay, d1	40.6	29.9		29.6	29.6		32.9	32.6	25.5		38.1	38.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	2.3	0.3		0.0	62.9		38.1	32.8	0.3		0.1	0.1
Delay (s)	42.9	30.2		29.6	92.6		71.0	65.4	25.8		38.1	38.2
Level of Service	D	C		C	F		E	E	C		D	D
Approach Delay (s)		32.2			88.3			57.5			38.2	
Approach LOS		C			F			E			D	

Intersection Summary			
HCM Average Control Delay	68.9	HCM Level of Service	E
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	92.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Mast Blvd & Fanita Parkway

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↱		↰	↑	↱	↰	↑	↱
Volume (vph)	48	346	73	52	1198	19	36	25	11	11	50	168
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3531		1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3531		1770	1863	1583	1770	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	52	376	79	57	1302	21	39	27	12	12	54	183
RTOR Reduction (vph)	0	0	38	0	1	0	0	0	10	0	0	156
Lane Group Flow (vph)	52	376	41	57	1322	0	39	27	2	12	54	27
Turn Type	Prot		Perm	Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)	4.2	36.9	36.9	4.3	37.0		3.2	13.1	13.1	0.5	10.4	10.4
Effective Green, g (s)	4.2	36.9	36.9	4.3	37.0		3.2	13.1	13.1	0.5	10.4	10.4
Actuated g/C Ratio	0.06	0.52	0.52	0.06	0.52		0.05	0.19	0.19	0.01	0.15	0.15
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	105	1844	825	108	1845		80	345	293	13	274	233
v/s Ratio Prot	0.03	0.11		c0.03	c0.37		c0.02	c0.01		0.01	c0.03	
v/s Ratio Perm			0.03						0.00			0.02
v/c Ratio	0.50	0.20	0.05	0.53	0.72		0.49	0.08	0.01	0.92	0.20	0.12
Uniform Delay, d1	32.3	9.1	8.3	32.3	12.9		33.0	23.9	23.5	35.1	26.5	26.2
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.6	0.1	0.0	4.6	1.4		4.6	0.1	0.0	207.3	0.4	0.2
Delay (s)	35.9	9.1	8.4	36.9	14.3		37.6	24.0	23.6	242.4	26.9	26.4
Level of Service	D	A	A	D	B		D	C	C	F	C	C
Approach Delay (s)		11.8			15.2			30.7			36.9	
Approach LOS		B			B			C			D	

Intersection Summary			
HCM Average Control Delay	17.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	70.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

	↙	↖	↑	↗	↘	↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↑↱		↰	↑↑
Volume (vph)	301	520	856	110	36	128
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frt	1.00	0.85	0.98		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1583	3479		1770	3539
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1583	3479		1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	327	565	930	120	39	139
RTOR Reduction (vph)	0	140	18	0	0	0
Lane Group Flow (vph)	327	425	1032	0	39	139
Turn Type		Perm			Prot	
Protected Phases	8		2		1	6
Permitted Phases		8				
Actuated Green, G (s)	16.2	16.2	18.8		1.3	24.1
Effective Green, g (s)	16.2	16.2	18.8		1.3	24.1
Actuated g/C Ratio	0.34	0.34	0.39		0.03	0.50
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	594	531	1354		48	1766
v/s Ratio Prot	0.18		c0.30		c0.02	0.04
v/s Ratio Perm		c0.27				
v/c Ratio	0.55	0.80	0.76		0.81	0.08
Uniform Delay, d1	13.1	14.6	12.8		23.4	6.3
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.1	8.3	2.6		64.2	0.0
Delay (s)	14.2	22.8	15.4		87.6	6.3
Level of Service	B	C	B		F	A
Approach Delay (s)	19.7		15.4			24.1
Approach LOS	B		B			C

Intersection Summary			
HCM Average Control Delay	17.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	48.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↱		↰	↑↑↑	↱	↰	↱		↰↰	↑	↱↱
Volume (vph)	278	218	10	17	388	530	5	13	7	124	8	339
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.95		1.00	0.91	1.00	1.00	1.00		0.97	1.00	0.88
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433	3516		1770	5085	1583	1770	1761		3433	1863	2787
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3433	3516		1770	5085	1583	1770	1761		3433	1863	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	302	237	11	18	422	576	5	14	8	135	9	368
RTOR Reduction (vph)	0	2	0	0	0	314	0	8	0	0	0	194
Lane Group Flow (vph)	302	246	0	18	422	262	5	14	0	135	9	174
Turn Type	Prot			Prot		pm+ov	Prot			Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2		1	6	7
Permitted Phases						8						6
Actuated Green, G (s)	10.4	23.2		1.0	13.8	22.2	0.5	1.0		8.4	8.9	19.3
Effective Green, g (s)	10.4	23.2		1.0	13.8	22.2	0.5	1.0		8.4	8.9	19.3
Actuated g/C Ratio	0.21	0.47		0.02	0.28	0.45	0.01	0.02		0.17	0.18	0.39
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	720	1645		36	1415	836	18	36		581	334	1309
v/s Ratio Prot	c0.09	0.07		0.01	0.08	c0.05	0.00	0.01		0.04	0.00	c0.03
v/s Ratio Perm						0.11						0.03
v/c Ratio	0.42	0.15		0.50	0.30	0.31	0.28	0.39		0.23	0.03	0.13
Uniform Delay, d1	17.0	7.6		24.1	14.1	8.8	24.4	24.0		17.8	16.8	9.8
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.4	0.0		10.5	0.1	0.2	8.3	7.0		0.2	0.0	0.0
Delay (s)	17.4	7.6		34.6	14.2	9.0	32.6	31.0		18.0	16.8	9.8
Level of Service	B	A		C	B	A	C	C		B	B	A
Approach Delay (s)		13.0			11.6			31.3			12.1	
Approach LOS		B			B			C			B	

Intersection Summary			
HCM Average Control Delay	12.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	49.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
7: Mission Gorge Road & SR 125

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑↱		↰↰	↑↑↑	↰↰	↱↱
Volume (vph)	511	144	672	1085	558	513
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.91		0.97	0.91	0.97	0.88
Frt	0.97		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	4917		3433	5085	3433	2787
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	4917		3433	5085	3433	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	555	157	730	1179	607	558
RTOR Reduction (vph)	43	0	0	0	0	25
Lane Group Flow (vph)	669	0	730	1179	607	533
Turn Type			Prot			pt+ov
Protected Phases	4		3	8	2	2 3
Permitted Phases						
Actuated Green, G (s)	16.8		25.1	45.9	22.1	51.2
Effective Green, g (s)	16.8		25.1	45.9	22.1	51.2
Actuated g/C Ratio	0.22		0.33	0.60	0.29	0.67
Clearance Time (s)	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1087		1134	3071	998	1878
v/s Ratio Prot	c0.14		c0.21	0.23	c0.18	0.19
v/s Ratio Perm						
v/c Ratio	0.62		0.64	0.38	0.61	0.28
Uniform Delay, d1	26.7		21.6	7.8	23.2	5.0
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0		1.3	0.1	1.1	0.1
Delay (s)	27.7		22.9	7.8	24.3	5.1
Level of Service	C		C	A	C	A
Approach Delay (s)	27.7			13.6	15.1	
Approach LOS	C			B	B	

Intersection Summary			
HCM Average Control Delay	16.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	58.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Mast Blvd & SR 52 EB Ramps

Ex PM
10/5/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↱		↰	↑					↰	✣	
Volume (vph)	0	9	11	229	15	0	0	0	0	1318	2	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.6		4.6	4.6					5.3	5.3	
Lane Util. Factor		1.00		1.00	1.00					0.95	0.95	
Frt		0.93		1.00	1.00					1.00	1.00	
Flt Protected		1.00		0.95	1.00					0.95	0.95	
Satd. Flow (prot)		1726		1770	1863					1681	1685	
Flt Permitted		1.00		0.95	1.00					0.95	0.95	
Satd. Flow (perm)		1726		1770	1863					1681	1685	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	10	12	249	16	0	0	0	0	1433	2	4
RTOR Reduction (vph)	0	12	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	10	0	249	16	0	0	0	0	716	723	0
Turn Type				Split						Split		
Protected Phases		4		8	8					6	6	
Permitted Phases												
Actuated Green, G (s)		2.2		17.2	17.2					43.5	43.5	
Effective Green, g (s)		2.2		17.2	17.2					43.5	43.5	
Actuated g/C Ratio		0.03		0.22	0.22					0.56	0.56	
Clearance Time (s)		4.6		4.6	4.6					5.3	5.3	
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	
Lane Grp Cap (vph)		49		393	414					945	947	
v/s Ratio Prot		c0.01		c0.14	0.01					0.43	c0.43	
v/s Ratio Perm												
v/c Ratio		0.21		0.63	0.04					0.76	0.76	
Uniform Delay, d1		36.8		27.2	23.6					12.9	13.0	
Progression Factor		1.00		1.00	1.00					1.00	1.00	
Incremental Delay, d2		2.1		3.3	0.0					3.5	3.7	
Delay (s)		38.9		30.6	23.7					16.4	16.7	
Level of Service		D		C	C					B	B	
Approach Delay (s)		38.9			30.2			0.0			16.6	
Approach LOS		D			C			A			B	

Intersection Summary			
HCM Average Control Delay	18.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	77.4	Sum of lost time (s)	14.5
Intersection Capacity Utilization	80.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Mast Blvd & SR 52 WB Ramps

Ex PM
10/5/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑			↱	↱		✣	↱			
Volume (vph)	1	1326	0	0	222	297	22	0	439	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	14	12	12	12	12	12	12
Total Lost time (s)	4.2	4.6			4.6	4.6		5.6	5.6			
Lane Util. Factor	1.00	0.95			0.95	0.95		0.95	0.95			
Frt	1.00	1.00			0.97	0.85		0.86	0.85			
Flt Protected	0.95	1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)	1770	3539			1718	1604		1522	1504			
Flt Permitted	0.95	1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)	1770	3539			1718	1604		1522	1504			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	1441	0	0	241	323	24	0	477	0	0	0
RTOR Reduction (vph)	0	0	0	0	6	139	0	40	40	0	0	0
Lane Group Flow (vph)	1	1441	0	0	293	126	0	213	208	0	0	0
Bus Blockages (#/hr)	0	0	0	0	0	0	3	0	0	0	0	0
Turn Type	Prot					Perm	Split		Perm			
Protected Phases	7	4			8		2	2				
Permitted Phases						8			2			
Actuated Green, G (s)	1.0	49.4			44.2	44.2		33.3	33.3			
Effective Green, g (s)	1.0	49.4			44.2	44.2		33.3	33.3			
Actuated g/C Ratio	0.01	0.53			0.48	0.48		0.36	0.36			
Clearance Time (s)	4.2	4.6			4.6	4.6		5.6	5.6			
Vehicle Extension (s)	3.0	3.0			3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)	19	1882			817	763		546	539			
v/s Ratio Prot	0.00	c0.41			0.17			c0.14				
v/s Ratio Perm						0.08			0.14			
v/c Ratio	0.05	0.77			0.36	0.17		0.39	0.39			
Uniform Delay, d1	45.5	17.2			15.4	13.9		22.2	22.2			
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00			
Incremental Delay, d2	1.2	1.9			0.3	0.1		2.1	2.1			
Delay (s)	46.6	19.1			15.7	14.0		24.3	24.3			
Level of Service	D	B			B	B		C	C			
Approach Delay (s)		19.1			14.9			24.3			0.0	
Approach LOS		B			B			C			A	

Intersection Summary			
HCM Average Control Delay	19.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	92.9	Sum of lost time (s)	10.2
Intersection Capacity Utilization	80.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Mast Blvd & Sycamore Landfill Rd

Ex PM
10/5/2011

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰↰	↑↱		↰	↰	↱		↰	↱
Volume (vph)	3	1151	611	90	322	2	180	0	152	2	2	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.4	5.0		4.4	5.5		4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.95		0.97	0.95		0.95	0.95	1.00		1.00	1.00
Frt	1.00	0.95		1.00	1.00		1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	0.95	1.00		0.98	1.00
Satd. Flow (prot)	1770	3355		3433	3536		1681	1681	1583		1817	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	0.95	1.00		0.98	1.00
Satd. Flow (perm)	1770	3355		3433	3536		1681	1681	1583		1817	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	1251	664	98	350	2	196	0	165	2	2	18
RTOR Reduction (vph)	0	44	0	0	0	0	0	0	144	0	0	17
Lane Group Flow (vph)	3	1871	0	98	352	0	98	98	21	0	4	1
Turn Type	Prot			Prot			Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases		4							2			6
Actuated Green, G (s)	1.0	47.5		8.2	54.2		11.5	11.5	11.5		6.1	6.1
Effective Green, g (s)	1.0	47.5		8.2	54.2		11.5	11.5	11.5		6.1	6.1
Actuated g/C Ratio	0.01	0.52		0.09	0.60		0.13	0.13	0.13		0.07	0.07
Clearance Time (s)	4.4	5.0		4.4	5.5		4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.4		2.0	4.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	20	1757		310	2113		213	213	201		122	106
v/s Ratio Prot	0.00	c0.56		c0.03	0.10		c0.06	0.06			c0.00	
v/s Ratio Perm									0.01			0.00
v/c Ratio	0.15	1.06		0.32	0.17		0.46	0.46	0.10		0.03	0.01
Uniform Delay, d1	44.4	21.6		38.6	8.2		36.7	36.7	35.0		39.5	39.5
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	3.5	41.1		0.2	0.1		1.6	1.6	0.2		0.1	0.0
Delay (s)	47.9	62.7		38.8	8.2		38.3	38.3	35.3		39.7	39.5
Level of Service	D	E		D	A		D	D	D		D	D
Approach Delay (s)		62.6			14.9			36.9			39.6	
Approach LOS		E			B			D			D	

Intersection Summary			
HCM Average Control Delay	51.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.7	Sum of lost time (s)	17.4
Intersection Capacity Utilization	80.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

4: Mast Blvd & Fanita Parkway

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↱		↰	↑	↱	↰	↑	↱
Volume (vph)	136	995	61	17	386	25	30	32	19	22	35	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3507		1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3507		1770	1863	1583	1770	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	148	1082	66	18	420	27	33	35	21	24	38	62
RTOR Reduction (vph)	0	0	27	0	4	0	0	0	19	0	0	58
Lane Group Flow (vph)	148	1082	39	18	443	0	33	35	2	24	38	4
Turn Type	Prot		Perm	Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)	8.6	28.8	28.8	0.8	21.0		2.0	3.7	3.7	1.9	3.6	3.6
Effective Green, g (s)	8.6	28.8	28.8	0.8	21.0		2.0	3.7	3.7	1.9	3.6	3.6
Actuated g/C Ratio	0.17	0.56	0.56	0.02	0.41		0.04	0.07	0.07	0.04	0.07	0.07
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	297	1991	890	28	1438		69	135	114	66	131	111
v/s Ratio Prot	c0.08	c0.31		0.01	0.13		c0.02	0.02		0.01	c0.02	
v/s Ratio Perm			0.02						0.00			0.00
v/c Ratio	0.50	0.54	0.04	0.64	0.31		0.48	0.26	0.01	0.36	0.29	0.04
Uniform Delay, d1	19.3	7.1	5.0	25.1	10.2		24.1	22.5	22.1	24.1	22.6	22.2
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3	0.3	0.0	40.9	0.1		5.1	1.0	0.0	3.4	1.2	0.1
Delay (s)	20.7	7.4	5.0	66.0	10.3		29.2	23.5	22.1	27.4	23.8	22.3
Level of Service	C	A	A	E	B		C	C	C	C	C	C
Approach Delay (s)		8.8			12.5			25.3			23.8	
Approach LOS		A			B			C			C	

Intersection Summary			
HCM Average Control Delay	11.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	51.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	49.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

5: Carlton Oaks Dr & West Hills Pkwy

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↑↱		↰	↑↑
Volume (vph)	84	138	284	170	279	376
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frt	1.00	0.85	0.94		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1583	3340		1770	3539
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1583	3340		1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	91	150	309	185	303	409
RTOR Reduction (vph)	0	128	126	0	0	0
Lane Group Flow (vph)	91	22	368	0	303	409
Turn Type		Perm			Prot	
Protected Phases	8		2		1	6
Permitted Phases		8				
Actuated Green, G (s)	5.7	5.7	12.4		9.1	25.5
Effective Green, g (s)	5.7	5.7	12.4		9.1	25.5
Actuated g/C Ratio	0.15	0.15	0.32		0.23	0.65
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	257	230	1057		411	2302
v/s Ratio Prot	c0.05		c0.11		c0.17	0.12
v/s Ratio Perm		0.01				
v/c Ratio	0.35	0.09	0.35		0.74	0.18
Uniform Delay, d1	15.1	14.5	10.3		13.9	2.7
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.8	0.2	0.2		6.8	0.0
Delay (s)	15.9	14.7	10.5		20.7	2.7
Level of Service	B	B	B		C	A
Approach Delay (s)	15.2		10.5			10.4
Approach LOS	B		B			B

Intersection Summary

HCM Average Control Delay	11.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	39.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	43.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↱		↰	↑↑↑	↱	↰	↱		↰↰	↑	↱↱
Volume (vph)	289	554	20	34	268	103	13	22	27	171	20	277
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.95		1.00	0.91	1.00	1.00	1.00		0.97	1.00	0.88
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.92		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433	3520		1770	5085	1583	1770	1710		3433	1863	2787
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3433	3520		1770	5085	1583	1770	1710		3433	1863	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	314	602	22	37	291	112	14	24	29	186	22	301
RTOR Reduction (vph)	0	2	0	0	0	66	0	26	0	0	0	167
Lane Group Flow (vph)	314	622	0	37	291	46	14	27	0	186	22	134
Turn Type	Prot			Prot		pm+ov	Prot			Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2		1	6	7
Permitted Phases						8						6
Actuated Green, G (s)	11.3	22.5		2.5	13.7	22.7	1.0	5.2		9.0	13.2	24.5
Effective Green, g (s)	11.3	22.5		2.5	13.7	22.7	1.0	5.2		9.0	13.2	24.5
Actuated g/C Ratio	0.20	0.41		0.05	0.25	0.41	0.02	0.09		0.16	0.24	0.44
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	703	1435		80	1262	766	32	161		560	446	1439
v/s Ratio Prot	c0.09	c0.18		0.02	0.06	0.01	0.01	c0.02		c0.05	0.01	0.02
v/s Ratio Perm						0.02						0.03
v/c Ratio	0.45	0.43		0.46	0.23	0.06	0.44	0.17		0.33	0.05	0.09
Uniform Delay, d1	19.2	11.8		25.7	16.5	9.8	26.8	23.0		20.4	16.2	8.9
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5	0.2		4.2	0.1	0.0	9.3	0.5		0.4	0.0	0.0
Delay (s)	19.7	12.0		29.9	16.6	9.8	36.1	23.5		20.8	16.2	8.9
Level of Service	B	B		C	B	A	D	C		C	B	A
Approach Delay (s)		14.5			16.0			26.1			13.6	
Approach LOS		B			B			C			B	

Intersection Summary			
HCM Average Control Delay	15.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	55.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	40.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
7: Mission Gorge Road & SR 125

Ex PM
10/5/2011

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↱		↰↰	↑↑↑	↰↰	↱↱
Volume (vph)	976	132	640	583	155	738
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.91		0.97	0.91	0.97	0.88
Frt	0.98		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	4995		3433	5085	3433	2787
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	4995		3433	5085	3433	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1061	143	696	634	168	802
RTOR Reduction (vph)	14	0	0	0	0	13
Lane Group Flow (vph)	1190	0	696	634	168	789
Turn Type			Prot			pt+ov
Protected Phases	4		3	8	2	2 3
Permitted Phases						
Actuated Green, G (s)	33.7		28.7	66.4	22.7	55.4
Effective Green, g (s)	33.7		28.7	66.4	22.7	55.4
Actuated g/C Ratio	0.35		0.30	0.68	0.23	0.57
Clearance Time (s)	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1734		1015	3477	803	1590
v/s Ratio Prot	c0.24		c0.20	0.12	0.05	c0.28
v/s Ratio Perm						
v/c Ratio	0.69		0.69	0.18	0.21	0.50
Uniform Delay, d1	27.2		30.2	5.5	30.0	12.5
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.1		1.9	0.0	0.1	0.2
Delay (s)	28.3		32.2	5.6	30.1	12.7
Level of Service	C		C	A	C	B
Approach Delay (s)	28.3			19.5	15.7	
Approach LOS	C			B	B	

Intersection Summary			
HCM Average Control Delay	21.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	97.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX E

QUAIL BRUSH CONSTRUCTION AND OPERATIONS INFORMATION

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Table 2.3-3 Construction Workforce

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
Carpenter	0	0	8	8	15	15	22	22	18	18	8	8	0	0	0	0	0	0	142
Cement Mason	0	6	12	20	20	24	26	26	26	12	12	12	6	6	2	0	0	0	210
Electricians	0	0	0	0	0	0	0	0	16	42	58	56	42	40	12	3	2	2	273
Iron Worker	0	0	0	8	14	20	22	14	14	14	14	12	12	8	2	0	0	0	154
Labor	9	15	10	24	46	56	50	44	44	34	46	46	36	18	9	0	0	0	487
Millwright	0	0	0	0	0	6	16	32	36	36	36	36	26	4	4	2	2	2	238
Operator	18	20	15	15	15	15	15	15	6	6	12	12	12	6	2	2	0	0	186
Pipe Fitter	0	0	0	0	0	6	6	12	38	42	52	52	38	8	6	2	2	2	266
Teamster	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0	0	0	30
Insulation Worker	0	0	0	0	0	0	0	0	6	6	12	12	12	12	8	2	0	0	70
Painter	0	0	0	0	0	0	0	0	0	0	0	6	6	8	8	2	2	2	34
Sheet Metal	0	0	0	0	0	0	0	0	6	10	16	10	10	0	0	2	0	0	54
Total Craft	**29**	**43**	**47**	**77**	**112**	**144**	**159**	**167**	**212**	**222**	**268**	**264**	**202**	**112**	**55**	**15**	**8**	**8**	**2144**

Notes: Table based on the construction of Plains End Facility with adjustments for Quail Brush site specifics:

2.1.1.2 Generation Plant Construction Schedule

An estimate of project construction activities by phase is shown in Table 2.3-4. Construction activities will be scheduled to occur between 7 a.m. and 7 p.m., Monday through Friday. Occasionally, additional hours may be necessary to make up schedule deficiencies or to complete critical construction activities. During some construction periods and during the startup phase of the Project, some activities will continue 24 hours per day, 7 days per week. The peak construction site workforce is expected to occur in months 11 and 12 of the construction period; however, peak heavy truck traffic, related to excavation efforts, will occur during months 1 and 2.

Table 2.3-4 Construction Schedule

Project Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Mobilize	■																	
Site Boundary Works	■																	
Demolition	■	■																
Civil Rough Grade Works	■	■																
Civil Foundation/Concrete Works		■	■	■	■													
Steel Works			■	■	■	■	■											
Gas Line Installation			■	■	■	■	■											
Building Erection				■	■	■	■	■	■									
Genset Delivery							■	■	■	■	■							
BoP Deliver							■	■	■	■	■	■						
Mechanical Installation				■	■	■	■	■	■	■	■	■	■					
Electrical Installation				■	■	■	■	■	■	■	■	■	■	■	■			
Interior Finishing and Landscaping						■	■	■	■	■	■	■	■					■
HV Interconnection Works					■	■	■	■	■	■	■	■	■					
Pre-Commissioning											■	■	■	■	■			
Training On-Site and O&M Team														■	■	■	■	■
1st Start and Commissioning														■	■	■		
Performance Testing																■	■	
Commercial Operation																	■	■
Final Grading																		■
Demobilization																		■

The Applicant retained an independent power market analysis to predict expected hours of operation over the 30-year design life of the facility. The analysis predicts the actual annual average operations of the plant will be 1,739 hours/year. Actual operation will, of course, depend upon actual SDG&E system demand and CAISO dispatch requirements. The plant work force requirements are provided in Table 2.3-6.

Table 2.3-6 Typical Plant Operation Workforce

Department	Personnel	Shift	Workdays
Operations & Maintenance	1 Plant Manager		5 days a week
	10 Plant Technicians	5 Rotating 12-hour shifts with 2 Plant Technicians per shift	7 days a week

All of the plant's capacity will be sold to SDG&E under the terms of the PPA between the Applicant and SDG&E. The exact operational profile of the plant will be dependent on SDG&E's needs and requirements.

While the capacity will be sold under the PPA and it is anticipated that the Project will be dispatched as a peaking, load-following facility for up to 3,800 hours per year, the exact mode of operation cannot be described. It is conceivable, however, that the facility could be operated in one or all of the modes described below.

2.1.1.1 Peak Operations

SDG&E will dispatch the facility, up to maximum continuous output, more often in the summer than during other seasons. Because the facility will be designed to be an intermediate/peaking plant, it is likely that the plant will primarily operate only during high ambient temperature (e.g., high load) periods. It is also quite possible that the plant will operate more in the summer to help support the local 230 kV system.

2.1.1.2 Load Following

The facility will be operated to meet PPA requirements up to the maximum available output at high load times of the day. The output of the plant will therefore be adjusted periodically either to meet SDG&E's load or, if under direct control of the CAISO by Distribution Dispatch Center (DDC) operation, to meet the CAISO's real time market needs.

2.1.1.3 Partial and Stand-by Operation

This mode of operation can be expected to occur during late evening and early morning hours and on weekends when SDG&E only requires a portion of the plant's maximum output; on those occasions only a few of the engines may be in operation. If the engines not in operation are not undergoing maintenance, they will in most cases be available to SDG&E for non-spinning (capacity) reserve.

2.1.1.4 Non-operational Periods

This mode will occur if forced by equipment malfunction, fuel supply interruption, transmission line disconnect, or scheduled maintenance. Because the Project will be an intermediate load/peaking unit, full shutdown would be expected for a majority of the off-peak hours of the year and in the winter, although non-spinning reserve capability would still be available for engines that are off-line, but not in maintenance.

2.1.1.5 Long-Term Closure

In the unlikely event of a situation that causes a long-term cessation of operations, security of the facility will be maintained on a 24-hour basis, and the CEC will be notified. Depending on the length of shutdown, a contingency plan for the temporary cessation of operations may be implemented. Such a contingency plan will be in conformance with all applicable LORS and protection of public health, safety, and the environment. The plan, depending on the expected duration of the shutdown, could include the draining of all chemicals from

APPENDIX F

EXISTING + CONSTRUCTION PEAK HOUR INTERSECTION ANALYSIS WORKSHEETS

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↱		↰	↑					↰	✥	
Volume (vph)	0	1	2	317	5	0	0	0	0	326	1	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.6		4.6	4.6					5.3	5.3	
Lane Util. Factor		1.00		1.00	1.00					0.95	0.95	
Frt		0.91		1.00	1.00					1.00	1.00	
Flt Protected		1.00		0.95	1.00					0.95	0.95	
Satd. Flow (prot)		1695		1770	1863					1681	1684	
Flt Permitted		1.00		0.95	1.00					0.95	0.95	
Satd. Flow (perm)		1695		1770	1863					1681	1684	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1	2	345	5	0	0	0	0	354	1	2
RTOR Reduction (vph)	0	2	0	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	1	0	345	5	0	0	0	0	177	179	0
Turn Type				Split						Split		
Protected Phases		4		8	8					6	6	
Permitted Phases												
Actuated Green, G (s)		0.9		19.4	19.4					9.9	9.9	
Effective Green, g (s)		0.9		19.4	19.4					9.9	9.9	
Actuated g/C Ratio		0.02		0.43	0.43					0.22	0.22	
Clearance Time (s)		4.6		4.6	4.6					5.3	5.3	
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	
Lane Grp Cap (vph)		34		768	809					372	373	
v/s Ratio Prot		c0.00		c0.19	0.00					0.11	c0.11	
v/s Ratio Perm												
v/c Ratio		0.03		0.45	0.01					0.48	0.48	
Uniform Delay, d1		21.5		8.9	7.2					15.1	15.2	
Progression Factor		1.00		1.00	1.00					1.00	1.00	
Incremental Delay, d2		0.4		0.4	0.0					1.0	1.0	
Delay (s)		21.8		9.3	7.2					16.1	16.1	
Level of Service		C		A	A					B	B	
Approach Delay (s)		21.8			9.3			0.0			16.1	
Approach LOS		C			A			A			B	

Intersection Summary			
HCM Average Control Delay	12.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	44.7	Sum of lost time (s)	14.5
Intersection Capacity Utilization	103.0%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

2: Mast Blvd & SR 52 WB Ramps

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑			↱	↱		✥	↱			
Volume (vph)	2	321	0	0	294	1902	4	0	122	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	14	12	12	12	12	12	12
Total Lost time (s)	4.2	4.6			4.6	4.6		5.6	5.6			
Lane Util. Factor	1.00	0.95			0.95	0.95		0.95	0.95			
Frt	1.00	1.00			0.89	0.85		0.86	0.85			
Flt Protected	0.95	1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)	1770	3539			1574	1604		1515	1504			
Flt Permitted	0.95	1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)	1770	3539			1574	1604		1515	1504			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	349	0	0	320	2067	4	0	133	0	0	0
RTOR Reduction (vph)	0	0	0	0	62	484	0	45	47	0	0	0
Lane Group Flow (vph)	2	349	0	0	1147	694	0	24	21	0	0	0
Bus Blockages (#/hr)	0	0	0	0	0	0	3	0	0	0	0	0
Turn Type	Prot					Perm	Split		Perm			
Protected Phases	7	4			8		2	2				
Permitted Phases						8			2			
Actuated Green, G (s)	1.1	65.4			60.1	60.1		33.0	33.0			
Effective Green, g (s)	1.1	65.4			60.1	60.1		33.0	33.0			
Actuated g/C Ratio	0.01	0.60			0.55	0.55		0.30	0.30			
Clearance Time (s)	4.2	4.6			4.6	4.6		5.6	5.6			
Vehicle Extension (s)	3.0	3.0			3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)	18	2131			871	888		460	457			
v/s Ratio Prot	0.00	c0.10			c0.73			c0.02				
v/s Ratio Perm						0.43			0.01			
v/c Ratio	0.11	0.16			1.32	0.78		0.05	0.05			
Uniform Delay, d1	53.3	9.5			24.2	19.1		26.7	26.7			
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00			
Incremental Delay, d2	2.7	0.0			150.9	4.5		0.2	0.2			
Delay (s)	56.0	9.6			175.2	23.6		26.9	26.9			
Level of Service	E	A			F	C		C	C			
Approach Delay (s)		9.8			100.4			26.9			0.0	
Approach LOS		A			F			C			A	

Intersection Summary			
HCM Average Control Delay	85.8	HCM Level of Service	F
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	108.6	Sum of lost time (s)	14.8
Intersection Capacity Utilization	103.0%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Mast Blvd & Sycamore Landfill Rd

Existing+Construction AM
10/17/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰↰	↑↱		↰	↰	↱		↰	↱
Volume (vph)	76	209	150	107	1287	4	866	14	292	0	6	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.4	5.0		4.4	5.5		4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.95		0.97	0.95		0.95	0.95	1.00		1.00	1.00
Frt	1.00	0.94		1.00	1.00		1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	0.95	1.00		1.00	1.00
Satd. Flow (prot)	1770	3317		3433	3538		1681	1688	1583		1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	0.95	1.00		1.00	1.00
Satd. Flow (perm)	1770	3317		3433	3538		1681	1688	1583		1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	83	227	163	116	1399	4	941	15	317	0	7	50
RTOR Reduction (vph)	0	115	0	0	0	0	0	0	185	0	0	45
Lane Group Flow (vph)	83	275	0	116	1403	0	480	476	132	0	7	5
Turn Type	Prot			Prot			Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases		4							2			6
Actuated Green, G (s)	8.6	23.1		23.6	37.6		31.9	31.9	31.9		10.8	10.8
Effective Green, g (s)	8.6	23.1		23.6	37.6		31.9	31.9	31.9		10.8	10.8
Actuated g/C Ratio	0.08	0.22		0.22	0.35		0.30	0.30	0.30		0.10	0.10
Clearance Time (s)	4.4	5.0		4.4	5.5		4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.4		2.0	4.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	143	717		759	1246		502	504	473		188	160
v/s Ratio Prot	c0.05	0.08		0.03	c0.40		c0.29	0.28			c0.00	
v/s Ratio Perm									0.08			0.00
v/c Ratio	0.58	0.38		0.15	1.13		0.96	0.94	0.28		0.04	0.03
Uniform Delay, d1	47.4	35.8		33.5	34.6		36.8	36.6	28.6		43.3	43.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	5.9	0.4		0.0	67.5		29.1	26.6	0.3		0.1	0.1
Delay (s)	53.2	36.2		33.6	102.1		65.8	63.2	29.0		43.4	43.4
Level of Service	D	D		C	F		E	E	C		D	D
Approach Delay (s)		39.2			96.9			55.7			43.4	
Approach LOS		D			F			E			D	

Intersection Summary			
HCM Average Control Delay	72.0	HCM Level of Service	E
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	106.8	Sum of lost time (s)	17.9
Intersection Capacity Utilization	84.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

4: Mast Blvd & Fanita Parkway

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↱		↰	↑	↱	↰	↑	↱
Volume (vph)	48	349	73	52	1210	19	36	25	11	11	50	169
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3531		1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3531		1770	1863	1583	1770	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	52	379	79	57	1315	21	39	27	12	12	54	184
RTOR Reduction (vph)	0	0	38	0	1	0	0	0	10	0	0	157
Lane Group Flow (vph)	52	379	41	57	1335	0	39	27	2	12	54	27
Turn Type	Prot		Perm	Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)	4.2	37.3	37.3	4.3	37.4		3.2	13.1	13.1	0.5	10.4	10.4
Effective Green, g (s)	4.2	37.3	37.3	4.3	37.4		3.2	13.1	13.1	0.5	10.4	10.4
Actuated g/C Ratio	0.06	0.52	0.52	0.06	0.53		0.04	0.18	0.18	0.01	0.15	0.15
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	104	1854	829	107	1855		80	343	291	12	272	231
v/s Ratio Prot	0.03	0.11		c0.03	c0.38		c0.02	c0.01		0.01	c0.03	
v/s Ratio Perm			0.03						0.00			0.02
v/c Ratio	0.50	0.20	0.05	0.53	0.72		0.49	0.08	0.01	1.00	0.20	0.12
Uniform Delay, d1	32.5	9.0	8.3	32.5	12.9		33.2	24.1	23.7	35.4	26.7	26.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.7	0.1	0.0	5.0	1.4		4.6	0.1	0.0	259.8	0.4	0.2
Delay (s)	36.2	9.1	8.3	37.5	14.3		37.8	24.2	23.7	295.2	27.1	26.6
Level of Service	D	A	A	D	B		D	C	C	F	C	C
Approach Delay (s)		11.7			15.2			30.9			39.6	
Approach LOS		B			B			C			D	

Intersection Summary			
HCM Average Control Delay	17.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	71.2	Sum of lost time (s)	16.0
Intersection Capacity Utilization	57.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

	↙	↖	↑	↗	↘	↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↑↱		↰	↑↑
Volume (vph)	301	520	882	110	36	218
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frt	1.00	0.85	0.98		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1583	3480		1770	3539
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1583	3480		1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	327	565	959	120	39	237
RTOR Reduction (vph)	0	139	17	0	0	0
Lane Group Flow (vph)	327	426	1062	0	39	237
Turn Type		Perm			Prot	
Protected Phases	8		2		1	6
Permitted Phases		8				
Actuated Green, G (s)	16.2	16.2	19.0		1.3	24.3
Effective Green, g (s)	16.2	16.2	19.0		1.3	24.3
Actuated g/C Ratio	0.33	0.33	0.39		0.03	0.50
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	591	529	1363		47	1773
v/s Ratio Prot	0.18		c0.31		c0.02	0.07
v/s Ratio Perm		c0.27				
v/c Ratio	0.55	0.81	0.78		0.83	0.13
Uniform Delay, d1	13.2	14.7	12.9		23.5	6.5
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.1	8.7	2.9		69.6	0.0
Delay (s)	14.3	23.5	15.8		93.1	6.5
Level of Service	B	C	B		F	A
Approach Delay (s)	20.1		15.8			18.7
Approach LOS	C		B			B

Intersection Summary			
HCM Average Control Delay	17.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	48.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

6: Mission Gorge Road & West Hills Pkwy

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↱		↰	↑↑↑	↱	↰	↱		↰↰	↑	↱↱
Volume (vph)	280	230	10	17	391	554	5	13	7	214	8	339
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.95		1.00	0.91	1.00	1.00	1.00		0.97	1.00	0.88
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433	3517		1770	5085	1583	1770	1761		3433	1863	2787
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3433	3517		1770	5085	1583	1770	1761		3433	1863	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	304	250	11	18	425	602	5	14	8	233	9	368
RTOR Reduction (vph)	0	2	0	0	0	301	0	8	0	0	0	185
Lane Group Flow (vph)	304	259	0	18	425	301	5	14	0	233	9	183
Turn Type	Prot			Prot		pm+ov	Prot			Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2		1	6	7
Permitted Phases						8						6
Actuated Green, G (s)	10.7	23.9		0.9	14.1	24.5	0.5	1.0		10.4	10.9	21.6
Effective Green, g (s)	10.7	23.9		0.9	14.1	24.5	0.5	1.0		10.4	10.9	21.6
Actuated g/C Ratio	0.20	0.46		0.02	0.27	0.47	0.01	0.02		0.20	0.21	0.41
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	704	1610		31	1374	864	17	34		684	389	1367
v/s Ratio Prot	c0.09	0.07		0.01	0.08	c0.07	0.00	0.01		0.07	0.00	c0.03
v/s Ratio Perm						0.12						0.04
v/c Ratio	0.43	0.16		0.58	0.31	0.35	0.29	0.42		0.34	0.02	0.13
Uniform Delay, d1	18.1	8.3		25.5	15.2	8.8	25.7	25.3		18.0	16.4	9.5
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.4	0.0		24.7	0.1	0.2	9.4	8.1		0.3	0.0	0.0
Delay (s)	18.5	8.3		50.2	15.3	9.0	35.1	33.4		18.3	16.4	9.5
Level of Service	B	A		D	B	A	D	C		B	B	A
Approach Delay (s)		13.8			12.3			33.7			13.0	
Approach LOS		B			B			C			B	

Intersection Summary			
HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	52.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↱		↰↰	↑↑↑	↰↰	↱↱
Volume (vph)	513	146	672	1091	567	513
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.91		0.97	0.91	0.97	0.88
Frt	0.97		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	4916		3433	5085	3433	2787
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	4916		3433	5085	3433	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	558	159	730	1186	616	558
RTOR Reduction (vph)	43	0	0	0	0	26
Lane Group Flow (vph)	674	0	730	1186	616	532
Turn Type			Prot			pt+ov
Protected Phases	4		3	8	2	2 3
Permitted Phases						
Actuated Green, G (s)	19.0		25.8	48.8	22.9	52.7
Effective Green, g (s)	19.0		25.8	48.8	22.9	52.7
Actuated g/C Ratio	0.24		0.32	0.61	0.29	0.66
Clearance Time (s)	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1172		1111	3114	986	1843
v/s Ratio Prot	c0.14		c0.21	0.23	c0.18	0.19
v/s Ratio Perm						
v/c Ratio	0.58		0.66	0.38	0.62	0.29
Uniform Delay, d1	26.8		23.1	7.8	24.7	5.7
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7		1.4	0.1	1.2	0.1
Delay (s)	27.5		24.6	7.9	25.9	5.7
Level of Service	C		C	A	C	A
Approach Delay (s)	27.5			14.2	16.3	
Approach LOS	C			B	B	

Intersection Summary			
HCM Average Control Delay	17.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	79.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	58.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↱		↰	↑					↰	✥	
Volume (vph)	0	9	11	238	15	0	0	0	0	1352	2	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.6		4.6	4.6					5.3	5.3	
Lane Util. Factor		1.00		1.00	1.00					0.95	0.95	
Frt		0.93		1.00	1.00					1.00	1.00	
Flt Protected		1.00		0.95	1.00					0.95	0.95	
Satd. Flow (prot)		1726		1770	1863					1681	1685	
Flt Permitted		1.00		0.95	1.00					0.95	0.95	
Satd. Flow (perm)		1726		1770	1863					1681	1685	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	10	12	259	16	0	0	0	0	1470	2	4
RTOR Reduction (vph)	0	12	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	10	0	259	16	0	0	0	0	735	741	0
Turn Type				Split						Split		
Protected Phases		4		8	8					6	6	
Permitted Phases												
Actuated Green, G (s)		2.2		17.9	17.9					45.0	45.0	
Effective Green, g (s)		2.2		17.9	17.9					45.0	45.0	
Actuated g/C Ratio		0.03		0.22	0.22					0.57	0.57	
Clearance Time (s)		4.6		4.6	4.6					5.3	5.3	
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	
Lane Grp Cap (vph)		48		398	419					950	953	
v/s Ratio Prot		c0.01		c0.15	0.01					0.44	c0.44	
v/s Ratio Perm												
v/c Ratio		0.22		0.65	0.04					0.77	0.78	
Uniform Delay, d1		37.9		28.0	24.1					13.4	13.4	
Progression Factor		1.00		1.00	1.00					1.00	1.00	
Incremental Delay, d2		2.2		3.8	0.0					4.0	4.0	
Delay (s)		40.1		31.8	24.2					17.3	17.5	
Level of Service		D		C	C					B	B	
Approach Delay (s)		40.1			31.4			0.0			17.4	
Approach LOS		D			C			A			B	

Intersection Summary			
HCM Average Control Delay	19.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	79.6	Sum of lost time (s)	14.5
Intersection Capacity Utilization	84.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑			↱	↱		✥	↱			
Volume (vph)	1	1360	0	0	231	375	22	0	442	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	14	12	12	12	12	12	12
Total Lost time (s)	4.2	4.6			4.6	4.6		5.6	5.6			
Lane Util. Factor	1.00	0.95			0.95	0.95		0.95	0.95			
Frt	1.00	1.00			0.96	0.85		0.86	0.85			
Flt Protected	0.95	1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)	1770	3539			1695	1604		1522	1504			
Flt Permitted	0.95	1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)	1770	3539			1695	1604		1522	1504			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	1478	0	0	251	408	24	0	480	0	0	0
RTOR Reduction (vph)	0	0	0	0	10	159	0	38	38	0	0	0
Lane Group Flow (vph)	1	1478	0	0	339	151	0	216	212	0	0	0
Bus Blockages (#/hr)	0	0	0	0	0	0	3	0	0	0	0	0
Turn Type	Prot					Perm	Split		Perm			
Protected Phases	7	4			8		2	2				
Permitted Phases						8			2			
Actuated Green, G (s)	1.0	51.4			46.2	46.2		33.4	33.4			
Effective Green, g (s)	1.0	51.4			46.2	46.2		33.4	33.4			
Actuated g/C Ratio	0.01	0.54			0.49	0.49		0.35	0.35			
Clearance Time (s)	4.2	4.6			4.6	4.6		5.6	5.6			
Vehicle Extension (s)	3.0	3.0			3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)	19	1915			824	780		535	529			
v/s Ratio Prot	0.00	c0.42			0.20			c0.14				
v/s Ratio Perm						0.09			0.14			
v/c Ratio	0.05	0.77			0.41	0.19		0.40	0.40			
Uniform Delay, d1	46.5	17.2			15.7	13.8		23.3	23.3			
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00			
Incremental Delay, d2	1.2	2.0			0.3	0.1		2.3	2.3			
Delay (s)	47.7	19.2			16.0	14.0		25.5	25.5			
Level of Service	D	B			B	B		C	C			
Approach Delay (s)		19.2			15.0			25.5			0.0	
Approach LOS		B			B			C			A	

Intersection Summary			
HCM Average Control Delay	19.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	84.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰↰	↑↱		↰	↰↑	↱		↰↑	↱
Volume (vph)	12	1151	639	94	322	2	247	2	162	3	5	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.4	5.0		4.4	5.5		4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.95		0.97	0.95		0.95	0.95	1.00		1.00	1.00
Frt	1.00	0.95		1.00	1.00		1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	0.95	1.00		0.98	1.00
Satd. Flow (prot)	1770	3350		3433	3536		1681	1687	1583		1828	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	0.95	1.00		0.98	1.00
Satd. Flow (perm)	1770	3350		3433	3536		1681	1687	1583		1828	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	1251	695	102	350	2	268	2	176	3	5	40
RTOR Reduction (vph)	0	45	0	0	0	0	0	0	153	0	0	37
Lane Group Flow (vph)	13	1901	0	102	352	0	134	136	23	0	8	3
Turn Type	Prot			Prot			Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases		4							2			6
Actuated Green, G (s)	1.3	58.7		10.8	67.7		14.1	14.1	14.1		8.5	8.5
Effective Green, g (s)	1.3	58.7		10.8	67.7		14.1	14.1	14.1		8.5	8.5
Actuated g/C Ratio	0.01	0.54		0.10	0.62		0.13	0.13	0.13		0.08	0.08
Clearance Time (s)	4.4	5.0		4.4	5.5		4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.4		2.0	4.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	21	1796		339	2186		216	217	204		142	123
v/s Ratio Prot	0.01	c0.57		c0.03	0.10		0.08	c0.08			c0.00	
v/s Ratio Perm									0.01			0.00
v/c Ratio	0.62	1.06		0.30	0.16		0.62	0.63	0.11		0.06	0.03
Uniform Delay, d1	53.9	25.4		45.8	8.9		45.2	45.2	42.2		46.8	46.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	43.9	38.7		0.2	0.0		5.4	5.6	0.2		0.2	0.1
Delay (s)	97.8	64.1		46.0	8.9		50.6	50.8	42.4		47.0	46.8
Level of Service	F	E		D	A		D	D	D		D	D
Approach Delay (s)		64.3			17.2			47.4			46.8	
Approach LOS		E			B			D			D	

Intersection Summary			
HCM Average Control Delay	54.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	109.5	Sum of lost time (s)	17.4
Intersection Capacity Utilization	81.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↱		↰	↑	↱	↰	↑	↱
Volume (vph)	137	1005	61	17	390	25	30	32	19	22	35	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3507		1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3507		1770	1863	1583	1770	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	149	1092	66	18	424	27	33	35	21	24	38	62
RTOR Reduction (vph)	0	0	26	0	5	0	0	0	19	0	0	56
Lane Group Flow (vph)	149	1092	40	18	446	0	33	35	2	24	38	6
Turn Type	Prot		Perm	Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)	11.7	30.8	30.8	0.9	20.0		2.0	6.5	6.5	1.1	5.6	5.6
Effective Green, g (s)	11.7	30.8	30.8	0.9	20.0		2.0	6.5	6.5	1.1	5.6	5.6
Actuated g/C Ratio	0.21	0.56	0.56	0.02	0.36		0.04	0.12	0.12	0.02	0.10	0.10
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	374	1971	882	29	1268		64	219	186	35	189	160
v/s Ratio Prot	c0.08	c0.31		0.01	0.13		c0.02	0.02		0.01	c0.02	
v/s Ratio Perm			0.03						0.00			0.00
v/c Ratio	0.40	0.55	0.05	0.62	0.35		0.52	0.16	0.01	0.69	0.20	0.04
Uniform Delay, d1	18.8	7.8	5.6	27.0	12.9		26.2	21.9	21.6	26.9	22.8	22.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	0.3	0.0	34.8	0.2		6.9	0.3	0.0	43.6	0.5	0.1
Delay (s)	19.5	8.2	5.6	61.8	13.1		33.0	22.3	21.6	70.5	23.3	22.5
Level of Service	B	A	A	E	B		C	C	C	E	C	C
Approach Delay (s)		9.3			14.9			26.1			32.1	
Approach LOS		A			B			C			C	

Intersection Summary			
HCM Average Control Delay	12.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	55.3	Sum of lost time (s)	16.0
Intersection Capacity Utilization	49.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

5: Carlton Oaks Dr & West Hills Pkwy

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↑↱		↰	↑↑
Volume (vph)	84	138	363	170	279	412
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frt	1.00	0.85	0.95		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1583	3370		1770	3539
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1583	3370		1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	91	150	395	185	303	448
RTOR Reduction (vph)	0	128	96	0	0	0
Lane Group Flow (vph)	91	22	484	0	303	448
Turn Type		Perm			Prot	
Protected Phases	8		2		1	6
Permitted Phases		8				
Actuated Green, G (s)	6.2	6.2	13.7		10.7	28.4
Effective Green, g (s)	6.2	6.2	13.7		10.7	28.4
Actuated g/C Ratio	0.15	0.15	0.32		0.25	0.67
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	258	230	1084		445	2359
v/s Ratio Prot	c0.05		c0.14		c0.17	0.13
v/s Ratio Perm		0.01				
v/c Ratio	0.35	0.09	0.45		0.68	0.19
Uniform Delay, d1	16.4	15.8	11.4		14.4	2.7
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.8	0.2	0.3		4.3	0.0
Delay (s)	17.2	15.9	11.7		18.7	2.7
Level of Service	B	B	B		B	A
Approach Delay (s)	16.4		11.7			9.2
Approach LOS	B		B			A

Intersection Summary			
HCM Average Control Delay	11.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	42.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	45.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

6: Mission Gorge Road & West Hills Pkwy

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↱		↰	↑↑↑	↱	↰	↱		↰↰	↑	↱↱
Volume (vph)	289	558	20	34	278	182	13	22	27	206	20	278
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.95		1.00	0.91	1.00	1.00	1.00		0.97	1.00	0.88
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.92		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433	3521		1770	5085	1583	1770	1710		3433	1863	2787
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3433	3521		1770	5085	1583	1770	1710		3433	1863	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	314	607	22	37	302	198	14	24	29	224	22	302
RTOR Reduction (vph)	0	2	0	0	0	116	0	26	0	0	0	162
Lane Group Flow (vph)	314	627	0	37	302	82	14	27	0	224	22	140
Turn Type	Prot			Prot		pm+ov	Prot			Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2		1	6	7
Permitted Phases						8						6
Actuated Green, G (s)	11.3	22.2		2.2	13.1	22.9	0.6	5.1		9.8	14.3	25.6
Effective Green, g (s)	11.3	22.2		2.2	13.1	22.9	0.6	5.1		9.8	14.3	25.6
Actuated g/C Ratio	0.20	0.40		0.04	0.24	0.41	0.01	0.09		0.18	0.26	0.46
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	701	1413		70	1205	770	19	158		608	482	1492
v/s Ratio Prot	c0.09	c0.18		0.02	0.06	0.02	0.01	c0.02		c0.07	0.01	0.02
v/s Ratio Perm						0.03						0.03
v/c Ratio	0.45	0.44		0.53	0.25	0.11	0.74	0.17		0.37	0.05	0.09
Uniform Delay, d1	19.3	12.1		26.0	17.1	9.9	27.3	23.1		20.0	15.4	8.3
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5	0.2		7.0	0.1	0.1	88.4	0.5		0.4	0.0	0.0
Delay (s)	19.7	12.3		33.1	17.2	10.0	115.7	23.7		20.4	15.4	8.4
Level of Service	B	B		C	B	A	F	C		C	B	A
Approach Delay (s)		14.8			15.7			42.9			13.6	
Approach LOS		B			B			D			B	

Intersection Summary			
HCM Average Control Delay	15.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	55.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	41.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↱		↰↰	↑↑↑	↰↰	↱↱
Volume (vph)	982	140	640	585	158	738
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.91		0.97	0.91	0.97	0.88
Frt	0.98		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	4990		3433	5085	3433	2787
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	4990		3433	5085	3433	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1067	152	696	636	172	802
RTOR Reduction (vph)	16	0	0	0	0	16
Lane Group Flow (vph)	1203	0	696	636	172	786
Turn Type			Prot			pt+ov
Protected Phases	4		3	8	2	2 3
Permitted Phases						
Actuated Green, G (s)	32.5		25.6	62.1	23.9	53.5
Effective Green, g (s)	32.5		25.6	62.1	23.9	53.5
Actuated g/C Ratio	0.35		0.27	0.66	0.25	0.57
Clearance Time (s)	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1725		935	3359	873	1586
v/s Ratio Prot	c0.24		c0.20	0.13	0.05	c0.28
v/s Ratio Perm						
v/c Ratio	0.70		0.74	0.19	0.20	0.50
Uniform Delay, d1	26.5		31.2	6.2	27.5	12.2
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2		3.2	0.0	0.1	0.2
Delay (s)	27.8		34.5	6.2	27.6	12.4
Level of Service	C		C	A	C	B
Approach Delay (s)	27.8			21.0	15.1	
Approach LOS	C			C	B	

Intersection Summary			
HCM Average Control Delay	21.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	54.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX G

POST MITIGATION PEAK HOUR INTERSECTION ANALYSIS WORKSHEETS

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3: Mast Blvd & Sycamore Landfill Rd

10/14/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰↰	↑↱		↰	↰↑	↱		↰↑	↱
Volume (vph)	57	209	74	95	1287	3	847	12	289	0	6	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.4	5.0		4.4	5.5		4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.95		0.97	0.95		0.95	0.95	1.00		1.00	1.00
Frt	1.00	0.96		1.00	1.00		1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	0.95	1.00		1.00	1.00
Satd. Flow (prot)	1770	3401		3433	3538		1681	1688	1583		1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	0.95	1.00		1.00	1.00
Satd. Flow (perm)	1770	3401		3433	3538		1681	1688	1583		1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	62	227	80	103	1399	3	921	13	314	0	7	45
RTOR Reduction (vph)	0	34	0	0	0	0	0	0	202	0	0	41
Lane Group Flow (vph)	62	273	0	103	1402	0	470	464	112	0	7	4
Turn Type	Prot			Prot			Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases		4							2			6
Actuated Green, G (s)	7.1	20.9		19.4	32.7		26.0	26.0	26.0		8.4	8.4
Effective Green, g (s)	7.1	20.9		19.4	32.7		26.0	26.0	26.0		8.4	8.4
Actuated g/C Ratio	0.08	0.23		0.21	0.36		0.28	0.28	0.28		0.09	0.09
Clearance Time (s)	4.4	5.0		4.4	5.5		4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.4		2.0	4.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	136	772		723	1256		475	477	447		170	144
v/s Ratio Prot	c0.04	0.08		0.03	c0.40		c0.28	0.27			c0.00	
v/s Ratio Perm									0.07			0.00
v/c Ratio	0.46	0.35		0.14	1.12		0.99	0.97	0.25		0.04	0.03
Uniform Delay, d1	40.7	29.9		29.6	29.7		32.9	32.7	25.5		38.2	38.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	2.4	0.3		0.0	63.6		38.1	34.0	0.3		0.1	0.1
Delay (s)	43.1	30.2		29.6	93.3		71.0	66.7	25.8		38.3	38.2
Level of Service	D	C		C	F		E	E	C		D	D
Approach Delay (s)		32.4			89.0			58.0			38.2	
Approach LOS		C			F			E			D	

Intersection Summary			
HCM Average Control Delay	69.4	HCM Level of Service	E
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	92.1	Sum of lost time (s)	17.9
Intersection Capacity Utilization	83.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

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ATTACHMENT 2

FAA RESPONSES

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Case 1

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Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8412-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Pole 1
Location:	San Diego, CA
Latitude:	32-51-06.95N NAD 83
Longitude:	117-01-41.52W
Heights:	508 feet site elevation (SE) 90 feet above ground level (AGL) 598 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/05/2013 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8412-OE.

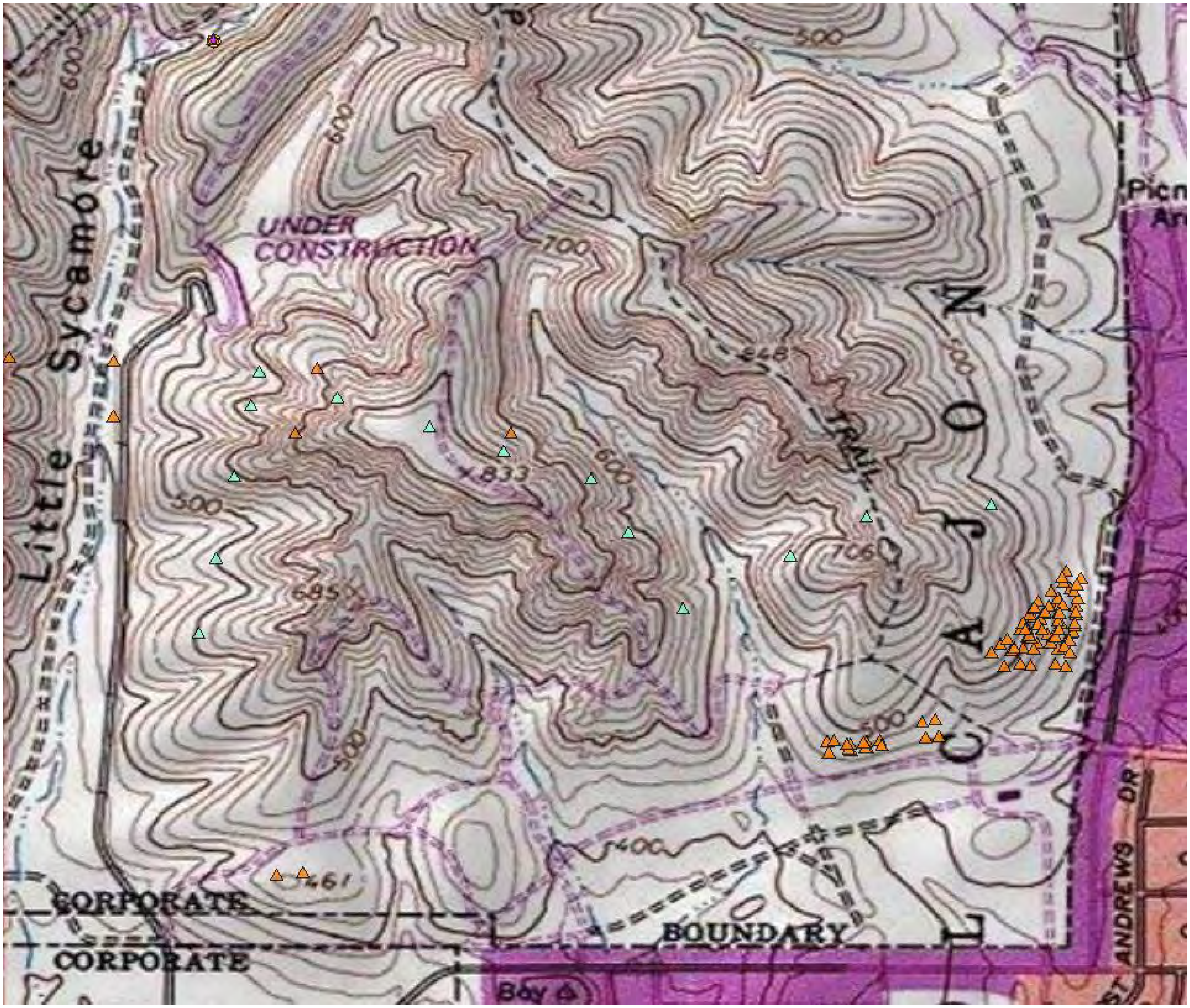
Signature Control No: 155420764-156196002 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

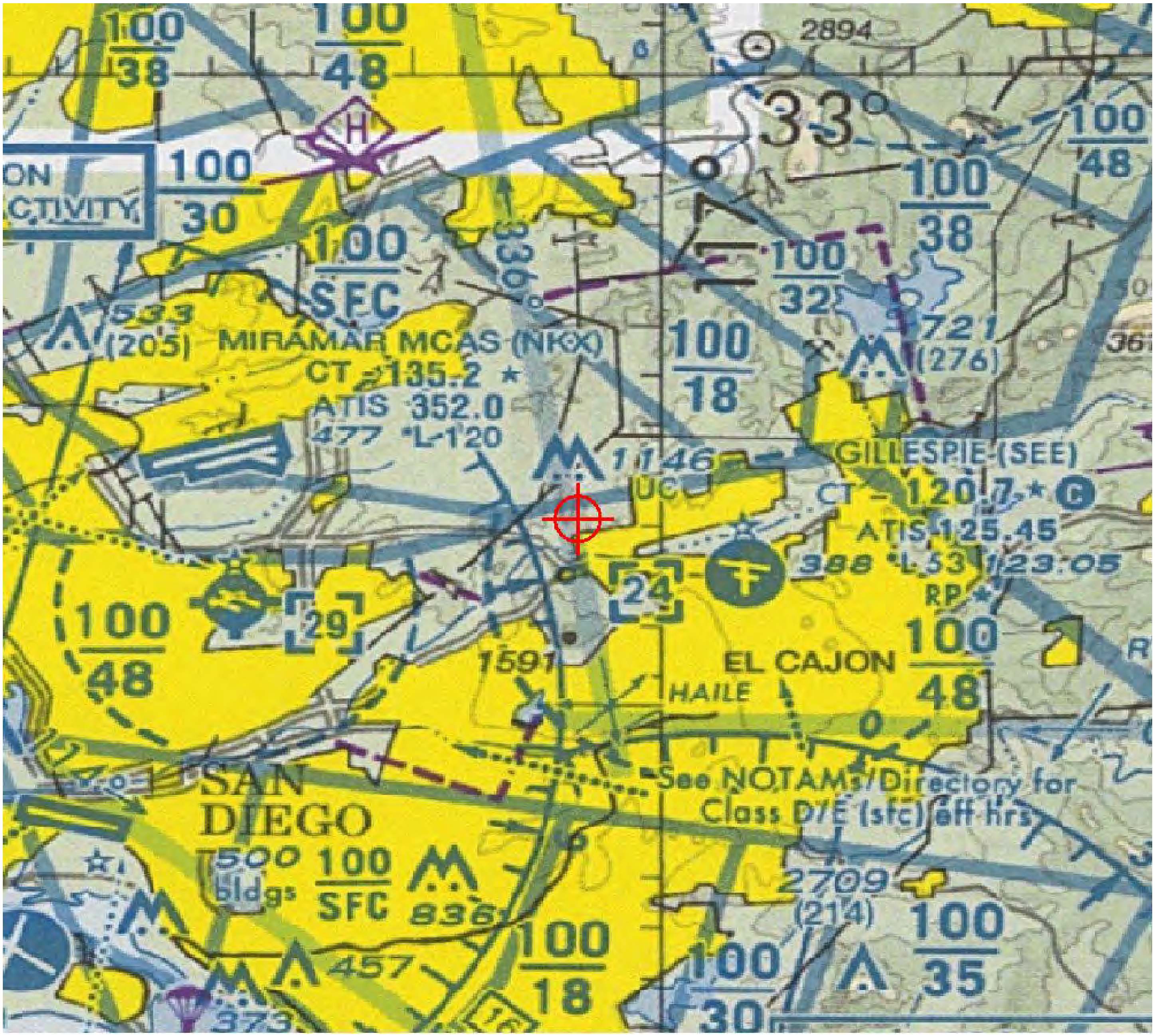
Case Description for ASN 2011-AWP-8412-OE

Transmission lines for Quail Brush generation site

Verified Map for ASN 2011-AWP-8412-OE



Sectional Map for ASN 2011-AWP-8412-OE



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Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8413-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Pole 2
Location:	San Diego, CA
Latitude:	32-51-12.13N NAD 83
Longitude:	117-01-40.30W
Heights:	498 feet site elevation (SE) 90 feet above ground level (AGL) 588 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/05/2013 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

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This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8413-OE.

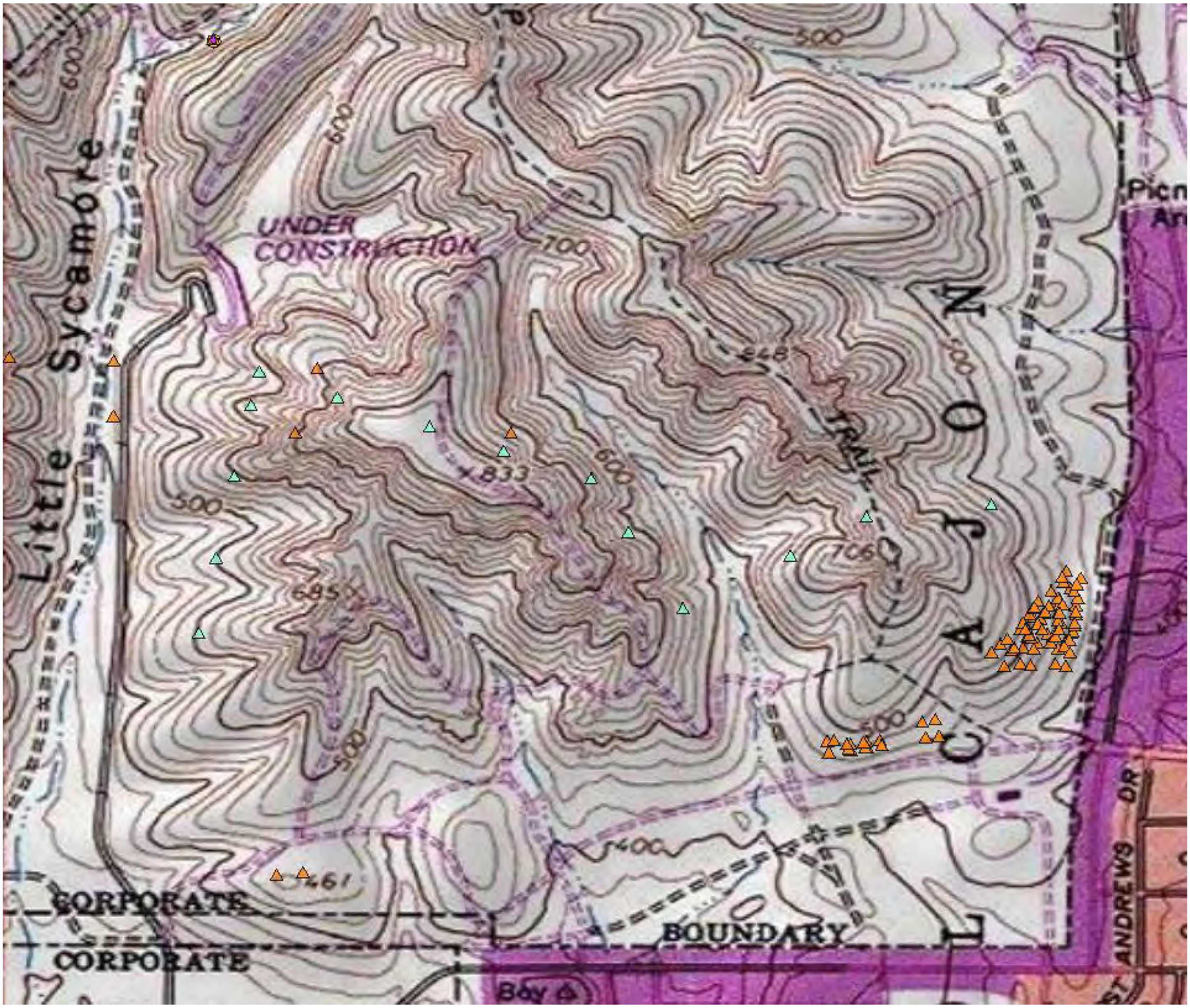
Signature Control No: 155420766-156195999 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

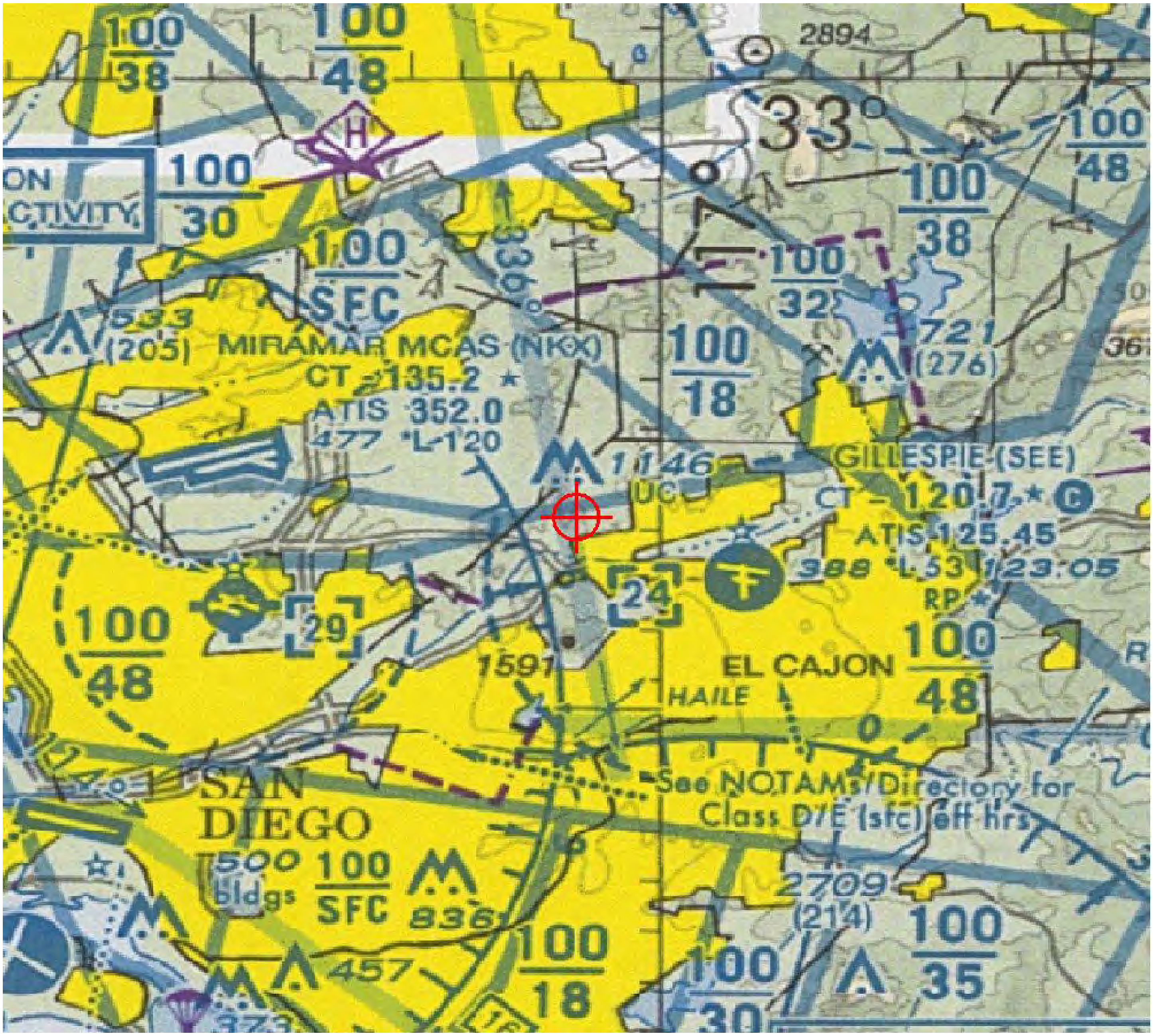
Case Description for ASN 2011-AWP-8413-OE

Transmission lines for Quail Brush generation site

Verified Map for ASN 2011-AWP-8413-OE



Sectional Map for ASN 2011-AWP-8413-OE



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Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8414-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Pole 3
Location:	San Diego, CA
Latitude:	32-51-17.82N NAD 83
Longitude:	117-01-39.04W
Heights:	597 feet site elevation (SE) 90 feet above ground level (AGL) 687 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/05/2013 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

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Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8414-OE.

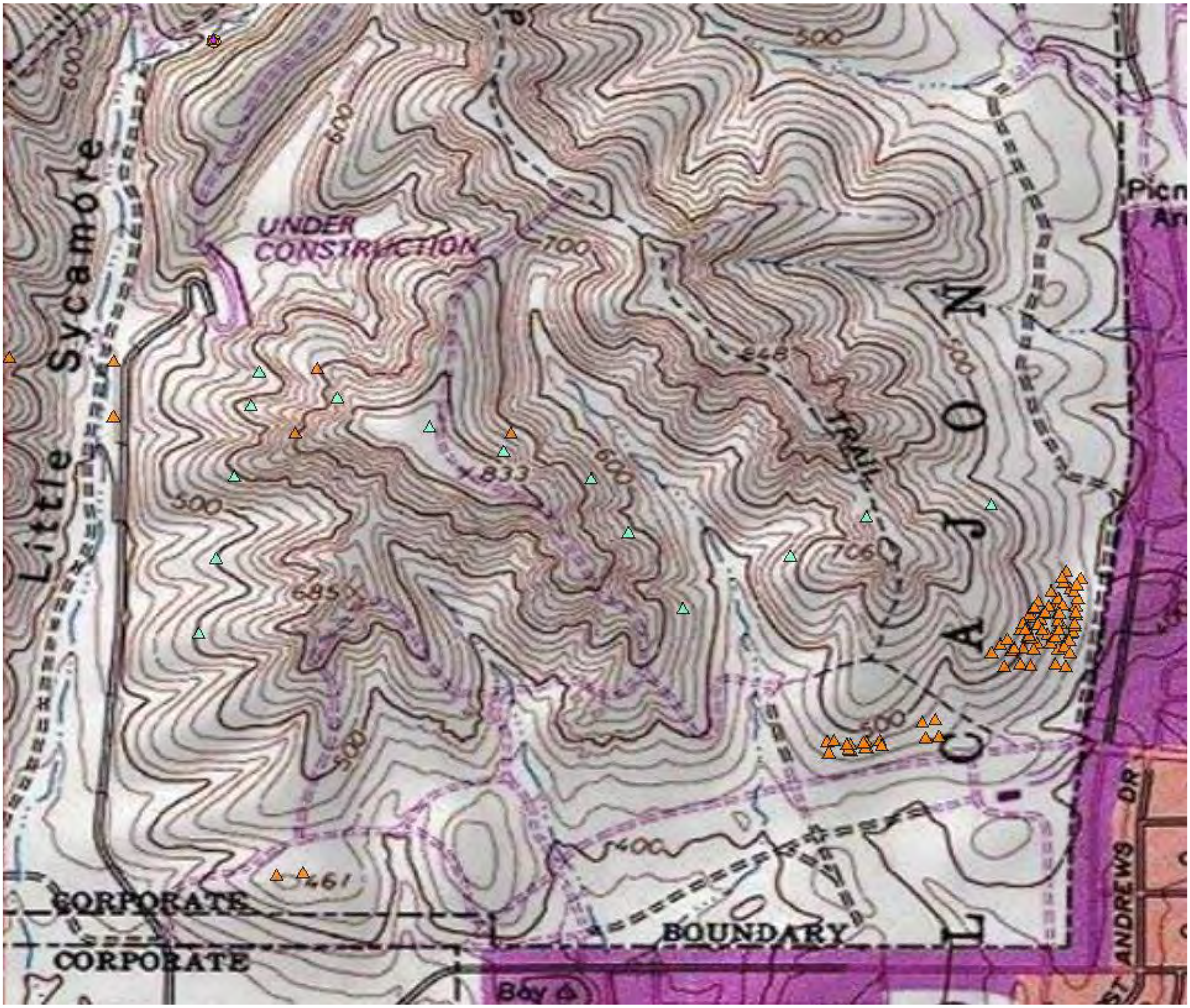
Signature Control No: 155420768-156195996 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

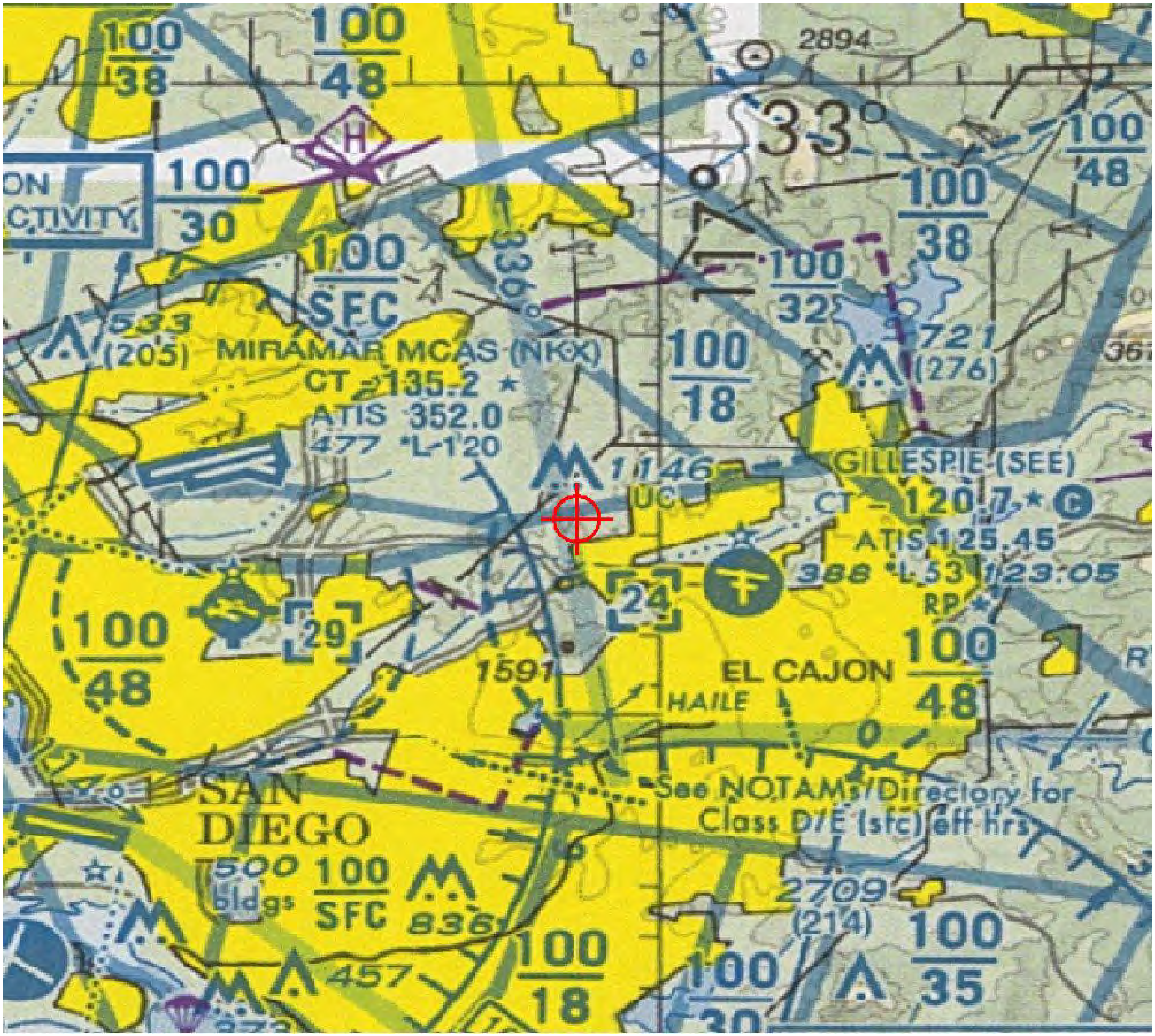
Case Description for ASN 2011-AWP-8414-OE

Transmission lines for Quail Brush generation site

Verified Map for ASN 2011-AWP-8414-OE



Sectional Map for ASN 2011-AWP-8414-OE



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Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8415-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Pole 4
Location:	San Diego, CA
Latitude:	32-51-22.72N NAD 83
Longitude:	117-01-37.88W
Heights:	625 feet site elevation (SE) 90 feet above ground level (AGL) 715 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/05/2013 unless:

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(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

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If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8415-OE.

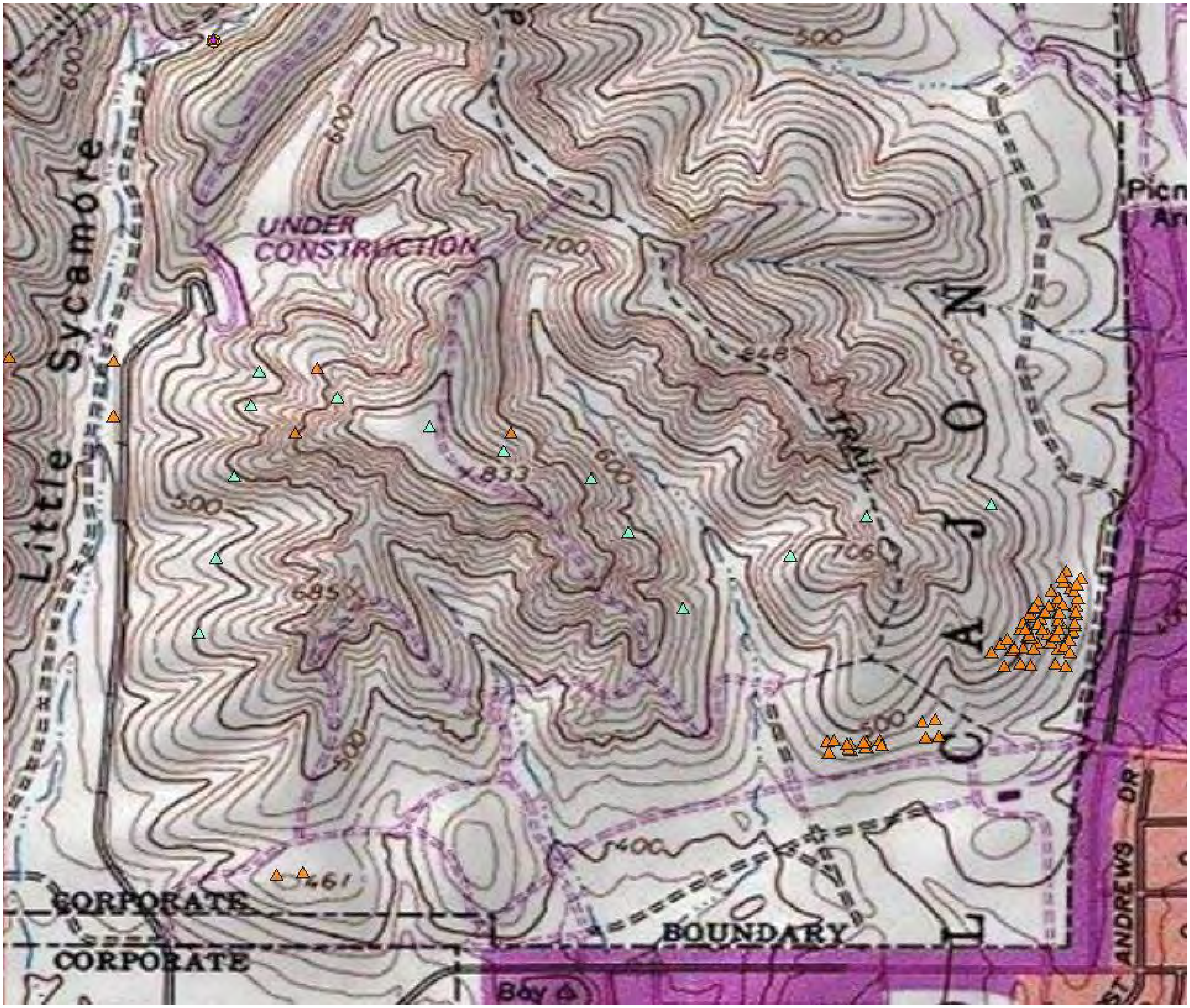
Signature Control No: 155420770-156195998 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

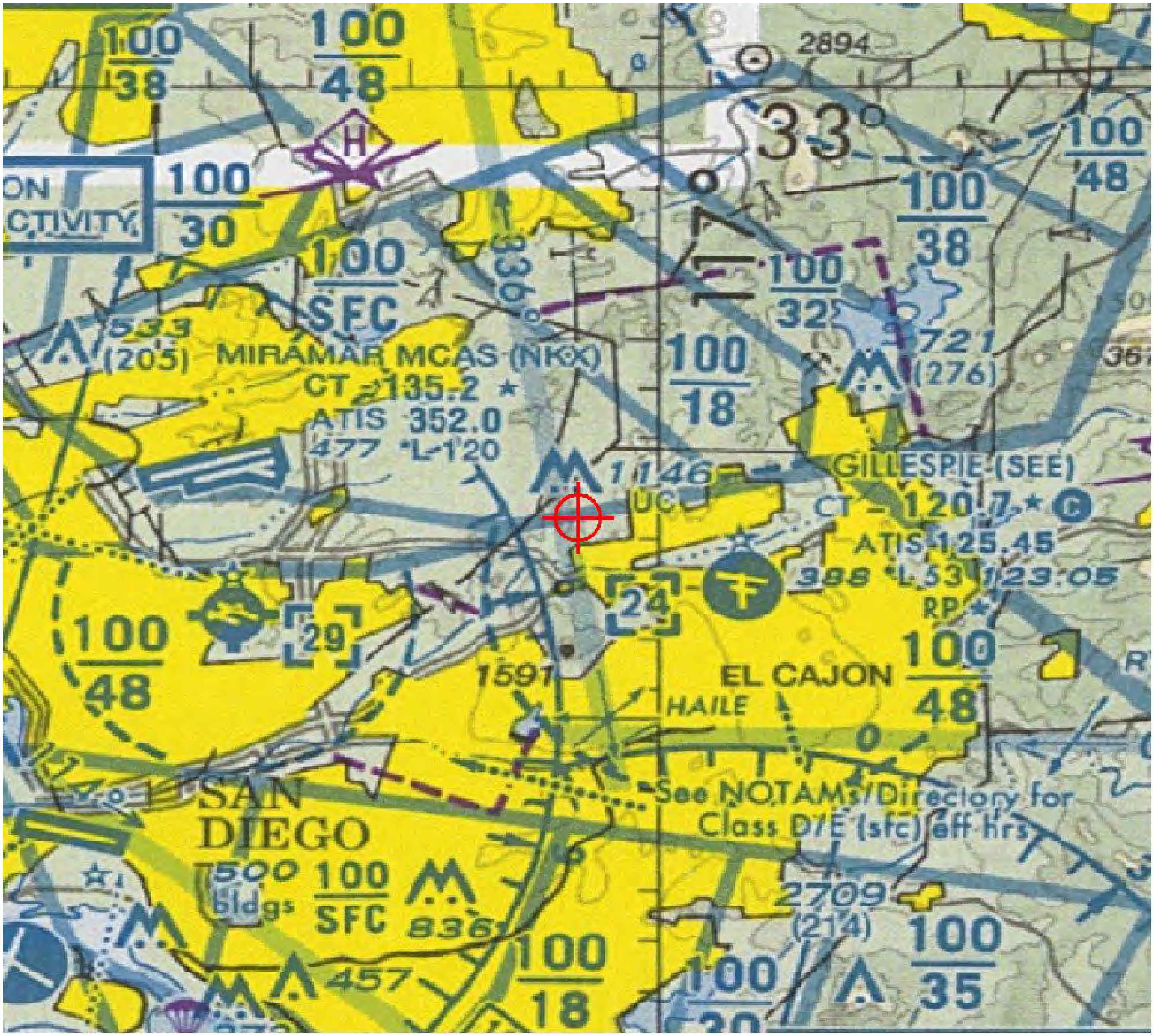
Case Description for ASN 2011-AWP-8415-OE

Transmission lines for Quail Brush generation site

Verified Map for ASN 2011-AWP-8415-OE



Sectional Map for ASN 2011-AWP-8415-OE



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Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8416-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Pole 5
Location:	San Diego, CA
Latitude:	32-51-25.06N NAD 83
Longitude:	117-01-37.31W
Heights:	575 feet site elevation (SE) 90 feet above ground level (AGL) 665 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/05/2013 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

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Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8416-OE.

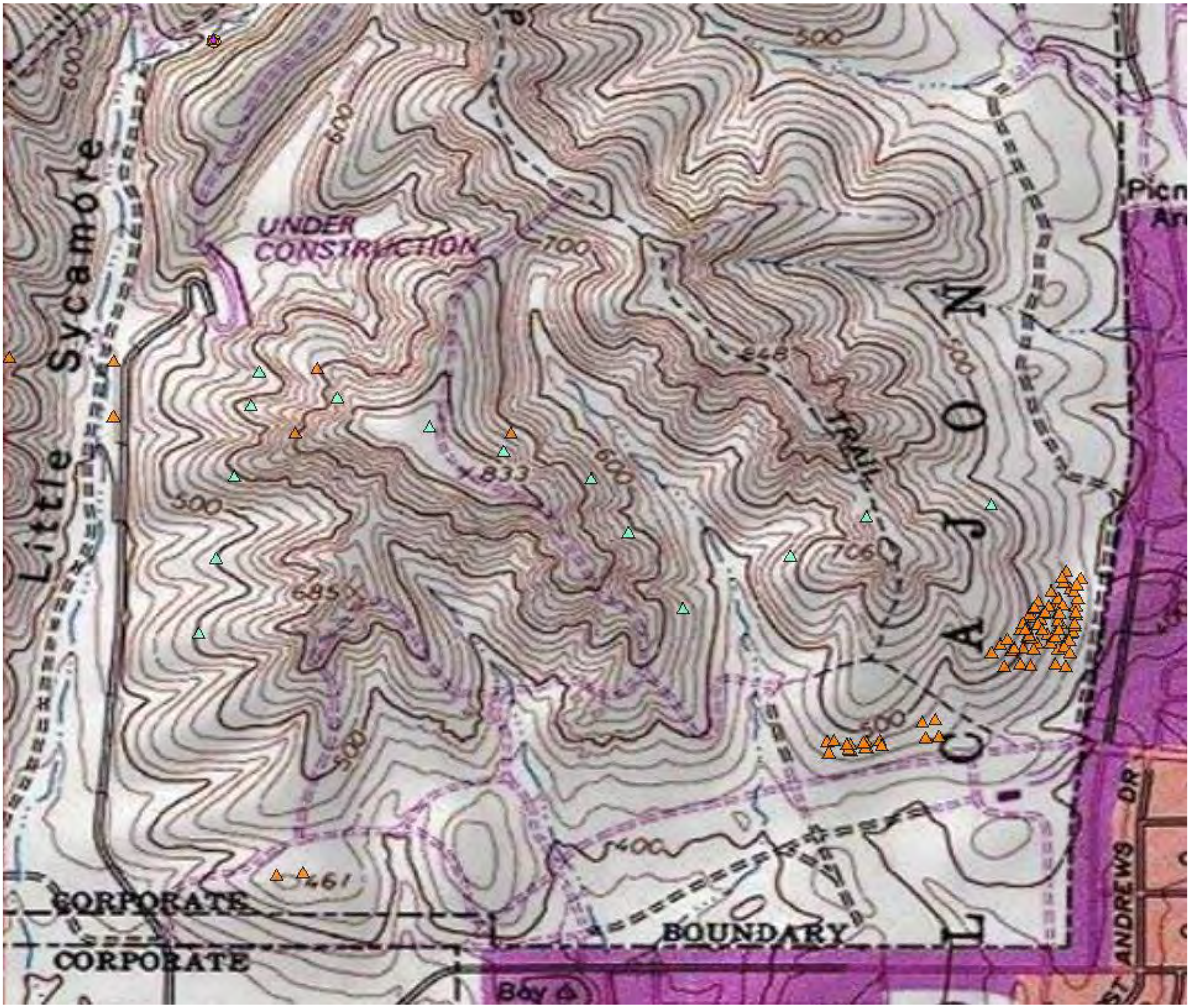
Signature Control No: 155420772-156196000 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

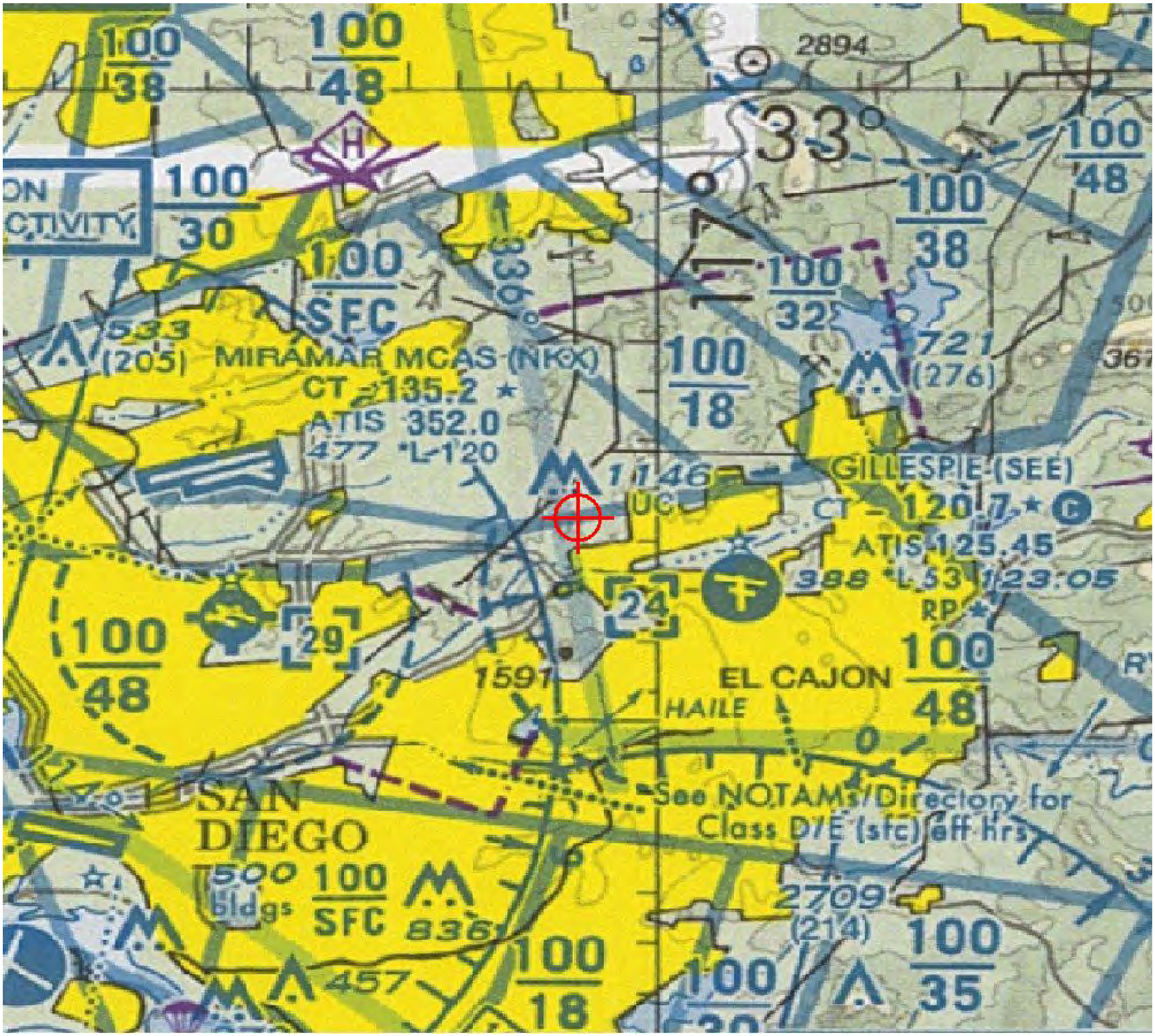
Case Description for ASN 2011-AWP-8416-OE

Transmission lines for Quail Brush generation site

Verified Map for ASN 2011-AWP-8416-OE



Sectional Map for ASN 2011-AWP-8416-OE



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Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8417-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Pole 6
Location:	San Diego, CA
Latitude:	32-51-23.29N NAD 83
Longitude:	117-01-31.91W
Heights:	755 feet site elevation (SE) 90 feet above ground level (AGL) 845 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/05/2013 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8417-OE.

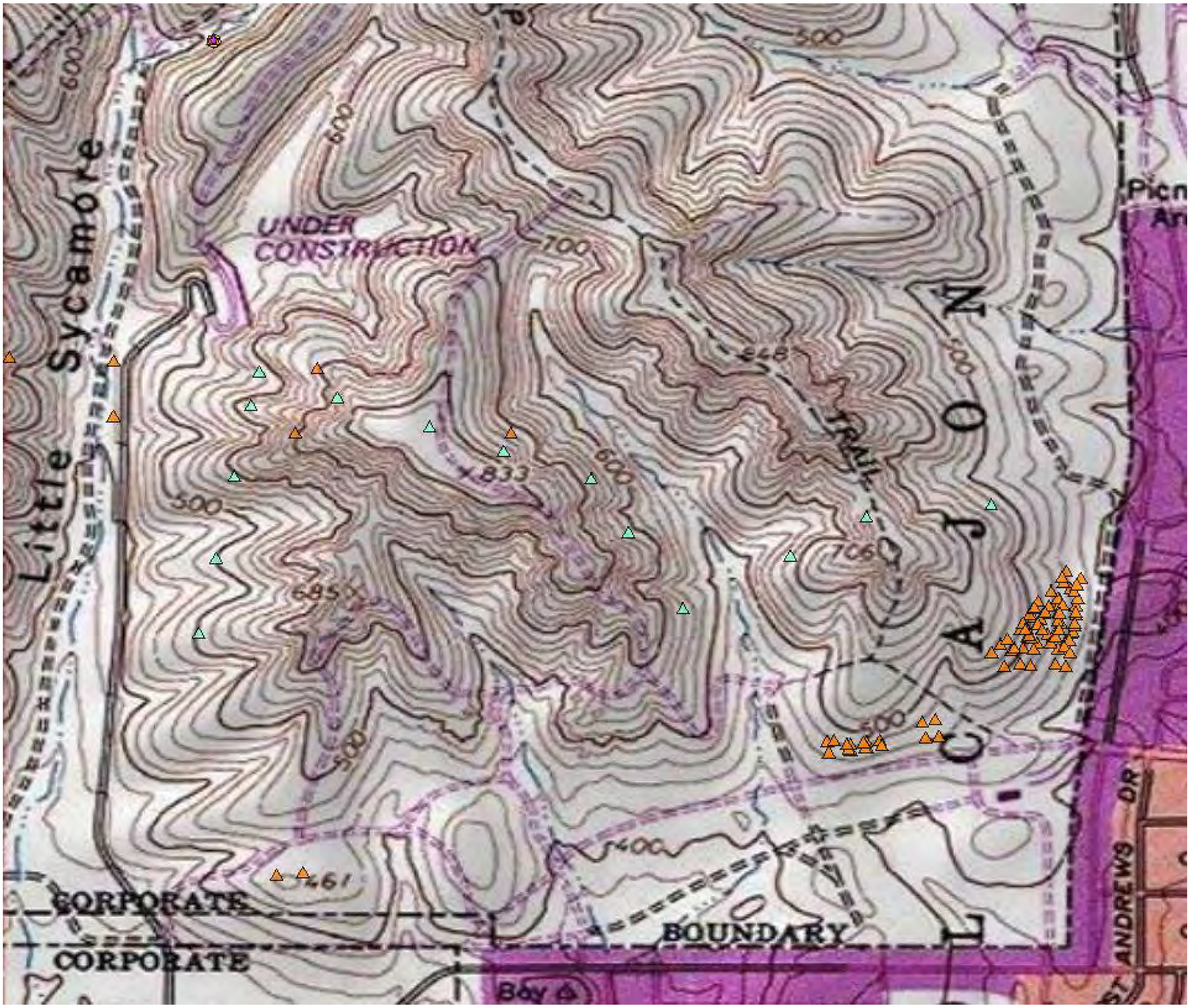
Signature Control No: 155420774-156195997 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

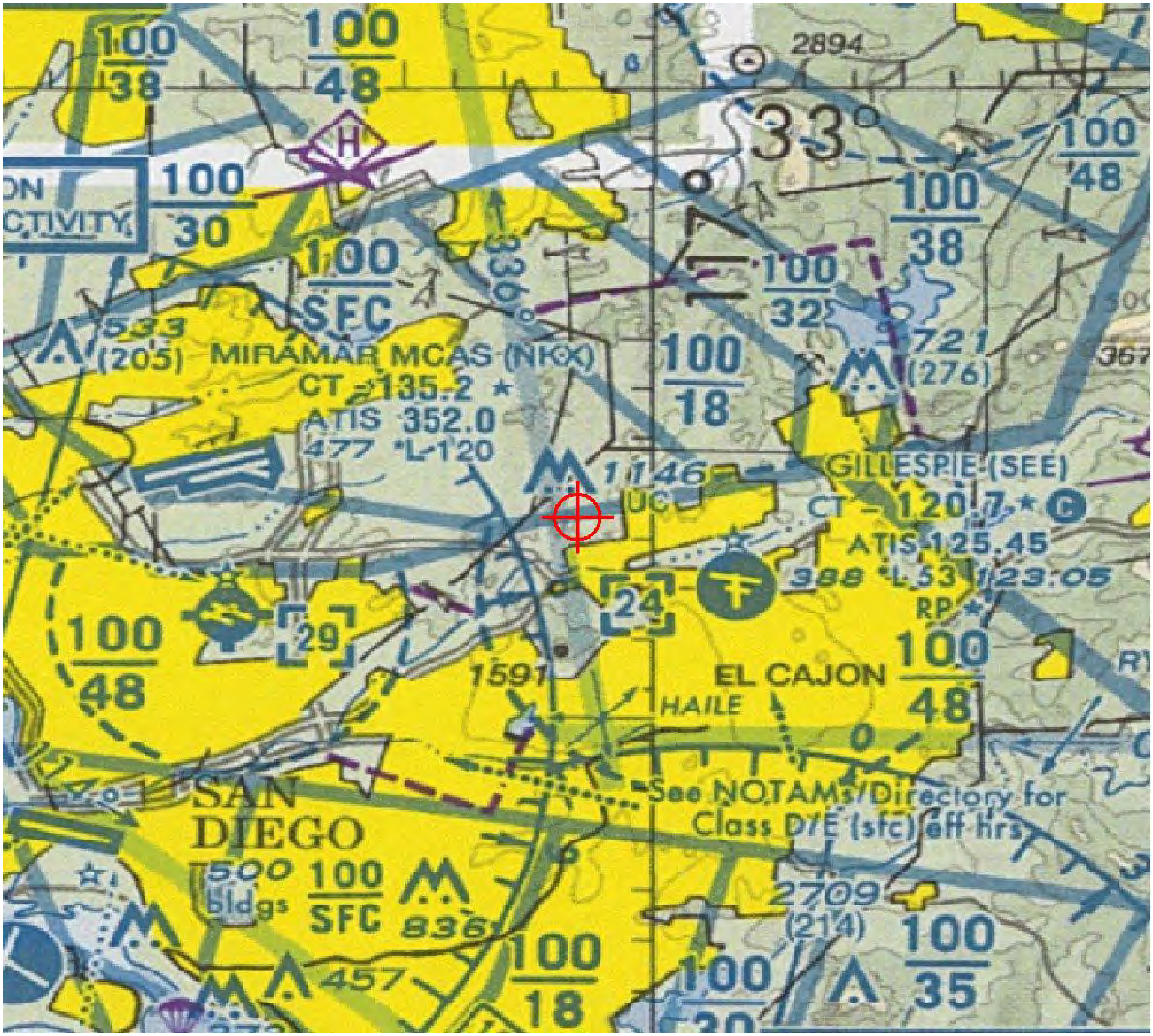
Case Description for ASN 2011-AWP-8417-OE

Transmission lines for Quail Brush generation site

Verified Map for ASN 2011-AWP-8417-OE



Sectional Map for ASN 2011-AWP-8417-OE



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Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8418-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Pole 7
Location:	San Diego, CA
Latitude:	32-51-21.24N NAD 83
Longitude:	117-01-25.50W
Heights:	834 feet site elevation (SE) 90 feet above ground level (AGL) 924 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/05/2013 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

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This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8418-OE.

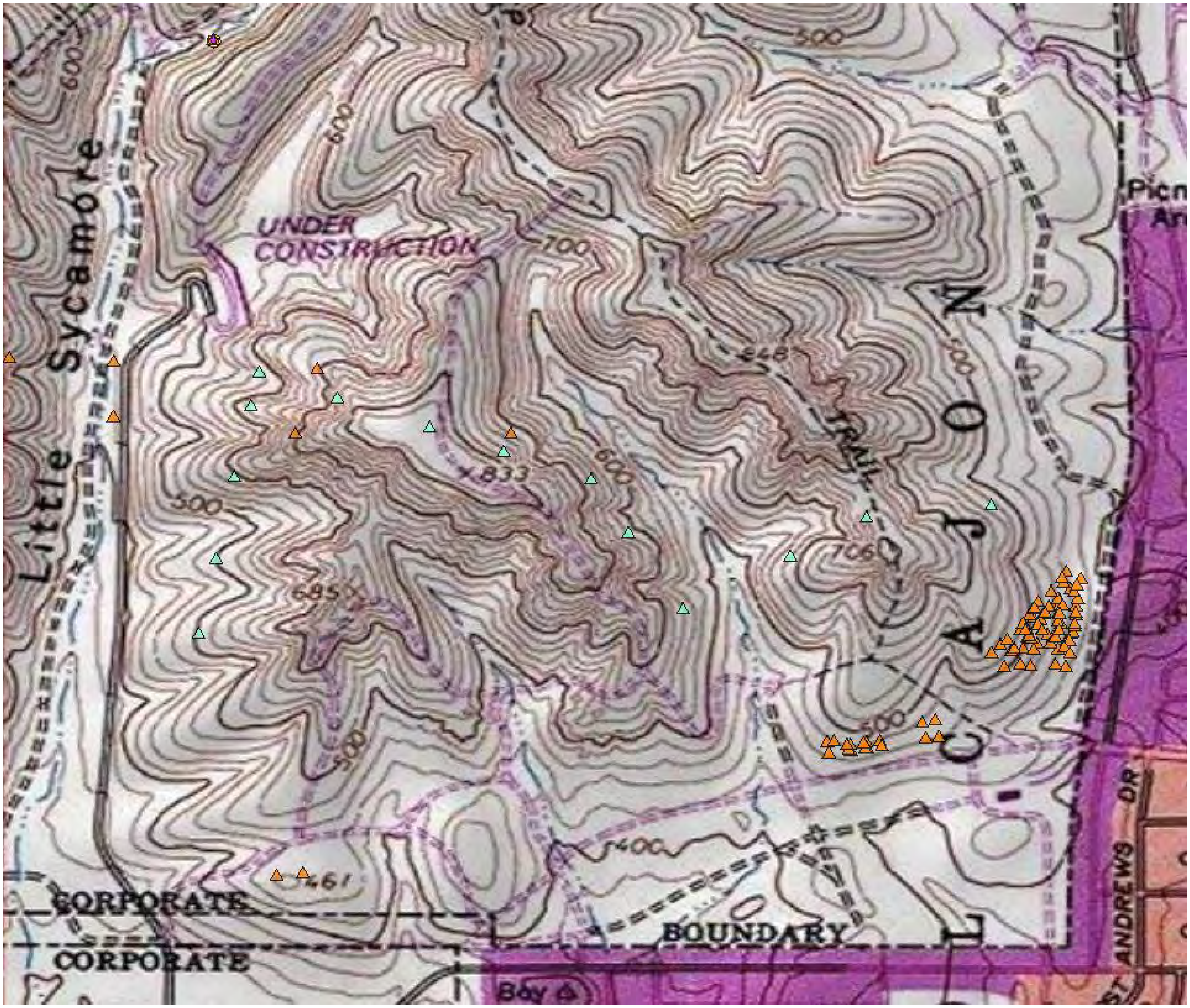
Signature Control No: 155420776-156196001 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

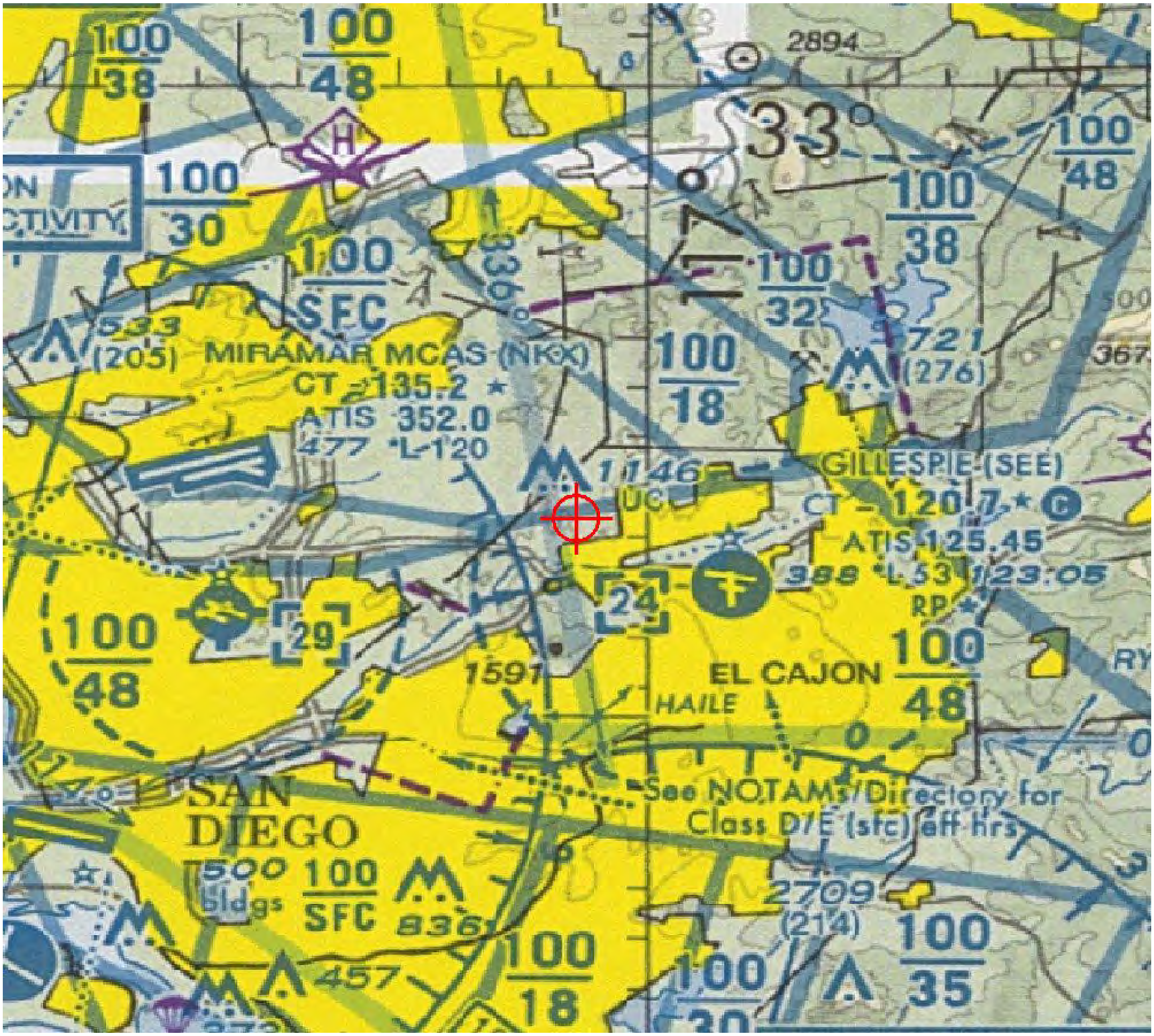
Case Description for ASN 2011-AWP-8418-OE

Transmission lines for Quail Brush generation site

Verified Map for ASN 2011-AWP-8418-OE



Sectional Map for ASN 2011-AWP-8418-OE



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Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8419-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Pole 8
Location:	San Diego, CA
Latitude:	32-51-19.58N NAD 83
Longitude:	117-01-20.39W
Heights:	774 feet site elevation (SE) 90 feet above ground level (AGL) 864 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/05/2013 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8419-OE.

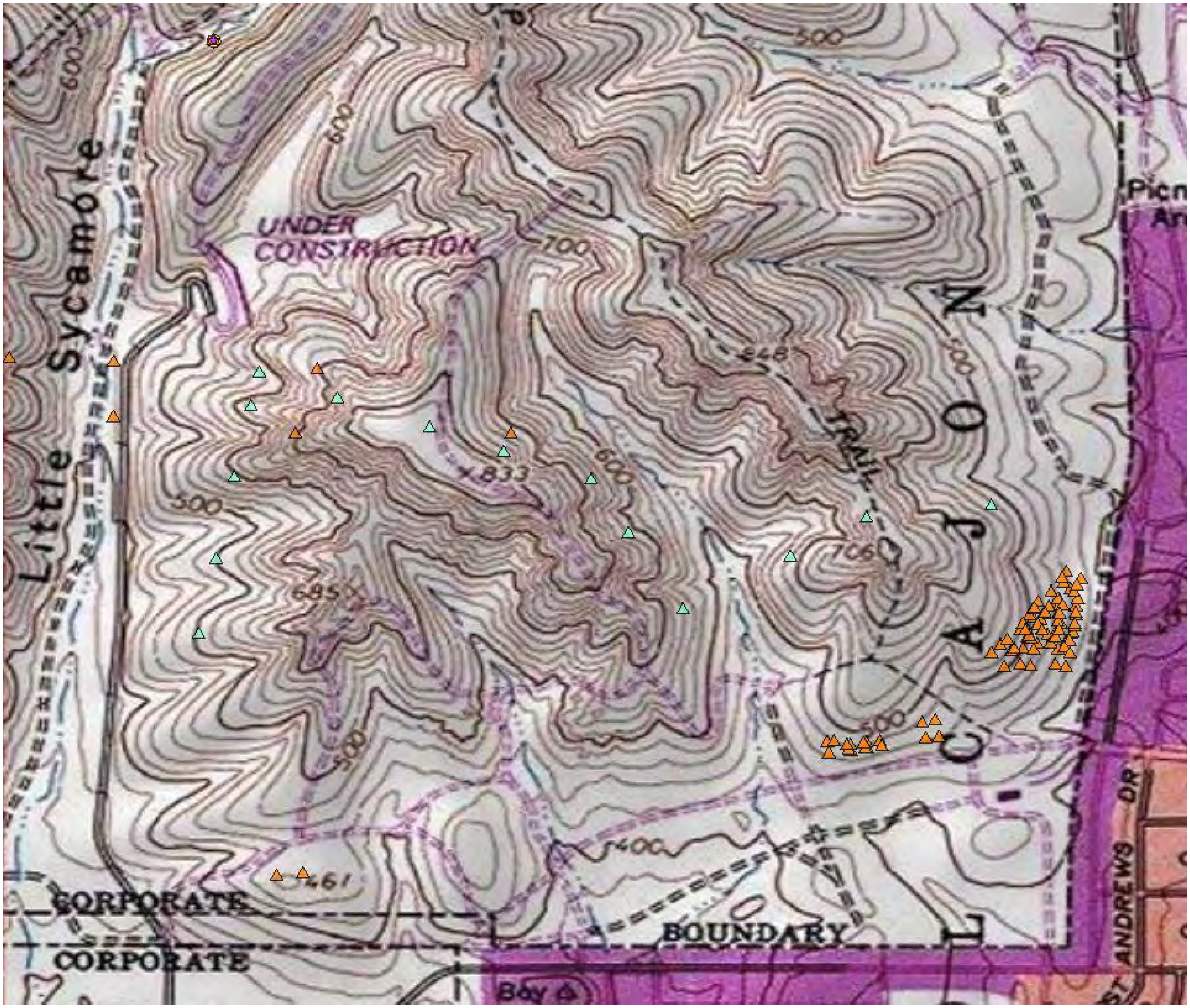
Signature Control No: 155420778-156195995 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

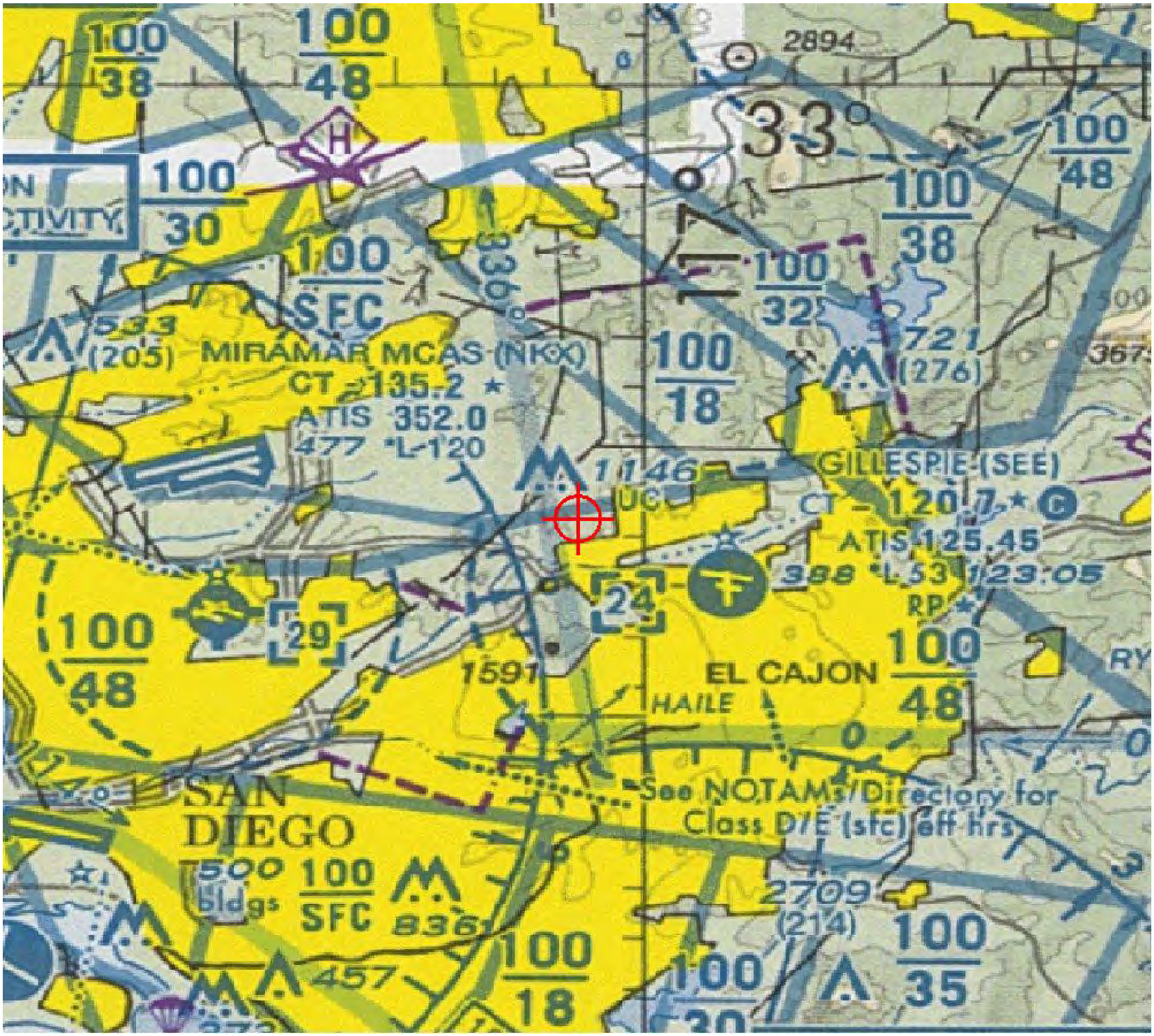
Case Description for ASN 2011-AWP-8419-OE

Transmission lines for Quail Brush generation site

Verified Map for ASN 2011-AWP-8419-OE



Sectional Map for ASN 2011-AWP-8419-OE



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Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8420-OE

Issued Date: 01/18/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Pole 9
Location:	San Diego, CA
Latitude:	32-51-17.64N NAD 83
Longitude:	117-01-14.30W
Heights:	665 feet site elevation (SE) 90 feet above ground level (AGL) 755 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/18/2013 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

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This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8420-OE.

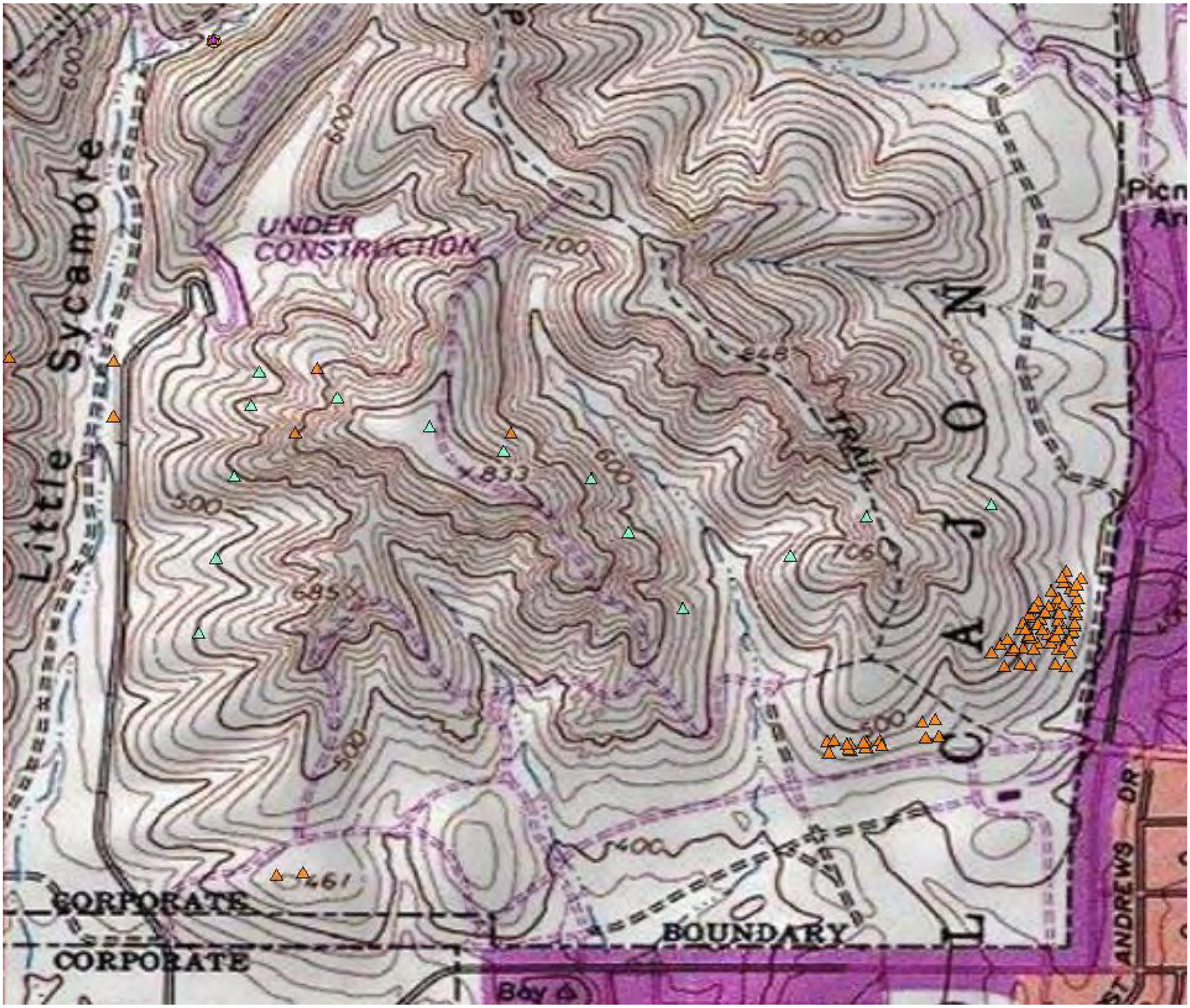
Signature Control No: 155420780-157406530 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

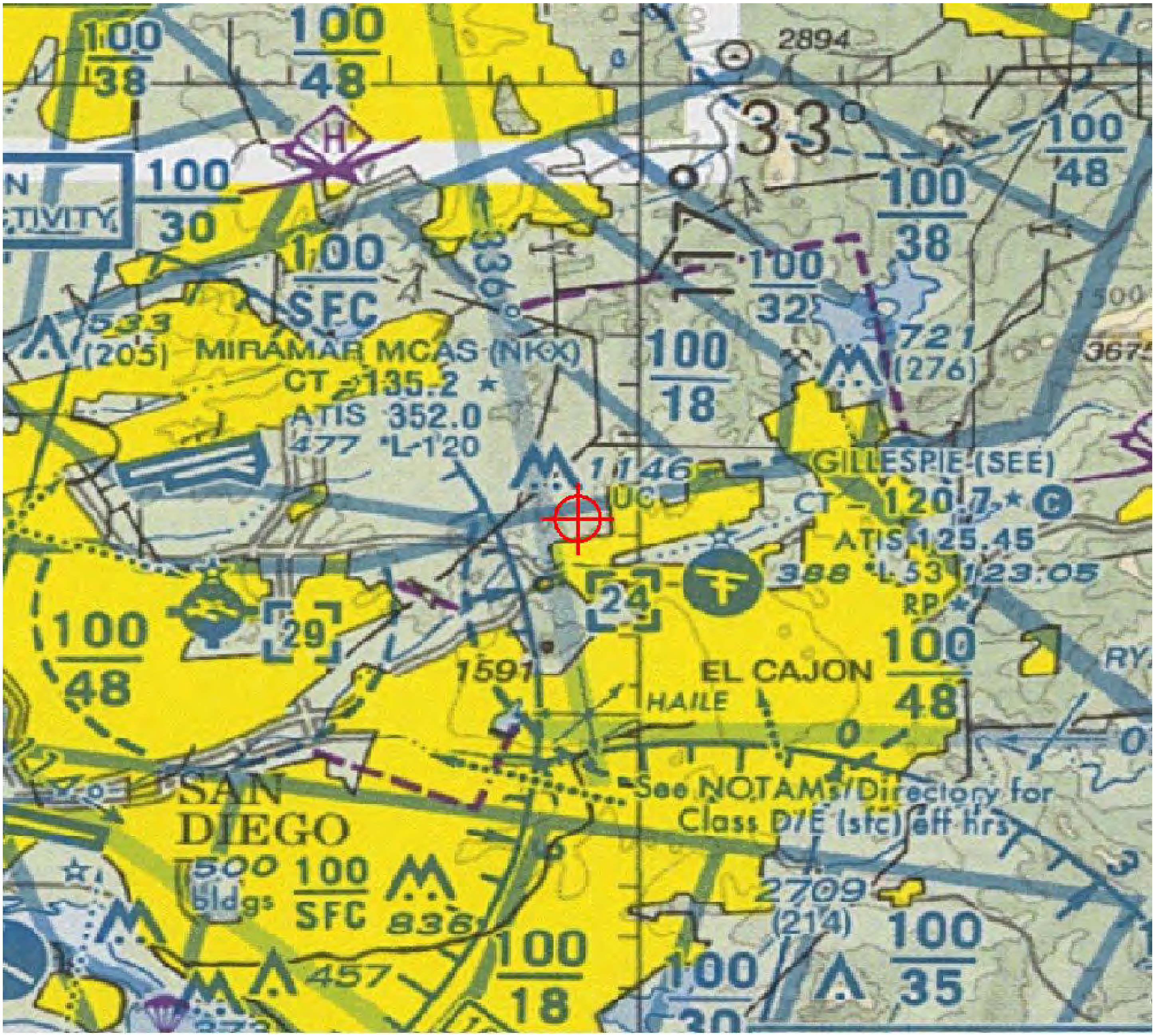
Case Description for ASN 2011-AWP-8420-OE

Transmission lines for Quail Brush generation site

Verified Map for ASN 2011-AWP-8420-OE



Sectional Map for ASN 2011-AWP-8420-OE



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Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8421-OE

Issued Date: 01/18/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Pole 10
Location:	San Diego, CA
Latitude:	32-51-13.93N NAD 83
Longitude:	117-01-11.71W
Heights:	614 feet site elevation (SE)
	90 feet above ground level (AGL)
	704 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/18/2013 unless:

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(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

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Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8421-OE.

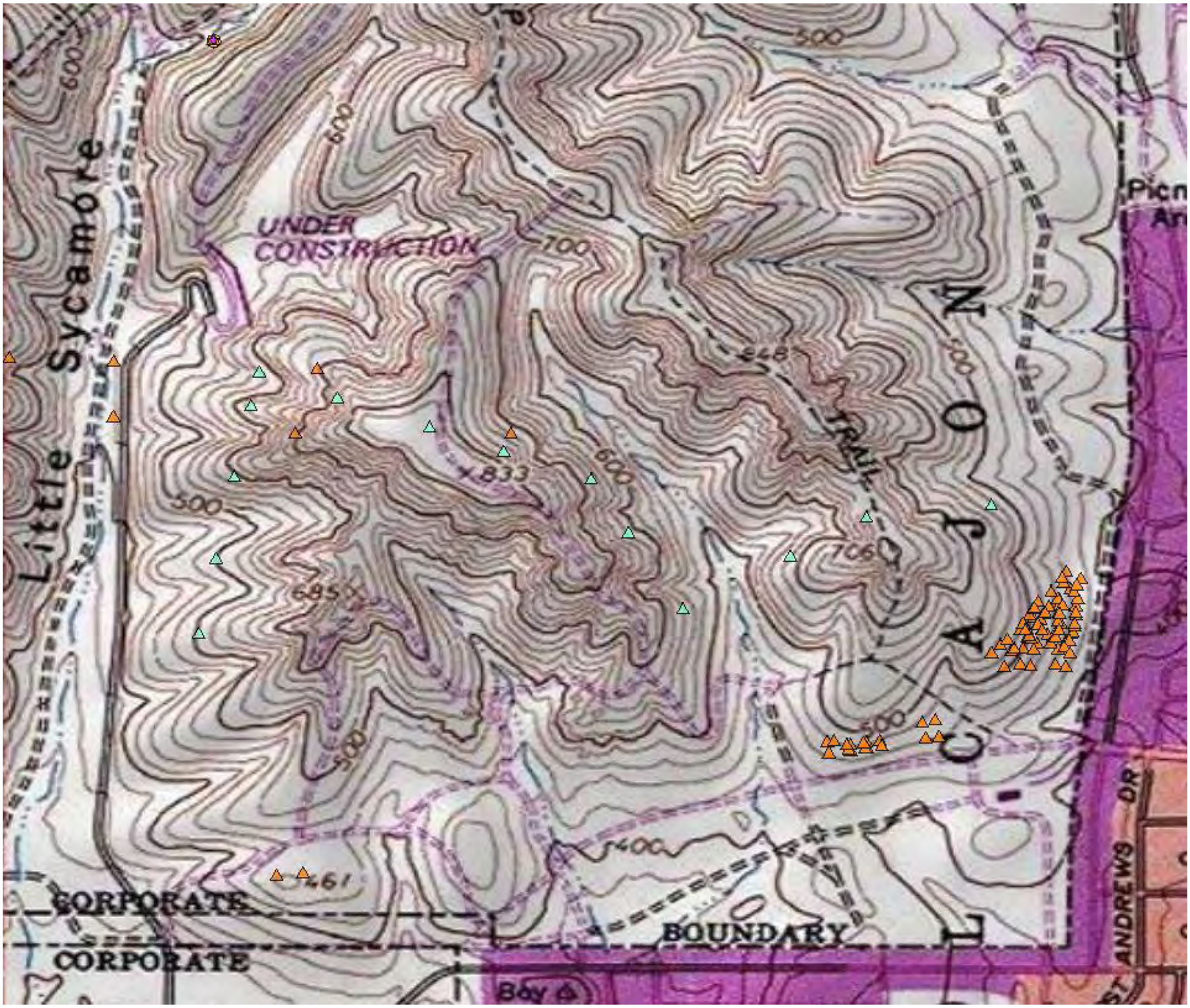
Signature Control No: 155420782-157406528 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

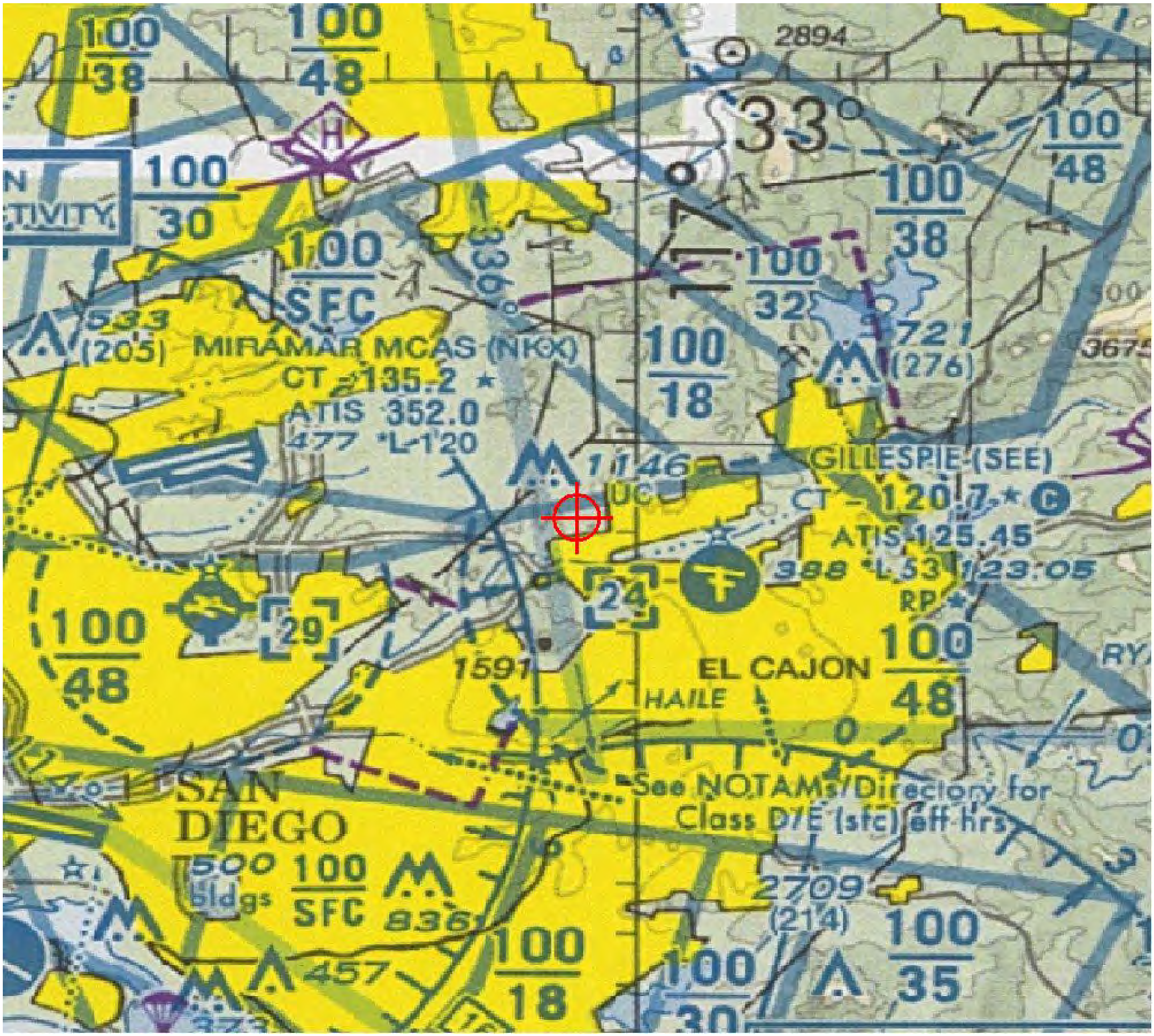
Case Description for ASN 2011-AWP-8421-OE

Transmission lines for Quail Brush generation site

Verified Map for ASN 2011-AWP-8421-OE



Sectional Map for ASN 2011-AWP-8421-OE



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Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8422-OE

Issued Date: 01/18/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure: Transmission Line Pole 11
Location: San Diego, CA
Latitude: 32-51-08.64N NAD 83
Longitude: 117-01-07.93W
Heights: 562 feet site elevation (SE)
90 feet above ground level (AGL)
652 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

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(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

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If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8422-OE.

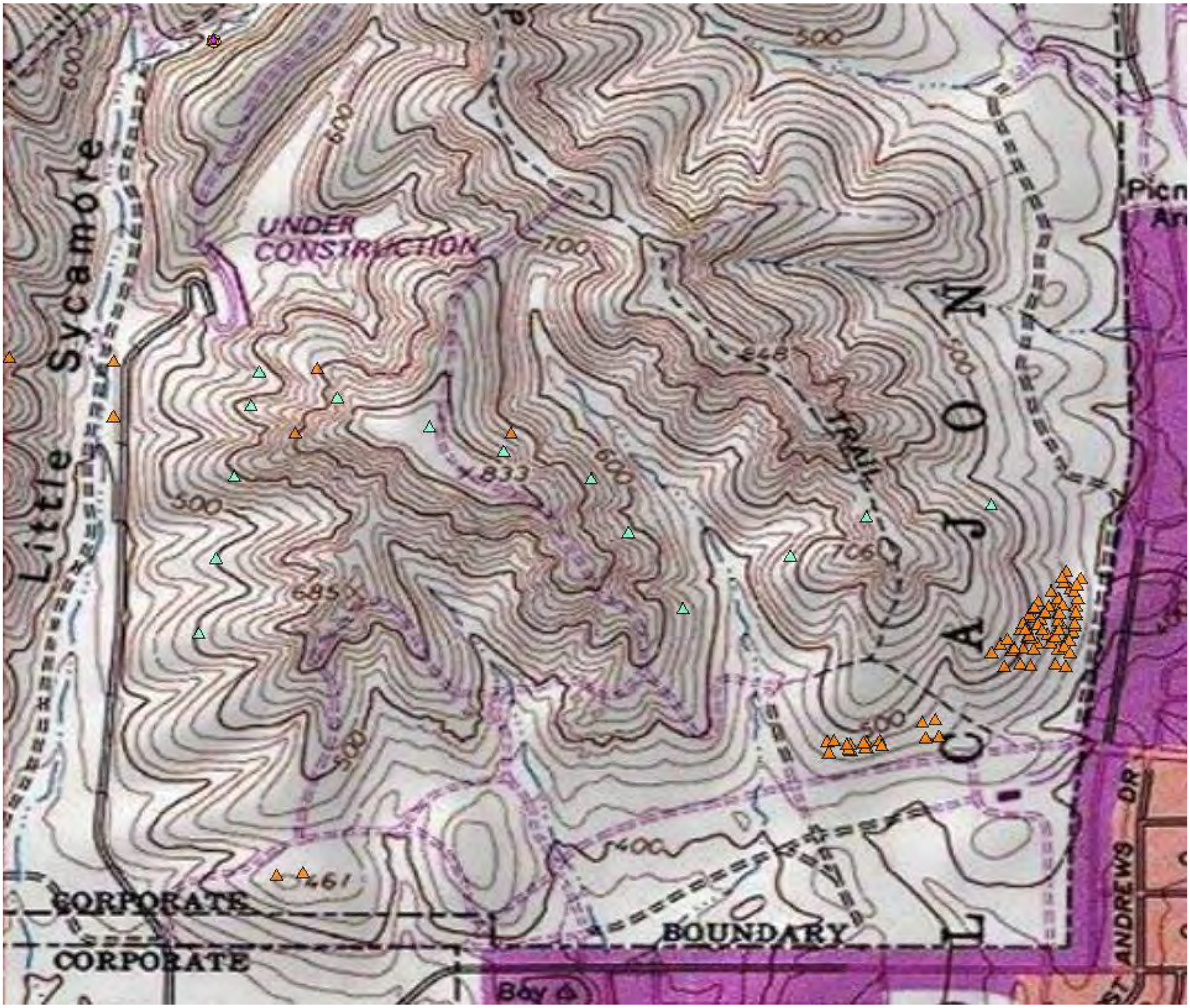
Signature Control No: 155420784-157406527 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

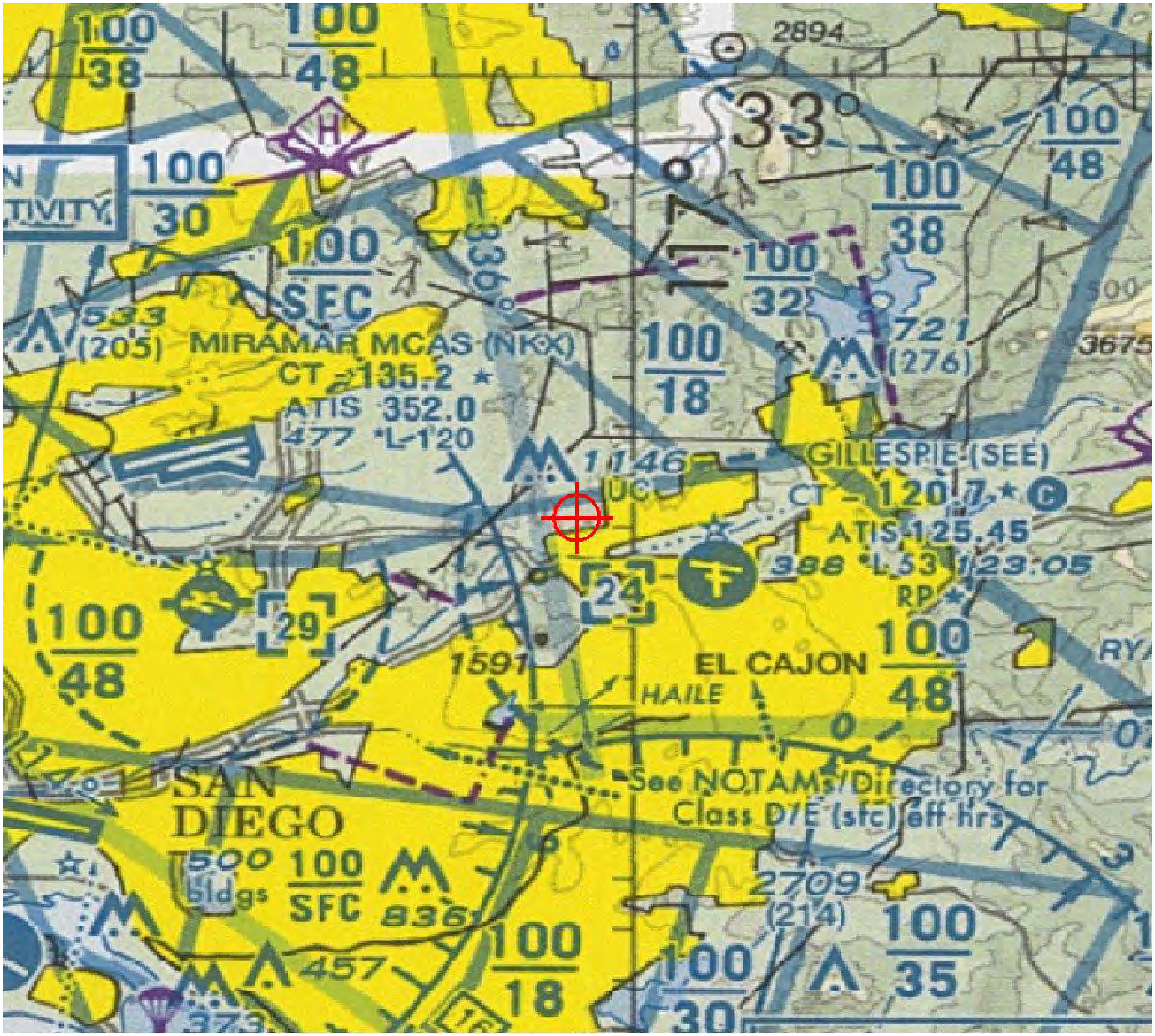
Case Description for ASN 2011-AWP-8422-OE

Transmission lines for Quail Brush generation site

Verified Map for ASN 2011-AWP-8422-OE



Sectional Map for ASN 2011-AWP-8422-OE



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Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8423-OE

Issued Date: 01/18/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure: Transmission Line Pole 12
Location: San Diego, CA
Latitude: 32-51-12.31N NAD 83
Longitude: 117-01-00.48W
Heights: 590 feet site elevation (SE)
90 feet above ground level (AGL)
680 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/18/2013 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8423-OE.

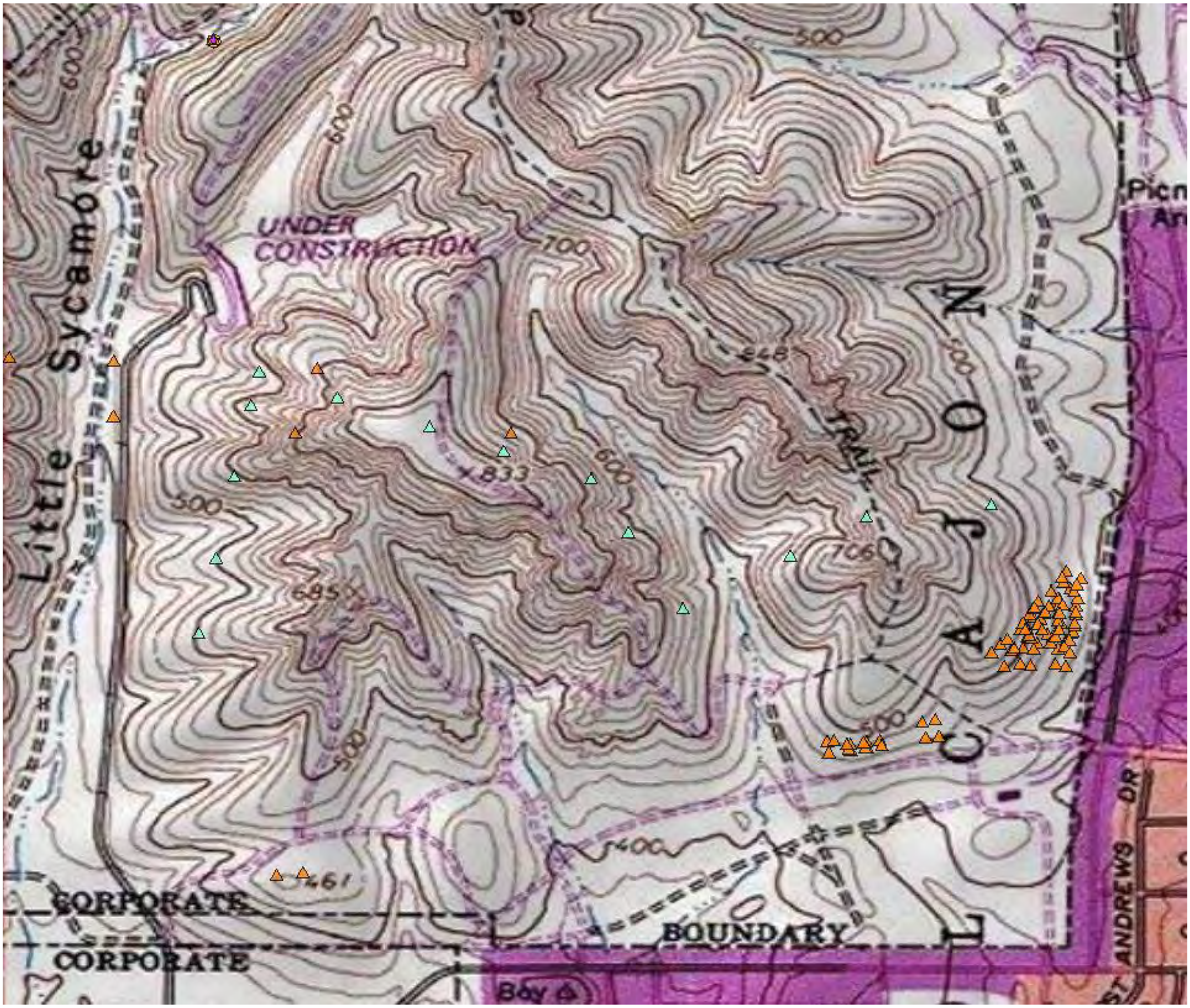
Signature Control No: 155420786-157406525 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

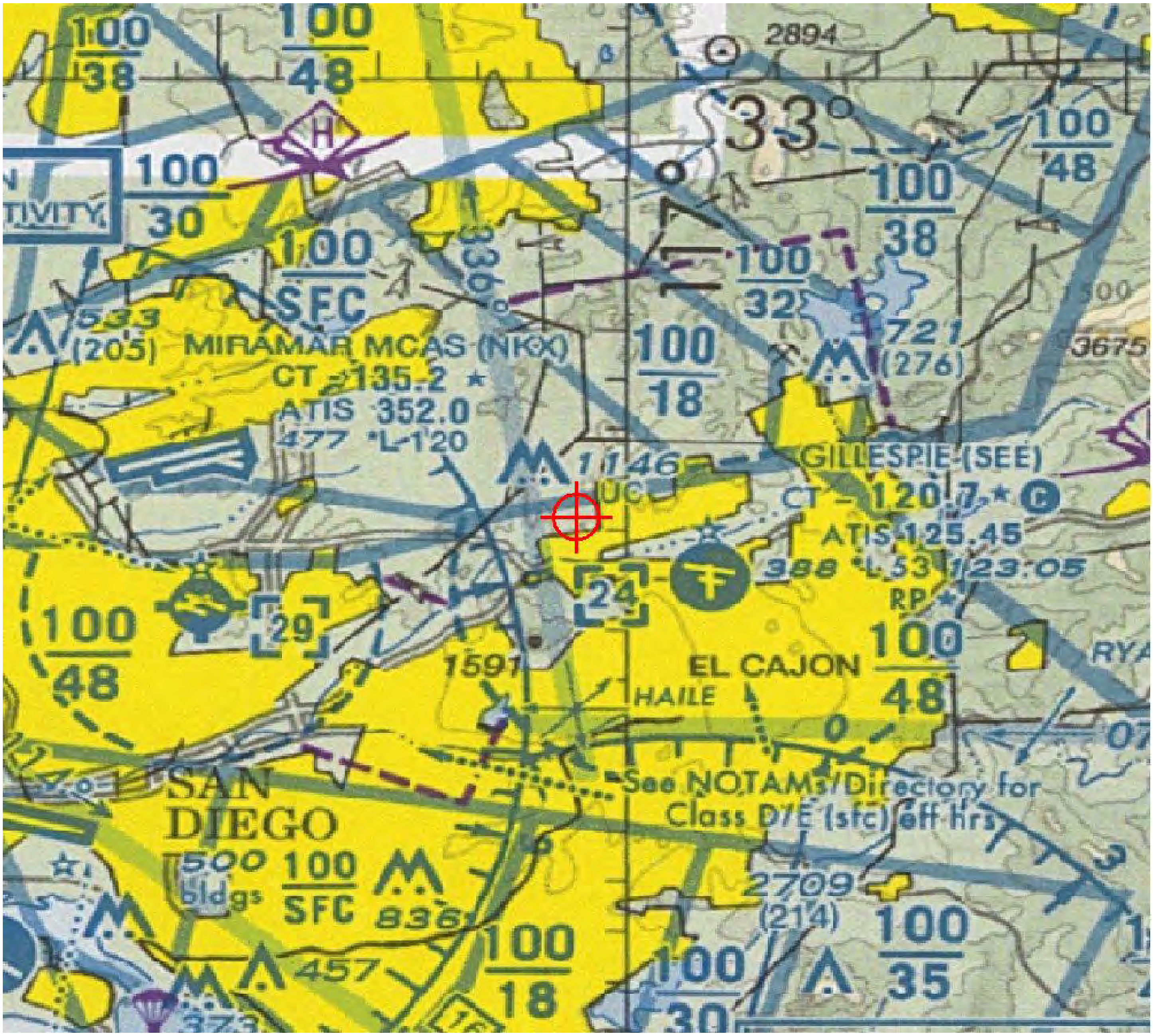
Case Description for ASN 2011-AWP-8423-OE

Transmission lines for Quail Brush generation site

Verified Map for ASN 2011-AWP-8423-OE



Sectional Map for ASN 2011-AWP-8423-OE



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Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8424-OE

Issued Date: 01/18/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Pole 13
Location:	San Diego, CA
Latitude:	32-51-14.98N NAD 83
Longitude:	117-00-55.20W
Heights:	684 feet site elevation (SE) 90 feet above ground level (AGL) 774 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/18/2013 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8424-OE.

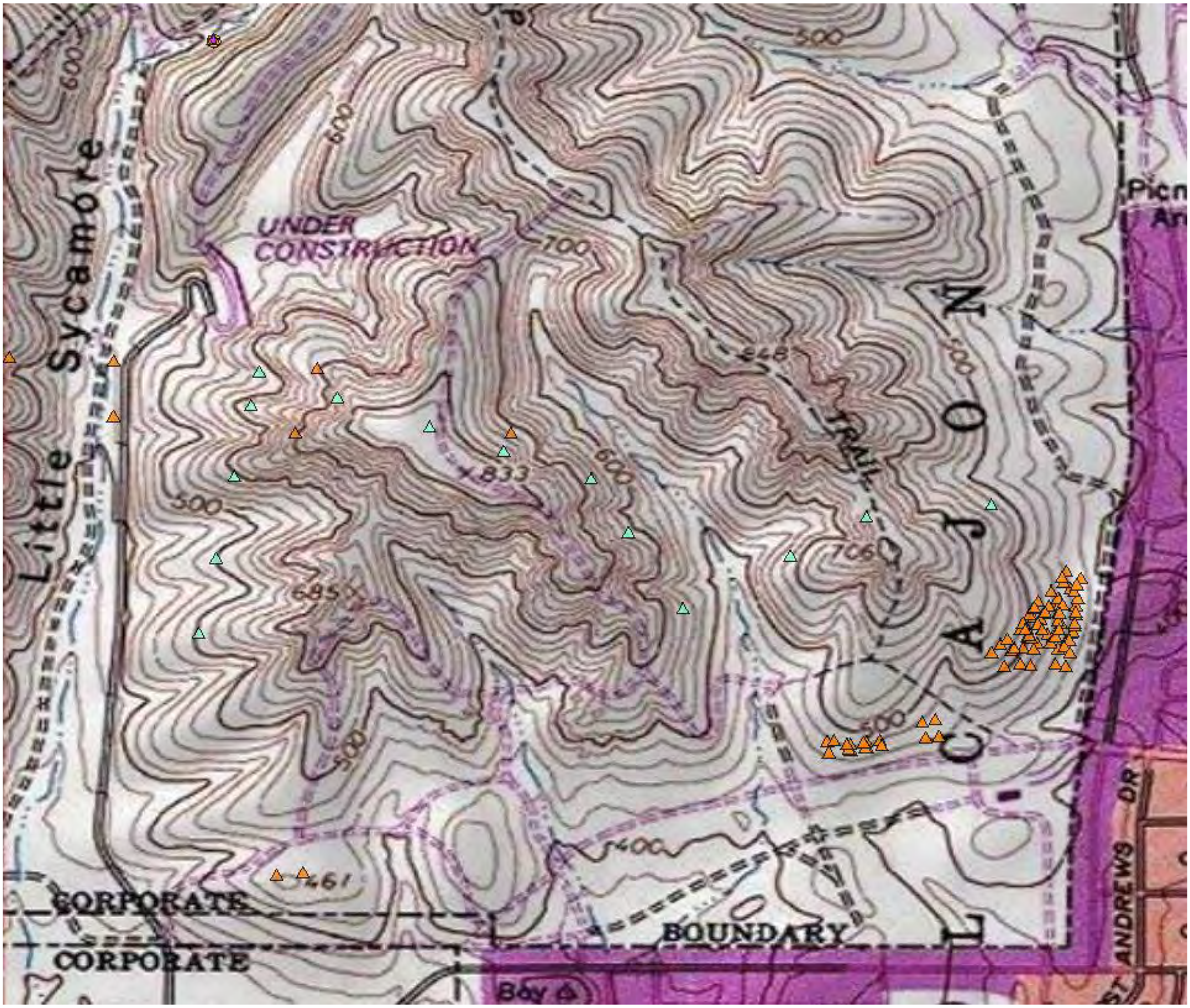
Signature Control No: 155420788-157406529 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

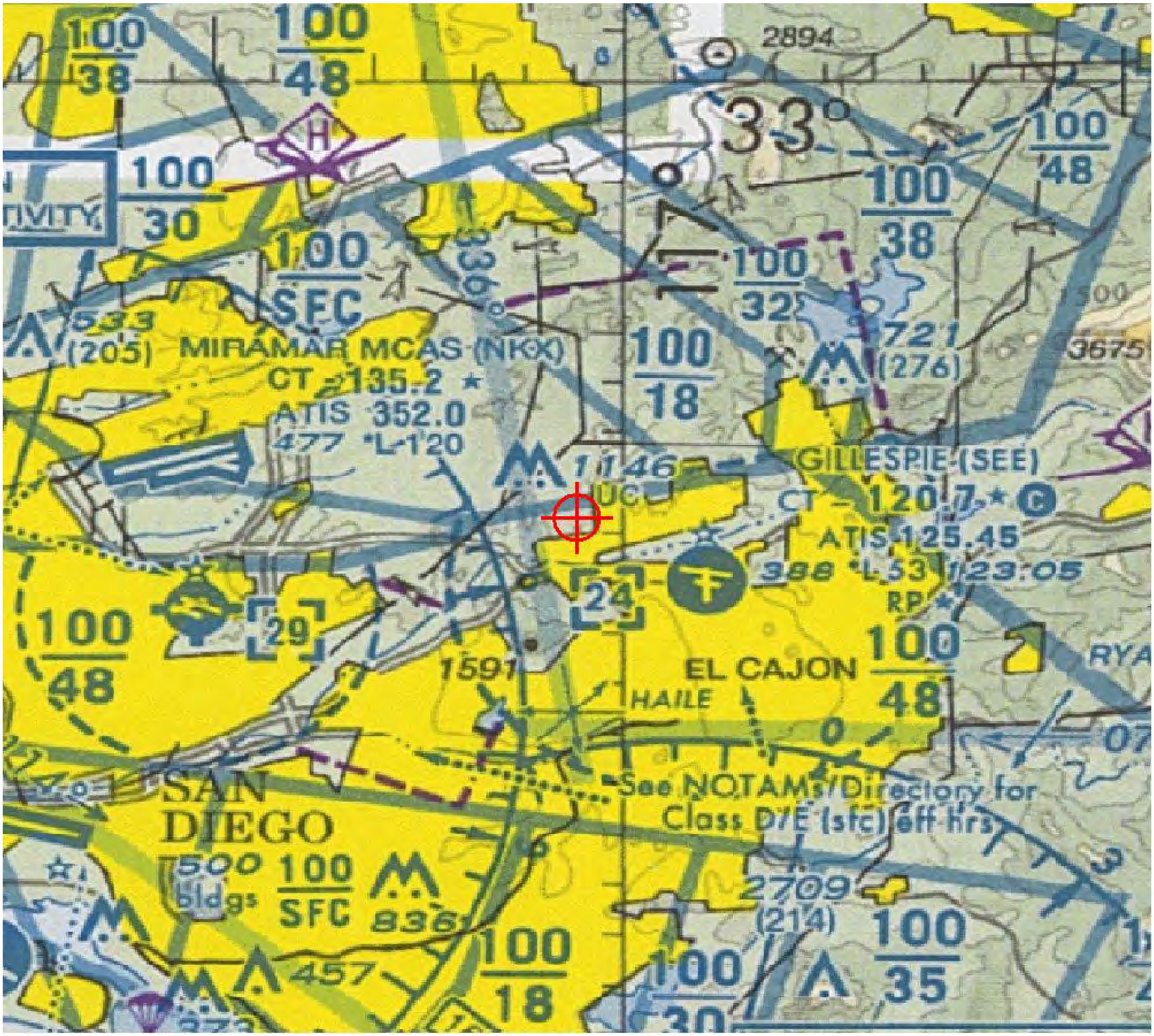
Case Description for ASN 2011-AWP-8424-OE

Transmission lines for Quail Brush generation site

Verified Map for ASN 2011-AWP-8424-OE



Sectional Map for ASN 2011-AWP-8424-OE



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Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8425-OE

Issued Date: 01/18/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Pole 14
Location:	San Diego, CA
Latitude:	32-51-15.84N NAD 83
Longitude:	117-00-46.55W
Heights:	528 feet site elevation (SE) 90 feet above ground level (AGL) 618 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/18/2013 unless:

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This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8425-OE.

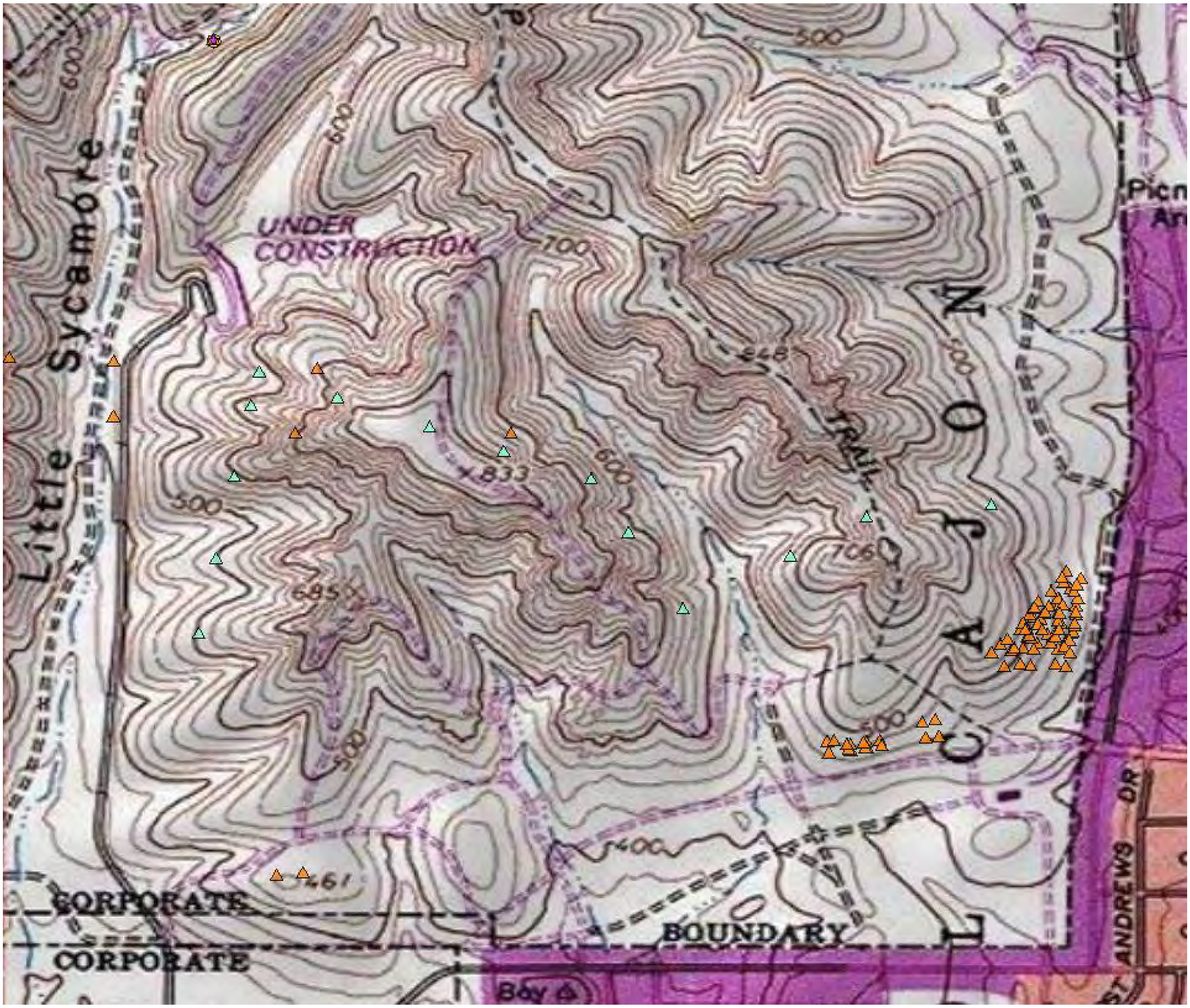
Signature Control No: 155420790-157406526 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

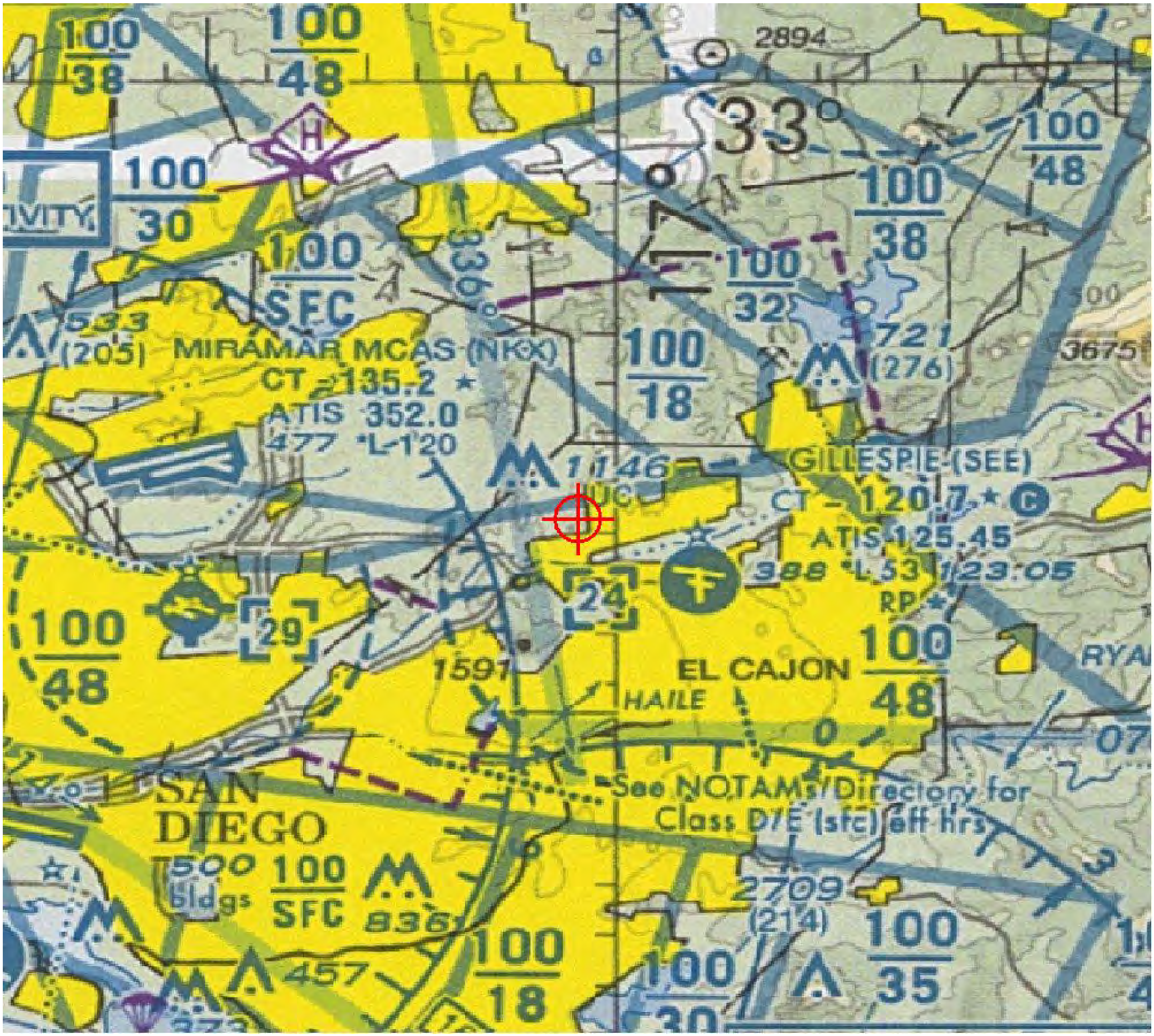
Case Description for ASN 2011-AWP-8425-OE

Transmission lines for Quail Brush generation site

Verified Map for ASN 2011-AWP-8425-OE



Sectional Map for ASN 2011-AWP-8425-OE



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Case 2

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8426-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Pole 15
Location:	San Diego, CA
Latitude:	32-51-07.42N NAD 83
Longitude:	117-01-33.42W
Heights:	650 feet site elevation (SE) 90 feet above ground level (AGL) 740 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/05/2013 unless:

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(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

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Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8426-OE.

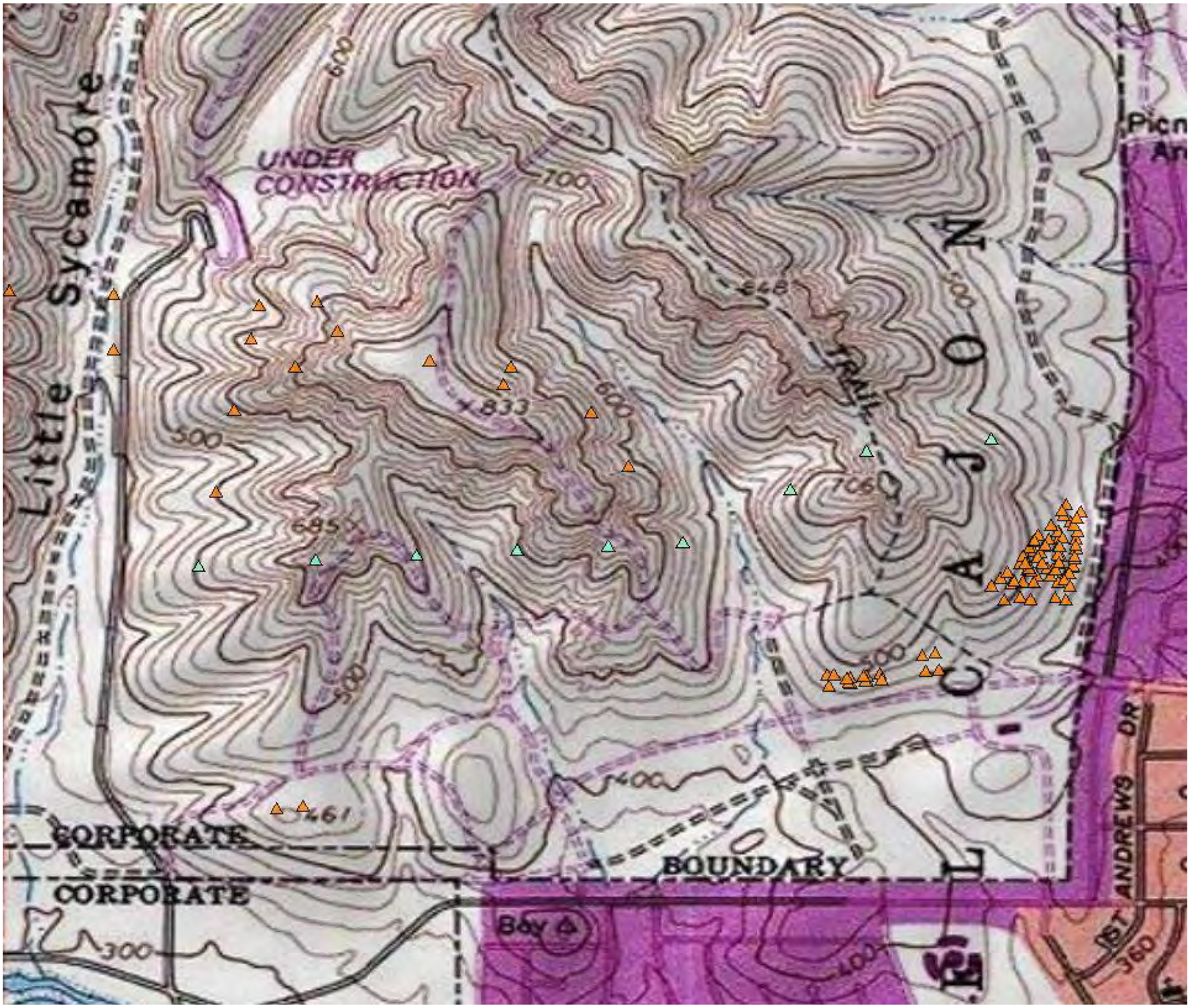
Signature Control No: 155420792-156197303 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

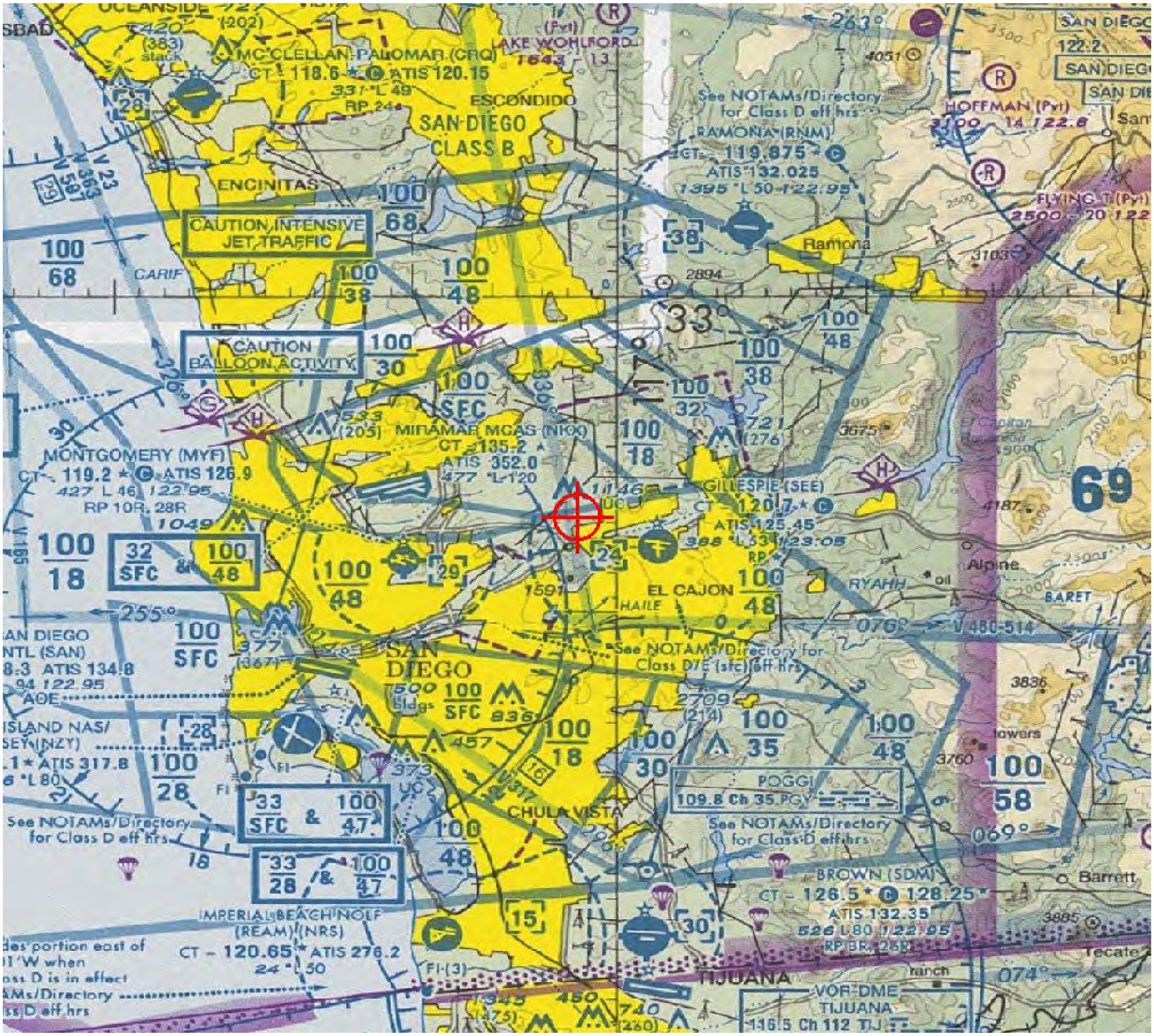
Case Description for ASN 2011-AWP-8426-OE

transmission line towers for Quail Brush generation site - Alt. Route

Verified Map for ASN 2011-AWP-8426-OE



Sectional Map for ASN 2011-AWP-8426-OE



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Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8427-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Pole 16
Location:	San Diego, CA
Latitude:	32-51-07.74N NAD 83
Longitude:	117-01-26.40W
Heights:	599 feet site elevation (SE) 90 feet above ground level (AGL) 689 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/05/2013 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

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This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

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This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8427-OE.

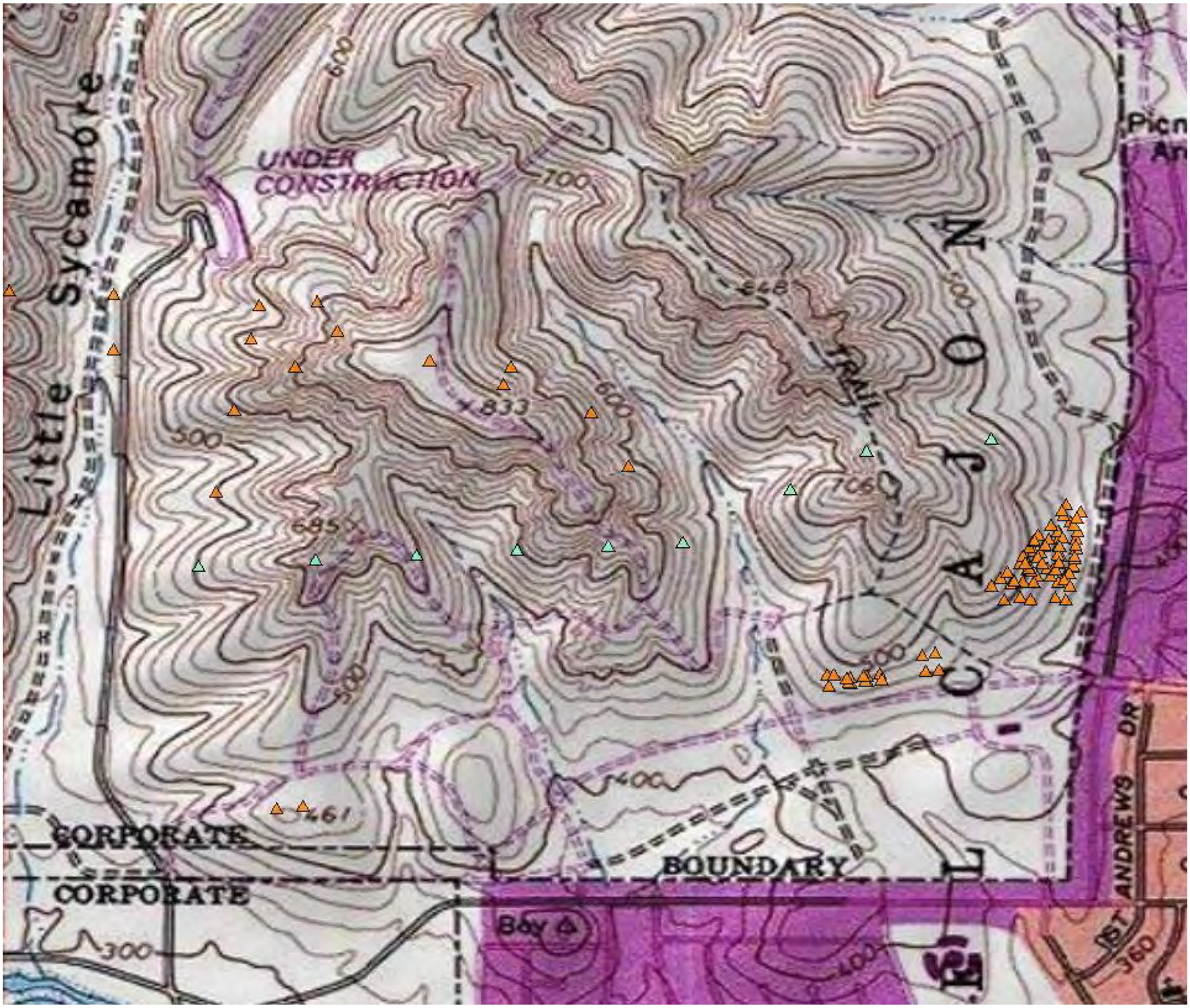
Signature Control No: 155420794-156197302 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

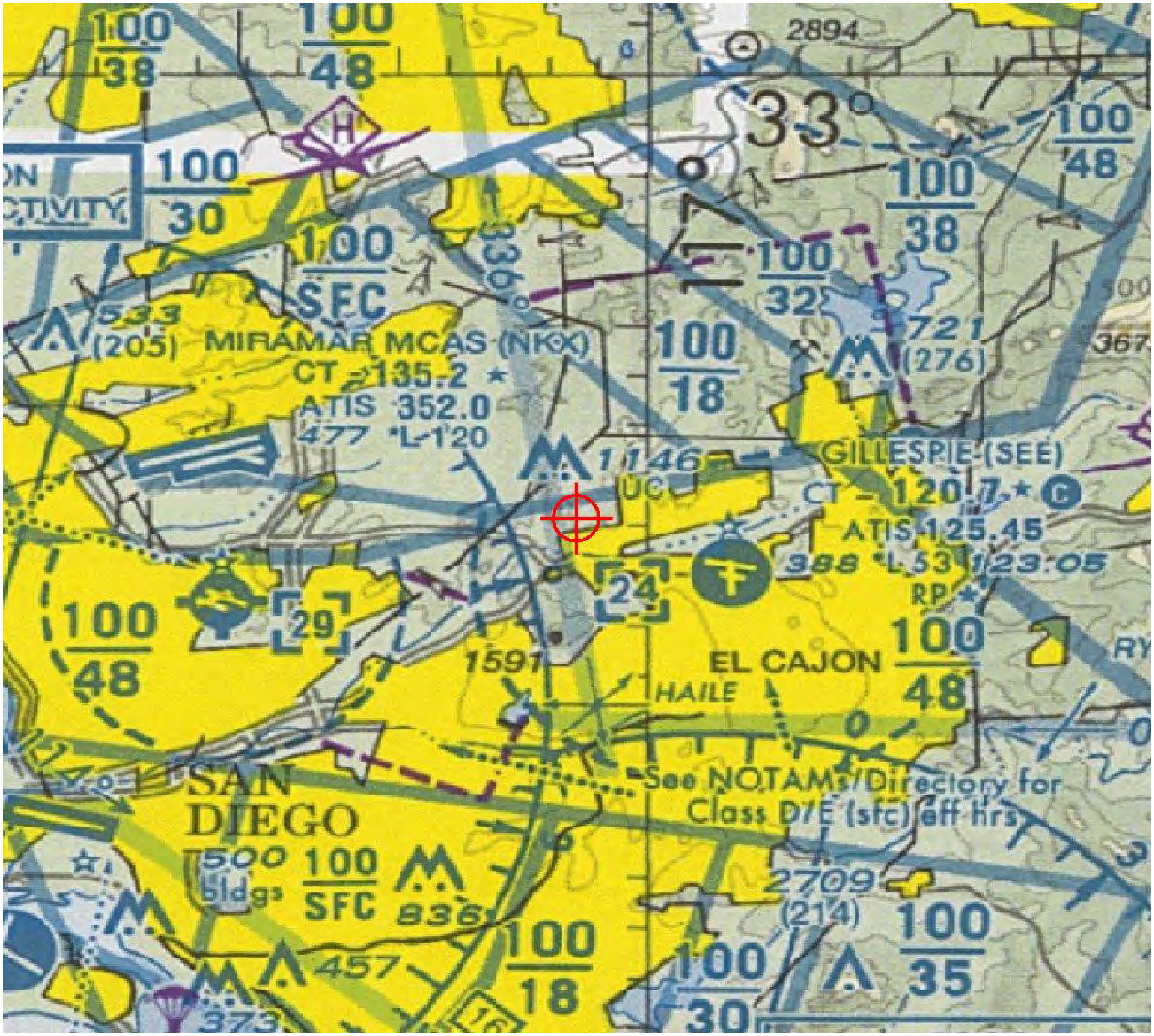
Case Description for ASN 2011-AWP-8427-OE

transmission line towers for Quail Brush generation site -Alt Route

Verified Map for ASN 2011-AWP-8427-OE



Sectional Map for ASN 2011-AWP-8427-OE



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Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8428-OE

Issued Date: 01/18/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Pole 17
Location:	San Diego, CA
Latitude:	32-51-08.10N NAD 83
Longitude:	117-01-19.45W
Heights:	658 feet site elevation (SE) 90 feet above ground level (AGL) 748 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

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Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8428-OE.

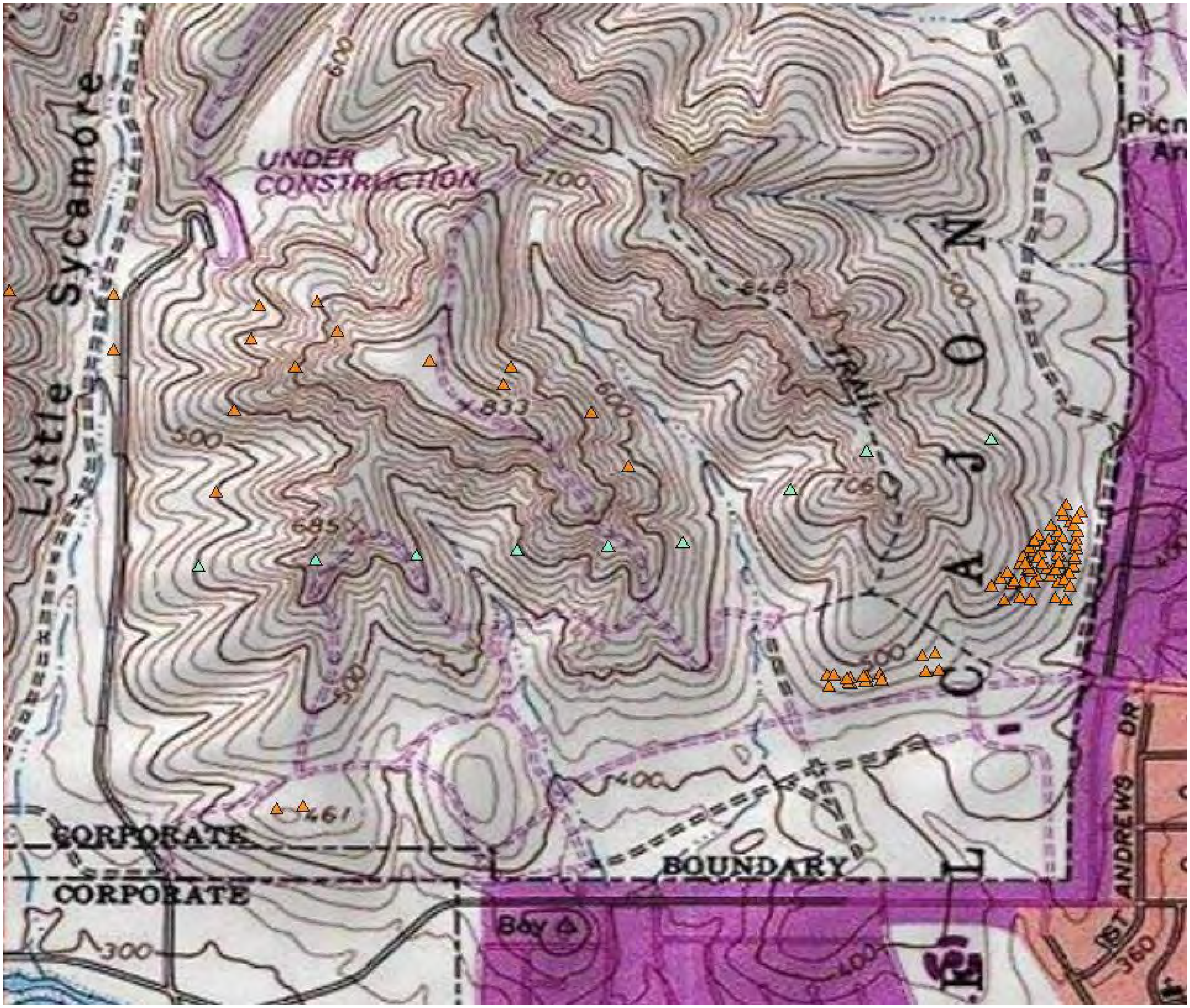
Signature Control No: 155420796-157406494 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

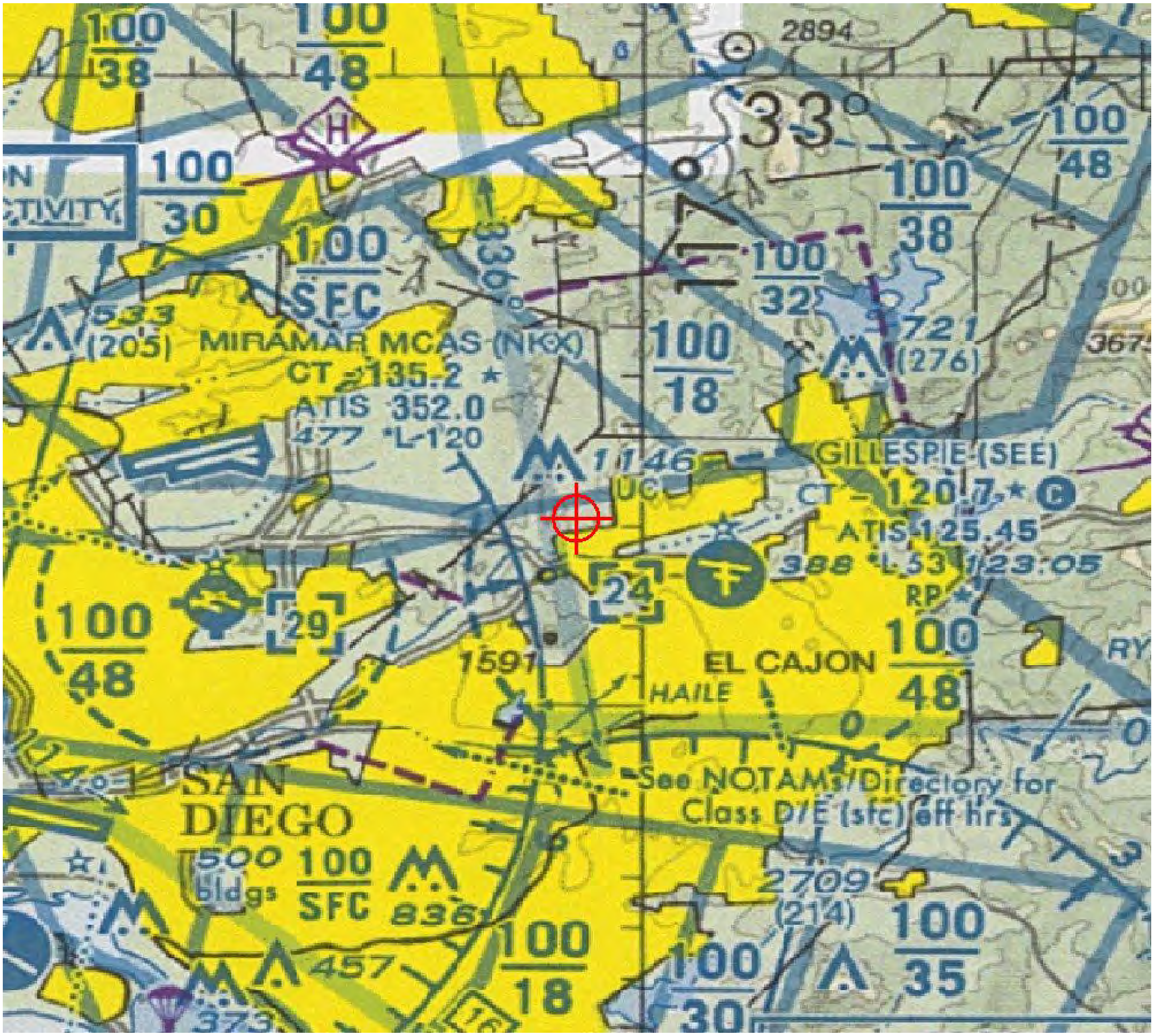
Case Description for ASN 2011-AWP-8428-OE

transmission line towers for Quail Brush generation site - Alt Route

Verified Map for ASN 2011-AWP-8428-OE



Sectional Map for ASN 2011-AWP-8428-OE



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Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8429-OE

Issued Date: 01/18/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Pole 18
Location:	San Diego, CA
Latitude:	32-51-08.39N NAD 83
Longitude:	117-01-13.12W
Heights:	661 feet site elevation (SE) 90 feet above ground level (AGL) 751 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

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Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

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(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8429-OE.

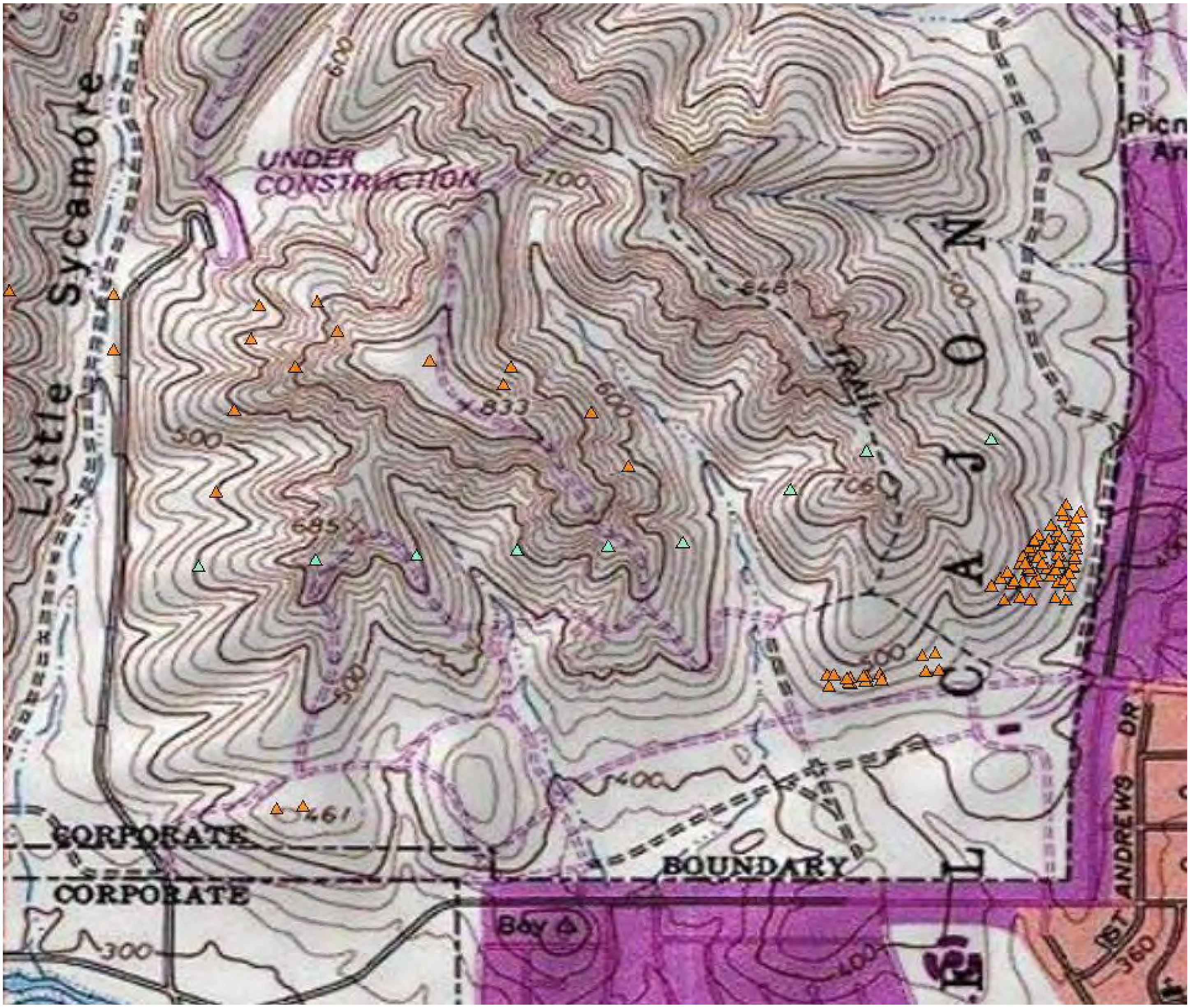
Signature Control No: 155420798-157406496 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

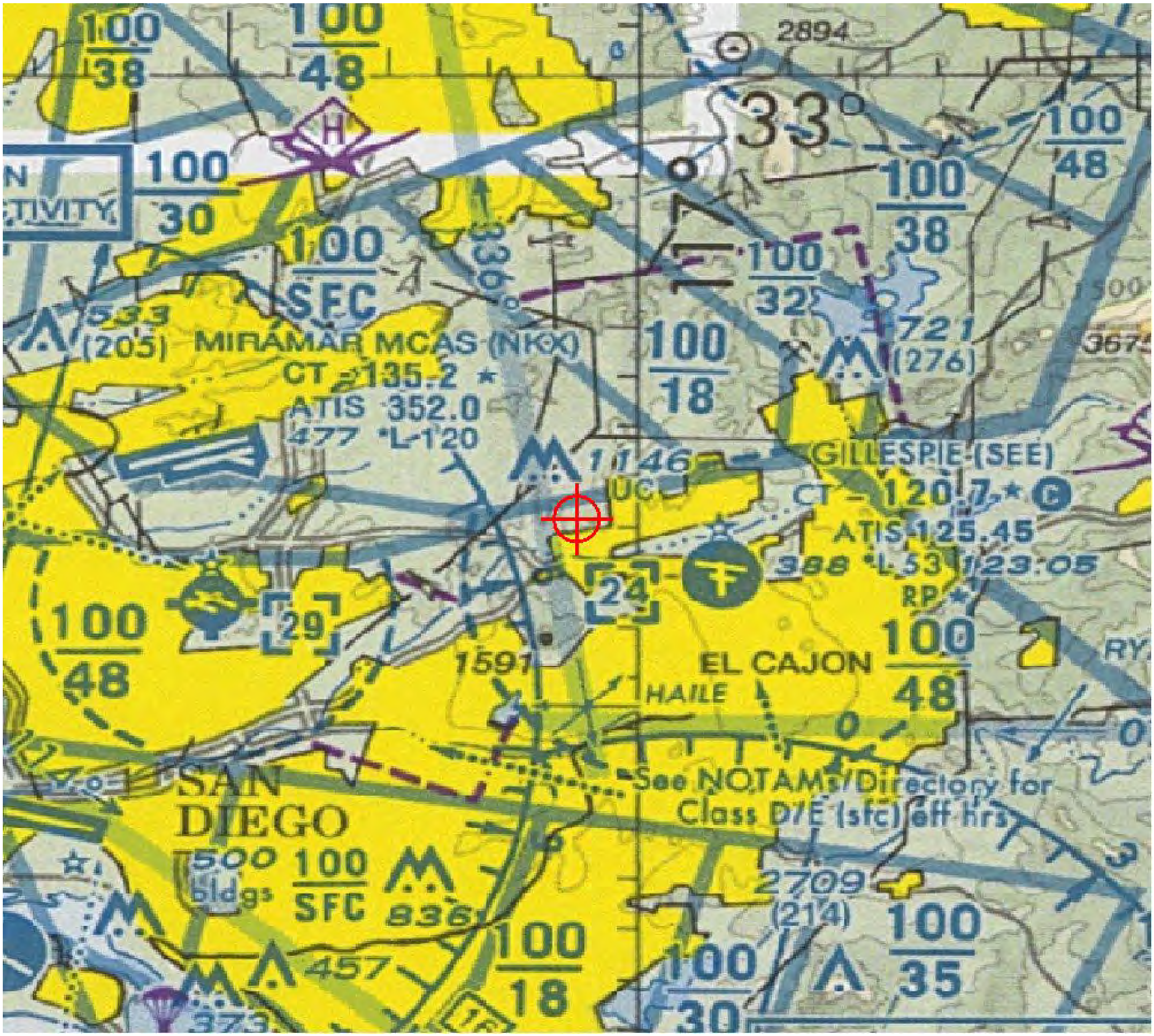
Case Description for ASN 2011-AWP-8429-OE

transmission line towers for Quail Brush generation site - Alt Route

Verified Map for ASN 2011-AWP-8429-OE



Sectional Map for ASN 2011-AWP-8429-OE



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Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8430-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Pole 1
Location:	San Diego, CA
Latitude:	32-51-06.95N NAD 83
Longitude:	117-01-41.52W
Heights:	508 feet site elevation (SE) 90 feet above ground level (AGL) 598 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/05/2013 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

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This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8430-OE.

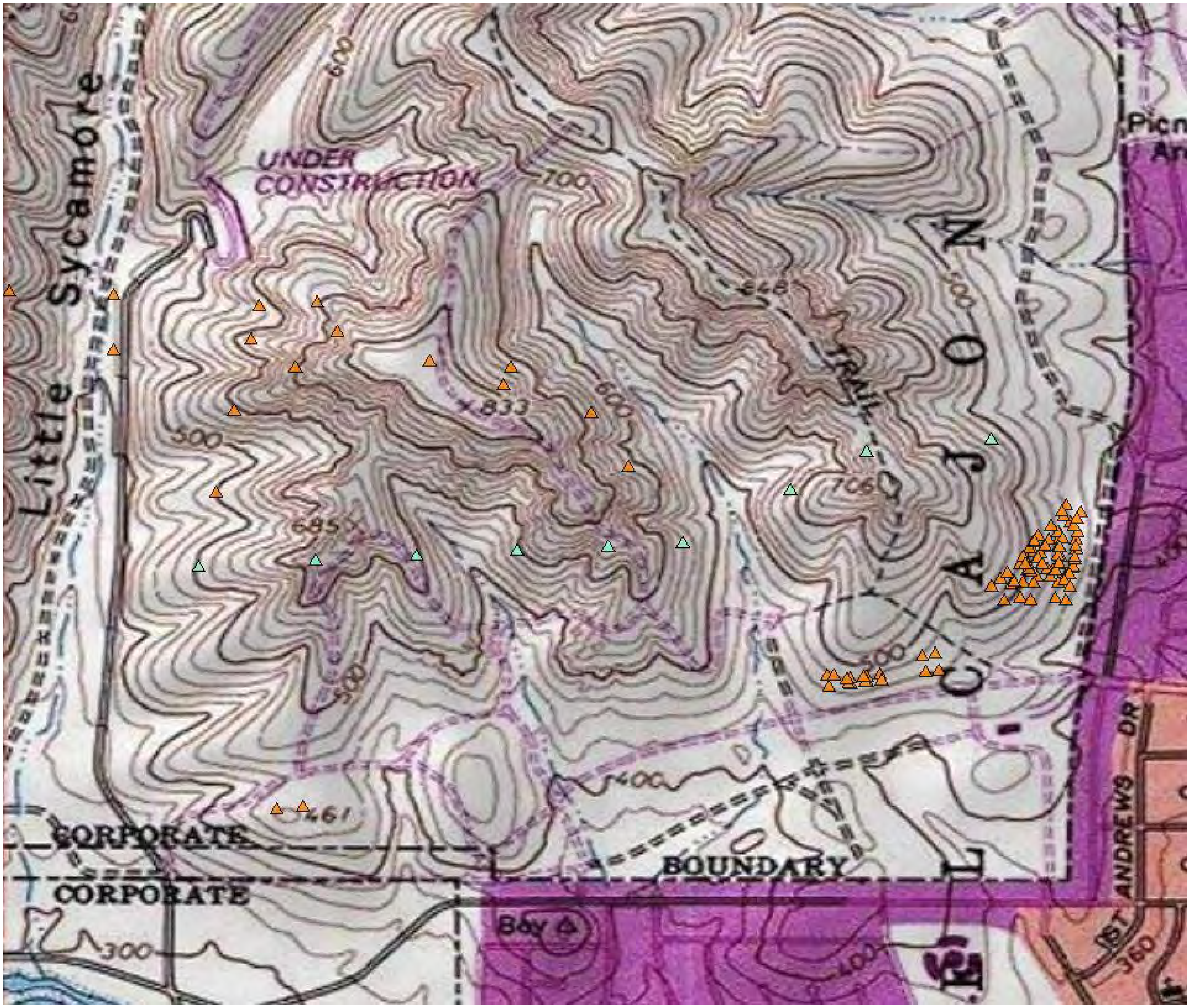
Signature Control No: 155420800-156197304 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

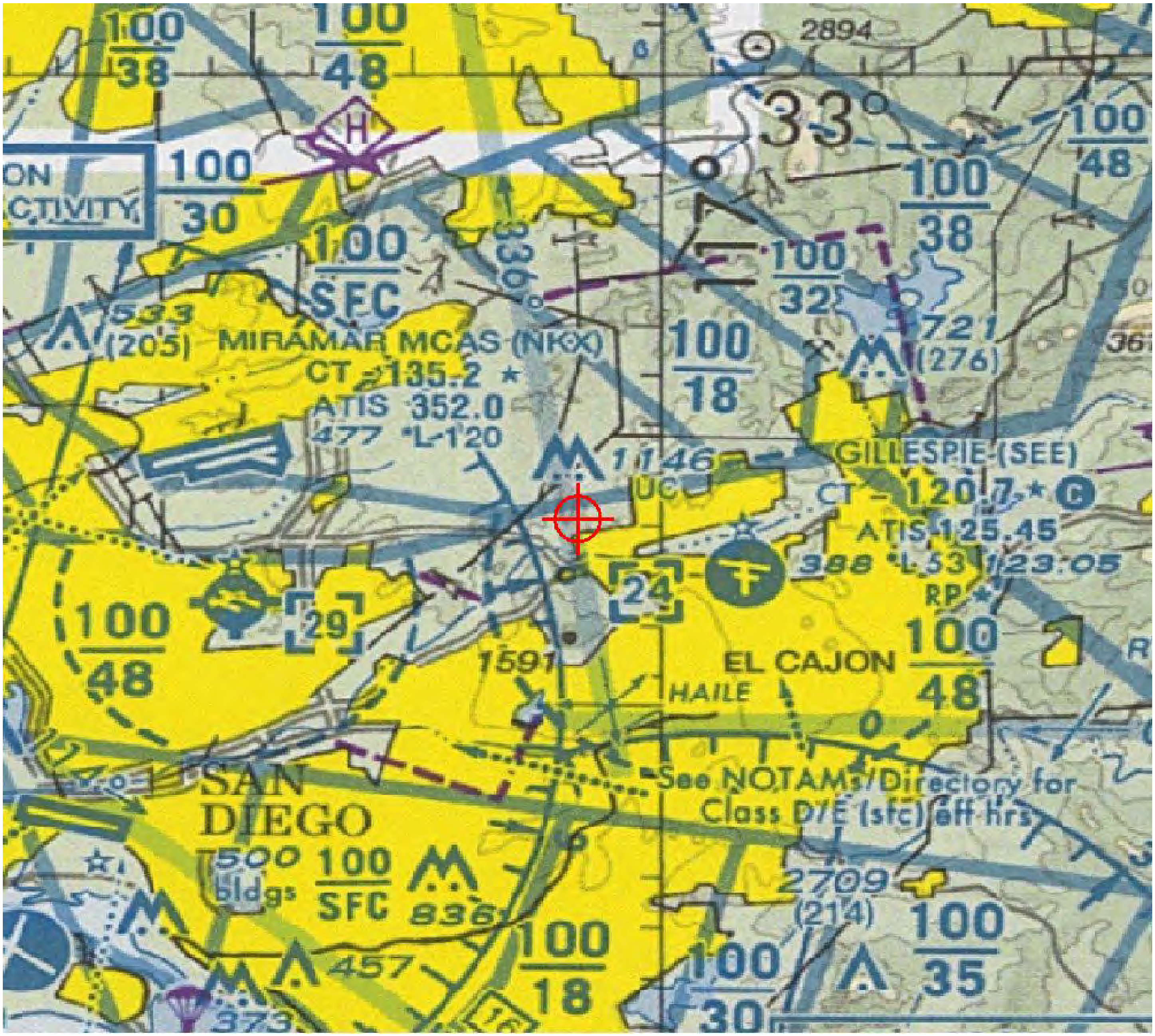
Case Description for ASN 2011-AWP-8430-OE

transmission line towers for Quail Brush Generation site

Verified Map for ASN 2011-AWP-8430-OE



Sectional Map for ASN 2011-AWP-8430-OE



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Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8431-OE

Issued Date: 01/18/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Pole 11
Location:	San Diego, CA
Latitude:	32-51-08.64N NAD 83
Longitude:	117-01-07.93W
Heights:	562 feet site elevation (SE) 90 feet above ground level (AGL) 652 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/18/2013 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

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This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8431-OE.

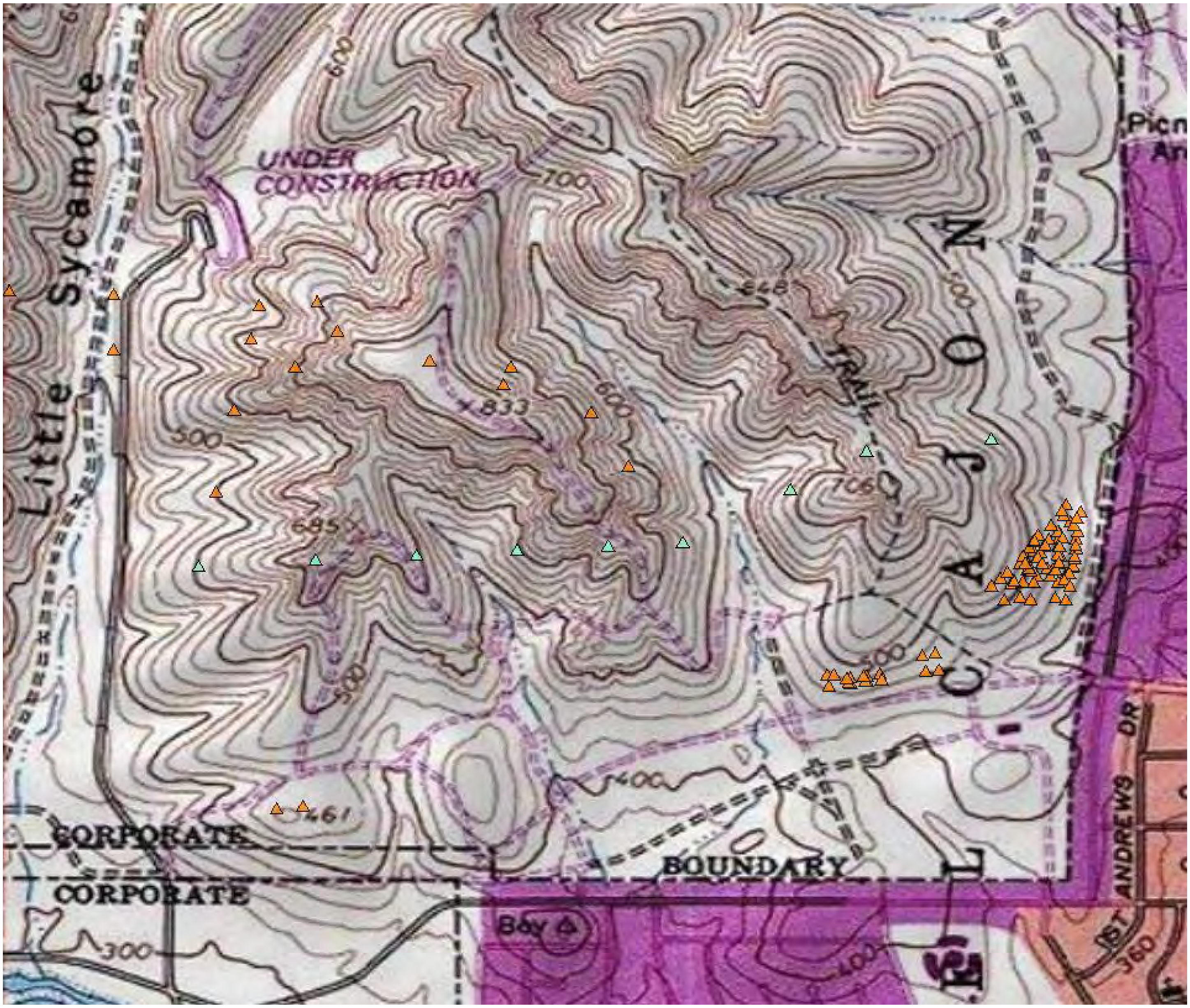
Signature Control No: 155420802-157406500 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

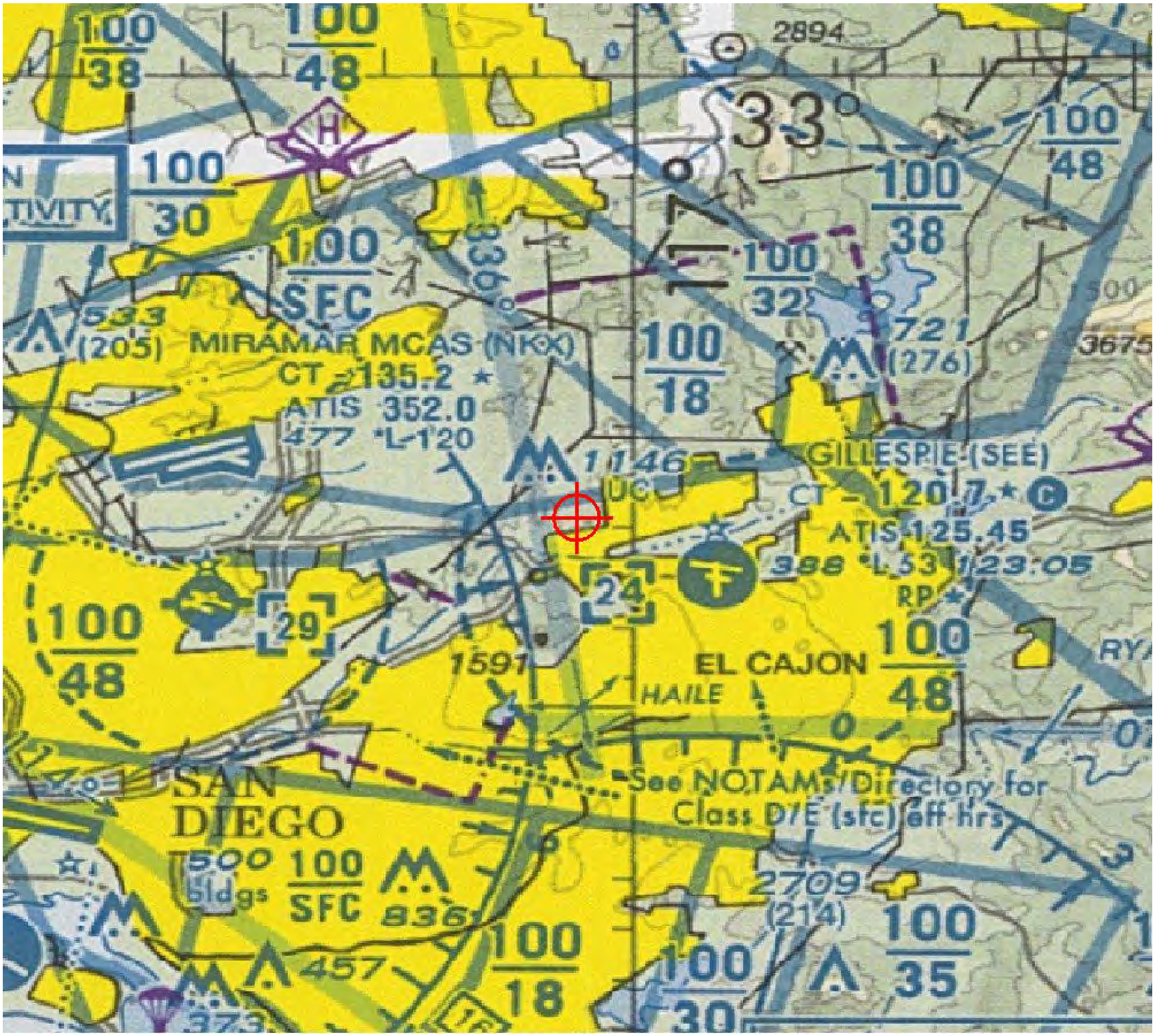
Case Description for ASN 2011-AWP-8431-OE

Transmission line towers for Quail Brush generation site

Verified Map for ASN 2011-AWP-8431-OE



Sectional Map for ASN 2011-AWP-8431-OE



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Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8432-OE

Issued Date: 01/18/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Pole 12
Location:	San Diego, CA
Latitude:	32-51-12.31N NAD 83
Longitude:	117-01-00.48W
Heights:	590 feet site elevation (SE) 90 feet above ground level (AGL) 680 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/18/2013 unless:

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(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

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Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8432-OE.

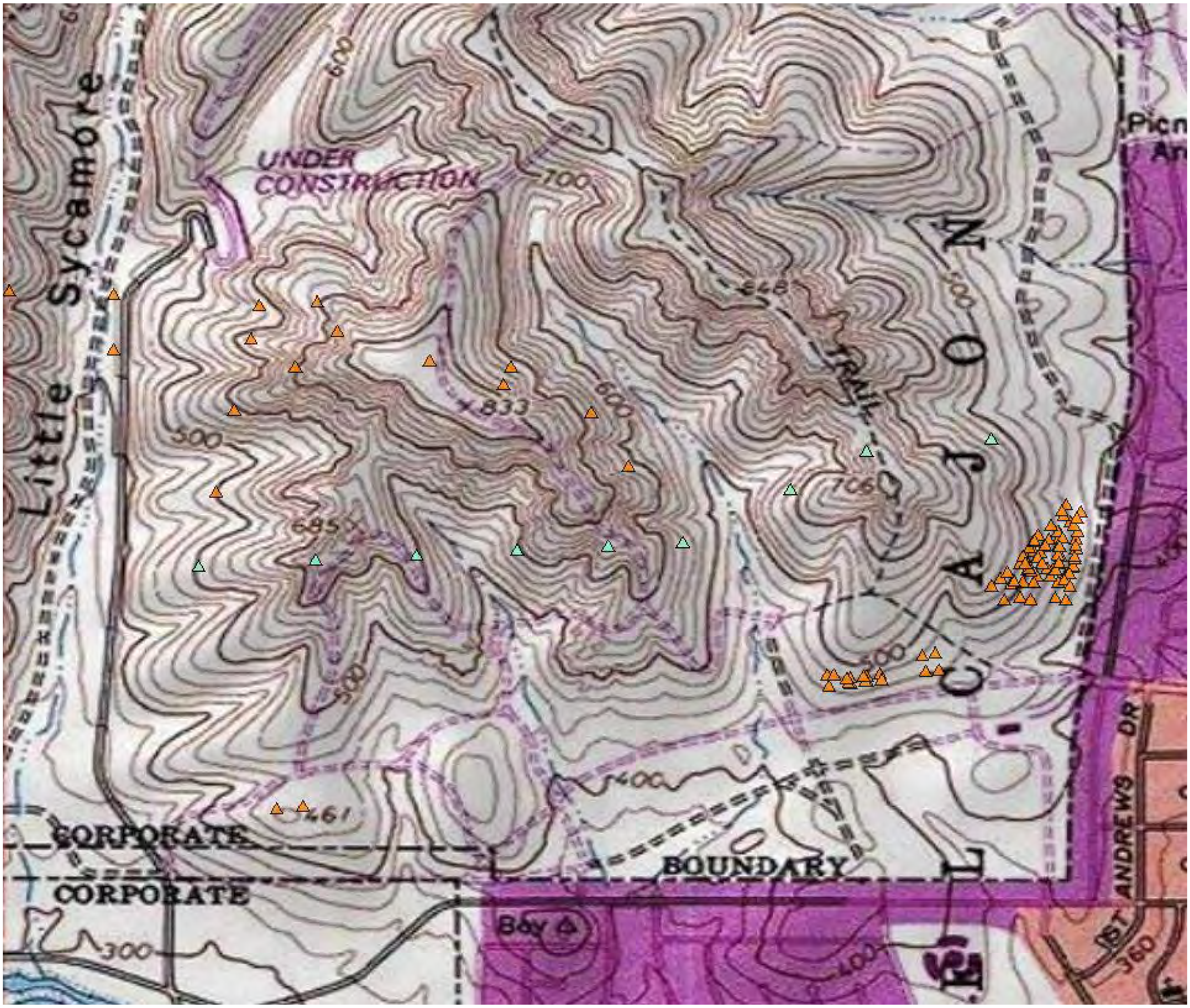
Signature Control No: 155420804-157406495 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

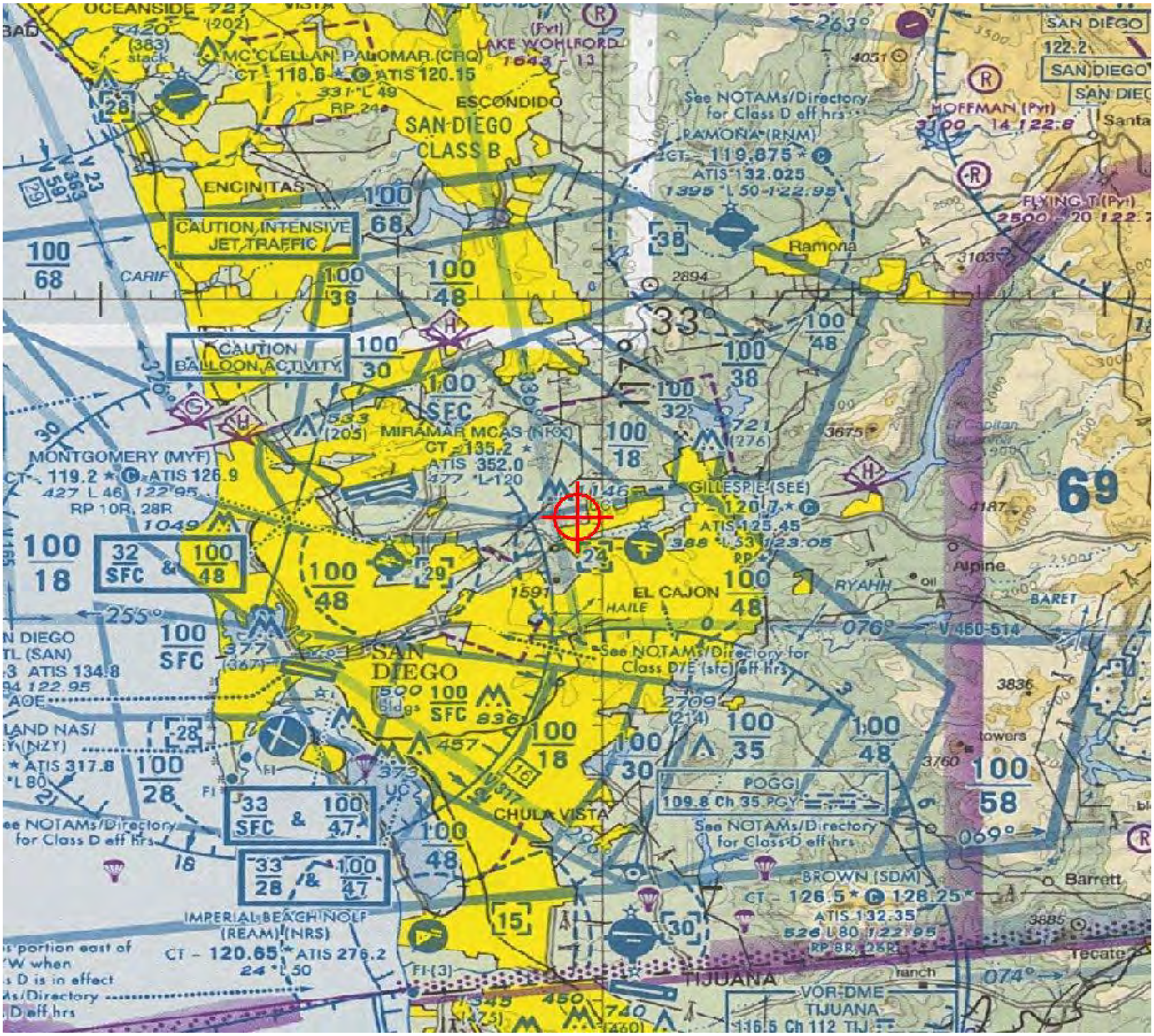
Case Description for ASN 2011-AWP-8432-OE

Transmission line towers for Quail Brush Solar photovoltaic system

Verified Map for ASN 2011-AWP-8432-OE



Sectional Map for ASN 2011-AWP-8432-OE



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2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8433-OE

Issued Date: 01/18/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Pole 13
Location:	San Diego, CA
Latitude:	32-51-14.98N NAD 83
Longitude:	117-00-55.20W
Heights:	684 feet site elevation (SE) 90 feet above ground level (AGL) 774 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

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If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8433-OE.

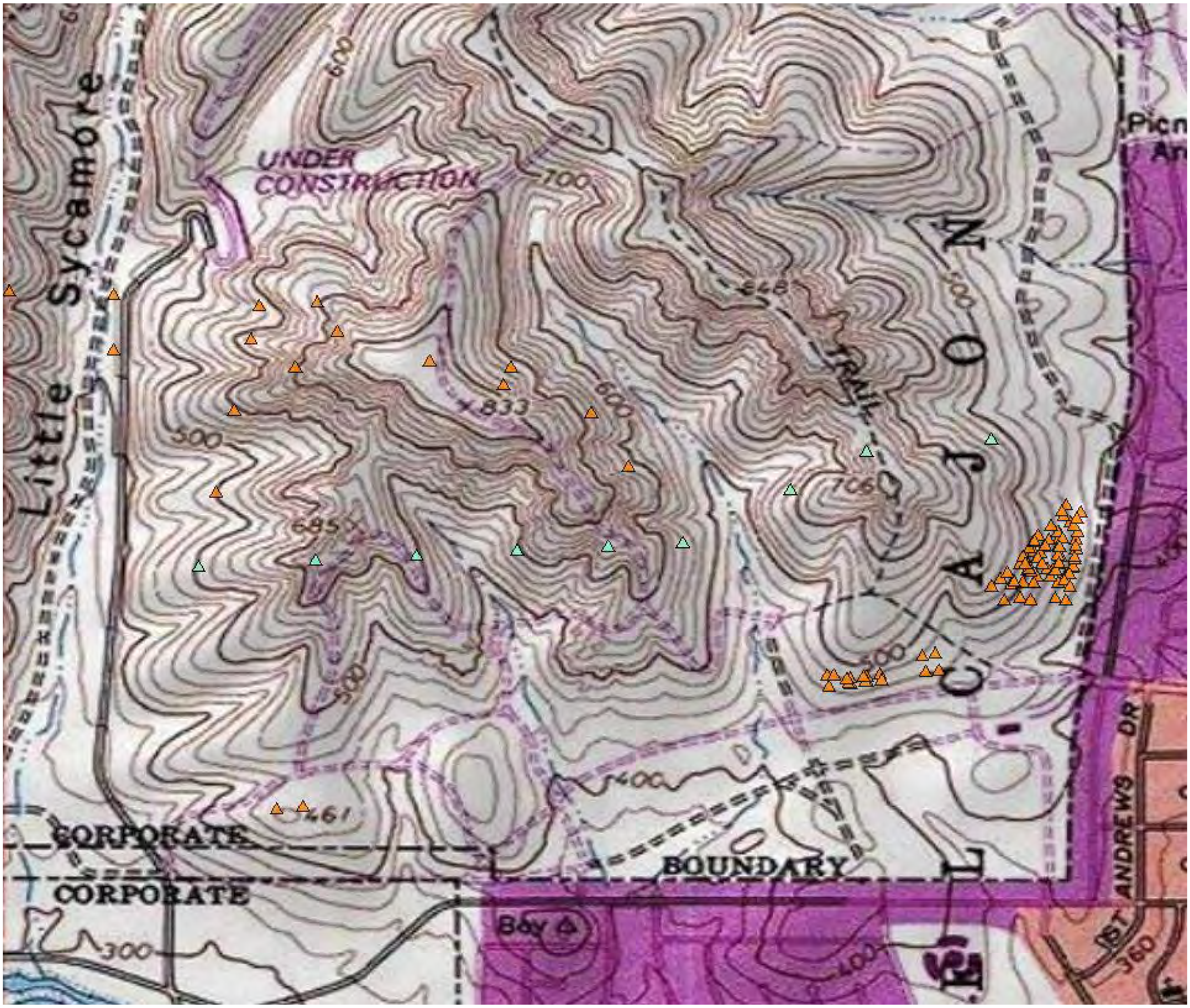
Signature Control No: 155420806-157406498 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

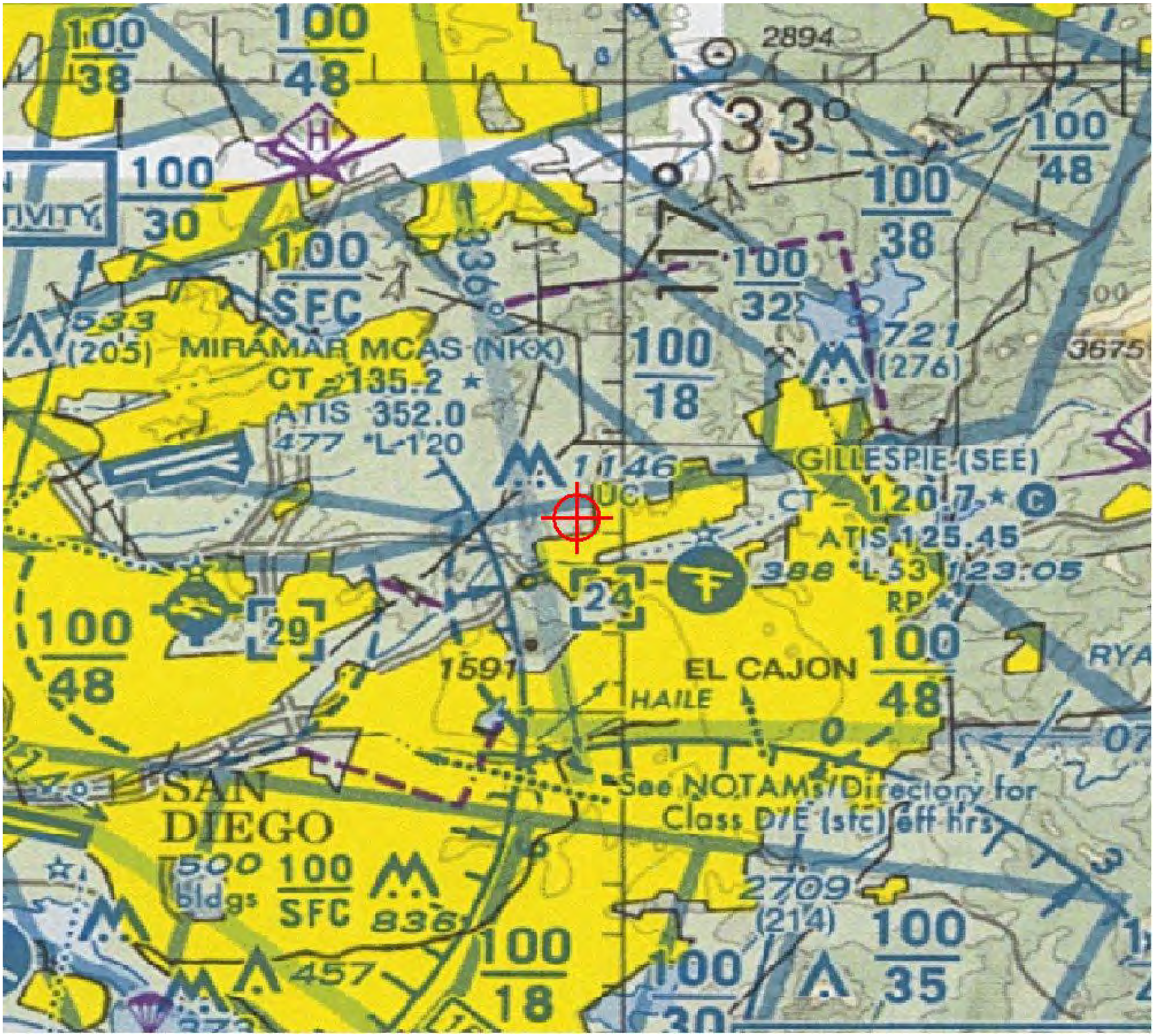
Case Description for ASN 2011-AWP-8433-OE

Transmission line towers for Quail Brush generation site

Verified Map for ASN 2011-AWP-8433-OE



Sectional Map for ASN 2011-AWP-8433-OE



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2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8434-OE

Issued Date: 01/18/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Transmission Line Pole 14
Location:	San Diego, CA
Latitude:	32-51-15.84N NAD 83
Longitude:	117-00-46.55W
Heights:	528 feet site elevation (SE)
	90 feet above ground level (AGL)
	618 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

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__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

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(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

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If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8434-OE.

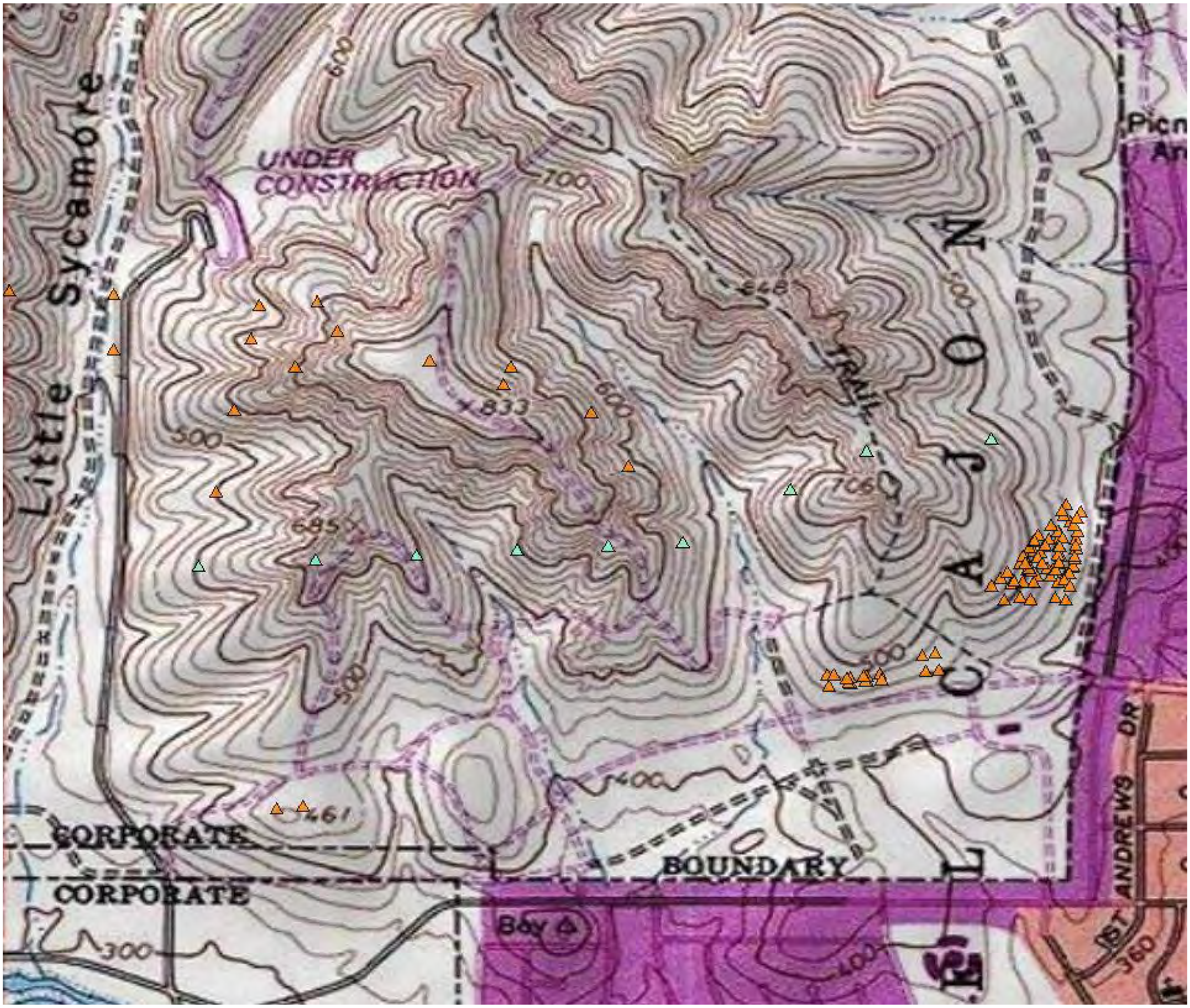
Signature Control No: 155420808-157406493 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

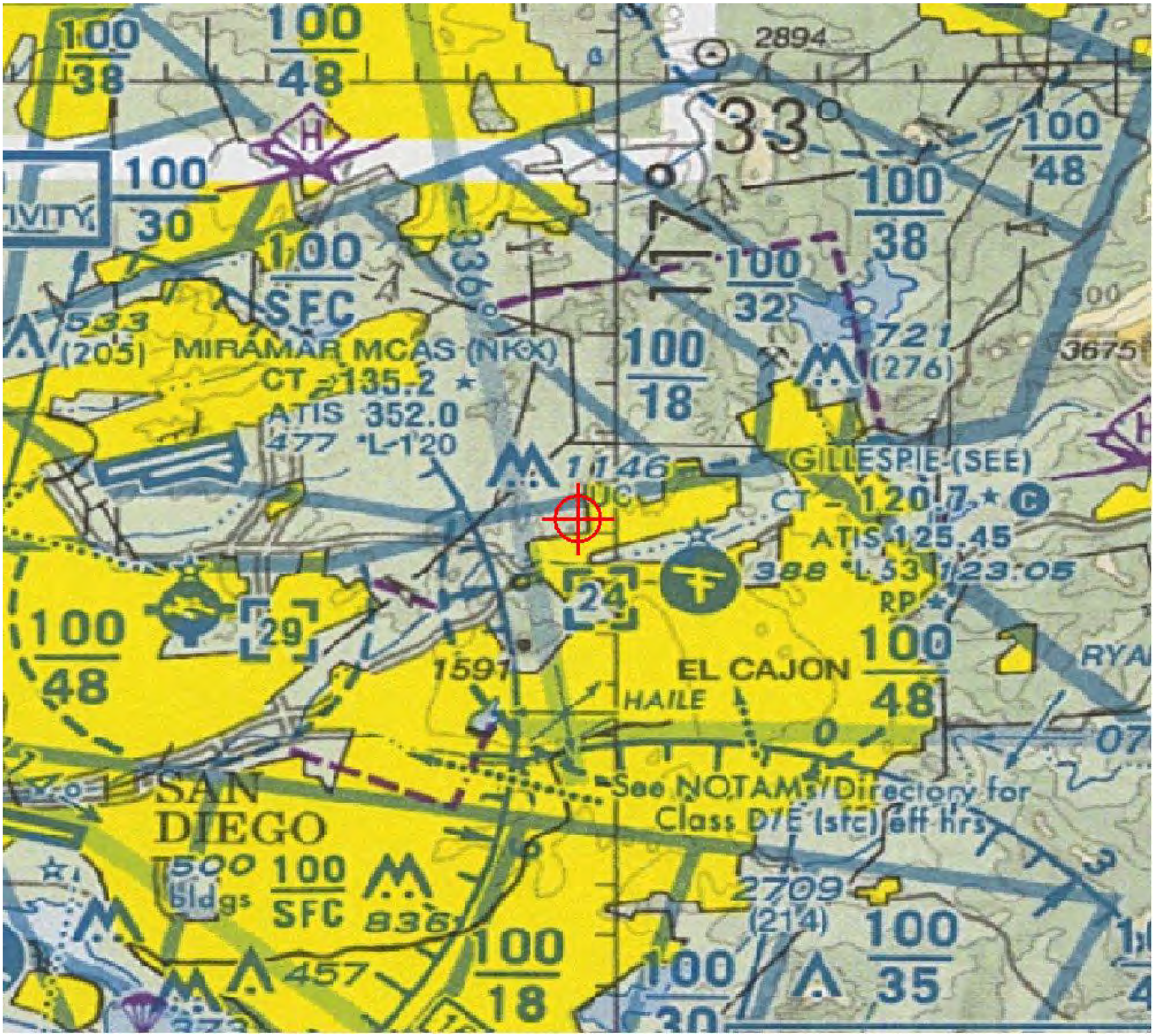
Case Description for ASN 2011-AWP-8434-OE

Transmission line towers for Quail Brush generation site

Verified Map for ASN 2011-AWP-8434-OE



Sectional Map for ASN 2011-AWP-8434-OE



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Southwest Regional Office
Obstruction Evaluation Group
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Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8435-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Stack Stack 1
Location:	San Diego, CA
Latitude:	32-51-03.31N NAD 83
Longitude:	117-01-44.00W
Heights:	465 feet site elevation (SE) 100 feet above ground level (AGL) 565 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

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__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

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NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

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This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8435-OE.

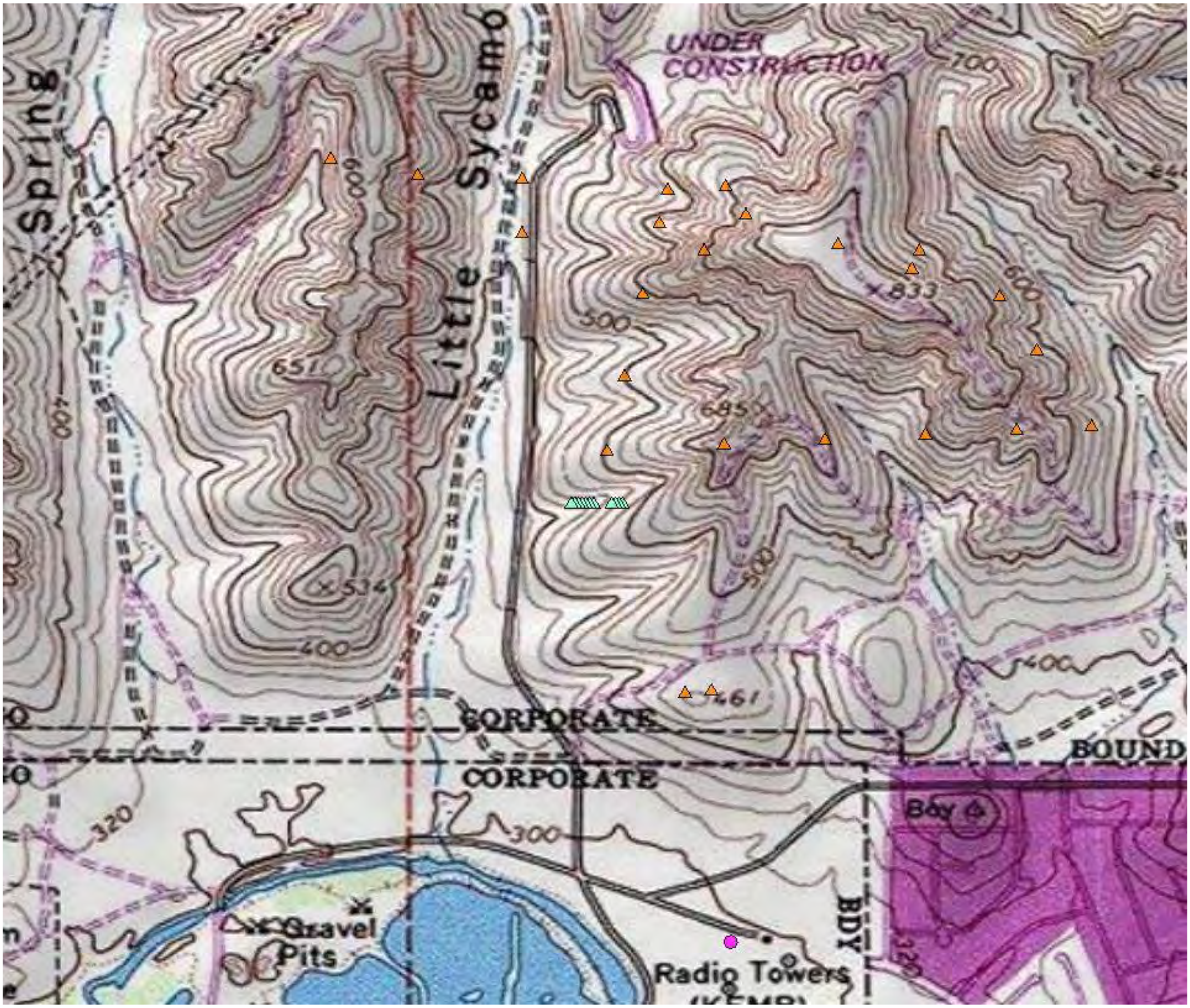
Signature Control No: 155420810-156197888 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

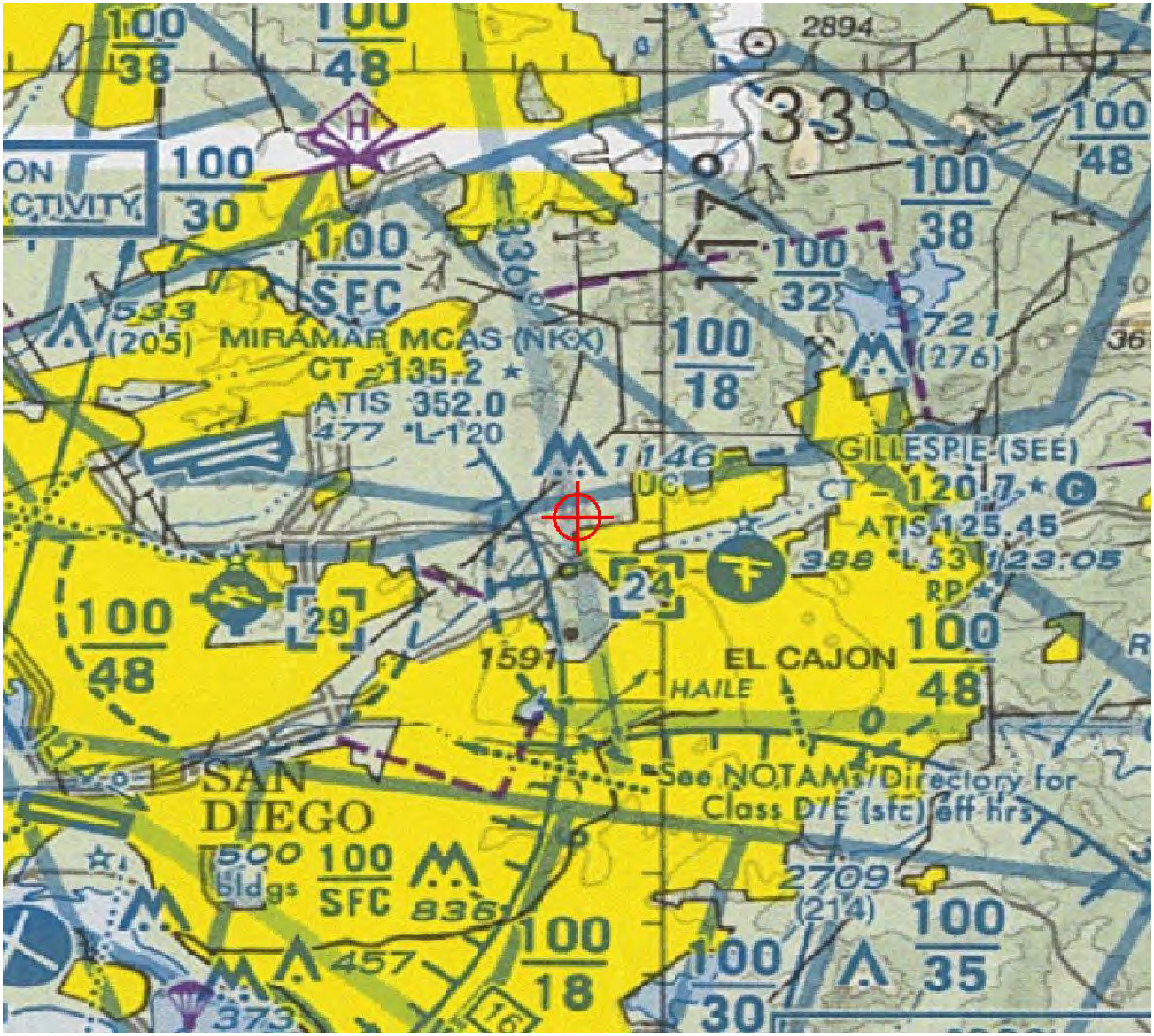
Case Description for ASN 2011-AWP-8435-OE

Stacks on power plant at Quail Brush Generation site

Verified Map for ASN 2011-AWP-8435-OE



Sectional Map for ASN 2011-AWP-8435-OE



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Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8436-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure: Stack Stack 2
Location: San Diego, CA
Latitude: 32-51-03.31N NAD 83
Longitude: 117-01-43.75W
Heights: 465 feet site elevation (SE)
100 feet above ground level (AGL)
565 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/05/2013 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8436-OE.

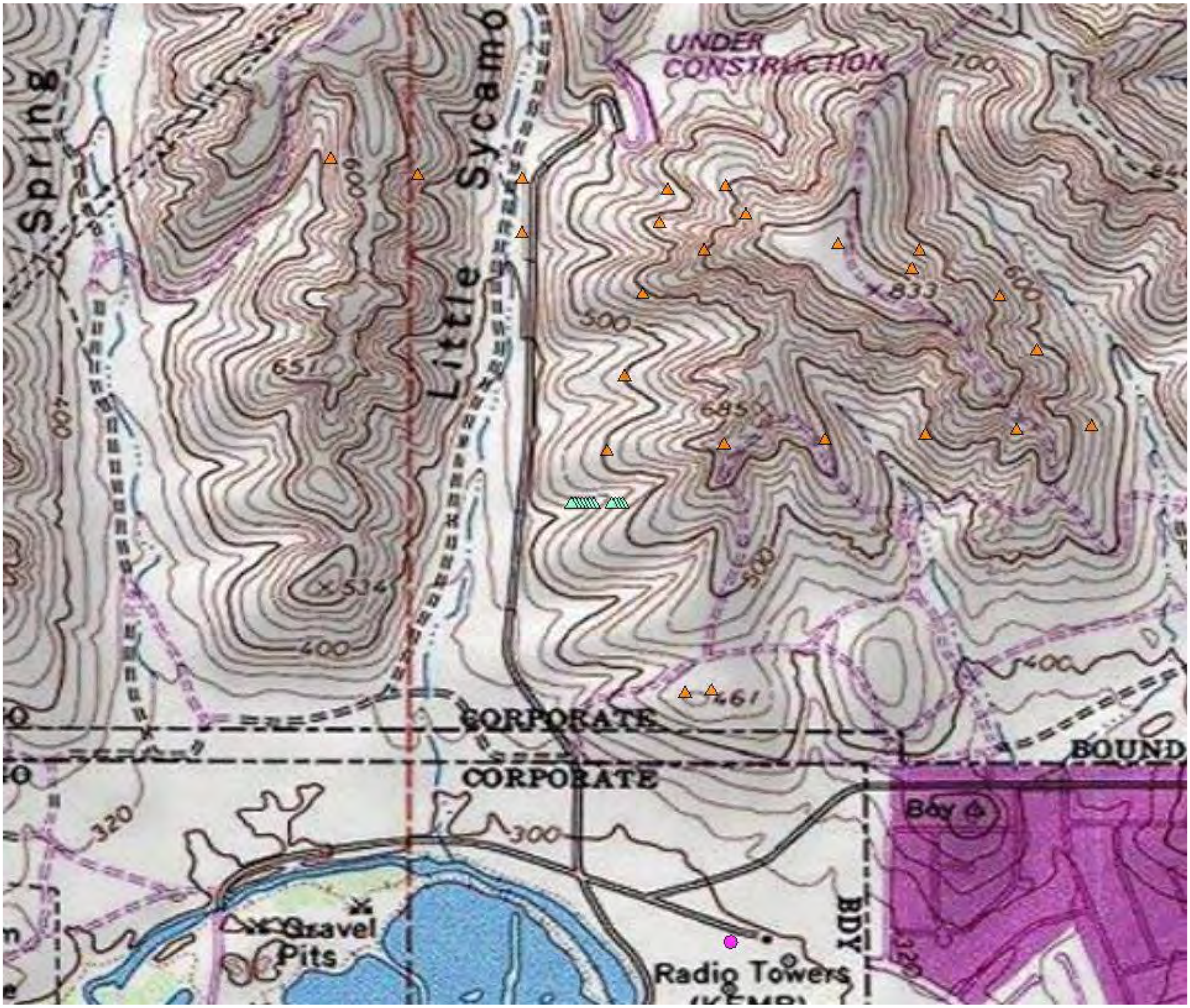
Signature Control No: 155420812-156197897 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

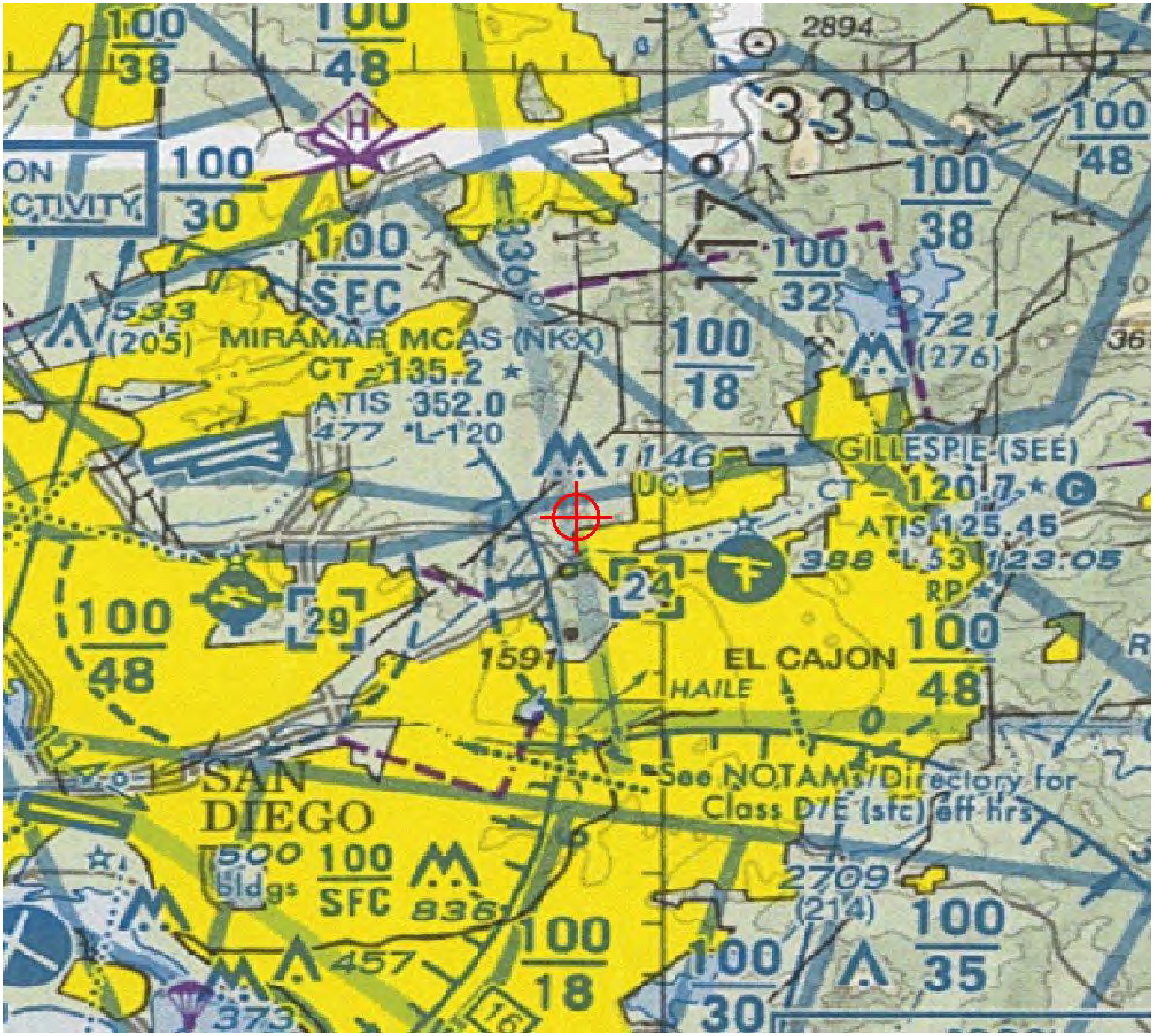
Case Description for ASN 2011-AWP-8436-OE

Stacks on power plant at Quail Brush Generation site

Verified Map for ASN 2011-AWP-8436-OE



Sectional Map for ASN 2011-AWP-8436-OE



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Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8437-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Stack Stack 3
Location:	San Diego, CA
Latitude:	32-51-03.31N NAD 83
Longitude:	117-01-43.50W
Heights:	465 feet site elevation (SE) 100 feet above ground level (AGL) 565 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/05/2013 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8437-OE.

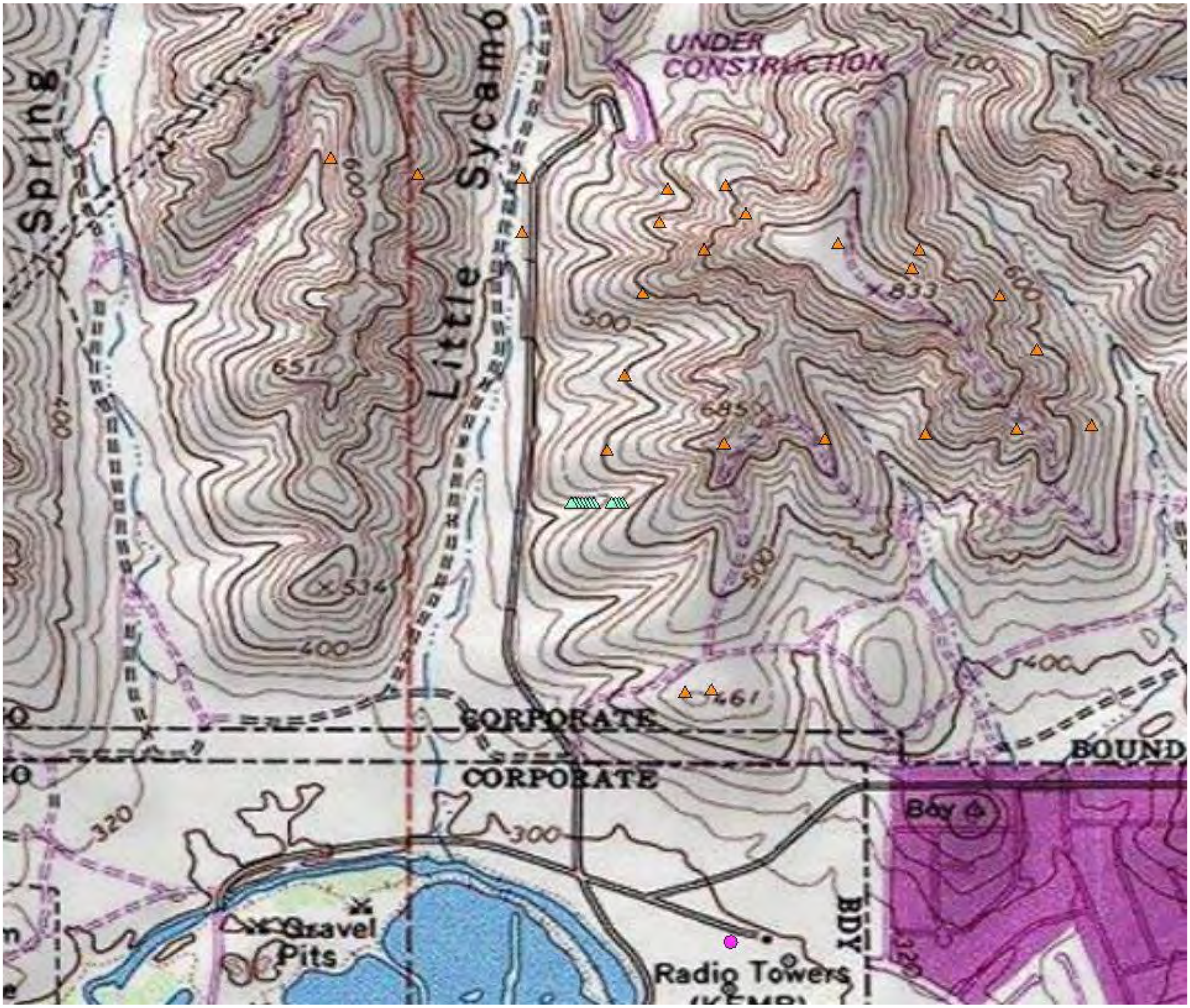
Signature Control No: 155420814-156197894 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

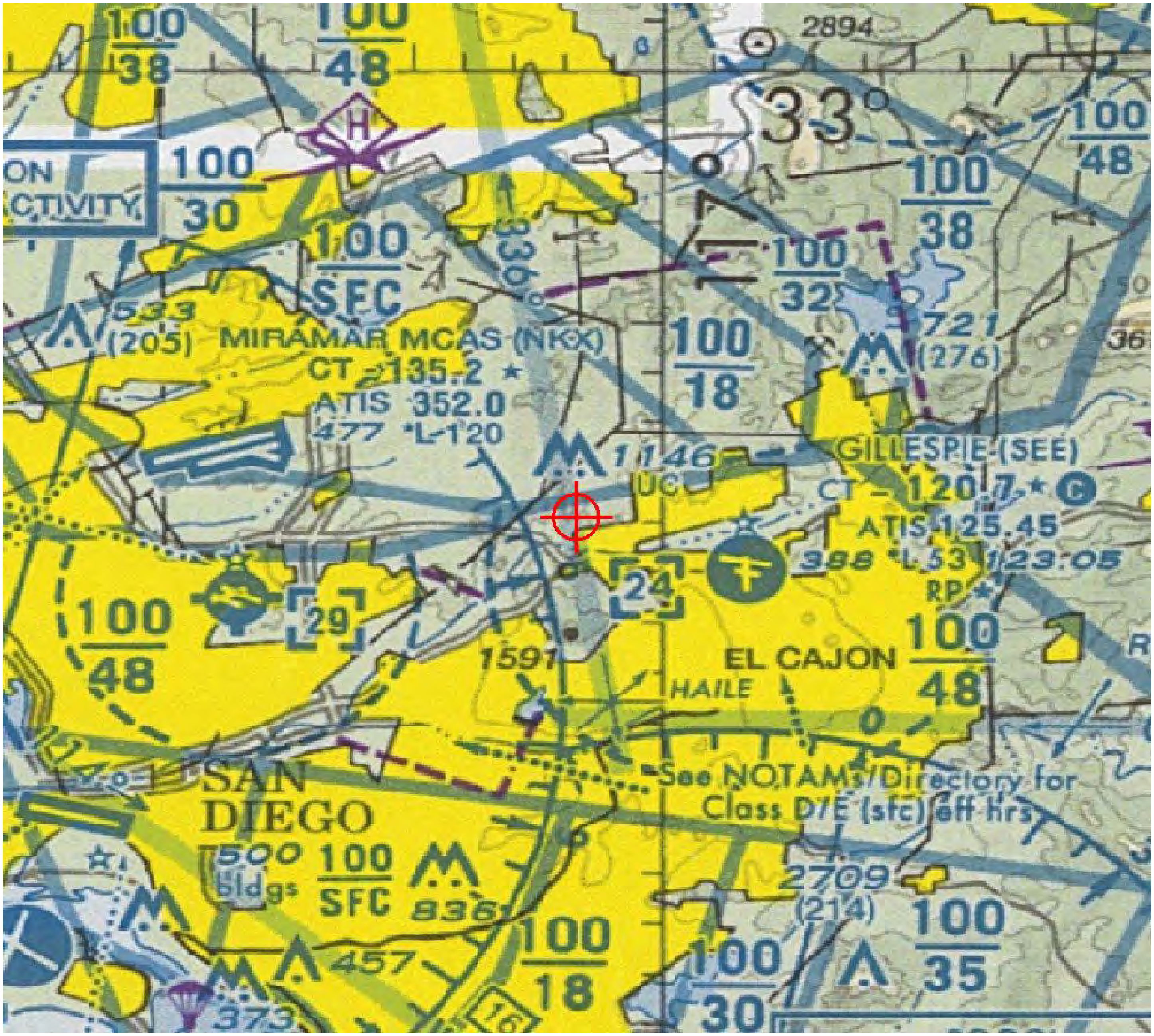
Case Description for ASN 2011-AWP-8437-OE

Stacks on power plant at Quail Brush Generation site

Verified Map for ASN 2011-AWP-8437-OE



Sectional Map for ASN 2011-AWP-8437-OE



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Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8438-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Stack Stack 4
Location:	San Diego, CA
Latitude:	32-51-03.31N NAD 83
Longitude:	117-01-43.25W
Heights:	465 feet site elevation (SE) 100 feet above ground level (AGL) 565 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/05/2013 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

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This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8438-OE.

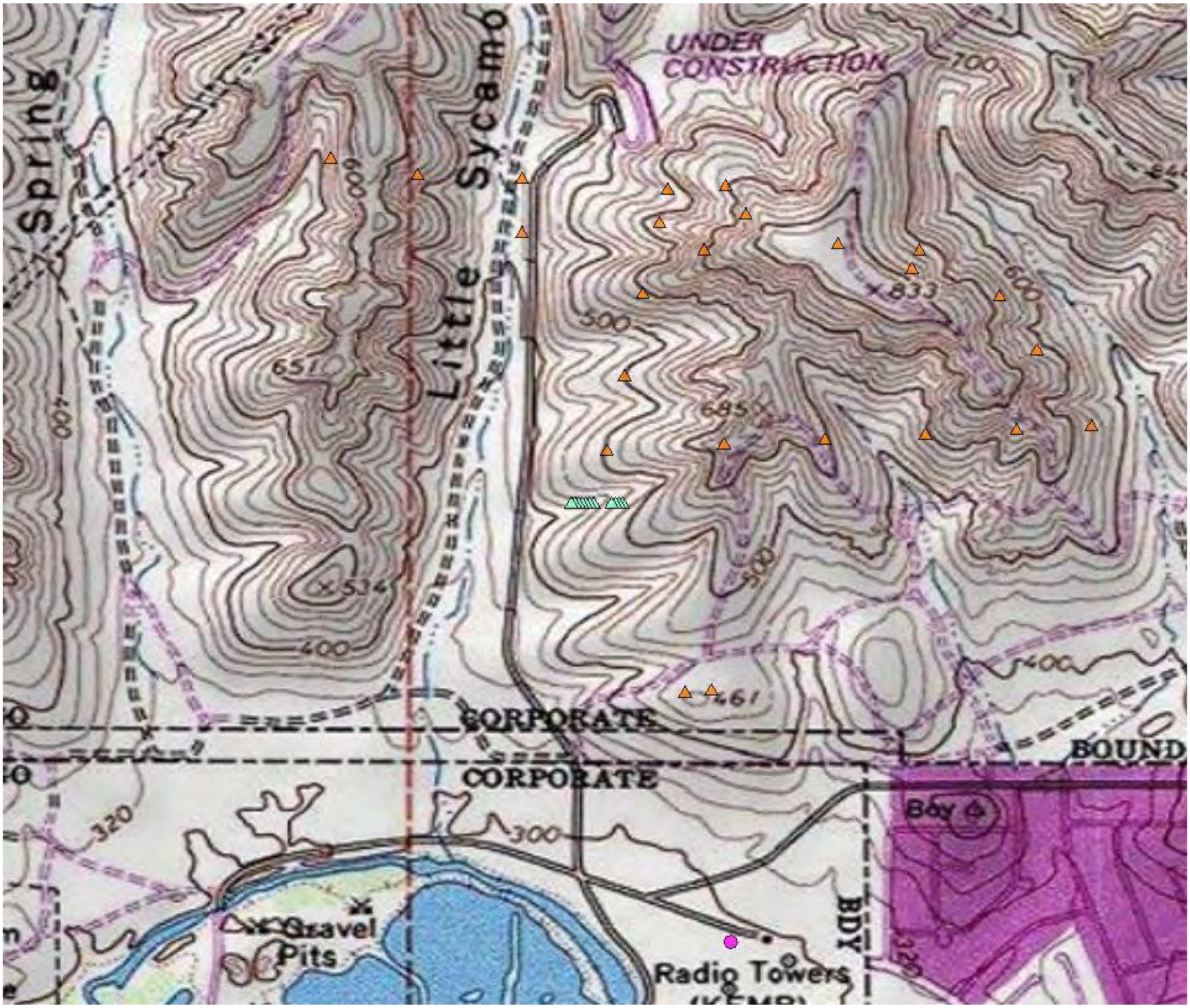
Signature Control No: 155420816-156197892 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

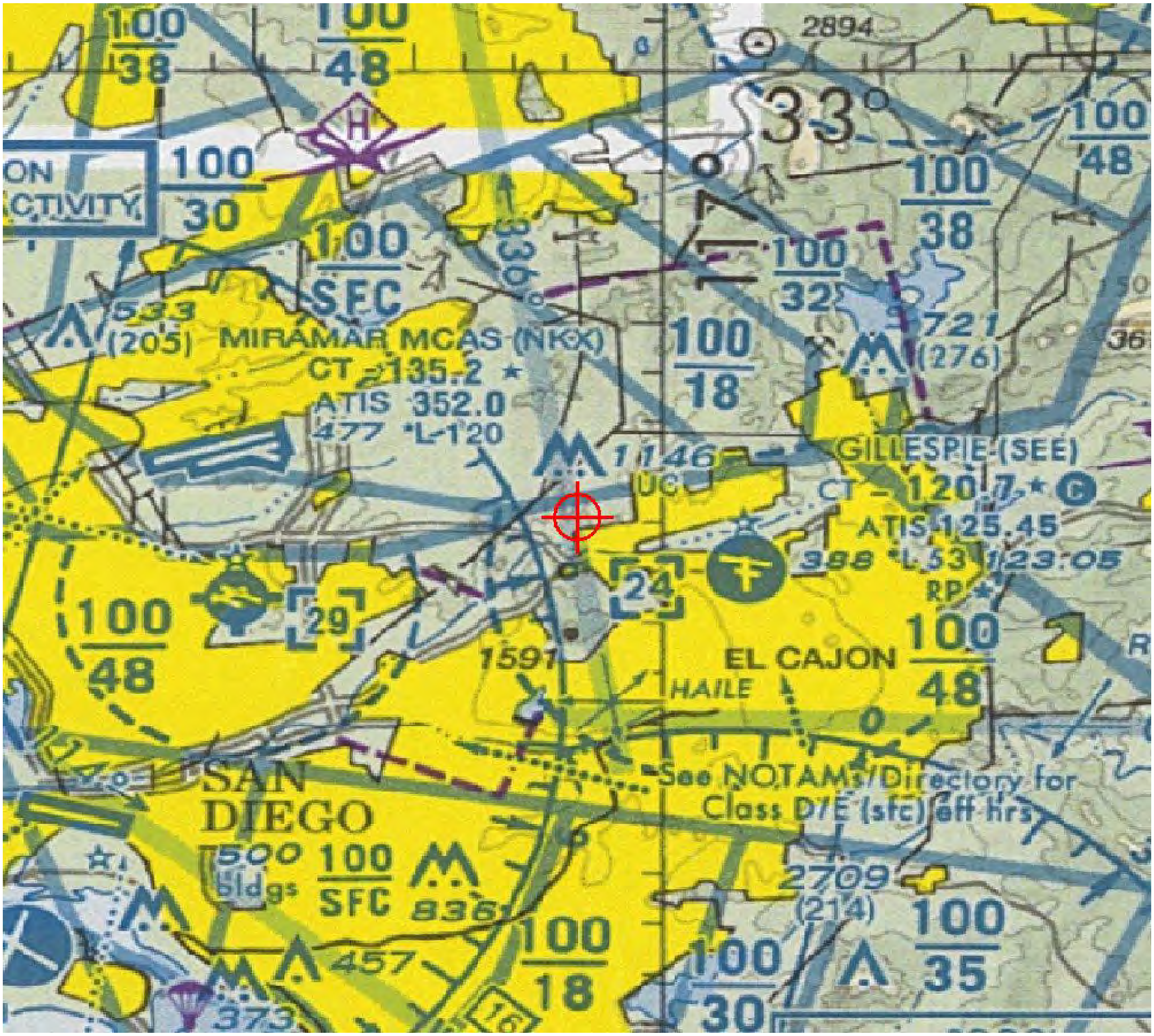
Case Description for ASN 2011-AWP-8438-OE

Stacks on power plant at Quail Brush Generation site

Verified Map for ASN 2011-AWP-8438-OE



Sectional Map for ASN 2011-AWP-8438-OE



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Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8439-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure: Stack Stack 5
Location: San Diego, CA
Latitude: 32-51-03.31N NAD 83
Longitude: 117-01-43.00W
Heights: 465 feet site elevation (SE)
100 feet above ground level (AGL)
565 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/05/2013 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

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Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8439-OE.

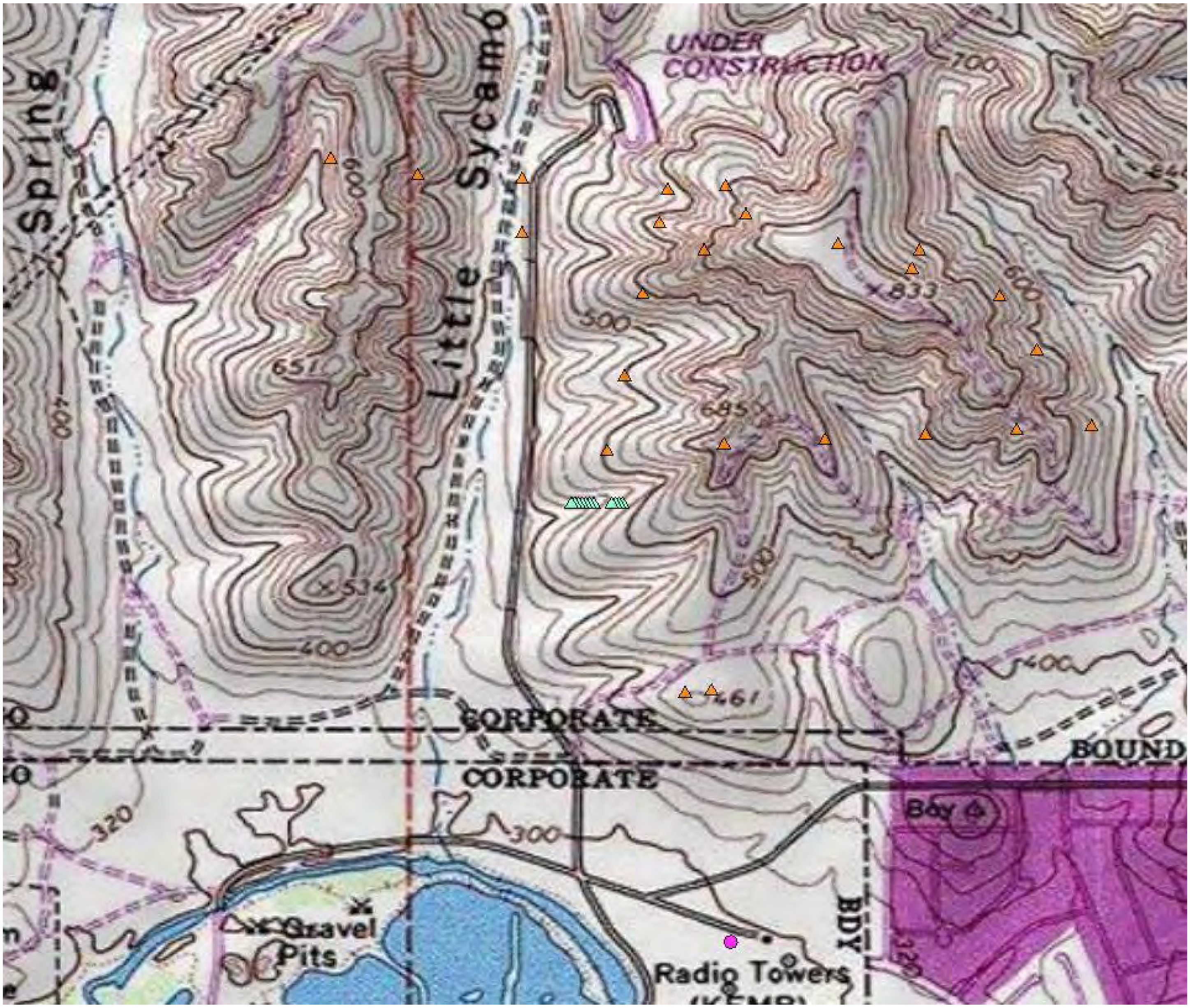
Signature Control No: 155420818-156197887 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

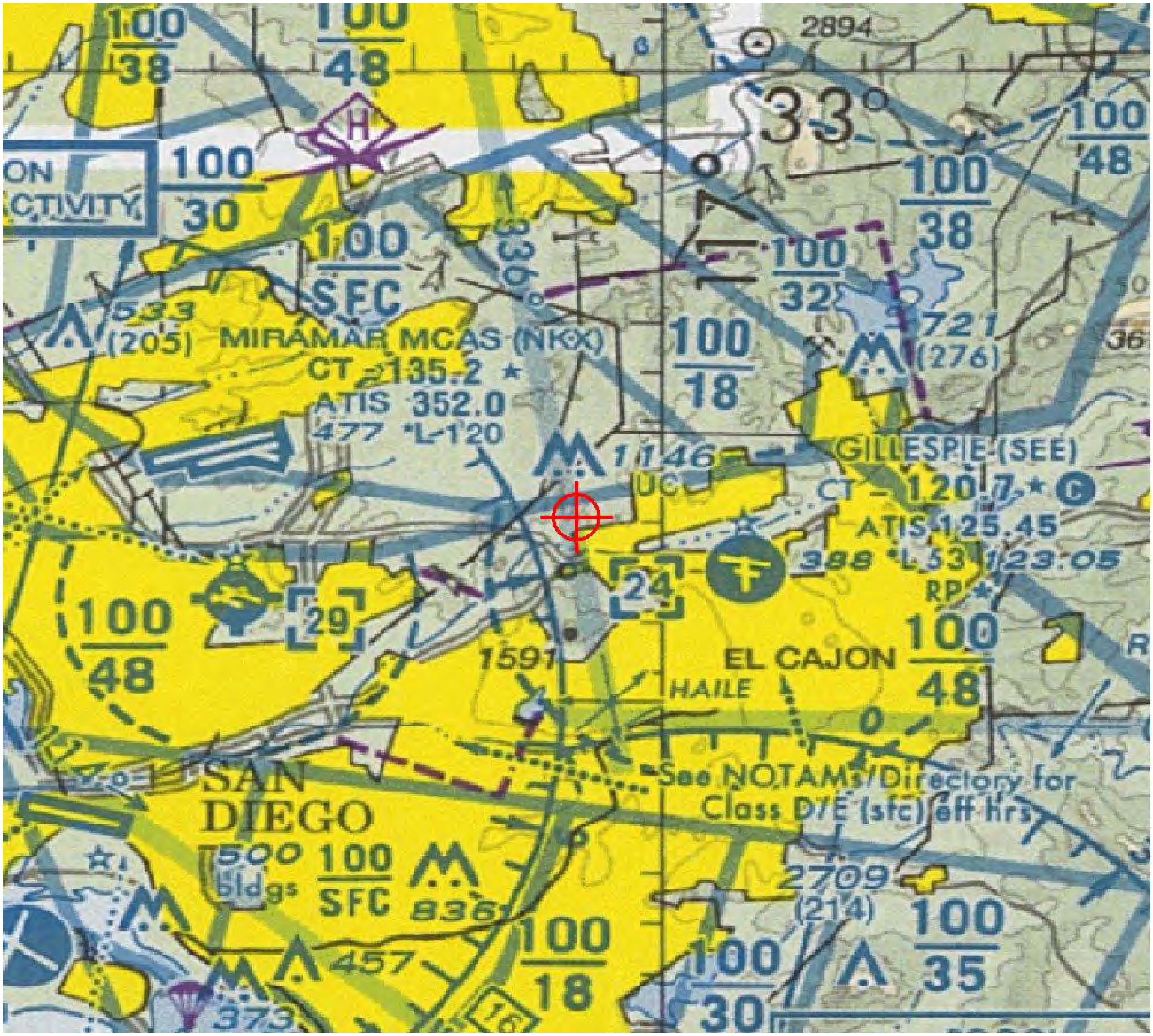
Case Description for ASN 2011-AWP-8439-OE

Stacks on power plant at Quail Brush Generation site

Verified Map for ASN 2011-AWP-8439-OE



Sectional Map for ASN 2011-AWP-8439-OE



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Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8440-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Stack Stack 6
Location:	San Diego, CA
Latitude:	32-51-03.31N NAD 83
Longitude:	117-01-42.74W
Heights:	465 feet site elevation (SE) 100 feet above ground level (AGL) 565 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/05/2013 unless:

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(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

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Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8440-OE.

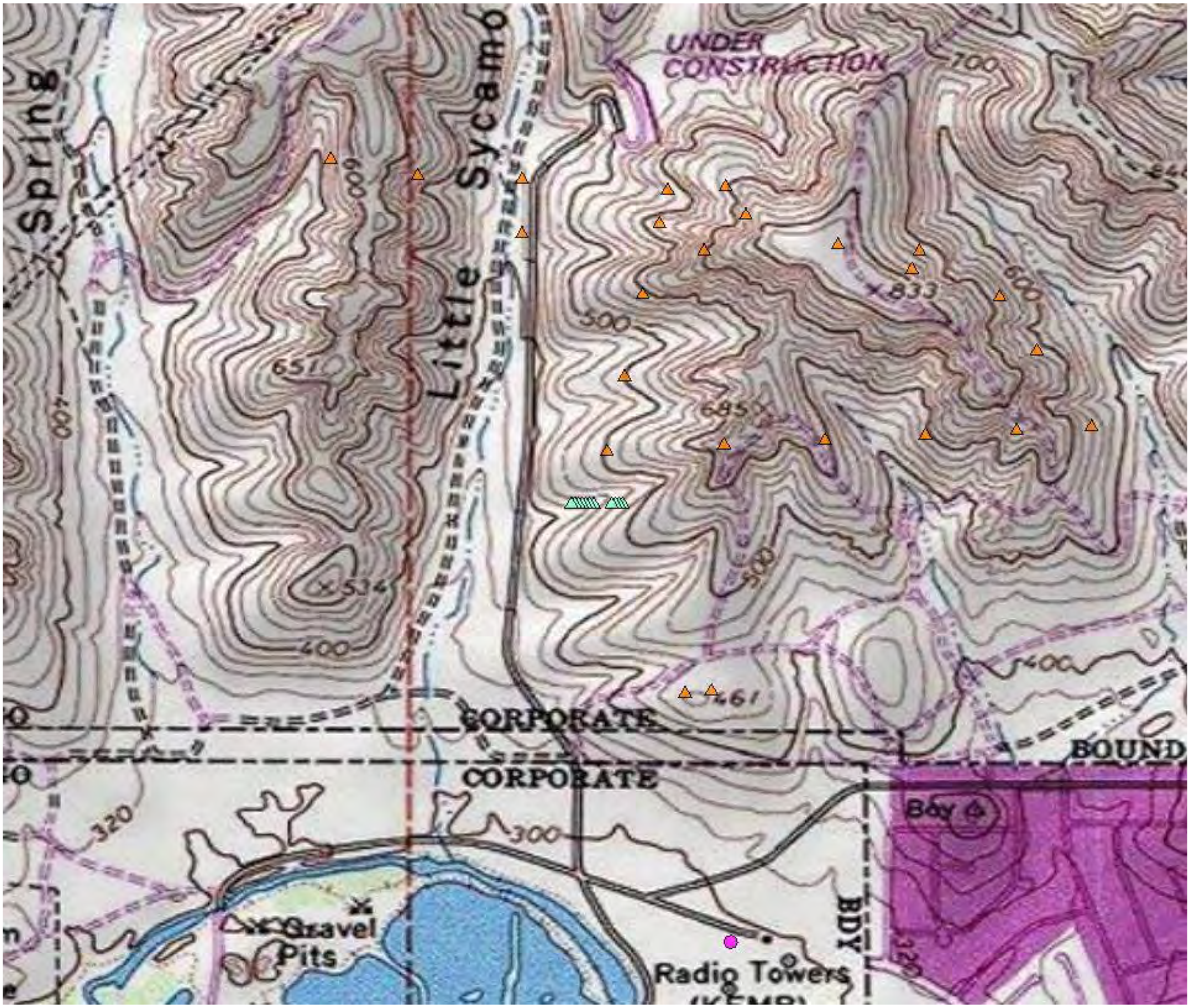
Signature Control No: 155420820-156197895 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

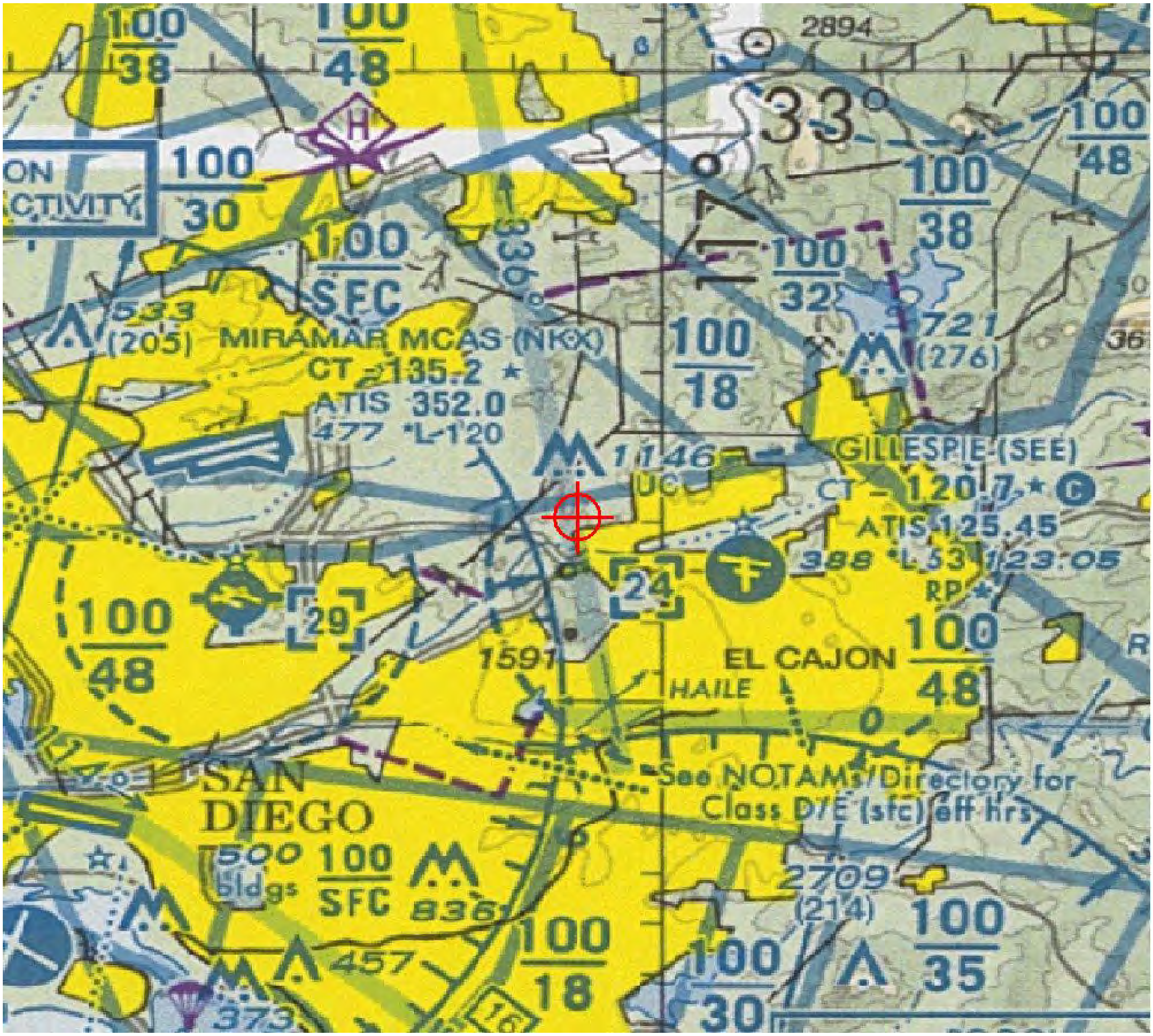
Case Description for ASN 2011-AWP-8440-OE

Stacks on power plant at Quail Brush Generation site

Verified Map for ASN 2011-AWP-8440-OE



Sectional Map for ASN 2011-AWP-8440-OE



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Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8441-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Stack Stack 7
Location:	San Diego, CA
Latitude:	32-51-03.31N NAD 83
Longitude:	117-01-42.45W
Heights:	465 feet site elevation (SE) 100 feet above ground level (AGL) 565 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/05/2013 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

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If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8441-OE.

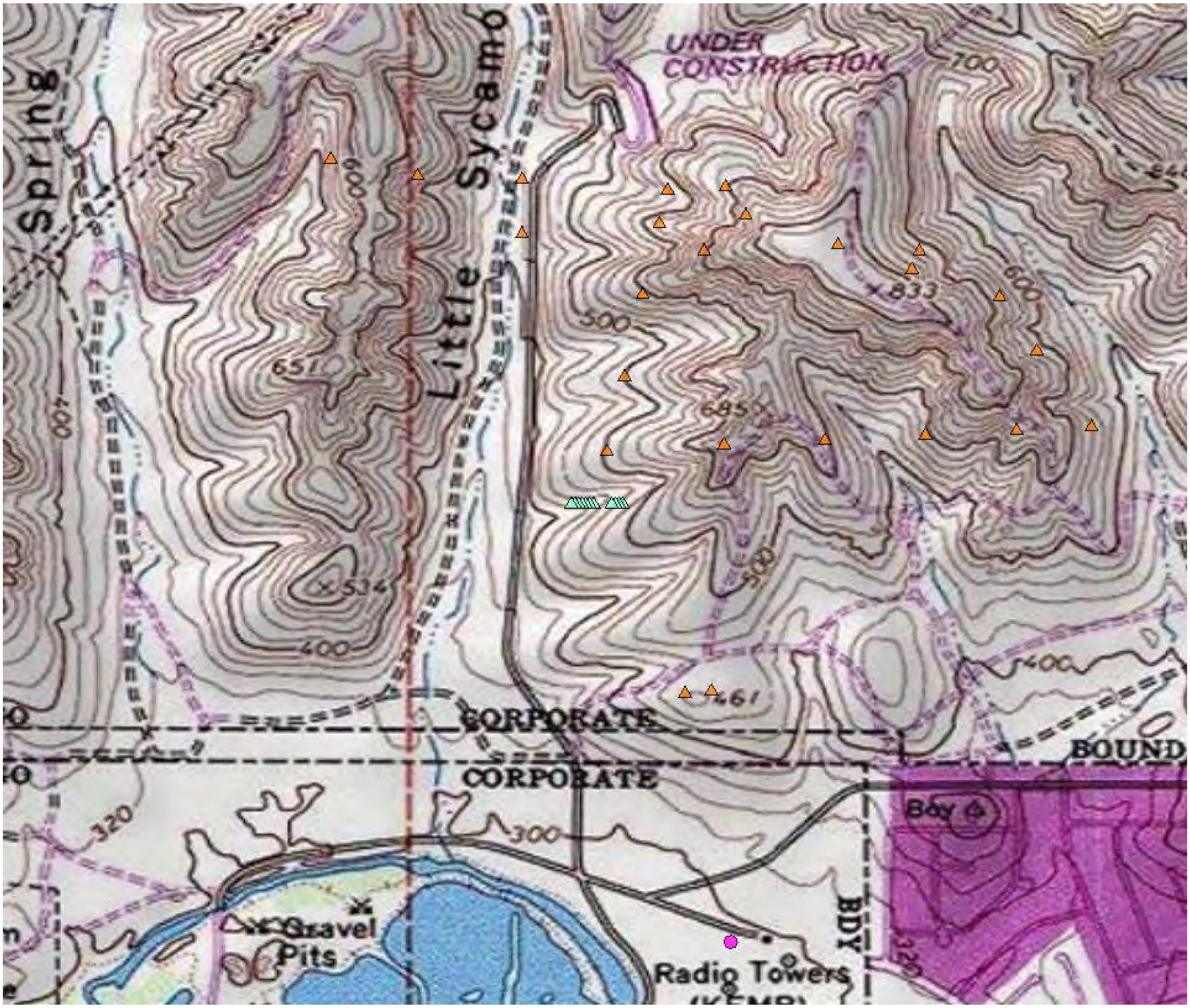
Signature Control No: 155420822-156197896 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

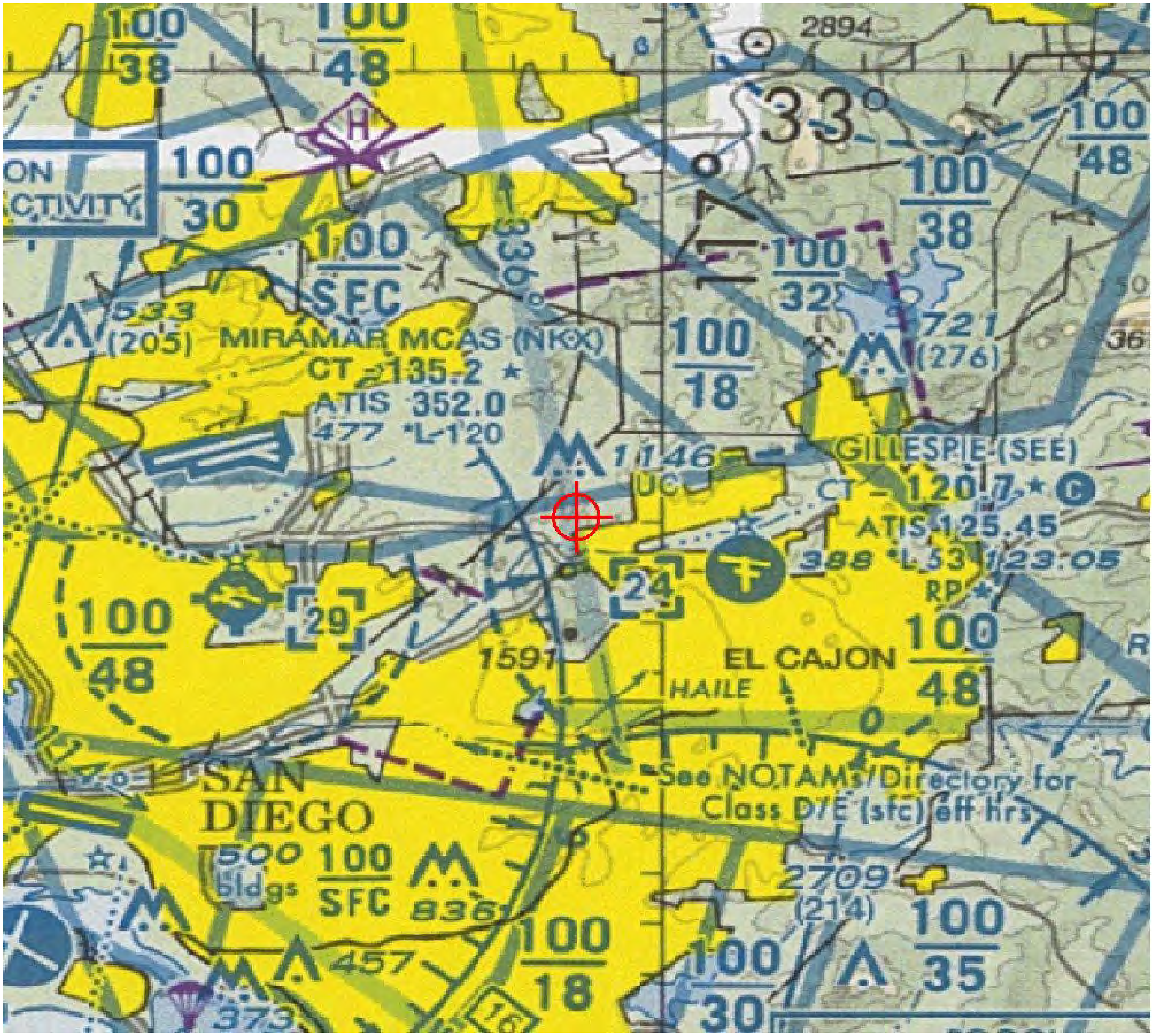
Case Description for ASN 2011-AWP-8441-OE

Stacks on power plant at Quail Brush Generation site

Verified Map for ASN 2011-AWP-8441-OE



Sectional Map for ASN 2011-AWP-8441-OE



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Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8442-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

** DETERMINATION OF NO HAZARD TO AIR NAVIGATION **

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Stack Stack 8
Location:	San Diego, CA
Latitude:	32-51-03.31N NAD 83
Longitude:	117-01-41.20W
Heights:	456 feet site elevation (SE) 100 feet above ground level (AGL) 556 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 07/05/2013 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

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Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8442-OE.

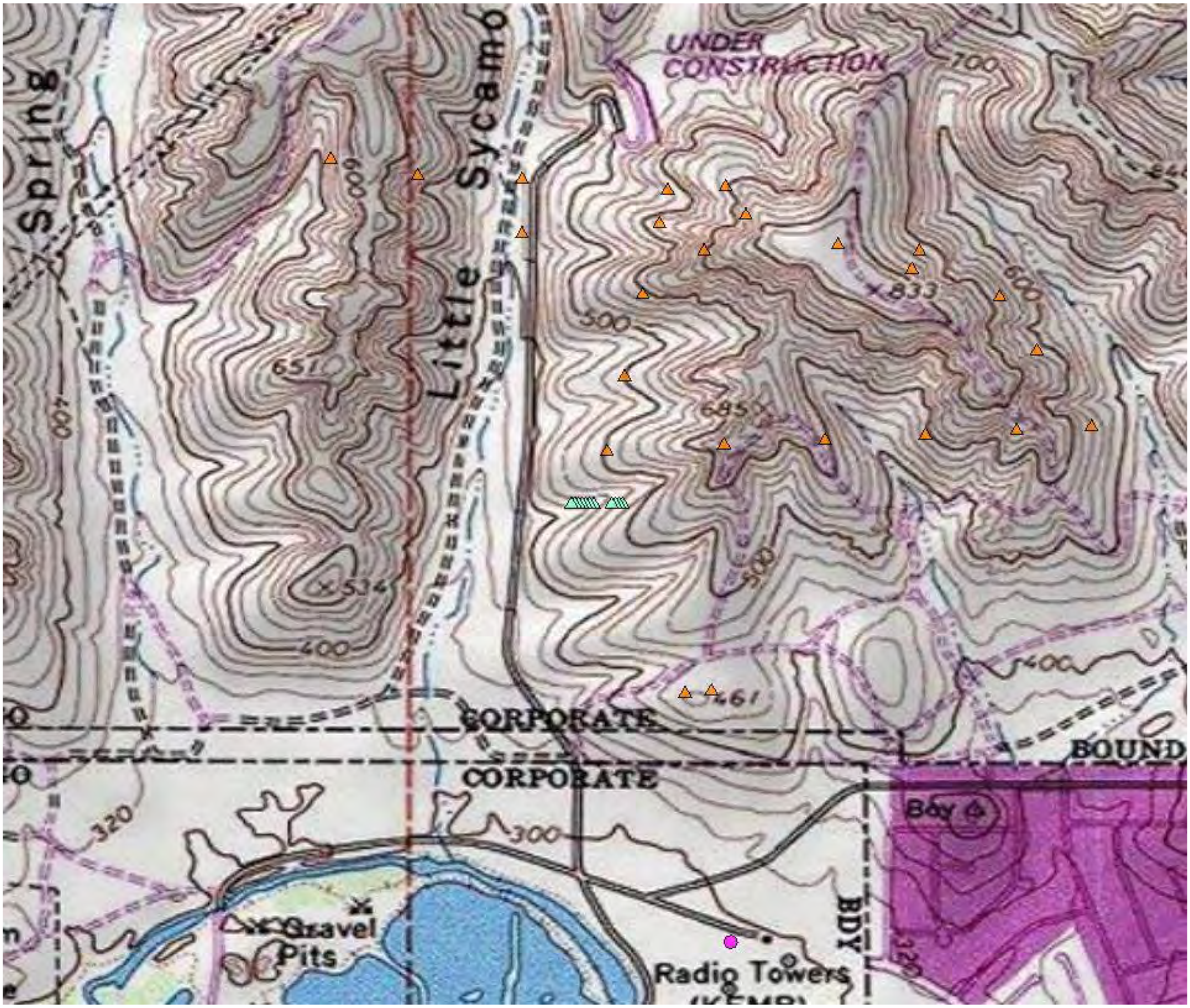
Signature Control No: 155420824-156197893 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

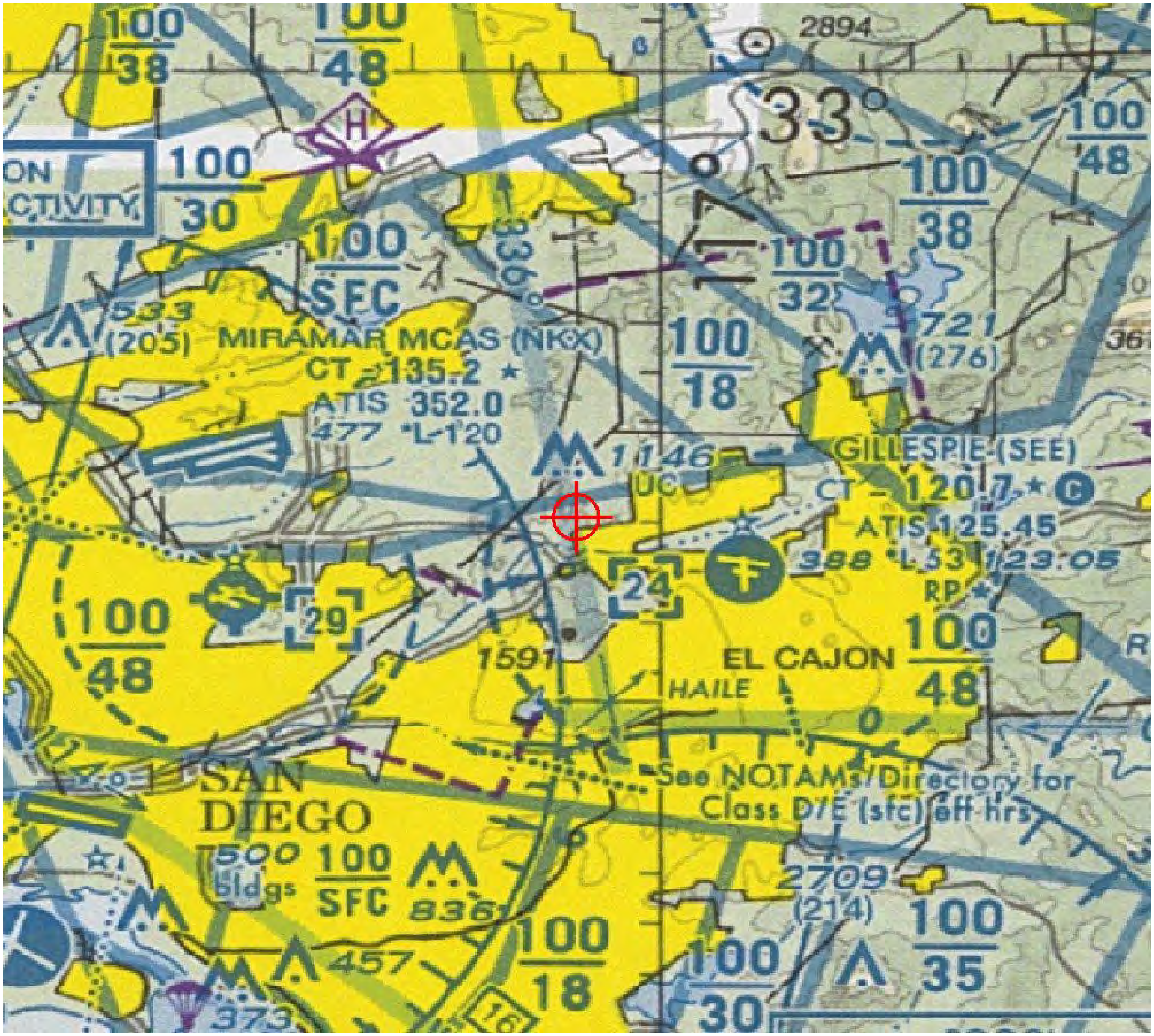
Case Description for ASN 2011-AWP-8442-OE

Stacks on power plant at Quail Brush Generation site

Verified Map for ASN 2011-AWP-8442-OE



Sectional Map for ASN 2011-AWP-8442-OE



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Southwest Regional Office
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2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8443-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Stack Stack 9
Location:	San Diego, CA
Latitude:	32-51-03.31N NAD 83
Longitude:	117-01-40.94W
Heights:	465 feet site elevation (SE) 100 feet above ground level (AGL) 565 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

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Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8443-OE.

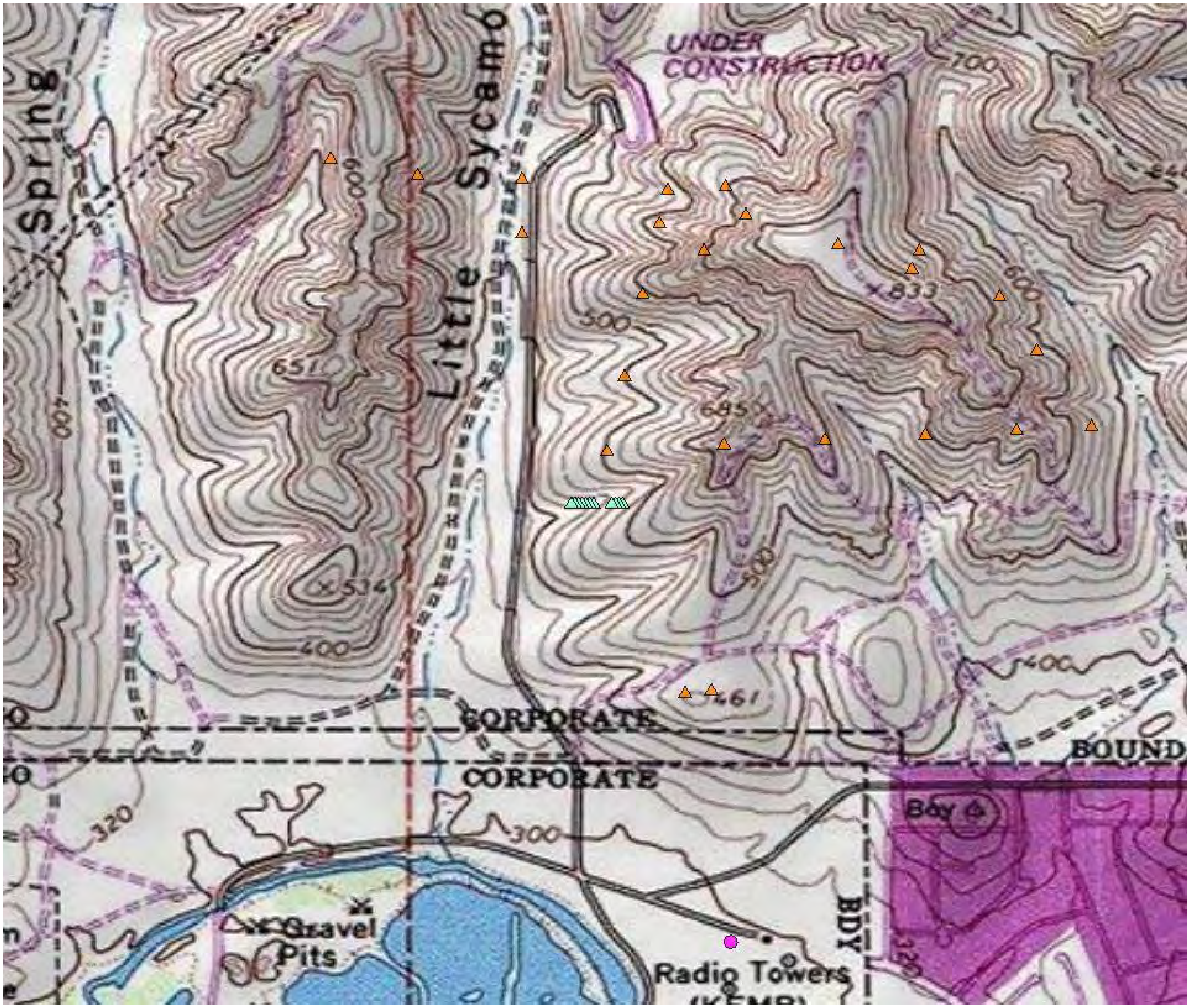
Signature Control No: 155420826-156197889 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

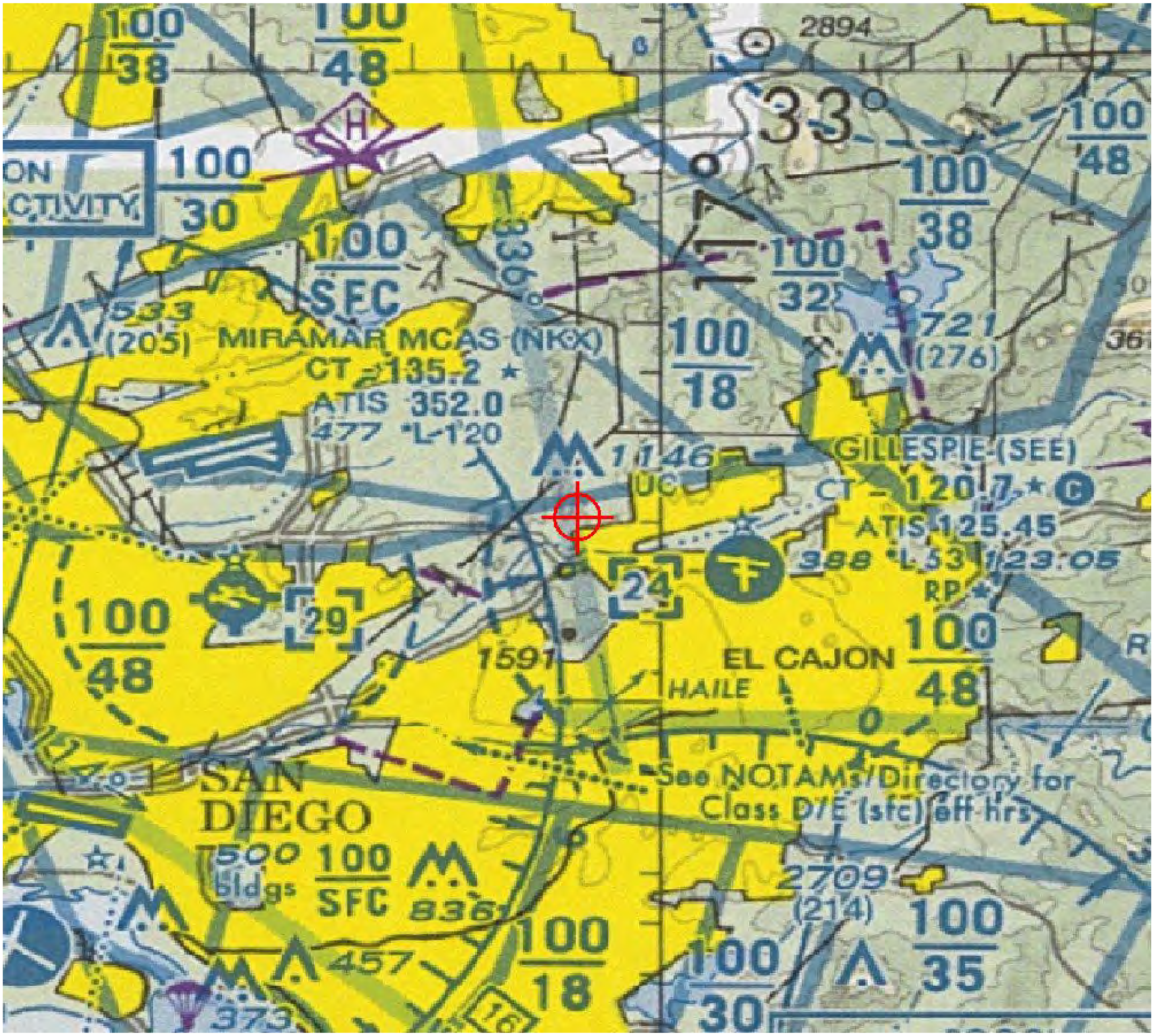
Case Description for ASN 2011-AWP-8443-OE

Stacks on power plant at Quail Brush Generation site

Verified Map for ASN 2011-AWP-8443-OE



Sectional Map for ASN 2011-AWP-8443-OE



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2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8444-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Stack Stack 10
Location:	San Diego, CA
Latitude:	32-51-03.31N NAD 83
Longitude:	117-01-40.69W
Heights:	465 feet site elevation (SE) 100 feet above ground level (AGL) 565 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

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If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8444-OE.

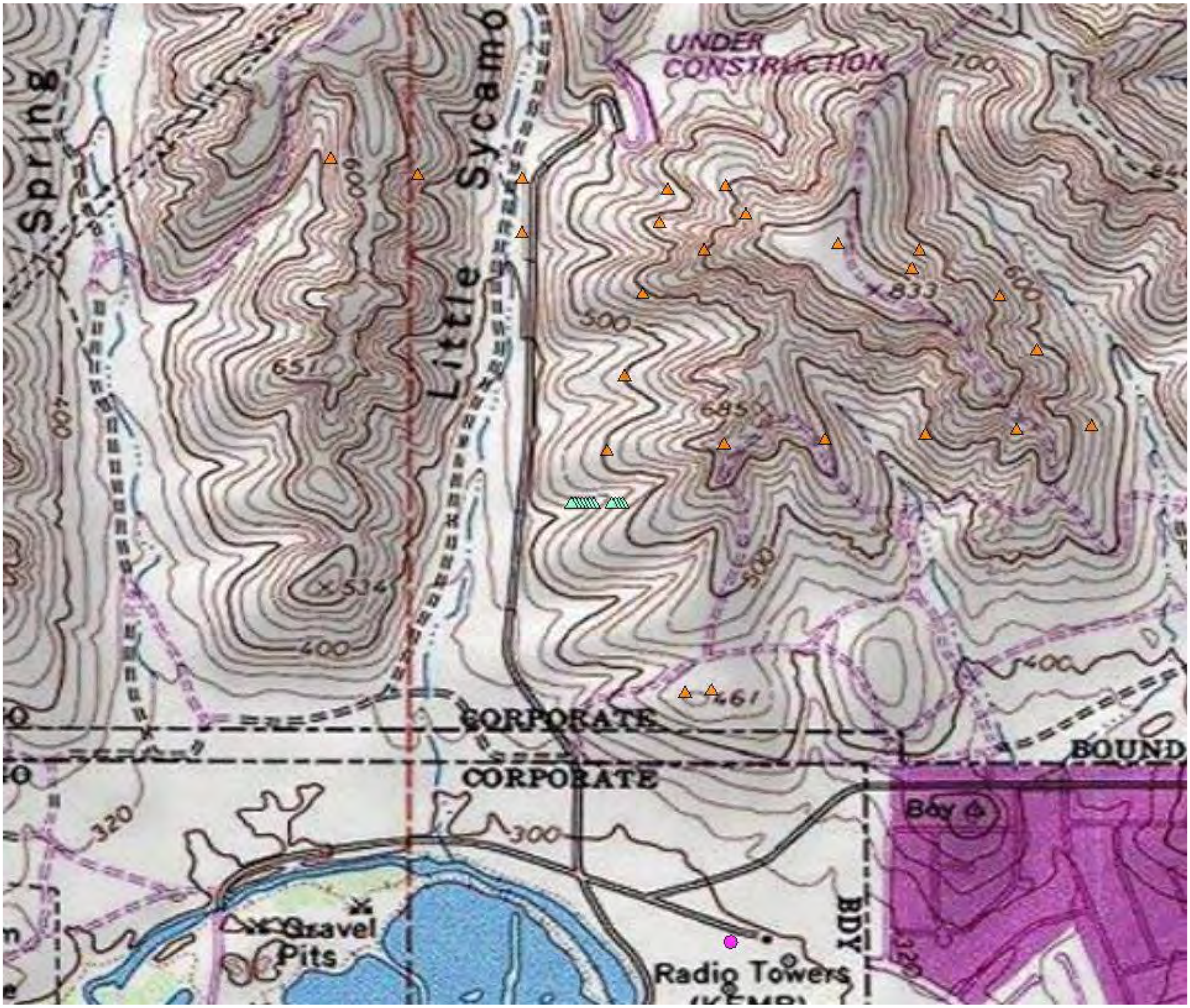
Signature Control No: 155420828-156197891 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

Case Description for ASN 2011-AWP-8444-OE

Stacks on power plant at Quail Brush Generation site

Verified Map for ASN 2011-AWP-8444-OE



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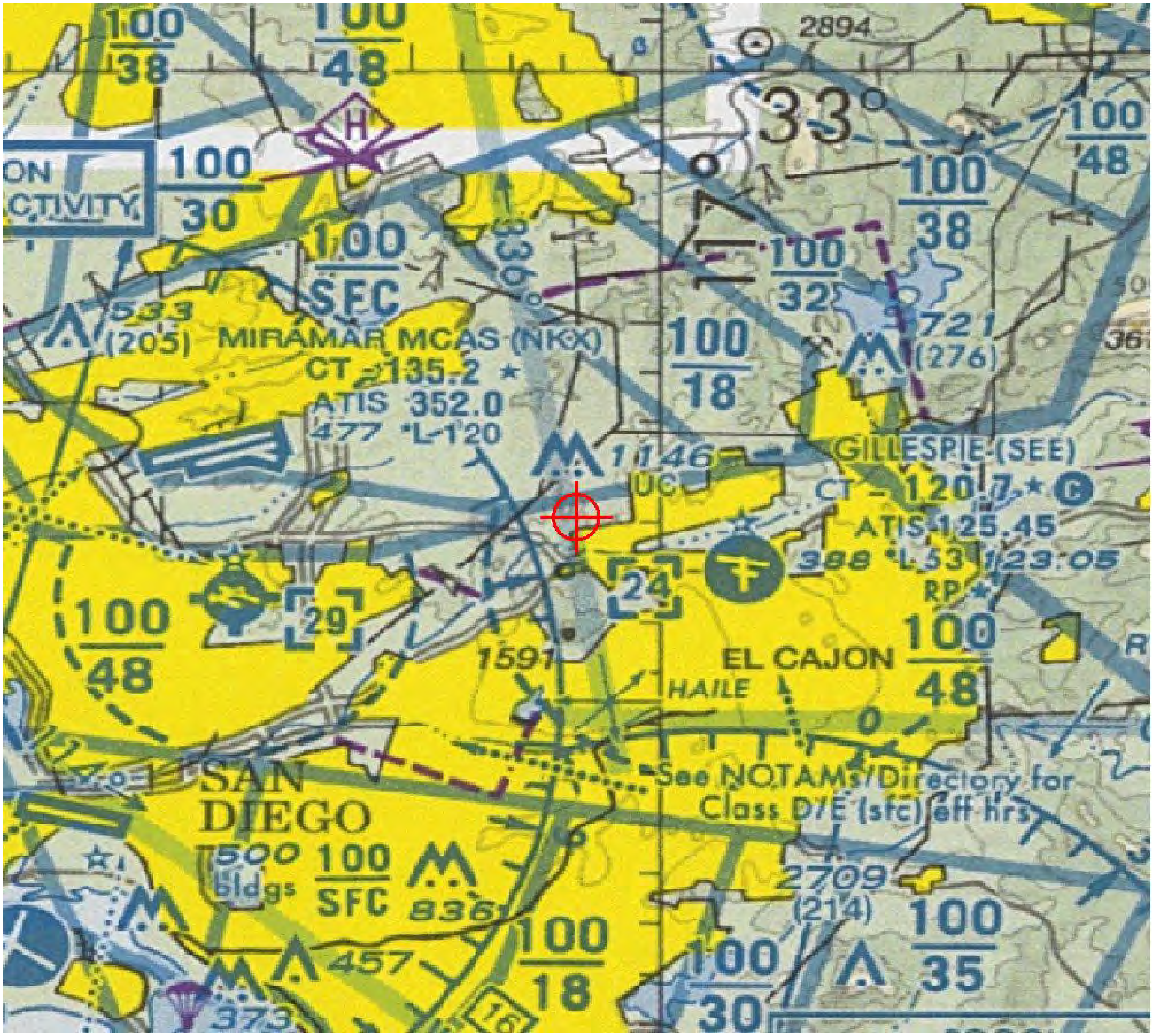

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Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2011-AWP-8445-OE

Issued Date: 01/05/2012

Connie Farmer
Tetra Tech
143 Union Blvd
Suite 1010
Lakewood, CO 80228

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Stack Stack 11
Location:	San Diego, CA
Latitude:	32-51-03.31N NAD 83
Longitude:	117-01-40.44W
Heights:	465 feet site elevation (SE) 100 feet above ground level (AGL) 565 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
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This determination expires on 07/05/2013 unless:

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If we can be of further assistance, please contact our office at (310) 725-6557. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2011-AWP-8445-OE.

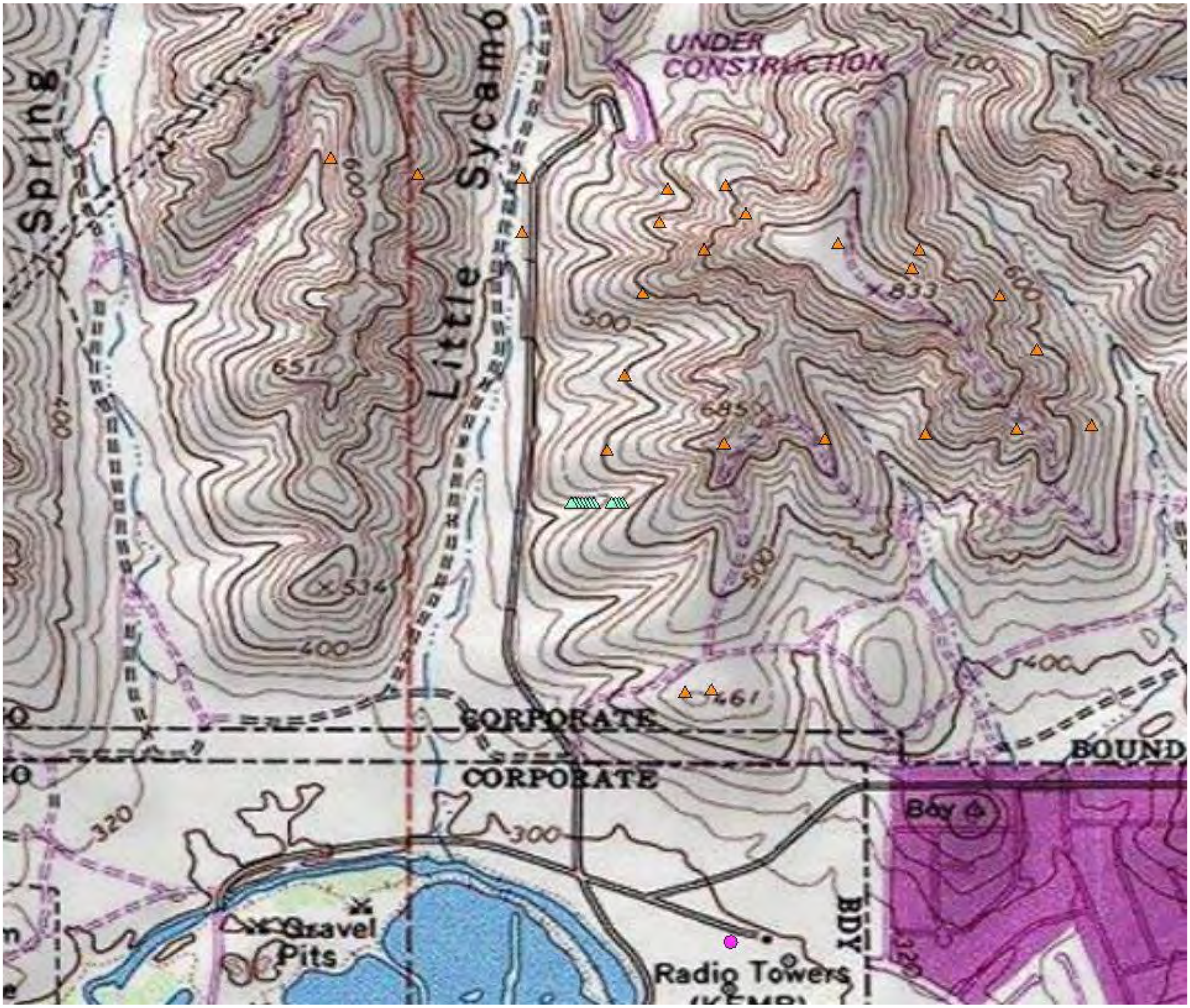
Signature Control No: 155420830-156197890 (DNE)
Karen McDonald
Specialist

Attachment(s)
Case Description
Map(s)

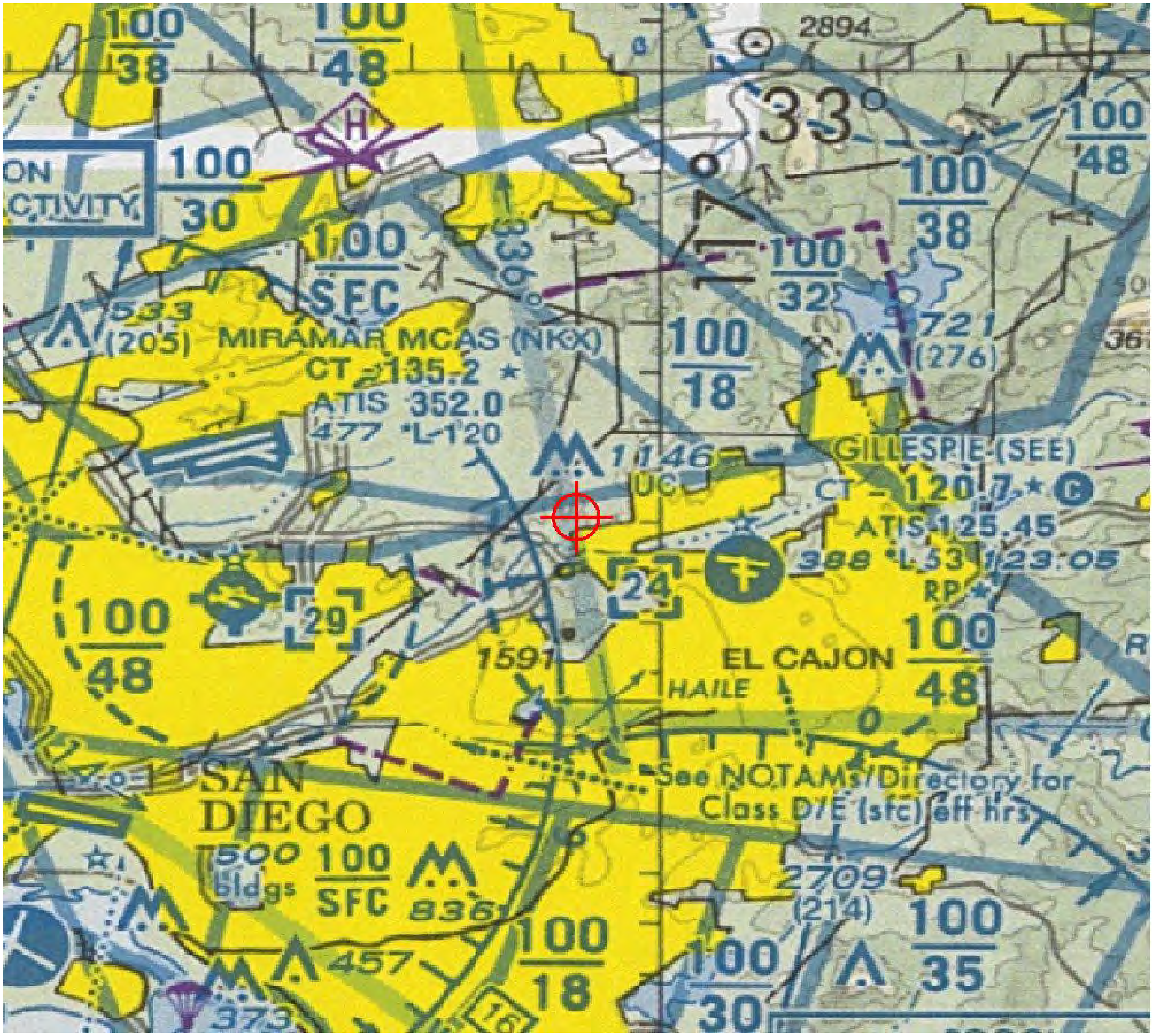
Case Description for ASN 2011-AWP-8445-OE

Stacks on power plant at Quail Brush Generation site

Verified Map for ASN 2011-AWP-8445-OE



Sectional Map for ASN 2011-AWP-8445-OE



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ATTACHMENT 3

QUAIL BRUSH PSD

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COGENTRIX QUAIL BRUSH GENERATION PROJECT

Application for Prevention of Significant Deterioration Permit

September 2011

QUAIL BRUSH GENCO, LLC

TETRA TECH EC, INC.

Cogentrix

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Prevention of Significant Deterioration Permit Application for the Quail Brush Power Project

Table of Contents

A copy of the complete Application for Certification as submitted to the California Energy Commission has been supplied to EPA Region IX staff as resource document for the enclosed PSD Permit application. The AFC in its entirety is incorporated by reference into this application.

Section 1

EPA Region IX Completeness Criteria

DRAFT PSD Application Completeness Criteria
October 19, 2009

Section of EPA R9 PSD App Guidelines	Information Needed	Legal Basis	Required for completeness?	Not required for completeness, but needed for timely permit issuance	Comments	Location in the PSD Permit Application Document where the information can be found.
A	Applicant information	52.21(n)	Yes	--	Per 124.3(a)(1), PSD applications must be signed. The regulations do not specify who must sign the application.	See Section 2 of the application, and Appendix F.9 (applicant information on APCD permitting forms).
B	Project location	52.21(n)	Yes	--		See Section 2 of the application.
C	Project description	52.21(n)	Yes	--		See Section 2 of the application.
D	Emissions from the proposed project	52.21(n)	Yes	--	Emission estimates for HAPs are required in the following two situations: • for pollutants listed in 52.21(b)(23)(i) that are also HAPs (e.g., lead); and • in the environmental portion of the BACT analysis when the top control technology is eliminated.	Detailed emissions estimates are provided in the Sections 3 and 4 of the application, as well as in Appendix F.1 of section 5.
E	Best Available Control Technology (BACT) Analysis	52.21(j)	Yes	--	The applicant must submit a top-down BACT analysis.	See Appendix F.6 in Section 5 of the application.
F	Air quality data	52.21(k)	Yes	--	The application guidelines will be revised to provide general guidance on PM2.5.	Air quality monitoring data is provided in the application for PM2.5. See the Air Quality analysis in Section 3.
G, H	Air Quality Impact Analysis (Class I and II)	52.21(h), (k), (l), (m), (p)	Yes	--	The application guidelines will be revised to provide general guidance on PM2.5.	Modeling and impact assessments are provided for both PM10 and PM2.5. See the Air Quality analysis in Section 3 and Appendices F.2 and F.3 in Section 5 of the application.
I	Additional Impact Analysis	52.21(o)	Yes	--		See the Air Quality modeling and impact assessment in the Air Quality analysis in Section 3 of the application and Appendices F.2 and F.3 in Section 5 of the application.
J	Compliance with other regulations (i.e., SIP, NSPS,	None	No	--	We prefer that applicant provide this information as part of the PSD application.	See the LORS sections and tables in the Air Quality and Public Health sections of the application,

	NESHAP)					i.e., (Sections 3 and 4).
K	Business confidentiality claims	40 CFR Part 2	No	--		No such claims are made.
L	Endangered Species Act (ESA) obligations	ESA	No	Yes	We strongly recommend that the applicant provide a biological assessment as part of the PSD application so that the permit is issued in a timely manner.	See Section 4.12 (Biological Resources) of the AFC provided, as well as Appendices H.1 through H.6 of the AFC provided.
M	Public notice information (i.e., city/county executives, planning agencies, Indian governing bodies)	124.10(c)(1(vii)	No	--		Public notifications will be handled by the CEC and the San Diego APCD.

A copy of the complete Application for Certification as submitted to the California Energy Commission has been supplied to EPA Region IX staff as resource document for the PSD Permit application. The AFC in its entirety is incorporated by reference into this application.

Section 2

Applicant Information and Project Description

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Applicant Information:

Quail Brush Genco, LLC
9405 Arrowpoint Blvd.
Charlotte, NC. 28273

Contacts:

C. Richard Neff
V.P.-EHS
Cogentrix Energy, LLC
9405 Arrowpoint Blvd.
Charlotte, NC. 28273
704-672-2818

Richard W. Gray, Jr.
Vice President
Quail Brush Genco, LLC
9405 Arrowpoint Blvd.
Charlotte, NC. 28273
704-672-2823

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TABLE OF CONTENTS PAGE

TABLES

FIGURES

2.0 PROJECT DESCRIPTION

2.1 INTRODUCTION AND OVERVIEW

The proposed Quail Brush Generation Project (Project) will be a nominal 100-megawatt (MW) intermediate/peaking load electrical generating facility employing a set of eleven (11) natural gas-fired reciprocating engine generators that provide flexibility in meeting the generation needs of San Diego Gas and Electric (SDG&E). The Project has a long-term Power Purchase Tolling Agreement (PPA) with SDG&E as a result of a 2009 Request for Offers (RFO). The Project will support SDG&E's efforts to increase reliance on wind, solar and other renewable energy resources. It will provide peaking and load-shaping power to the grid, along with several ancillary services intended to assure system reliability within the SDG&E service area.

The Project will be located in the City of San Diego, California, west of the City of Santee, south of the Sycamore Landfill and north of State Route 52. The portion of the Project where the power plant (plant) will be constructed is approximately 11 acres and is located within a 21.6-acre privately owned parcel optioned by Development Land Holdings, LLC. The Project company Quail Brush Genco, LLC (Applicant), and Development Land Holdings are wholly owned subsidiaries of Cogentrix Energy, LLC. Additional Project components located beyond the plant site include a 230 kilovolt (kV) generation tie-line (gen tie), utility switchyard, and natural gas pipeline lateral.

The Project will provide unique flexibility to dispatch in increments of 5 to 10 percent of its total capacity, while maintaining high efficiency across the entire load range. In this respect, it compares very favorably to a similarly sized plant consisting of one or two simple-cycle combustion turbines, which would have a much lower turn-down ratio and therefore operate at reduced efficiencies as total plant output is reduced to match demand and output of variable generating resources, such as wind and solar. The high efficiency of the proposed Project across its entire load range, coupled with its fast-starting and fast-ramping design, suggest that the Project will be dispatched with increasing frequency as SDG&E moves to increase its reliance upon renewable generation sources and achieve California's ambitious Renewable Performance Standards (RPS).

In addition, the proposed Project will use very little water since the Wartsila engines use a closed loop cooling system. A demineralizing system will not be required since there is no requirement for purified water. Site water usage will be primarily for fire protection, personal consumption, sanitary purposes, landscape irrigation, and wash-down cleaning. As a result, site consumption will average approximately 1.0 gallon per minute (gpm) or 1.61 acre feet per year (afy). Section 2.3.6 includes additional details about water supply.

The major features associated with the installation of the proposed Project include the following:

- Eleven (11) nominal 9.3 MW (gross) Wartsila model 20V34SG natural gas-fired reciprocating engines;
- Eleven (11) separate state-of-the-art air pollution control systems representing Best Available Control Technology (BACT), one system for each of the 11 reciprocating engines, consisting of a selective catalytic reduction (SCR) unit for oxides of nitrogen (NO_x) control and an oxidation catalyst unit for control of carbon monoxide (CO) and precursor organic compounds (POC);

- Eleven (11) approximately 48-inch diameter x 100-foot tall stacks, each with a separate continuous emissions monitoring system (CEMS);
- Acoustically engineered building enclosing all 11 reciprocating engines;
- Closed loop cooling system consisting of multiple fan-cooled radiator assemblies outside of the engine building;
- One (1) urea storage tank, approximately 20,000 gallons, and a handling system serving the SCR units;
- One (1) 4 million British thermal units per hour (MMBtu/hr) natural gas-fired heater, used for heating of the natural gas fuel to the reciprocating engines;
- One (1) 4 MMBtu/hr natural gas-fired heater, used for heating of the engine cooling water system for 10-minute start capability;
- One (1) engine standby heater;
- One (1) new lube oil tank, approximately 10,000 gallons;
- One (1) used lube oil tank, approximately 10,000 gallons;
- One (1) maintenance service oil tank, approximately 6,000 gallons;
- Two (2) maintenance water tanks, approximately 5,000 gallons each;
- Two (2) bunkered wastewater holding tanks, approximately 3,000 gallons each;
- One (1) fire water tank, approximately 600,000 gallons, and associated fire water system,;
- One (1) diesel fueled fire pump engine, rated at approximately 144 boiler horse power unit (bhp);
- One (1) diesel storage tank, approximately 250 gallons;
- One (1) domestic water storage tank, approximately 10,000 gallons;
- Onsite septic tank and tile field;
- Plant site access road;
- Onsite 230kV facility switchyard including switchgear and the main voltage step-up transformer, switchgear, circuit breakers, and disconnects;
- Approximately 1 mile of 230kV single-circuit gen tie between the Project and the anticipated Point of Interconnection (POI) to the existing San Diego Gas & Electric (SDG&E) Miguel to Mission 230kV transmission line situated west of the plant site;
- New SDG&E 230kV utility switchyard at the POI configured as a line-break of the existing SDG&E 230kV transmission line that will include circuit breakers and disconnects, and an access road;
- Approximately 2,200 feet of 8-inch diameter natural gas pipeline lateral between the Project site and the existing SDG&E 20-inch diameter high pressure natural gas pipeline located across Mast Avenue from the landfill entrance and associated onsite metering station;
- Chain-link security fencing enclosing the facility with a secured entrance on the access road leading from Sycamore Landfill Road to the facility;
- Chain-link security fencing enclosing the utility switchyard at the POI; and

- Temporary construction laydown and parking areas that are proposed to be located on previously disturbed Sycamore Landfill property approximately one-half mile from the plant site (approximately 5 acres is required), subject to the approval of the property owner, Sycamore Landfill, Inc. A truck turnout for equipment unloading/loading will be located along Sycamore Landfill Road adjacent to the plant site. Additional construction personnel parking will be located offsite with shuttle service to the Project site.

The preliminary details for structural design are discussed in design criteria found in Appendices B2 and B7. Summary descriptions of the design criteria are included in the following appendices:

- Appendix B1 – Civil Engineering Design Criteria
- Appendix B2 – Structural Engineering Design Criteria
- Appendix B3 – Mechanical Engineering Design Criteria
- Appendix B4 – Electrical Engineering Design Criteria
- Appendix B5 – Control Engineering Design Criteria
- Appendix B6 – Chemical Engineering Design Criteria
- Appendix B7 – Geologic and Foundation Design Criteria

The proposed Project site is located in the City of San Diego, California on land immediately south and west of the Sycamore Landfill (Figure 2.1-1). The property tax assessor designation for the plant site parcel is APN 366-081-42. The parcel is located in an area currently zoned RS-1-8 (single family residential use). The Applicant is currently seeking a zoning change and community plan amendment to allow for development of the proposed facility. The City of San Diego will be processing the zoning change concurrently with the CEC siting and permitting effort. The proposed Project is located within Township 15 South, Range 1 West, Section 7, Township 15 South, Range 2 West, Section 12, and unsectioned portions of the El Cajon and Mission San Diego Land Grants, within the La Mesa, California, United States Geological Survey (USGS) 7.5-minute topographic quadrangle map. The legal description of the proposed plant site parcel is provided in Appendix A2. A list of current assessor's parcel numbers and owners' names and addresses for all parcels within 1,000 feet of the plant site parcel boundaries or within 500 feet of the Project linear facilities is provided in Appendix A1.

The proposed Project is sited to minimize engineering constraints, site geology, electric transmission constraints, waste and fuel constraints, and environmental impacts, including stabilizing construction disturbance. Figure 2.1-2 provides an aerial photograph of the proposed Project showing the locations of the proposed plant site and other components including the gen tie, utility switchyard, and natural gas pipeline lateral in relationship to the surrounding area. To the immediate south of the Project is SR 52. To the immediate north is the Sycamore Landfill. The City of Santee is located to the east of the Project.

The proposed approximately 5-acre temporary construction laydown and parking area are proposed to be located on previously disturbed Sycamore Landfill property approximately one-half mile from the plant site, subject to the approval of the property owner, Sycamore Landfill, Inc.. Additional construction personnel parking will be located offsite on Mission Gorge Road with shuttle service to construction areas.

The proposed Project will connect to the SDG&E 230kV electric transmission system via the gen tie to the utility switchyard, which is anticipated to be located approximately 1 mile northwest of the plant site. The utility switchyard and the entire run of 230kV gen tie are proposed to be located on property owned by the Sycamore Landfill subject to the approval of the property owner, Sycamore Landfill, Inc. The proposed 230kV gen tie route would run north on property owned by Sycamore Landfill, east of Sycamore Landfill Road for approximately 2,600 feet, then cross the road and run northwest for approximately 2,600 feet to the utility switchyard, subject to the approval of the property owner, Sycamore Landfill, Inc. Additional details on the transmission system are included in Section 2.5.

The proposed Project will connect to the existing 20-inch diameter SDG&E natural gas pipeline that is located 2,200 feet away from the proposed plant site at the intersection of Mast Boulevard and Sycamore Landfill Road within the City of Santee. From the tie-in point, the Project's 8-inch natural gas pipeline lateral will generally follow Sycamore Landfill Road to the proposed plant site. Section 2.3.5 includes additional details about the natural gas fuel supply.

The proposed Project occurs in an area with a mild semi-arid climate; therefore, there are no adverse meteorological or climate conditions that would require special engineering measures. Several engineering investigations and studies have been conducted to support the development of the Project design. Geology and geologic hazards have been evaluated as described in Section 4.16, Geologic Hazards and Resources. A Preliminary Geological/Geotechnical Investigation (Geotechnical Report) for the plant site performed by Petra Geotechnical Inc., is included in Appendix J. A final geotechnical report will be prepared in the first or second quarter of 2012. The resulting report will be provided to the California Energy Commission (CEC) in a future submittal.

The Geotechnical Report deems the Project site to be suitable for the proposed development. The site's existing slope is 16 percent. Approximately 150,000 cubic yards of cut and fill will be required to grade the site. Provided the site grading is performed in accordance with the recommendations of the Geotechnical Report, the use of conventional shallow foundations, rigid mat or structural slab foundations are considered feasible for support of the various structural elements of the facility. Soil conditions have been evaluated as described in Section 4.14, Soil Resources. Based on the results of these engineering investigations and studies there are no adverse site conditions that would require special engineering or pose any unmitigated hazard to the Project. In addition to these engineering investigations, a number of environmental evaluations have been conducted as described in Section 4.0, Environmental Information, and the results of these studies have been considered in the development of the conceptual Project design.

2.2 FACILITY NEED

The Project will help serve the peak demand and transmission reliability needs of SDG&E. The flexibility, efficiency and operational benefits of the Project will assist SDG&E to effectively meet its customers' needs at times of high energy demand and will support the variability of renewable energy sources, such as wind or solar.

The Applicant has entered into a long-term (20-year) Power Purchase Tolling Agreement (PPA) with SDG&E resulting from the utility's 2009 competitive solicitation for new generating resources. The Request for Offers (RFO) sought several types of energy products to support reliability within SDG&E's service territory, supply energy to bundled customers, meet Resource

Adequacy requirements and provide other portfolio needs. The requested energy products in the RFO included peaking facilities (such as the Project), demand-side management, and renewable resource generation. In particular, the RFO sought projects that would be online no later than October 1, 2014, have an annual capacity of at least 30 percent and an availability of at least 98 percent. The RFO also specified that SDG&E was seeking flexible resources that would be capable of providing regulation during the morning and evening ramps and/or units that can be started and shutdown as needed. It also emphasized the importance of quick start operations and black start capability.

The Project is designed to specifically satisfy the needs identified by SDG&E: it is expected to begin delivering electric power in mid-2014 and will provide SDG&E and the San Diego area for more peaking and load-shaping generation for both the short and long term. By necessity, peaking plants must be able to start quickly and adjust load levels easily. In particular, SDG&E needs peaking facilities to support renewable energy generation, including generation from wind, hydroelectric, and solar facilities, that have variable outputs. When the output of the renewable resources decreases, the Project can be dispatched quickly. Conversely, when the output of renewable resources increases, the Project can be ramped down quickly and still operate efficiently with the lower load. The design of the project as consisting of multiple reciprocating engines, as opposed to one or two combustion turbines, provides unique flexibility, while still achieving higher efficiencies across the entire load range. The Project can thus support further integration of renewable resources into SDG&E's generation portfolio, and assist statewide goals calling for increased reliance on renewable energy.

Additionally, the design of the Project will allow it provide several ancillary services necessary for reliability of the grid operated by the California Independent System Operator (CAISO) within SDG&E's service territory. These services include: (1) regulation service (regulation up and regulation down) to allow the CAISO balancing authority area to meet reliability standards set by the North American Electric Reliability Corporation (NERC) and the Western Electricity Coordinating Council (WECC); (2) spinning and non-spinning reserves to help maintain contingency capacity and energy on the grid; and (3) voltage support to help maintain required voltage levels and reactive margins on the grid within NERC and WECC reliability standards. Provision of such services requires the Project to be under the direct control of CAISO's Automatic Generation Control system. The ability of the Project to start quickly, operate efficiently across the entire load range, and provide such ancillary services will help improve system-wide reliability within SDG&E's service territory. These features are all key elements to the Project's overall business objectives.

The Project has a small land requirement of approximately 11 acres and has been purposefully sited near the existing Sycamore Landfill in the northeast corner of the City of San Diego to minimize potential siting impacts and to effectively enable access to existing electric and natural gas transmission systems also at this location.

The Project represents a capital investment of over $150 million and will generate significant tax revenues. Quail Brush is anticipated to provide approximately 150 construction jobs over a 12-month period.

2.3 GENERATION FACILITY DESCRIPTION

This section describes the power plant's conceptual design and proposed operation.

2.3.1 Power Plant Site Arrangement and Layout

The plant site layout including ancillary facilities is shown on Figure 2.3-1. Typical elevation views of the proposed plant are shown on Figures 2.3-2a and 2.3-2b. The General Arrangement is provided in Appendix B.8.

2.3.2 Power Plant Process Description

The power plant will consist of 11 Wartsila 20V34SG natural-gas fired reciprocating engines. Total facility generating capacity will be approximately 103 MW gross or 100 MW net. Each engine will have a gross capacity of approximately 9.3 MW based on a design temperature range of 32 degrees Fahrenheit (ºF) to 95ºF. Above 95ºF the output of the engine degrades and is expected to be approximately 9.1 MW at 100ºF. It is anticipated that the Project may be dispatched up to 3,800 hours per year excluding start-ups, equivalent to an annual capacity factor of 43.4 percent. The plant's actual operating profile will depend upon SDG&E's dispatch pattern under the terms of the Applicant's PPA. The plant heat balance (gross) is shown in Figure 2.3-3. This balance depicts performance at the expected extreme operational design ambient dry bulb temperature ranges (35ºF to 95ºF). The gross and net heat rate (higher heating value basis) of the power plant is expected to be 8,600 British thermal units per kilowatt hour (Btu/kWh) and 8,834 Btu/kWh, respectively, at steady-state, full load average summer condition of 81ºF.

In addition to the above, each engine will be equipped with standard support auxiliaries (e.g., a fuel gas system, lube oil system, charge air systems consisting of inlet air filtration, turbochargers and aftercoolers, and an engine cooling system). The charge air system provides combustion air for the engine and the turbocharger increases the density of air to the engine which increases the output. Supporting the overall plant will be a starting air system, an instrument/service air system, a main generator step-up transformer (GSUT), two 100 percent redundant auxiliary/station service transformers, clean and dirty lube oil storage tanks, maintenance water tanks, a domestic water tank, a fire water tank, two wastewater holding tanks, one urea tank, a service oil tank for temporary storage of engine oil during maintenance of engines, and associated support equipment.

All of the technologies described above are proven technologies that have been commercially demonstrated in numerous installations and are considered mature from a development standpoint. Cogentrix has owned and operated the Plains End 1 Power Generating Plant located in Arvada Colorado since 2005. In 2006, Cogentrix permitted and constructed the Plains End 2 Power Generation Plant located adjacent to Plains End 1. Both of these facilities use the same natural gas-fired reciprocating engine technology as being proposed for the Project. In early 2011, Cogentrix divested itself of these power generating plants. Use of technology that has been demonstrated in numerous commercial installations will help achieve the Project's goals, consistent with the RFO, of providing at least 98 percent availability.

2.3.3 Generating Facility Cycle

A startup air system, operating at a nominal 450 pounds per square inch gauge (psig), will provide direct injection of startup air into one main cylinder bank of each engine. Once started, combustion air for each engine will be drawn from outside the power house, flow through a combustion air filter followed by an air silencer, and then be fed to the compressor side of each engine's turbocharger (driven by exhaust flow). The pressurized air (about 50 psig) will then be supplied to the engine to mix with the natural gas fuel. Pressurized natural gas (at about 75 – 100 psig) will be fed to the engine's cylinders via header pipes that will supply the engine's main fuel regulating valve train and then the individual feed pipes to the main fuel admission valve on each cylinder head. An ignition module will be located on the top of each cylinder head, and will be connected to a spark plug for fuel/air combustion.

The hot combustion gases will exit each engine at approximately 730°F and enter the engine's dedicated air pollution control system catalyst housing for reduction of emissions. The air pollution control system will exhaust through an exhaust silencer to atmosphere via the engine's exhaust stack.

2.3.4 Reciprocating Engine Generator Components

2.3.4.1 Reciprocating Engine Generators

Electricity will be produced at the generation facility by 11 Wartsila model 20V34SG reciprocating engine generator sets, as described above. These engine generator sets will be driven by four-stroke, lean burn, pre-chamber, spark ignited, port injected, turbocharged and inter-cooled engines. This lean-burn spark ignition reciprocating engine technology has been commercially demonstrated in several hundred installations worldwide and is considered mature.

Each engine generator set will consist of two components – the engine and the generator. Thermal energy produced in the engine side through the combustion of natural gas will be converted into mechanical energy when the expanding combustion gases force a translational movement of the pistons, which in turn rotate a drive shaft. Each engine's drive shaft will be flexibly coupled to an associated electric generator to convert the rotational mechanical energy of the drive shaft into electricity.

The engines will be equipped with the following required accessories to provide safe and reliable operation:

- Auxiliary modules, including the engine pre-heating unit, a booster pump, various engine controls and indication, and piping;
- A fuel gas system;
- A charge air system, including filter, silencer, and pre-heater;
- An exhaust gas-driven turbocharger/charge air compressor and cooler;
- A lubricating oil system;
- A compressed air system;
- A cooling system;

- Fire detection and suppression; and
- An exhaust system.

2.3.4.2 Reciprocating Engine Generator Building

The 11 engine generator sets will be housed in an engine hall structure, both for their general environmental protection and for abatement of engine noise.

The engine hall will be approximately 365 feet long by 70 feet wide by 32 feet high at eave height. The building will be a pre-engineered metal building featuring a bridge crane for engine component handling. Contiguous to the engine hall will be a two-story building, approximately 92 feet long by 44 feet wide by 32 feet tall at eave height, which will house the electrical room, control, room, and administration area. Insulation will be applied to the walls of this structure as required to meet heating, ventilating, air conditioning (HVAC), and noise abatement requirements of the Project.

Initial foundation design will be based on the Geotechnical Report conducted by Petra Geotechnical, Inc. Provided site grading is performed in accordance with the recommendations of the Geotechnical Report, the use of conventional shallow foundations, rigid mat, or structural slab foundations are considered feasible for support of the various structural elements of the facility. Foundations for the engine hall will generally be constructed of reinforced concrete. Structures, equipment foundations, slabs on grade, sumps, trenches, radiators, pumps and containment areas will be constructed of reinforced concrete, and designed to meet seismic requirements for the site location. Additional details on the engineering design can be found in the design criteria in Appendices B1 through B7.

Transmission of vibration and structure borne noise will be minimized by having the engines flexibly mounted on their isolated concrete foundations and connected to piping and exhaust systems through flexible bellows. As a result, each engine will be vibrationally isolated from the building, piping, and steel structures.

2.3.4.3 Air Pollution Control System Catalyst Housing

The air pollution control system catalyst housings, one for each engine, will be equipped with SCR catalyst modules to reduce emissions of NO_x, CO and POC. The SCR emission control system will use atomized urea in the presence of a catalyst to reduce NO_x in the exhaust gases of the engines. Urea will be injected into the exhaust gas stream via a grid of nozzles located upstream of the catalyst module. The subsequent chemical reaction will reduce NO_x to nitrogen gas and water vapor, resulting in a NO_x concentration in the exhaust gas no greater than 1.317 lb/hr from each engine at 100 percent load. An excess of urea must be injected to ensure an acceptable NO_x control efficiency. Unreacted ammonia (slip) will be limited to 10 parts per million (ppm).

An oxidation catalyst will also be installed within the housing to control the concentration of CO in the exhaust gas emitted to atmosphere to no greater than 1.564 lb/hr from each engine at 100 percent load. The exhaust from each catalyst housing will be discharged through an exhaust silencer to an individual exhaust stack that is approximately 100 feet tall (top of steel) with a 48-inch outside diameter.

2.3.5 Fuel System

The reciprocating engines will be designed to burn natural gas. Natural gas requirements for a single engine at full load, over an ambient range of 32ºF to 100ºF, will be approximately 80 MMBtu/hr on a higher heating value (HHV) basis.

Natural gas will be delivered to the site at 800 psig via a new underground pipeline lateral, which will be owned by SDG&E that will connect to their existing 20-inch diameter pipeline that runs along Mast Boulevard. Additional information about natural gas supply can be found in Section 2.4, Natural Gas Pipeline Construction. Onsite, the natural gas will flow through a custody transfer flow-metering station, gas moisture scrubber/filtering equipment, a gas heater, and a gas pressure control station that will reduce the pressure to 75 to 80 psig prior to the gas being distributed to the individual engines and their gas control equipment. SDG&E's custody transfer meter station will be located onsite.

2.3.6 Water Supply and Water Quality

This subsection describes the quantity of water required, the source of the water supply, and water treatment requirements.

The estimated water usage for the generation facility operation is provided in Table 2.3-1. Figures 2.3-4a and 2.3-4b illustrate the annual and peak daily flows for the plant water distribution system. The water consumption for the proposed Project will be extremely low. Normal operations will only require water for infrequent washing of the turbocharger compressor and turbine, and for make-up water in the closed cooling system. Three design factors contribute to low water requirements for the Project:

- Use of closed-loop engine cooling;
- Use of lean-burn reciprocating engines, eliminating the need for water injection for NO_x control as typically used in conventional combustion turbine technology; and
- Use of a radiator cooling system as opposed to a cooling tower, which is the major water consumed in typical combined cycle power plants.

Table 2.3-1 Estimated Average Water Operational Usage

All Uses for Entire Facility	Expected Usage	
Average Annual Usage[a]	1.00 gpm	1.61 afy
Peak Usage (Maximum Summer Condition)	1.25 gpm	2.02 afy
Makeup Water for Engine Cooling for Entire Facility	**Expected Usage**	
Average Annual Usage[a]	0.17 gpm[b]	0.27 afy
Peak Usage (Maximum Summer Condition)	0.21 gpm	0.34 afy

Basis

[a] Usage is based on 4,000 annual operating hours, and 4,760 non-operational hours, exclusive of first fills.

[b] Average between operational and non-operational/maintenance periods.

gpm = gallons per minute; afy = acre-feet per year (1 gpm = 1.613 afy).

2.3.6.1 Water Supply

The estimated peak water usage will occur during the construction phase, and is estimated to be approximately 5,200,000 gallons during the first three months. During normal operations, the estimated peak facility water usage will be approximately 685,000 gallons per year (2 afy).

Average annual and peak use water balance diagrams are included in Figures 2.3-4a and 2.3-4b.

Construction

Construction water during the 18-month construction process will be supplied from the City of San Diego Municipal Water Department under a temporary water use permit via a nearby fire hydrant adjacent to Mission Gorge Road, south of the intersection with West Hills Parkway. Water at this location will be pumped into water trucks that will deliver the water to construction areas. If this location becomes unavailable, another suitable hydrant will be selected. Appendix I-3 provides a water chemistry profile for the Palomar water supply. Construction water use will be greatest during the first three months, when site grading is scheduled. Peak water use of 58,000 gallons per day (gpd) during construction is based on the application of 40 gallons of water per cubic yard of fill and 130,000 total cubic yards of grading over three months. For remaining construction water uses, approximately 8,000 gpd will be required to build the gas line, plant site, gen tie, and switchyard.

Operations

During plant operations, water consumption will average approximately 1,440 gpd (Table 4.13-3). Domestic water will be supplied by Palomar Mountain Premium Spring Water (Palomar). Will-serve correspondence indicating Palomar's agreement to provide water for the Project is included in Appendix I-4. The Project water use represents approximately 3 percent of Palomar's available spring sources and less than 1 percent of Palomar's overall water sources (which also includes municipal water). Appendix I-5 provides a water chemistry profile for the Palomar water supply. Water will be delivered from spring sources at Palomar (on SR 76) in two 6,500-gallon water trucks per week and kept in a storage tanks located onsite. A 10,000-gallon domestic water tank and a 600,000-gallon fire water storage tank are proposed for the plant. Domestic water will be used for all facility needs including service water, irrigation, and fire protection. No pumping of groundwater wells is anticipated. Drinking water will be served by bottle water service supplied by a local service company. Although unlikely, if back-up water supplies are required, the Project would contract with another private water supplier instead.

As described in Section 2.3.6.1, water consumption for the proposed Project will be low because the closed-loop engine cooling requires little water, the lean-burn reciprocating engines do not require water injection for NO_x control, and the system does not use a cooling tower, which is the major water consumer in typical combined-cycle gas turbine power plants.

As described in Section 2.3.7, the engine cooling water system will provide cooling water to the engine jacket, charge air, and generator set lube oil. A separate cooling water system will be provided for each of the 11 generator sets. Each system will consist of three closed-loop "fin fan" type forced draft heat exchangers (radiators), engine-driven pumps, interconnecting piping, valves, heat exchangers/coolers, and electric heaters.

Fire water will be supplied by an onsite storage tank sized in accordance with National Fire Protection Association (NFPA) guidelines. Fire water will be provided to a dedicated underground fire loop piping system, which will supply fire hydrants and fixed suppression systems. Fixed fire suppression systems will be installed at determined fire risk areas. Sprinkler systems also will be installed in the engine hall as required by NFPA and/or local code requirements.

2.3.6.2 Water Quality and Treatment

Since domestic water will be sufficient for all plant service needs, no treatment/demineralized water system will be required. If required, recirculation and aeration within the tanks will be accomplished using the fire pump or a dedicated recirculation pump. Water use will be divided into the following four areas: (1) water used for engine cooling system minor makeup and/or maintenance; (2) water for turbo-compressor cleaning; (3) general powerhouse and exterior service water; and (4) personal consumptive/sanitary water. Water balance diagrams are presented in Figures 2.3-4a and 2.3-4b. Drinking water will be served by bottle water service supplied by a local service company.

The only water treatment required onsite will be to add an anti-corrosion agent consistent with original equipment manufacturer (OEM) recommendations to the closed loop radiator system, which will result in a closed cooling loop pH in the range of 8.5 to 9.5. Anti-corrosion agent concentration will nominally be 1,500 milligrams per liter (mg/L). No additional treatment (such as glycol for anti-freeze) is anticipated.

Addition of water (make-up) and/or the anti-corrosion agent to a given engine's closed loop cooling system will only be performed during periods of engine maintenance, as required to maintain proper water levels and agent concentration. Two 5,000 gallon maintenance water tanks, one per group of engines, will be provided for this purpose. Addition of water and/or the anti-corrosion agent will be a manual activity; no automatic addition systems or equipment will be required. Water quality is described further in Section 4.13, Water Resources.

Service Water. Service water for plant functions in which operating personnel may have direct contact will be provided by the onsite storage tanks. Runoff from any service water area(s) that has the potential for contamination will be directed to the wastewater holding tank for analysis prior to removal by a licensed contractor for offsite treatment and disposal.

2.3.7 Engine Generator Set Cooling Systems

Three radiators per engine will be provided for engine cooling. As previously stated, engine cooling will be a closed loop. Engine driven pumps will provide the motive force for cooling water circulation. Two primary loops will be provided: an engine jacket water cooling loop; and an engine charge air cooling loop that will service both the engine's high and low temperature charge air cooling heat exchangers (two per engine) and the engine's lube oil cooling heat exchanger. The radiators will cool the cooling water and the heat exchangers will transfer the heat to the cooling water from the charge air, lube oil, and engine jacket. Variable frequency drives for the radiator fans will be used to minimize parasitic losses, reduce net plant heat rate, and increase net output during low load operation and/or operation on cooler days.

The cooled water discharged from the radiators will flow to either the engine's engine-driven jacket water cooling pump, or to the engine-driven charge air cooling pump. The cool water will be directed from the jacket water pump through the engine jacket and then to a three-way thermostatic valve for return either to the engine jacket and/or to the radiators.

Water from the charge air cooling pump will be directed to the low temperature charge air heat exchangers. The discharge from these heat exchangers will then be directed to the lube oil cooler, and then to the high temperature charge air heat exchangers. Water discharged from the high temperature charge air heat exchangers will then be directed back to either the radiators for cooling, and/or through a three-way thermostatic valve for return to the various engine cooling heat exchangers.

2.3.8 Waste Management

Waste management is the process whereby all wastes produced by the proposed Project are properly collected, treated if necessary, and disposed. Wastes will include potentially contaminated service and/or process wastewater, solid non-hazardous waste, and both liquid and solid hazardous waste. Waste management is discussed in more detail in Section 4.11, Waste Management.

2.3.8.1 Wastewater Collection, Treatment, and Disposal

The primary wastewater collection system will collect wastewater from all of the generation facility equipment maintenance areas where periodic maintenance/service functions can result in spillage, and from routine service water areas (including engine turbo-compressor washing). The second wastewater collection system will collect sanitary wastewater from sinks, toilets, showers, and other sanitary facilities. The two wastewater systems are described below.

Plant Equipment Maintenance Areas. In areas where periodic and/or "routine" maintenance (e.g., engine overhauls) will require water drainage, the wastewater will be collected via a floor drain or comparable system and directed to the wastewater holding tank for testing. Contents will periodically be pumped to a tanker truck for disposal by a properly-licensed contractor.

Sanitary and Consumptive System. All drains from personal uses (e.g., consumptive, showers, personal hygiene, etc.) will be directed to the onsite septic system.

The onsite wastewater treatment system will be designed with a septic tank and leach field. The sanitary system will be gravity flow and will be designed and constructed to meet applicable requirements. The San Diego Regional Water Quality Control Board (RWQCB) has jurisdiction under the California Water Code Section 13282 and transfers jurisdiction to the County of San Diego, Department of Environmental Health (DEH). The sanitary system will be designed and constructed in accordance with the requirements of, and obtain a permit from, the San Diego County DEH. Three or four percolation test borings will be drilled in the proposed leach field location to identify the average infiltration rate. A certified San Diego County sanitary sewer system consultant will be used for the design of the septic tank and leach field system.

2.3.8.2 Solid Wastes

The proposed Project will produce maintenance and plant wastes typical of natural gas-fired power generation operations. Plant wastes will include oily rags, broken and rusted metal and machine parts, defective or broken electrical materials, empty containers, and other solid wastes including the typical refuse generated by workers. Trash and other non-hazardous solid wastes will be removed by a licensed waste disposal firm and disposed of at the Sycamore Landfill.

Recyclable materials will be recycled at the Landfill's recycling facility. Waste collection and disposal will be in accordance with applicable Laws, Ordinances, Regulations, and Standards (LORS) to minimize health and safety effects. Additional details regarding waste disposal are included in Section 4.11.

2.3.8.3 Hazardous Waste Management and Disposal

Several methods will be used to properly manage and dispose of hazardous wastes generated by the proposed Project. Used lubricating oil and other materials classified as hazardous waste under Title 22 of the California Code of Regulations (CCR) will be generated by Project operations. Hazardous waste will be managed in accordance with CCR Title 22 Division 4.5 and County requirements. The plant is anticipated to be a small quantity generator for hazardous waste under 22 CCR Division 4.5, and much of the waste oil will be recycled.

Waste lubricating oil will be recovered and reclaimed by a waste oil hauler to a certified recycling facility. Spent lubrication oil filters from the reciprocating engines and other equipment will be disposed of through a local, licensed Used Oil Filter Transporter in a Class I landfill. Spent SCR and oxidation catalysts will be reclaimed by the supplier or disposed of in accordance with regulatory requirements. Workers will be trained to handle hazardous wastes generated at the plant site. Additional details on the wastes generated and their proper disposal are included in Section 4.11.

Potentially contaminated wastewater used during turbo-compressor washing and/or regular equipment maintenance, which may include high metal concentrations and/or oils, will be temporarily stored in the wastewater holding tanks. This wastewater, if verified as contaminated, will be disposed of offsite by a properly licensed contractor.

2.3.9 Management of Hazardous Materials

There will be a variety of chemicals stored and used during the construction and operation of the proposed Project. The storage, handling, and use of all chemicals will be conducted in accordance with all applicable LORS. The limited number of chemicals (e.g., cooling water corrosion-inhibitors, urea, solvents, etc.) will be stored in appropriate chemical storage tanks or cabinets. Urea will be stored in one 20,000-gallon capacity aboveground storage tank. Other chemicals will be stored in returnable delivery containers. Berm and drain piping design will allow a full-tank capacity spill, plus capacity for the rainfall from a 25-year, 24-hour storm event without overflowing the berms. For multiple tanks located within the same bermed area, the capacity of the largest single tank will determine the volume of the bermed area. Chemicals that may react with each other, if any (e.g., acid and base), will not use common containment.

For liquid materials delivered by truck, such as lubricating oil and urea, there will be truck unloading/containment area(s) to contain any potential spill that might occur during the truck unloading operation.

The urea storage area will have spill containment and ammonia vapor detection equipment inside the containment area. Urea will be transported and stored onsite as a 40 percent solution by weight.

Safety showers and eyewashes will be provided in the vicinity of all chemical storage and use areas. Hose connections will be provided near the chemical storage areas to flush spills and leaks to the plant wastewater holding tank. Approved personal protective equipment will be provided and used, as required, by plant personnel during chemical spill containment and cleanup activities. Personnel will be properly trained in the handling of these chemicals and instructed in the procedures to follow in case of a chemical spill or accidental release. Adequate supplies of absorbent material will be stored onsite for spill cleanup.

A list of the chemicals anticipated to be used at the generating facility and their locations is provided in Section 4.9, Hazardous Materials Handling. This list identifies each chemical by type, intended use, and the estimated quantity to be stored onsite.

2.3.10 Emission Control and Continuous Emissions Monitoring

Air emissions from the combustion of natural gas in the reciprocating engines will be controlled using state-of-the-art emission control systems. Emissions that will be controlled include NO_x, POC, CO, and particulates. Exhaust gases from each engine generator set will be treated by a dedicated emission control system. Each emission control system will include a SCR system and an oxidation catalyst, as described further in the following subsections.

To ensure that the emission control systems are performing correctly, CEMS will be used. Each of the 11 stacks will have a dedicated CEMS.

Section 4.7, Air Quality, includes additional information on emission control and monitoring.

2.3.10.1 NO_x Emission Control

The NO_x concentrations in the exhaust gas emitted to the atmosphere from each engine generator set will be controlled to 1.317 lb/hr per engine at full load by the SCR system. The SCR process will use urea. Ammonia slip, or the concentration of unreacted ammonia in the exiting exhaust gas, will be limited to 10 ppmvd at 15 percent oxygen. The SCR equipment will include a reactor chamber, catalyst modules, urea storage system, urea injection system, and control and monitoring equipment and sensors.

2.3.10.2 Carbon Monoxide and Precursor Organic Compounds

An oxidation catalyst will be used to reduce the CO and POC concentrations in the exhaust gas emitted to the atmosphere from the engine generators. At full load, the CO and POC emissions from each engine will be controlled to 1.564 and 1.584 lb/hr, respectively.

2.3.10.3 Particulate Emission Control

Particulate emissions will be controlled by the use of natural gas as the sole fuel for the engines, which will result in low particulate emissions. The engines will also use filters on the charge air (combustion air) supplied to the engines, also serving to minimize the introduction of particulates to the engines from the ambient air.

2.3.10.4 Continuous Emission Monitoring

The CEMs will sample, analyze, and record NO_x and CO concentrations, the percentage of O_2 and other conditions, in the exhaust gas from each engine's exhaust stack downstream of its catalyst housing and exhaust silencer, and record fuel gas flow rate as required by the San Diego Air Quality Management District. This system will generate reports of emissions data in accordance with permit requirements. The plant control system will alarm when emissions approach or exceed pre-selected limits.

2.3.11 Generation Plant Fire Protection

The plant fire protection system will be designed to protect personnel and limit property loss and plant downtime in the event of a fire. Fire water will be supplied by an approximately 600,000-gallon onsite fire water tank. The fire water tank will be sized in accordance with NFPA guidelines to provide protection from the onsite worst-case single fire.

The fire protection systems will be designed to protect personnel and limit property loss and plant downtime from fire or explosion. The Project will have the following fire protection systems:

Wet Pipe Sprinkler Fire Protection System. This system will protect the engines and their accessory equipment from fire. The system will have fire detection sensors and gas detectors. Actuation of any one local sensor will trip the associated engine, turn off ventilation and charge air to the engine, and automatically actuate the sprinkler system.

Electrical/Controls Fire Protection. For those systems where the use of fire sprinklers is not recommended, an FM-200 or comparable fire protection system will be employed. Fire detection sensors will be used; actuation of any one sensor will result in release of the active agent and, as appropriate, tripping of equipment controlled by the device(s) subject to the fire situation.

GSUT Fire Protection. The GSUT will be protected by a deluge sprinkler system which will be actuated by rate of rise temperature detectors.

Fire Hydrants/Hose Stations. This system will supplement the plant fire protection system. Water will be supplied from the plant underground fire water/domestic water system and a proposed fire water pump and associated storage tank.

Fire Extinguisher. The plant control room/maintenance area and other operational areas will be equipped with portable fire extinguishers as required by the local Fire Marshall.

Fire water will be provided to a dedicated underground fire loop piping system. Both the fire hydrants and the fixed suppression systems will be supplied from the fire water loop.

Fixed fire suppression systems will be installed at determined fire risk areas. Sprinkler systems will also be installed in the engine hall as required by NFPA and/or local code requirements. For areas such as the control room, in which water cannot be used, an FM-200 or comparable waterless system will be used. FM-200 is a colorless, liquefied compressed gas. It is stored as a liquid and dispensed into the hazard as a colorless, widely non-conductive vapor that is clear and does not obscure vision. It leaves no residue and has acceptable toxicity for use in occupied spaces at design concentration. FM-200 does not displace oxygen and therefore is safer for use in occupied spaces without fear of oxygen deprivation. Hand-held fire extinguishers of the appropriate size and rating will be located in accordance with NFPA 10 throughout the facility.

The proposed plant is located within an area San Diego County has designated as Very High Severity Hazard zone for brush fires. A brush fire burned in the vicinity of the Project 3 years ago. Section 4.6, Socioeconomics, provides information on local fire protection capability.

A comprehensive Fire Protection Plan will be prepared for the Project that will be approved by the Fire Marshal. If the Fire Protection Plan requires more stringent design requirements than described herein, then the more stringent requirements will be incorporated in the final plant design.

Section 4.9, Hazardous Materials Handling, includes additional information for fire and explosion risk.

2.3.12 Plant Electrical Systems

Plant electrical systems will be designed to provide a safe, coordinated, cost-effective, reliable, operable, and maintainable power generation and delivery system. Electrical power will be exported to the SDG&E 230 kV system by way of the Plant Switchyard, described in Section 2.5.4. A total of 11 reciprocating engine generator sets, each complete with excitation system and appurtenances, will be grouped into two clusters. Each cluster of generator sets will be provided with a 13.8 kV metal-clad switchgear lineup: one bus will collect outputs of six (6) individual generators and the second bus will collect outputs of five (5) individual generators. The summed power at each bus will be transmitted by separate 13.8 kV nonsegregated-phase bus ducts to a dedicated (low side) winding of the GSUT inside the Plant Switchyard.

A 13.8kV-480V auxiliary power transformer will be connected to each 13.8kV metal-clad switchgear bus. The auxiliary power transformers will provide power to all auxiliary loads within the plant. Plant auxiliary power distribution equipment includes station service transformers, low voltage switchgear, 480V motor control centers, 480V distribution panels, dry type transformers, lighting and receptacle power panelboards, DC station battery and battery chargers, UPS, etc. (AC and DC systems). Startup and standby power will be supplied from the grid through the GSUT, which will backfeed power into the 13.8kV switchgear and onto the auxiliary transformers. Alternately, startup and standby power might be provided by SDG&E via the existing distribution line along Sycamore Landfill Road.

The following systems will support, protect, and control the generating facility:

2.3.12.1 Lighting

The lighting system will provide personnel with illumination for operation under normal conditions and for egress under emergency conditions, and will include emergency lighting to perform manual operations during an outage of the normal power source. Light standards will be shielded and directed downward and toward the plant property per City of San Diego building requirements. In areas that do not require continuous lighting for safety reasons, lighting will be operated manually as appropriate. The system will also provide 120-volt convenience outlets for portable lamps and tools.

2.3.12.2 Grounding

The plant electrical system will be susceptible to ground faults, lightning, and switching surges that may result in high voltage that may constitute a hazard to site personnel and electrical equipment. The facility grounding system will provide an adequate electrical path to permit the safe dissipation of current created by these events. The station grounding grid will be designed for adequate capacity to dissipate heat from ground current under the most severe conditions in areas of high ground fault current concentration. The facility grounding grid will consist of buried copper electrodes, and conductors will be bonded to each metallic structure or stand-alone piece of equipment for safety and electrical continuity per the applicable standards. Equipment grounding conductors will be circuited with each power system circuit for additional safety. The grid spacing will maintain touch and step voltage potentials within acceptable limits. Bare conductors will be installed below-grade in a grid pattern. Each junction of the grid will be bonded together by an exothermic weld or compression connection.

Ground resistivity readings will be used to determine the necessary numbers of ground rods and grid spacing to ensure safe step and touch potentials under severe fault conditions. Grounding stingers will be brought from the ground grid and connected to all building steel and non-energized metallic parts of electrical equipment. Concrete foundations will have the reinforcing steel (rebar) tied to the grounding grid as well.

The facility grounding systems, including the building containing the engine generator sets and the gen tie switchyard areas, will be designed in accordance with the latest National Electric Safety Code (NESC), Institute of Electrical and Electronics Engineers (IEEE), and National Electrical Code (NEC) standards pertaining to power plant grounding systems. Plant protective relay systems will be designed to trip equipment off-line under certain ground fault conditions as required or recommended by the applicable standards.

2.3.12.3 Plant Control System

The plant control system will provide modulating control, digital control, monitoring, and indicating functions for the plant power block systems.

The following functions will be provided:

- Controlling the engines and other systems in a coordinated manner;
- Controlling the balance-of-plant systems in response to plant demands;
- Monitoring controlled plant equipment and process parameters and delivery of this information to plant operators;

- Monitoring the stack CEM units for critical alarms, and collecting data for historical logging;
- Data acquisition, annunciation, and historical storage of engine operating information;
- Providing control displays (printed logs, operator interface) for signals generated within the system or received from input/output (I/O);
- Providing consolidated plant process status information through displays presented in a timely and meaningful manner; and
- Providing alarms for out-of-limit parameters or parameter trends, displaying on operator interface units and recording on an alarm log printer.

The plant control system, provided by Wartsila NA, will provide an interface to allow remote (from site) control and dispatch capabilities on a per-engine basis, and limited data monitoring, as required by California Independent System Operator (CAISO).

The system will be designed with sufficient redundancy to preclude a single device failure from significantly affecting overall plant control and operation. This also will allow critical control and safety systems to have redundancy of controls where needed, as well as an uninterruptible power source.

2.3.12.4 Cathodic Protection

The cathodic protection system will be designed to control the electrochemical corrosion of designated metal piping (primarily natural gas lines) buried in the soil. Depending upon the corrosion potential and the site soils, either passive or impressed current cathodic protection will be provided. Isolation devices will be used between the plant systems and the underground pipeline.

2.3.12.5 Freeze Protection

A freeze protection system will not be required for this facility. A thermal warning in the control system will provide notification if circulation of the engine cooling systems is needed during unusually cold periods.

2.3.12.6 Service Air

The service air system will supply compressed air to hose connections for general plant use. Service air headers will be routed to hose connections located at various points throughout the facility.

2.3.12.7 Instrument Air

The instrument air system will provide dry, oil-free air to pneumatic operators and devices. An instrument air header will be routed to locations within the facility equipment areas.

2.3.13 Generation Plant Construction

Laydown, office trailers, and parking for plant construction will occur within the site boundaries. Portable office trailers will be provided for construction management. A temporary construction laydown area will be located on previously disturbed Sycamore Landfill property approximately one-half mile from the site (approximately 5 acres). Temporary construction parking will be located on an existing paved parking lot at 7927 Mission Gorge Road in the City of Santee.

Onsite construction activities will include clearing of existing vegetation; grading; hauling and laydown of equipment, materials, and supplies; facility construction; and testing. The preliminary grading plan indicates that the maximum cut will be approximately 50 feet into the existing grade and the maximum fill will be approximately 80 feet above the existing grade. The total volume of soil excavation will be approximately 125,000 to 150,000 cubic yards (cy). Actual quantities will be calculated from the final grading plans and the Geotechnical Report. Final grading design will balance cut and fill volumes to the extent possible, so that there is no net import or export of common soil. Grading will be performed in accordance with the requirements of the proposed Project's geotechnical investigations. Site access and the required storm water management provisions will be constructed as part of initial grading so these facilities will be in place shortly after construction is initiated.

A Storm Water Pollution Prevention Plan (SWPPP) will be prepared in accordance with the State Water Resources control Board General Permit for Discharges of Storm Water Associated with Construction Activities prior to start of construction, and the Applicant will file a notice of intent (NOI) to comply with the General Permit. The SWPPP will identify measures to control and treat stormwater during construction and identify the appropriate Best Management Practices that will be implemented. Graded surfaces will be stabilized promptly as they are completed to control erosion and runoff when precipitation events occur during the construction period. Engineered erosion control measures will be maintained until the surface is stabilized. The Landscaping Plan will include planting of native grasses and wildflower seed mix and visual screening vegetation in the construction laydown area as soon as practical once construction activities in the area are complete.

The engine generator sets and most ancillary equipment will be supplied as prefabricated modules to the greatest practical extent, which will facilitate construction of the plant. Once rough grading is completed and underground systems are installed, foundations and footings will be poured and finished, building erection will commence, gen-sets will be mounted, and auxiliary systems will be constructed or installed. The engine hall, administration area, control room, electrical room, and maintenance area will be housed in a prefabricated metal building erected onsite.

Construction of the plant, from mobilization, through site preparation and grading, to commercial operation, is expected to take place from March 2013 until June 2014. Major construction milestones are listed in Table 2.3-2. The Project schedule is discussed in Section 2.3.13.2.

Table 2.3-2 Project Schedule Milestones

Mobilization	March 2013
Start-up and Testing	March 2014
Commercial Operation	June 2014

2.3.13.1 Generation Plant Construction Workforce

There will be an expected average and peak workforce of approximately 120 and 268, respectively, of construction craft people, supervisory, support, and construction management personnel onsite during construction (Table 2.3-3).

Table 2.3-3 Construction Workforce

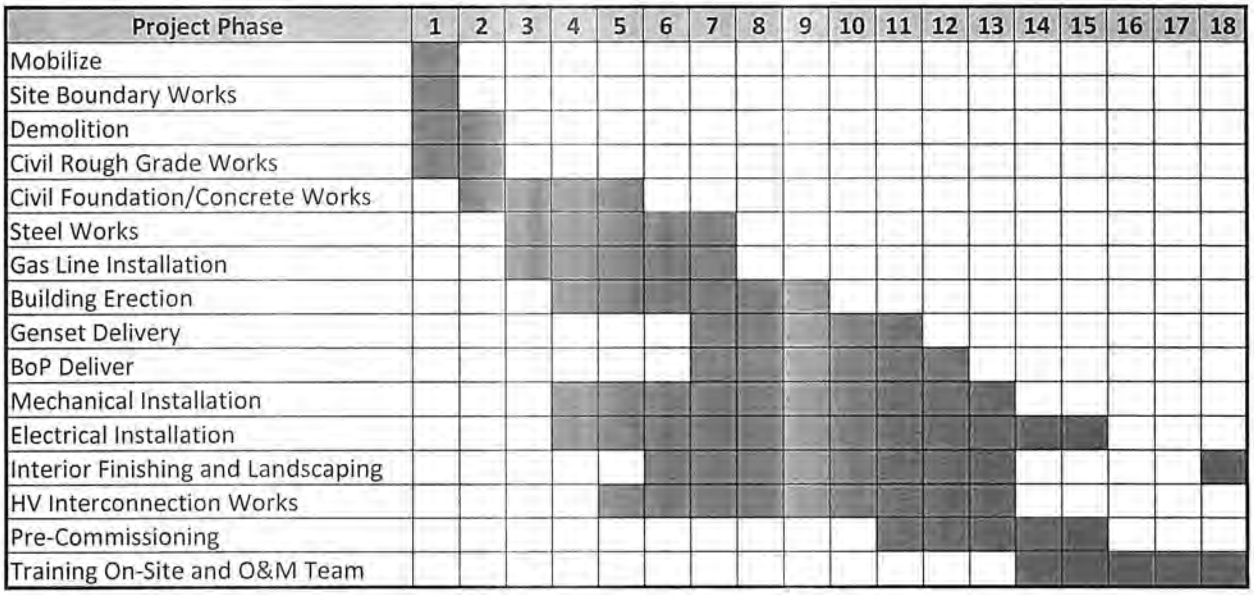
Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
Carpenter	0	0	8	8	15	15	22	22	18	18	8	8	0	0	0	0	0	0	142
Cement Mason	0	6	12	20	20	24	26	26	26	12	12	12	6	6	2	0	0	0	210
Electricians	0	0	0	0	0	0	0	0	16	42	58	56	42	40	12	3	2	2	273
Iron Worker	0	0	0	8	14	20	22	14	14	14	14	12	12	8	2	0	0	0	154
Labor	9	15	10	24	46	56	50	44	44	34	46	46	36	18	9	0	0	0	487
Millwright	0	0	0	0	0	6	16	32	36	36	36	36	26	4	4	2	2	2	238
Operator	18	20	15	15	15	15	15	15	6	6	12	12	12	6	2	2	0	0	186
Pipe Fitter	0	0	0	0	0	6	6	12	38	42	52	52	38	8	6	2	2	2	266
Teamster	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0	0	0	30
Insulation Worker	0	0	0	0	0	0	0	0	6	6	12	12	12	12	8	2	0	0	70
Painter	0	0	0	0	0	0	0	0	0	0	0	6	6	8	8	2	2	2	34
Sheet Metal	0	0	0	0	0	0	0	0	6	10	16	10	10	0	0	2	0	0	54
Total Craft	**29**	**43**	**47**	**77**	**112**	**144**	**159**	**167**	**212**	**222**	**268**	**264**	**202**	**112**	**55**	**15**	**8**	**8**	**2144**

Notes: Table based on the construction of Plains End Facility with adjustments for Quail Brush site specifics.

2.3.13.2 Generation Plant Construction Schedule

An estimate of project construction activities by phase is shown in Table 2.3-4. Construction activities will be scheduled to occur between 7 a.m. and 7 p.m., Monday through Friday. Occasionally, additional hours may be necessary to make up schedule deficiencies or to complete critical construction activities. During some construction periods and during the startup phase of the Project, some activities will continue 24 hours per day, 7 days per week. The peak construction site workforce is expected to occur in months 11 and 12 of the construction period; however, peak heavy truck traffic, related to excavation efforts, will occur during months 1 and 2.

Table 2.3-4 Construction Schedule



Project Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Mobilize	■																	
Site Boundary Works	■																	
Demolition	■	■																
Civil Rough Grade Works	■	■																
Civil Foundation/Concrete Works		■	■	■	■													
Steel Works			■	■	■	■	■											
Gas Line Installation			■	■	■	■	■											
Building Erection				■	■	■	■	■	■									
Genset Delivery							■	■	■	■	■							
BoP Deliver							■	■	■	■	■	■						
Mechanical Installation				■	■	■	■	■	■	■	■	■	■					
Electrical Installation				■	■	■	■	■	■	■	■	■	■	■	■			
Interior Finishing and Landscaping						■	■	■	■	■	■	■	■					■
HV Interconnection Works					■	■	■	■	■	■	■	■	■					
Pre-Commissioning											■	■	■	■	■			
Training On-Site and O&M Team														■	■	■	■	■

Project Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1st Start and Commissioning														■	■	■		
Performance Testing																■	■	
Commercial Operation																	■	■
Final Grading																		■
Demobilization																		■

2.3.13.3 Construction Facilities

Water supply during construction will be the responsibility of the contractor. The primary construction water use will include dust control, soil moisture conditioning for compaction, and hydraulic testing of fire and other water systems. The contractor will truck water to the site from a permitted fire hydrant located nearby within the City of San Diego.

Sanitary facilities will be provided for the construction workforce using self-contained portable facilities. Bottled water will be provided for drinking.

2.3.13.4 Construction Deliveries

Construction materials and supplies such as equipment modules, concrete, structural steel, pipe, wire, cable, fuel, lubricant, paint, adhesives, tools, water, and consumables will be delivered by truck. Deliveries will arrive via SR 52. A truck turnout will be provided along Sycamore Landfill Road on the northwest edge of the site to allow construction equipment that cannot be driven on the paved landfill road to be delivered and picked up.

An average of approximately 15 and a peak of approximately 30 deliveries will occur each weekday during the construction period to bring equipment, materials, and supplies to the site, including about four deliveries per day to gas pipeline staging areas. These deliveries will be distributed throughout the work day.

The site will be fenced during construction and 24-hour security will be provided.

Table 2.3-5 provides an estimate of the average and peak round trip construction traffic during the appropriate 18-month construction and startup period. Additional discussion on traffic volumes is presented in Section 4.4, Traffic and Transportation.

Table 2.3-5 Average and Peak Construction Traffic

Vehicle Type	Average Daily Trips	Peak Daily Trips (Occurs in Month 11)
Construction Workers	120	268
Delivery	15	30
Heavy Trucks	5	10
Total	140	308

Construction laydown and parking areas will either be within the proposed Project site and/or a previously disturbed portion of Sycamore Landfill property. Construction worker parking will be located at 7927 Mission Gorge Road in the City of Santee. This location is an existing paved parking lot that Quail Brush will enter into an agreement with the property owner for its use for this purpose. Construction workers will be bused to construction areas from this location. Construction access will be from Sycamore Landfill Road, as shown on Figure 2.1-2. Materials and equipment will be delivered by truck via Sycamore Landfill Road.

Construction of the utility switchyard will be managed and controlled by SDG&E in a manner that will be supportive of the construction and initial operation schedule for the proposed Project.

2.3.13.5 Generation Plant Construction Disturbance

Construction of the generation plant will result in disturbance to 11 acres of the 21.6-acre plant site parcel.

2.3.14 Generation Plant Operation

The Project will be designed as an intermediate/peaking and load-shaping facility to serve SDG&E load during periods of high demand, which generally occur during daytime hours, and more frequently during the summer than other periods. Because the high efficiency of the 20V34SG engines, the plant's flat, high efficiency profile across its load range, and because of the support this plant will provide both to SDG&E's local 230kV transmission systems, it is anticipated that the Project may be dispatched up to 3,800 hours/year excluding start-ups.

The Applicant retained an independent power market analysis to predict expected hours of operation over the 30-year design life of the facility. The analysis predicts the actual annual average operations of the plant will be 1,739 hours/year. Actual operation will, of course, depend upon actual SDG&E system demand and CAISO dispatch requirements. The plant work force requirements are provided in Table 2.3-6.

Table 2.3-6 Typical Plant Operation Workforce

Department	Personnel	Shift	Workdays
Operations & Maintenance	1 Plant Manager		5 days a week
	10 Plant Technicians	5 Rotating 12-hour shifts with 2 Plant Technicians per shift	7 days a week

All of the plant's capacity will be sold to SDG&E under the terms of the PPA between the Applicant and SDG&E. The exact operational profile of the plant will be dependent on SDG&E's needs and requirements.

While the capacity will be sold under the PPA and it is anticipated that the Project will be dispatched as a peaking, load-following facility for up to 3,800 hours per year, the exact mode of operation cannot be described. It is conceivable, however, that the facility could be operated in one or all of the modes described below.

2.3.14.1 Peak Operations

SDG&E will dispatch the facility, up to maximum continuous output, more often in the summer than during other seasons. Because the facility will be designed to be an intermediate/peaking plant, it is likely that the plant will primarily operate only during high ambient temperature (e.g., high load) periods. It is also quite possible that the plant will operate more in the summer to help support the local 230 kV system.

2.3.14.2 Load Following

The facility will be operated to meet PPA requirements up to the maximum available output at high load times of the day. The output of the plant will therefore be adjusted periodically either to meet SDG&E's load or, if under direct control of the CAISO by Distribution Dispatch Center (DDC) operation, to meet the CAISO's real time market needs.

2.3.14.3 Partial and Stand-by Operation

This mode of operation can be expected to occur during late evening and early morning hours and on weekends when SDG&E only requires a portion of the plant's maximum output; on those occasions only a few of the engines may be in operation. If the engines not in operation are not undergoing maintenance, they will in most cases be available to SDG&E for non-spinning (capacity) reserve.

2.3.14.4 Non-operational Periods

This mode will occur if forced by equipment malfunction, fuel supply interruption, transmission line disconnect, or scheduled maintenance. Because the Project will be an intermediate load/peaking unit, full shutdown would be expected for a majority of the off-peak hours of the year and in the winter, although non-spinning reserve capability would still be available for engines that are off-line, but not in maintenance.

2.3.14.5 Long-Term Closure

In the unlikely event of a situation that causes a long-term cessation of operations, security of the facility will be maintained on a 24-hour basis, and the CEC will be notified. Depending on the length of shutdown, a contingency plan for the temporary cessation of operations may be implemented. Such a contingency plan will be in conformance with all applicable LORS and protection of public health, safety, and the environment. The plan, depending on the expected duration of the shutdown, could include the draining of all chemicals from storage tanks and other equipment and the safe shutdown of all equipment. All wastes from equipment shutdown will be disposed of according to applicable LORS. If the cessation of operations becomes permanent, the plant will be decommissioned. Section 2.8, Facility Closure, includes more information on facility closure.

2.4 NATURAL GAS PIPELINE LATERAL CONSTRUCTION

The Project will connect to the existing 20-inch diameter SDG&E natural gas pipeline that is located 2,200 feet away from the proposed Project site at the intersection of Mast Boulevard and Sycamore Landfill Road. From the tie-in point, the Project's 8-inch natural gas pipeline lateral will generally follow along the north side of Sycamore Landfill Road to the proposed Project site.

Gas pipeline construction will be scheduled so that it is finished and operational when the plant is ready for testing near the end of the construction period. The tap to the existing SDG&E gas main will be constructed by SDG&E. The gas line between the tap point and the onsite metering station, including the metering station itself, will be constructed by SDG&E, who will own and operate this portion of the gas line. From the metering station to each of the engines, the gas piping will be constructed, owned, and operated by the Applicant. Construction of the gas pipeline will occur over an approximately 6-month long period. The gas pipeline will be designed and constructed in accordance with California Department of Transportation (Caltrans), San Diego County, Department of Transportation (DOT), and SDG&E specifications.

The gas pipeline will be installed underground using open trenching and backfill construction methods, except for the Mast Boulevard crossing. The trenching and backfill construction method will include: hauling and stringing of pipe along the pipeline route in advance of the moving area of installation; trenching for pipe installation; welding; radiographic inspection and coating of pipe welds; lowering the pipe into the trench; pressure testing; and backfilling of the trench. At the Mast Boulevard crossing, the pipeline will be installed beneath the road using either the horizontal-directional-drilling or jack-or-bore construction method. The crossing will be completed from a bore pit to a bore receiving pit located outside of Mast Boulevard. The bore pit excavation will be approximately 10 feet wide and 30 feet long, and the receiving pit will be approximately 10 feet wide and 10 feet long. The boring will be cased with a steel encasement within the right-of-way (ROW), the gas pipeline will be installed within the casing with spacers to center the pipeline, and the void between the pipeline and the casing will be pressure grouted.

Traffic control for pipeline construction will be in accordance with Caltrans and the California Manual on Uniform Traffic Control Devices (MUTCD).

The trenching and crossing excavations for gas pipeline construction will total approximately 1,500 cy of cut soil, most of which will be required for backfill. The trenching and crossing work will generate an estimated 200 cy of remaining soil in excess of the backfill requirement. Remaining material will be delivered to the Sycamore Landfill.

The majority of the pipeline route occurs along the north side of Sycamore Landfill Road. The road surface will be stabilized by engineering measures including compacting and crowning the backfilled trench and constructing water bars on the road surface to prevent concentrated runoff. Off of the road surface, disturbances from pipeline construction will be stabilized by planting of native grasses and wildflower seed mix and coastal sage scrub species. The pipeline route will be monitored following the completion of construction, and engineering erosion control measures will be maintained in disturbed areas until the surface is stabilized.

2.5 TRANSMISSION LINE DESCRIPTION, DESIGN, AND OPERATION

2.5.1 Introduction

Section 2.5 discusses the transmission interconnection between the proposed Project and the existing SDG&E electrical grid, and the potential impacts that the operation of the proposed Project will have on the flow of electrical power in the local and regional transmission systems. To better understand the potential impacts of the proposed Project on the regional transmission system and power flows, the analysis presented will focus on (a) the existing electrical transmission system in the immediate area of the proposed Project, (b) the proposed 230kV gen tie between the Project and the electrical grid, and (c) the proposed gen tie route. The anticipated system impacts of the proposed interconnection to the SDG&E transmission system are also discussed. The Project Cluster 2 – Phase II Interconnection Study is being conducted by CAISO/SDG&E and the study results will be available in late August 2011. The Phase II Study report will be provided as supplemental transmission interconnection information upon its receipt. Hence, where appropriate the information described herein will be updated as required after the receipt of the Phase II Study Report.

Additional detail provided below is focused on potential nuisances (e.g., electrical, magnetic, audible noise, and corona effects), and safety issues associated with the proposed 230kV gen tie. A description of applicable laws, ordinances, regulations and standards (LORS) is also provided in Section 2.9.

The site for the proposed Project was selected, in part, for its proximity to the existing transmission and natural gas lines. SDG&E has several transmission lines near the proposed power plant. SDG&E owns and maintains two separate parallel Mission to Miguel 230kV transmission lines, which pass approximately 4,800 feet west of the plant site in a north south direction. SD&E also owns and maintains the two parallel Sycamore to Miguel 230kV transmission lines located approximately 1.5 miles north of the proposed power plant site. Figure 2.1-2 shows the proposed Project in relation to the relevant transmission resources in the immediate vicinity.

The proposed 230kV gen tie will be connected directly to a new utility switchyard, which will be designed, built, and owned by SDG&E. The new SGD&E switchyard will be constructed at a site northwest of the plant site in the vicinity of the existing Mission to Miguel 230kV transmission lines. The new utility switchyard will be selected from three possible sites described herein along the existing or realigned Mission to Miguel transmission corridor. The exact routing of the Project gen tie from the plant site to the new SDG&E utility switchyard location will be determined during route survey and detailed design.

The initial examination of the local transmission system concentrated on anticipated Project power flows, the capacity and location of existing transmission lines, and the physical distances involved with the proposed gen tie. Primary consideration in the analysis was given to the ability of the existing transmission lines to carry the anticipated Project output. Additional aspects considered included environmental effects of building and maintaining the new interconnecting gen tie, right-of-way (ROW) modification(s) and acquisition, engineering requirements, and costs. Alternative interconnection options were identified after analyses of these data and review of the SDG&E system maps and one-line diagrams for their respective service areas. From these alternatives, the proposed transmission line alignment, interconnection configuration, and construction techniques were selected.

Conceptual engineering of the proposed 230kV gen tie will be performed by the Applicant based on the results of the Phase II Study being performed by CAISO/SDG&E and technical engineering support provided by SDG&E.

2.5.2 Existing Transmission Facilities

The proposed power plant site is located west of the City of Santee, south of the Sycamore Canyon Landfill, and north of Hwy 52 in the City of San Diego, California. The two nearest transmission lines are the Mission to Miguel 230kV transmission lines (23022 and 23023) located approximately 4,800 feet west of the plant site and the Sycamore to Miguel (23021) and Sycamore to Miguel Tap (23041) 230kV transmission lines, which run approximately 1.5 miles north of the proposed plant site. Based on preliminary information addressing the capability to accept the added generation capacity represented by the proposed Project, the Mission to

Miguel (23023) 230kV transmission line was selected based on proximity of the line to the Project and the feasibility of interconnection.

2.5.3 System Interconnection Studies

The Phase II Study for the San Diego Area Cluster 2, of which the Project is included, is being performed jointly by CAISO/SDG&E. The study is examining the local and regional loads, rating of the existing 230kV transmission system and the ability of the existing transmission grid to safely and reliably transmit the Project nominal capacity (100 MW net), along with the anticipated increases in capacity from other projects in the San Diego Area Cluster 2. It is anticipated that the results of the system impact studies, coupled with the physical location of the transmission resources relative to the proposed Project, will aid in the selection of the proposed interconnecting transmission line route and design of interconnection facilities.

2.5.4 Proposed Generation Tie-Line

The proposed 230kV gen tie will start at the dead-end structure inside the plant switchyard on the north side of the plant. The gen tie route will then proceed north along the west side of Sycamore Landfill Road for approximately 2,600 feet, then travel northwest for approximately 2,600 feet to the proposed preferred location of the new SDG&E switchyard. The final location of the utility switchyard and its interconnection to the existing or realigned Mission to Miguel transmission line is subject to SDG&E approval. The Applicant intends to commence interconnection facilities review with SDG&E transmission department personnel pursuant to a an engineering support agreement entered into with SDG&E.

The total length of this segment of the 230kV gen tie between the plant site and the proposed location for the new SDG&E switchyard will depend on the final site selected for the new switchyard. The 230kV gen tie will be installed on steel poles (Figure 2.5-1) and will have a ruling span of about 350 to 400 feet. The location and width of the gen tie corridor ROW will consider, as required, 230kV line clearances and address operational and maintenance criteria required by California Public Utilities Commission (CPUC) General Order (GO)-95 In addition, the new gen tie will conform to the recent Electromagnetic Field (EMF) Guidelines for Electrical Facilities prepared in response to the CPUC Decision 06-01-042.

The proposed route of the gen tie requires a line crossing with the existing 230kV Mission to Miguel 230kV line. The Applicant has identified two possible options for this crossing:

- A direct buried 230kV cable: In this option, the overhead line would terminate before the existing line and transition to an underground cable. Once under the existing line the option exists to either transition back up to an overhead line, which will then lead directly to the proposed new switchyard or to continue the underground cable from the crossing into the proposed switchyard.
- Raised overhead transmission line: In this option, the gen tie line would "go over" the SDG&E T-lines by raising. In this scenario, the gen tie towers on either side of the SDG&E transmission lines are raised to ensure that the gen tie line height provides the proper clearance. However, due to concerns about potential interruption caused by an upper line falling on a lower line and the resulting unexpected outage and mechanical damage, typically require that the existing T-lines remain high in these types of line crossings. This option would necessitate the developer to pay for raising the towers on

the utility lines. In this crossing that would mean four large multi-bundled towers would need to be raised and the cost would be high and the responsibility of the developer. This option is therefore impractical.

In light of these options, the Applicant proposes to underground the gen tie line prior to the crossing and, depending on the final location of the switchyard, to continue running the underground cable directly into the switchyard.

The Applicant proposes to direct bury the 230kV cable ensuring proper protection of the cable and attention to thermal management as well as the associated electric and magnetic field management. The greatest benefit of this option is the reduced impact on the existing line – mainly in terms of live-line maintenance. As the proposed route of the cable is relatively short, no manholes or joints are anticipated. 230kV cable technology is considered routine and there are many competitors providing very reliable products. Likewise, the bushings to be used at the connection between the overhead line conductors and the cable as well as between the cable and the switchyard equipment are considered well established, with many products available.

2.5.5 Generation Plant Switchyard

The proposed Project 230kV switchyard consists of a single three-winding generation station unit transformer (GSUT) and associated 230kV gas-insulated (SF_6) circuit breaker, disconnect switches, and interconnecting bus structures. The plant switchyard general arrangement layout is shown on Figure 2.3-1. An electrical single-line diagram of the proposed Project substation is shown on Figure 2.5-2.

The 230kV plant switchyard and all associated equipment will be designed for 1,200 amperes (A) continuous current and a 40 kiloampere interrupting capacity (kAIC). As shown on Figure 2.4-2, each cluster of generator sets would be provided with an independent tie to a dedicated low side winding of the GSUT inside the plant switchyard via 15kV nonsegregated-phase bus duct. The high-side bus, consisting of rigid aluminum bus structures, or strain bus, will be connected to the new 230kV transmission line through 60-foot dead-end structures on the southeast end of the switchyard.

One 13.8kV-480 volt auxiliary power transformer will be connected to each 15kV metal-clad switchgear. This switchgear would collect power from a cluster of five to six generator sets and distribute it to the respective GSUT winding. The auxiliary power transformers would provide power to all auxiliary loads within the plant. Startup and standby power would be supplied from the grid through the GSUT, which will backfeed 13.8kV power into the power plant 15kV switchgear and to the respective auxiliary transformers. Alternately, startup and standby power might be provided by separate 480 volt services from the local distribution system, if available.

Auxiliary controls and protective relay systems for the 230kV plant switchyard would be installed in a controlled enclosure on the west side of the plant switchyard.

2.5.6 Overhead Generation Tie-Line Characteristics

The proposed gen tie will be designed to carry the full output of the facility at 230kV. The gen tie would be arrayed in a single-circuit configuration, supported by steel structures placed at appropriate intervals. The overhead line conductor type (Table 2.5-1) to be considered will have a range of 859 thousand circular mil (kcmil) Aluminum Conductor Steel Reinforced (ACSR), Expanded, 954 kcmil ACSR (Rail) to 1113 kcmil ASCR/SDC (or higher) to curtail corona effect.

Table 2.5-1 Comparisons of Conductor Sags and Tensions

Span Length in Feet	Conditions	Type 1113 kcmil ACSR SDC	Type 954 kcmil Alloy Expanded	Type 859 kcmil ACSR Expanded
400 ft span **				
MTHL	I	14506	8500	8950
0° bare	F	9881	5060	5060
120° bare	F	3874 (06.20')	2282 (10.54')	3270 (07.35')
212° bare	F	2664 (09.02')	1694 (14.21')	2662 (09.03')
600 ft span				
MTHL	I	14743	9109	9437
1 inch ice	I		10710	11133
21 psf wind	I		7328	7723
0° bare	F	9488	5060	5060
120° bare	F	4487 (12.08')	2702 (14.80')	3097 (15.25')
212° bare	F	3279 (16.57')	2099 (19.12')	2514 (18.84')
800 ft span				
MTHL	I	15403	9998	9861
1 inch ice	I		12243	12472
21 psf wind	I		8395	8166
0° bare	F	9095	5060	5060
120° bare	F	5197 (18.56')	3200 (22.24')	3587 (23.45')
212° bare	F	4035 (23.97')	2600 (27.49')	3021 (27.92')
1,000 ft span				
MTHL	I	16039	10679	10416
1 inch ice	I		13483	13520
21 psf wind	I		9218	8860
0° bare	F	8914	5060	5060
120° bare	F	5778 (26.12')	3578 (31.14')	3934 (33.49')
212° bare	F	4682 (32.32')	3011 (37.15')	3429 (38.53')

Notes:

** tension data extrapolated

Acronyms and Abbreviations:

ACSR – Aluminum Conductor Steel Reinforced Cable
F – Final
ft - feet
I – Initial
kcmil – thousand circular mil
MTHL – Maximum Tension Heavy Loading
psf – pound per square foot
SDC - Self Damping Conductor

Selection of the appropriate conductor depends upon the peak power to be transmitted through the gen tie line. The Project is capable of generating 100 MW. Assuming power factor equal to 0.95, nominal current of single circuit 230 kV line will be 264 (A).

Below are the current ratings for the three conductors suggested above:

Conductor type	Current Rating (A)*
859 kcmil ACSR	>918
954 kcmil ACSR (Rail)	993
1113 kcmil ASCR/SD	1092

* Ratings are from Vendor's catalogue

Current ratings for all conductors are greater than 3 times as many amps as required to accommodate the proposed gen tie line current. Considering all ampacity de-rating factors; solar heat absorption and conductor heat due to current and all site condition factors (such as maximum ambient temperature, azimuths of sun and line), all conductors are more than sufficient with regards to ampacity. The only concern in conductor selection is corona. By experience, use of conductors larger than 900 kcmil in size guarantees limitation of corona in acceptable range. As a result, the Applicant proposes to use 954 kcmil Rail ASCR conductor for this line.

The selection of the steel pole designs for the 230kV gen tie will be determined by the exact route and to accommodate changes of direction in the transmission line route. The dead-end poles, heavy-angle poles, and tangent type poles would be used as needed.

The structure of gen tie line will be of single circuit steel mono-pole design with 230kV circuit. Tangent pole outline and geometry will be as shown in Figure 2.5-1 and Table 2.5-2.

Table 2.5-2 Steel Pole Structure Dimensions

Minimum Dimensions (ft)		
Voltage	230kV	
Number of Insulators	12	13
Dimension A	10.0	10.5
Dimension B	11.0	11.5
Dimension C	13.0	14.
Dimension D	10.0	11.0

Reference: RUS BULETTIN 1724E-204, Transmission Line Structures, Guide for Steel Pole Structure Dimensions (115kV-230kV)

Referring to Table 2.5-1, the maximum sag for 954 kcmil ACSR (Rail) conductor in 600-foot span and 212° F is 19.12 feet. Therefore, tangent pole height will reach (assuming 13 insulators per string):

D + 2*C + insulator string length + sag + clearance above ground =
11 + 2* 14 + 6.78 + 19.12 + 20.9 = 85.8 (feet)

The proposed 230kV gen tie will exit the plant switchyard in a slack span configuration from the dead-end structures (approximately 60 feet tall) on the north side of the plant site (Figure 2.3-1). From that structure, the 230kV gen tie will travel north then northwest with an average span of 400 to 600 feet. Depending on the final routing of the gen tie, heavy-angle structures will be placed as required along the approximate one mile long ROW of the 230kV gen tie to accommodate changes in direction of the line. The remaining new pole structures will be tangent-type design and will be spaced based on engineering criteria. The new pole structures will be approximately 70 to 90 feet tall. Figure 2.5-1 shows a typical mono steel pole with vertical arrangement of three phases at one side of conductor, which has been chosen for the gen tie. Reference is made to RUS Bulletin 1724E-204, Transmission Line Structures, Guide for Steel Pole Structure Dimensions (115kV-230kV) in Table 2.5-2. A 954 kcmil ACSR Rail conductor has been chosen to avoid Corona. This conductor has sufficient capacity to carry required current.

2.5.7 Transmission Interconnection System Impact Studies (SIS)

The proposed Project will be operated as a peaking station and will enhance the reliability and availability of the 230kV network in the area by supporting intermittent solar and wind generation. The Phase II SIS is being performed by CAISO/SDG&E for the proposed Project. From the SIS report, the impact of the proposed Project's generation capacity on the grid will be determined. The transmission system's transient performance, relative to CAISO reliability guidelines, will also be analyzed. A copy of the Phase II SIS report will be provided when the final version is available. A copy of the Large Generator Interconnection Study Process Agreement is provided as Appendix B.9.

2.5.8 Transmission Interconnection Safety and Nuisances

This section discusses safety and nuisance issues associated with the proposed electrical interconnection of the proposed Project to the SDG&E electrical grid. Construction and operation of the proposed overhead gen tie will be undertaken in a manner that ensures the safety of the public, as well as maintenance and ROW crews, while supplying power with minimal electrical interference.

2.5.8.1 Electrical Clearances

Typical high-voltage overhead transmission lines are composed of bare conductors connected to supporting structures by means of porcelain, glass, or polymer insulators. The air surrounding the energized conductor acts as the insulating medium. Maintaining sufficient clearances, or air space, around the conductors to protect the public and utility workers is paramount to safe operation of the line.

The proposed 230kV gen tie will be installed overhead and will be approximately one mile in length, and will be constructed with bare overhead conductors connected to supporting structures by means of porcelain, glass, or polymer insulators. The overhead gen tie will be built by the Applicant and owned and operated by SDG&E. The safety clearance required around the conductors is determined by normal operating voltages, conductor temperatures, short-term abnormal voltages, windblown swinging conductors, contamination of the insulators, clearances for workers, and clearances for public safety. Minimum clearances are specified in GO-95 and the National Electrical Safety Code (NESC). Electric utilities, state regulators, and local ordinances may specify additional (more restrictive) clearances.

Gen tie line clearances above ground and ROW width for the 230 kV gen tie are provided in Tables 2.5-3 and 2.5-4 below.

Table 2.5-3 Ground Clearance (Reference: RUS BULLETIN 1724E-200)

Clearance description	Clearance above ground for 230kV line (Nominal Voltage, Phase to Phase (kV_{LL})) in (ft)
Spaces and ways accessible to pedestrians only Note: Areas accessible to pedestrians only are areas where riders on horses or other large animals, vehicles or other mobile units exceeding 8 feet in height are prohibited by regulation or permanent terrain configurations or are not normally encountered nor reasonably anticipated. Land subject to highway right-of-way maintenance equipment is not to be considered as being accessible to pedestrians only	20.9

Table 2.5-4 ROW Width (Reference: RUS BULLETIN 1724E-200)

Clearance description	Typical ROW width for 230kV line (Nominal Voltage, Phase to Phase (kVLL)) in (ft)
ROW width	125-200

Other typical clearances will be specified for the following, as part of the final design:

- Distance between the energized conductors themselves (same line)
- Distance between the energized conductors and the supporting structure (taking into account the length of insulators used and the swing and vibration movement of the conductors)
- Distance between the energized conductors and other power or communication wires on the same supporting structure, or between other power or communication wires above or below the conductors
- Distance from the energized conductors to the ground and features, such as roadways, railroads, driveways, parking lots, navigable waterways, and airports
- Distance from the energized conductors to buildings and signs
- Distance from the energized conductors to other power lines (examples include other parallel lines and line being crossed over)

The proposed Project gen tie will be designed to meet all national, state, and local code clearance requirements. These standards are summarized in the LORS table in Section 2.9 and described in more detail in Appendix B Engineering Design Criteria.

2.5.8.2 Electrical Effects

The electrical effects of high-voltage transmission lines fall into two broad categories—corona effects and field effects. Because these effects have the potential to cause a deviation from the normal they are often termed Electromagnetic Interference (EMI):

- Corona is the ionization of the air that occurs at the surface of the energized conductor and suspension hardware due to very high (i.e., when it is above a critical level) electric field strength at points between the high voltage side of the line and ground. The location and extend of corona varies and is dependent on the design, construction techniques and the environment. Besides the power loss associated with corona, corona could result in radio and television reception interference (RI and TVI), audible noise (AN), light, and production of ozone. The key technical parameters affecting corona include: line voltage, line phase configuration, insulating distances, insulating hardware, conductors and configuration of conductor bundles, environmental parameters, and attention to detail during construction.

- Field effects are a direct result of the voltage and current associated with the line. Electric field effects are a direct result of the 60 hertz (Hz) line voltage and the 60Hz magnetic field effects and are a consequence of the load current. These fields are of interest because they couple into nearby objects. Consequently, levels need to be managed such that the coupling does not produce unintended consequences.

Operating power lines, like the energized components of electrical motors, home wiring, lighting, and all other electrical appliances, produce electric and magnetic fields commonly referred to as the electromagnetic field (EMF). The dominant EMF produced by the alternating current electrical power system in the United States has a frequency of 60 Hz, meaning that the intensity and orientation of the field changes 60 times per second. Consequently, it is essential to ensure electromagnetic compatibility (EMC) with the operating environment.

The 60 Hz power line fields are considered to be extremely low frequency. To place this in context, other common frequencies include: AM radio, which operates up to 1,600,000 Hz (1,600 kilohertz [kHz]); television, 890,000,000 Hz (890 megahertz [MHz]); cellular telephones, 900,000,000 Hz (900 MHz); microwave ovens, 2,450,000,000 Hz (2.4 gigahertz [GHz]); and X-rays, about 1 billion Hz. Higher frequency fields have shorter wavelengths and greater energy in the field. Microwave wavelengths are a few inches long and have enough energy to cause heating in conducting objects. High frequencies, such as x-rays, have enough energy to cause ionization (breaking of atomic or molecular bonds). At the 60 Hz frequency associated with electric power transmission, the electric and magnetic fields have a wavelength of 3,100 miles and have very low energy that does not cause heating or ionization. The 60 Hz fields do not radiate, unlike radio frequency fields.

2.5.8.3 Electric Fields

Electric fields around transmission lines are produced by potential difference (voltage) between an energized conductor and surrounding objects. Electric field strength is directly proportional to the line's voltage; that is, increased voltage produces a stronger electric field. The electric field is inversely proportional to the distance from the conductors, so that the electric field strength declines as the distance from the conductor increases. As the electric field is relative to line voltage which can be considered a "constant", electric field around a transmission line remains practically steady and is not affected by the common daily and seasonal fluctuations in use of electricity by customers. The electric field pattern is however affected by both permanent and temporary objects within the electric field.

The basic unit of measurement for an electric field is V/m – volts per meter. In the case of transmission lines the usual unit of measure is kV/m – thousands of volts per meter. Table 2.5-5 provides a preliminary calculation of the electric field strength for the Project's 230kV gen tie line.

Table 2.5-5 Calculation of Electric Field at Ground

Reference: EPRI's Red Book, section 8.5, Nomogram to calculate Emax.

Introducing involved parameters:

- H: Distance between conductor to measuring point at ground,
- D: Diameter of conductor: 1.165 (in) or 0.097 (ft) taken from vendor's catalogue,
- S: Phase spacing: 14 (ft),
- E: Electrical field,
- V: nominal line-line voltage: 230 kV,
- HE/V: To be taken from reference graph,
- H/D: To be calculated.

Distance from ROW Centerline (ft)	H (ft)	H (m)	H/D	S/H	HE/V	E (kV/m)
-50	43.81	13.35	451.62	0.32	0.0685	1.1799
-45	39.48	12.04	407.06	0.35	0.071	1.3569
-40	35.34	10.77	364.35	0.40	0.083	1.7721
-35	31.45	9.59	324.22	0.45	0.087	2.0875
-30	27.91	8.51	287.75	0.50	0.095	2.5683
-25	24.88	7.58	256.50	0.56	0.097	2.9418
-20	22.56	6.88	232.60	0.62	0.108	3.6120
-15	21.19	6.46	218.46	0.66	0.112	3.9882
-10	20.95	6.39	216.02	0.67	0.1125	4.0514
-5	21.89	6.67	225.64	0.64	0.1085	3.7406
0	23.85	7.27	245.93	0.59	0.1055	3.3372
5	26.63	8.12	274.52	0.53	0.0965	2.7346
10	29.98	9.14	309.12	0.47	0.092	2.3153
15	33.75	10.29	347.94	0.41	0.0845	1.8893
20	37.80	11.52	389.72	0.37	0.079	1.5769
25	42.06	12.82	433.61	0.33	0.069	1.2379
30	46.47	14.16	479.03	0.30	0.0675	1.0962
35	50.98	15.54	525.58	0.27	0.0645	0.9547
40	55.58	16.94	572.98	0.25	0.063	0.8553
45	60.24	18.36	621.05	0.23	0.0615	0.7704
50	64.95	19.80	669.63	0.22	0.06	0.6970

Anticipated electric field "E" levels are well within acceptable margin of 230kV lines.

The highest electric field on ground (directly below the conductor) is approximately 4.05 kV/m. The electric field at 40 feet from that point is approximately 0.7 kV/m. Since the ROW width of this line is 125 feet, the electric field at the edge of ROW should be well below the acceptable maximum value (utilized formulas and graphs are taken from EPRI's red book, ROW from RUS Bulletin 1724E-200).

Once the gen tie route is finalized, a final calculation will be performed to determine the actual strength of the electric field along the proposed route.

2.5.8.4 Magnetic Fields

Magnetic fields or EMF around transmission lines are produced by the current flow, measured in terms of amperes, through the conductors. The magnetic field strength is directly proportional to the magnitude of current flow; that is, increased amperes produce a stronger magnetic field, or increased magnetic flux density. The magnetic field is inversely proportional to the distance from the conductors. Thus, like the electric field, the magnetic field strength declines as the distance from the conductor increases. The international unit of measure for magnetic flux density is Tesla (T). In the United States, the more common measure is Gauss (G). For transmission lines, typical magnetic fields are expressed in units of milligauss (mG). The amperes and, therefore, the magnetic field around a transmission line, fluctuate daily and seasonally as the use of electricity varies.

Considerable research has been conducted over the last 30 years on the possible biological effects and human health effects from EMF. This research has produced many studies that offer no uniform conclusions about whether or not long-term exposure to EMF is harmful. In the absence of conclusive or evocative evidence, some states, California in particular, have chosen not to specify maximum acceptable levels of EMF. Instead, these states mandate a program of prudent avoidance whereby EMF exposure to the public would be minimized by encouraging electric utilities to use low-cost techniques to reduce the levels of EMF.

EMF field strengths were calculated using the Transmission Line Parameters and Transmission Line Calculator program developed by the Safe Engineering Services & Technologies, LTD (SESTLC). SESTLC calculates the electric fields (EF) expressed as kV/m and the EMF expressed in mG (Table 2.5-6).

The various inputs for the calculations include voltage, current load, current angle, conductor type and spacing, number of subconductors, subconductor bundle symmetry, spatial coordinates of the conductors and shield wire, various labeling parameters, and other specifics. The field level is calculated perpendicular to the line and at mid-span where the overhead line sags closest to the ground (calculation point). The midspan location, therefore, provides the maximum value for the field. The EF and EMF values should be calculated at a level of 3 feet (or 1 meter) above flat terrain.

Table 2.5-6 Calculation of Magnetic Field at 1 Meter above Ground

1- Calculation of magnetic field at 1 meter above ground:

Reference: EPRI's Red Book, section 8.6.

Introducing involved parameters:

- B: Magnetic field (in mG),
- R: Distance between center of set of conductors (phases) to measuring point at 1 meter above ground (in m),
- P: Spacing between conductors: 14 (ft) or 4.27 (m)
- I: Current: 264 (A).

Distance from ROW Centerline (ft)	R(m)	B (mG)
-50	39.94	2.45
-45	35.15	3.16
-40	30.42	4.22
-35	25.80	5.87
-30	21.34	8.57
-25	17.19	13.22
-20	13.62	21.06
-15	11.20	31.13
-10	10.75	33.82
-5	12.47	25.12
0	15.67	15.91
5	19.63	10.13
10	23.99	6.79
15	28.56	4.79
20	33.25	3.53
25	38.02	2.70
30	42.84	2.13
35	47.70	1.72
40	52.59	1.41
45	57.49	1.18
50	62.41	1.00

While the State of California does not set a statutory limit for electric and magnetic field levels, the CPUC, which regulates electric transmission lines, mandates EMF reduction as a practicable design criterion for new and upgraded electrical facilities. As a result of this mandate, the regulated electric utilities have developed their own design guidelines to reduce EMF at each new facility. In the spring of 2006, a utility workshop culminated in the development of standardized design guidelines. The CEC, which regulates transmission lines to the first POI, requires independent power producers (IPP) to follow the existing guidelines used by local electric utilities or transmission system owners.

In keeping with the goal of EMF reduction, the interconnection of the proposed Project will be designed and constructed using the principles outlined in the SDG&E publication, *EMF Design Guidelines for Electrical Facilities*. These guidelines explicitly incorporate the directives of the CPUC by developing design procedures compliant with Decision 93-11-013 and General Orders 95, 128, and 131-D. When the gen tie structures, conductors, and ROW are designed according to the SDG&E guidelines, the gen tie will be consistent with the CPUC mandate.

From page 37 of the SDG&E guidelines, the following are the primary techniques for reducing EMF along the line:

1. Increase the pole height for overhead design.
2. Use compact pole-head configuration.
3. Minimize the current on the line.
4. Optimize the configuration of the phases (A, B, C).

The anticipated EMF levels have been calculated for the proposed Project gen tie as preliminarily designed. The CEC requires actual measurements of pre-interconnection background EMF to compare with measurements of post-interconnection EMF levels. If required, the pre- and post-interconnection verification measurements will be made consistent with IEEE guidelines and will provide sample readings of EMF at the edge of the ROW. Additional measurements will be made by request for locations of particular concern.

The highest magnetic field at 1 meter above ground (directly below the conductor) is 34 mG. The magnetic field at 40 feet from that point is 1 mG. Since the ROW width of this gen tie is 125 feet, the magnetic field at the edge of the ROW is well below the acceptable maximum value (utilized formulas are taken from EPRI's red book).

2.5.8.5 Audible Noise

Corona is a function of the voltage of the line, the diameter of the conductor, and the condition of the conductor and suspension hardware and the environment. The electric field gradient is the rate at which the electric field changes and is directly related to the line voltage. The electric field gradient is greatest at the surface of the conductor. Large-diameter conductors and bundles of conductors (a bundle of conductors is equivalent to a conductor of the same diameter as the outer diameter of the bundle) have lower electric field gradients at the conductor surface and, hence, lower corona than smaller conductors, everything else being equal. Irregularities, such as knicks and scrapes on the conductor surface, or sharp edges on suspension hardware, concentrate the electric field at these locations and increase corona at these spots. Similarly, contamination on the conductor surface, such as dust or insects, can cause irregularities that are a source for corona. Raindrops, snow, fog, and condensation are also sources of irregularities. Corona typically becomes a design concern for transmission lines having voltages of 345kV and above.

It is important that any discussion of EMF and audible noise include the assumptions used to calculate these values and remembering that EMF and audible noise near the power lines vary with regard to line design, line loading, distance from the line, and other factors. Both the electric field and audible noise depend on line voltage, which remains nearly constant for a transmission line during normal operation. A worst-case voltage of 242kV (230 kV +5 percent) will be used in the calculations for the proposed 230kV gen tie.

Once the transmission line route is finalized a calculation will be performed to determine the magnitude of audible noise from the 230kV gen tie along the proposed route. The following assumptions commonly used by utility companies will be adopted for this study:

- The line will be considered loaded at 75 percent of forecasted load.
- Magnetic field strength will be calculated at 3 feet above ground.
- Resultant magnetic fields are to be utilized.
- All line loadings are assumed balanced.
- Dominant power flow directions will be used.

Currently, the region immediately surrounding the power plant site is undeveloped land and the majority of noise sensitive areas are located to the east in the City of Santee. There is significant terrain shielding that will help block sound propagating to the residential areas. Given the extended separation distances and terrain shielding, operation of the electrical transmission line and switchyard are not expected to result in an adverse noise impact. Transmission line and switchyard audible noise are further discussed in AFC Section 4.3.4.3.

2.5.8.6 Induced Current and Voltages

A conducting object, such as a vehicle or person located within an electric field, will have induced voltages and currents. The strength of the induced current will depend on the electric field strength, the location, size and shape of the conducting object, and the object-to-ground resistance. Examples of measured induced currents in a 1 kV/m electric field are about 0.016 milliamps (mA) for a person, about 0.41 mA for a large school bus, and about 0.63 mA for a large trailer truck.

When a conducting object is isolated from the ground (e.g. the rubber tires of a vehicle) and a grounded person touches the object, a perceptible current or shock could occur as the current flows to ground. In the case of a person the common terms for this are called: step-and-touch potential. Shocks are classified as below perception, above perception, secondary, and primary. The mean perception level is 1.0 mA for a 180-pound man and 0.7 mA for a 120-pound woman. Secondary shocks cause no direct physiological harm, but could annoy a person and cause involuntary muscle contraction. The lower average secondary shock level for an average sized man is about 2 mA. Primary shocks can be harmful. Their lower level is described as the current at which 99.5 percent of subjects can still voluntarily "let go" of the shocking electrode. For a 180-pound man this is 9 mA, for a120-pound woman, 6 mA, and for children, 5 mA. The NESC specifies 5 mA as the maximum allowable short-circuit current-to-ground from vehicles, trucks, and equipment near transmission lines.

The mitigation for hazardous and nuisance shocks is to ensure that metallic objects on or near the ROW are grounded, and that sufficient clearances are provided at roadways and parking lots to keep electric fields at these locations sufficiently low to prevent vehicle short circuit currents from exceeding 5 mA.

Magnetic fields can also induce voltages and currents in conducting objects. Typically, this requires a long metallic object, such as a wire fence or aboveground pipeline that is grounded at only one location. A person who closes an electrical loop by grounding the object at a different location will experience a shock similar to that previously described for an ungrounded object. Mitigation for this problem is to ensure multiple grounds on fences or pipelines, especially those that are oriented parallel to the transmission line.

The proposed 230kV gen tie will be constructed in conformance with CPUC GO-95 and Title 8 CCR 2700 requirements. Therefore, hazardous shocks are unlikely to occur as a result of Project construction, operation, or maintenance.

2.5.8.7 Communications (Radio or Television) Interference

The communication interference (radio or television) for the proposed Project 230kV gen tie has been calculated for two different environmental conditions applied to the new gen tie—the heavy rain condition and the fair weather condition.

The North American Regional Broadcasting Agreement recognizes a 54 decibel (dB) signal level as the outer boundary of an AM radio station's primary service territory. The amount of AM radio interference caused by the gen tie depends on the relative signal strength of the radio signal and other sources of ambient radio noise. The Federal Communications Commission (FCC) recommends the following minimum signals as necessary to reliably serve a primary service area:

- Business City Area: 80 to 94 dB
- Residential City Area: 66 to 80 dB
- Rural Area: 40 to 54 dB

The requirements for higher signal strengths in city areas takes into consideration the higher level of ambient noise levels typically found in the city as compared with a rural location.

Good radio reception is typically based on a signal strength 26 dB greater than ambient noise. This 26 dB signal-to-noise ratio is applied to the fair weather ambient noise level. A commonly accepted level of transmission radio noise is 40 to 45 dB at the edge of ROW for fair weather conditions. A 40 dB noise level and 26 dB signal-to-noise ratio would imply a signal strength of 66 dB, which agrees with recommended signal strength as listed above for a residential city area.

Digital communication (digital radio and TV) and FM radio is immune to corona type radio noise and, therefore, is not considered in evaluation of transmission radio interference. Television audio is also an FM signal that is not affected by transmission line radio noise. In the past and in some areas, Television video is an AM signal that is subject to interference from transmission lines. As analog TV is phased out in favor of digital TV, TVI will not be an issue. However, the frequency spectrum for fair weather corona noise follows an inverse law. The transmission noise attenuates at a rate of 20 dB per frequency decade. In addition to attenuation for frequency, an adjustment is made for the different bandwidth of the television signal versus AM radio. When the frequency and bandwidth adjustments are made, the net correction is 10 dB. The expected noise at television frequencies is 10 dB less than for AM radio.

The following is a calculation of potential radio and TV interference levels:

Reference: EPRI's Red Book, sections 5.3 and 5.4.

Introducing involved parameters:

- RI: Radio interference,
- TVI: Television interference,
- h: Height of closest phase to ground (in m),
- R: Lateral distance from antenna to nearest phase

Assumptions:

- Ground resistivity is taken equal to 100 ohms (Ω).
- Prediction of RI & TVI is made for an antenna located at 100 m from the line.

- Frequency of interest for RI and TVI prediction is assumed to be 83.25 MHz (carrier frequency of TV channel 6 with a grade B signal of 47dB above 1 µV/m).
- RI and TVI have been calculated for heavy rain condition as the worst case.
- RI level of 362 kV line has been considered as the base case and correction factors and dB adders have been extrapolated. This assumption will result in conservative values as 230 kV line has smaller corona than a 362 kV line. Base case parameters are:
  - Line voltage: 362 kV,
  - Phase arrangement and spacing: Vertical and 7.5 m,
  - Lowest phase to ground clearance: 12.5 m

Calculations:

- RI level in heavy rain from base case graph (introduced reference): 73.2 dB,
- Adjustment due to voltage level from corresponding graph: -18.5 dB,
- Adjustment due to phase spacing: +2.2 dB from corresponding graph,
- Adjustment due to average height above ground from corresponding graph: +0.5 dB,
- 3.2 = Constant
- Tie-Line project's RI = 73.2 - 18.5 +2.2 + 0.5 = 57.4 dB above 1 µV/m,
- $\mathrm{TVI} = \mathrm{RI} - 20\ \mathrm{Log}_{10}(f((1 + (R/h)^2)/(1 + (15/h)^2))^{0.5}) + 3.2 = 57.4 - 54.18 + 3.2 = 6.42$ dB above 1 µV/m,
- SNR (Signal to Noise ratio) = 47 - 6.42 = 40.58 dB.

Referring to SNR rating scale (graph 5.3.5 of introduced reference), TVI of the project is less than scale 3 and is within the acceptable range. SNR in other conditions such as wet conductor or dry weather condition is much smaller and is actually negligible.

2.5.8.8 Aviation Safety

Federal Aviation Administration (FAA) Regulations, Title 14 of the Code of Federal Regulations (CFR), Part 77, establishes standards for determining obstructions in navigable airspace in the vicinity of airports that are available for public use and are listed in the airport directory of the current airman's information manual. These regulations set forth requirements for notification of proposed obstructions that extend above the earth's surface. FAA notification is required for any potential obstruction structure erected over 200 feet in height above ground level. Notification is required if the obstruction is greater than specified heights and falls within any restricted airspace in the approach to airports. For airports with runways longer than 3,200 feet, the restricted space extends 20,000 feet (3.3 nautical miles) from the runway with no obstruction greater than a 100:1 ratio of the distance from the runway. For airports with runways measuring 3,200 feet or less, the restricted space extends 10,000 feet (1.7 nautical miles) with a 50:1 ratio of the distance from the runway. For heliports, the restricted space extends 5,000 feet (0.8 nautical miles) with a 25:1 ratio.

The Marine Corps Air Station (MCAS) Miramar boundary is to the north of the Project approximately 1.55 miles, and the main runway complex at MCAS Miramar is 6 miles to the northwest. Gillespie Field (airport) lies approximately 3 miles to the southeast, and Montgomery

Field (airport) lies 6.4 miles to the southwest. While the gen tie will be below the thresholds associated with FAA regulations and impacts would be less than significant, the Applicant will file a Notice of Proposed Construction or Alteration (Form 7460-1) with the FAA. The Project would also comply with the San Diego County Regional Airport Land Use Commission (ALUC) – Miramar Airport Land Use Compatibility Plan.

2.5.8.9 Vegetation Management and Associated Fire Hazards

The proposed 230kV gen tie will be designed, constructed, and maintained in accordance with GO-95, which establishes clearances from other constructed and natural structures and tree-trimming requirements to mitigate fire hazards. In the event that trees are encountered along the proposed gen tie corridor, those trees will be trimmed or removed to ensure mitigation of these hazards. However, it is unlikely that any vegetation management will be required because the entire proposed route is over scrubland. SDG&E will maintain the gen tie ROW and immediate area in accordance with accepted industry practices that will include identification and abatement of any fire hazards to ensure safe operation of the gen tie.

2.5.9 Generation Tie-Line Interconnection Construction

The proposed 230kV gen tie will start at the dead-end structure inside the plant switchyard on the north side of the power plant. The gen tie will then proceed north along property owned by Sycamore Landfill for approximately 2,600 feet then run north-west for approximately 2,600 feet to the POI, the new SDG&E switchyard. The location of the utility switchyard needs to be finalized by SDG&E. The total length of this segment of the 230kV gen tie between the Project site and the proposed location for the new SDG&E switchyard is approximately 5,280 feet. The 230kV gen tie will be installed on steel poles and will have a ruling span of about 350 to 400 feet. The gen tie corridor ROW is estimated to be approximately 125 to 200 feet wide and will consider, as required, 230kV gen tie clearances and address operational and maintenance criteria required by the CPUC GO-95. In addition, the new gen tie will conform to the recent EMF Guidelines for Electrical Facilities prepared in response to CPUC Decision 06-01-042. The gen tie will be serviced by an unpaved, approximately 16-foot wide access road that will parallel the gen tie route.

Construction of the gen tie to the proposed SDG&E switchyard will occur within the limits of Sycamore Landfill-owned property.

The proposed 230kV gen tie will be connected directly to a new SDG&E switchyard, which will be designed, built, and operated by SDG&E. The new SGD&E switchyard is anticipated to be located approximately 1 mile northwest of the plant site, along the existing 230kV transmission lines. The Applicant has requested SDG&E assistance in selection of the site for the new switchyard from possible sites along the existing transmission corridor. The exact routing of this gen tie will be determined during the route survey and detailed design.

Transmission system upgrades may be required beyond the immediate SDG&E point of interconnection.

2.6 FACILITY CLOSURE

2.6.1 Introduction

Facility closure can be temporary or permanent. Temporary closure is defined as a shutdown for a period exceeding the time required for normal maintenance. Causes for temporary closure include a disruption in the supply of natural gas or damage to the plant from earthquake, fire, storm, or other natural acts. Permanent closure is defined as a cessation in operations with no intent to restart operations due to plant age, damage to the plant beyond repair, economic conditions, or other reasons. Section 2.6.2 discusses temporary facility closure; Section 2.6.3 discusses permanent facility closure.

2.6.2 Temporary Closure

For a temporary facility closure where no release of hazardous materials occurs, security of the plant will be maintained on a 24-hour basis and the CEC and other responsible agencies will be notified. Depending on the length of shutdown necessary, a contingency plan for the temporary shutdown of operations will be implemented. The contingency plan will be conducted to ensure conformance with all applicable LORS and the protection of public health, safety, and the environment. The plan, depending on the expected duration of the shutdown, may include the draining of all chemicals from storage tanks and other equipment and the safe shutdown of all equipment. All wastes will be disposed of according to applicable LORS, as discussed in Section 2.9.

If the temporary closure includes damage to the facility and there is a release or threatened release of acutely hazardous materials into the environment, procedures will be followed as set forth in a Risk Management Plan (RMP) to be developed. Procedures will include methods to control releases, notification of applicable authorities and the public, emergency response, and training for plant personnel in responding to and controlling releases of hazardous materials. Once the immediate problem is solved and the acutely hazardous materials release is contained and cleaned up, temporary closure will proceed as described above for a closure where there is no release of hazardous materials.

2.6.3 Permanent Closure

The planned life of the proposed Project is 30 years. However, if the plant is still economically viable, it could be operated longer. It is also possible that the plant could become economically noncompetitive earlier than 30 years, forcing early decommissioning. When the plant is permanently closed, the closure procedure will follow a plan that will be developed as described below.

The removal of the plant from service or decommissioning may range from "mothballing" to the removal of all equipment and appurtenant facilities, depending on conditions at the time. Because the conditions that would affect the decommissioning decision are largely unknown at this time, these conditions would be presented to the CEC and the City of San Diego when more information is available and the timing for decommissioning is more imminent.

To ensure that public health and safety and the environment are protected during decommissioning, a decommissioning plan will be submitted to the CEC for approval prior to decommissioning. The plan will discuss the following:

- Proposed decommissioning activities for the facility and all appurtenant facilities constructed as part of the facility
- Conformance of the proposed decommissioning activities to all applicable LORS and local/regional plans
- Activities necessary to restore the site if the plan requires removal of all equipment and appurtenant facilities
- Decommissioning alternatives other than complete restoration
- Associated costs of the proposed decommissioning and the source of funds to pay for the decommissioning

In general, the decommissioning plan for the facility will attempt to maximize the recycling of all facility components. The Applicant will attempt to sell unused chemicals back to the suppliers or other purchasers or users. All equipment containing chemicals will be drained and shut down to ensure public health and safety and to protect the environment. All nonhazardous wastes will be collected and disposed of in appropriate landfills or waste collection facilities. All hazardous wastes will be disposed of according to all applicable LORS. The site will be secured 24 hours per day during the decommissioning activities.

2.7 SAFETY, AVAILABILITY, AND RELIABILITY

2.7.1 Natural Hazards

The principal natural hazard associated with the proposed Project is the potential for earthquakes and brush fires.

2.7.1.1 Seismic Hazards

The Project lies outside of designated Fault Hazard Zones. The site is located in Seismic Risk Zone 4. Structures will be designed to meet the seismic requirements of the latest edition of the CBC. Section 4.16, Geologic Hazards and Resources, includes additional information on natural hazards.

2.7.1.2 Flooding Hazards

Flooding is not a hazard of concern. According to the Federal Emergency Management Agency (FEMA), the site is not within either the 100- or 500-year flood plain. Section 4.13, Water Resources, includes additional information on the potential for flooding.

2.7.1.3 Fire Hazards

The proposed Project will be designed, constructed, and maintained in accordance with LORS to mitigate fire hazards.

The plant site and associated linear facilities are located in a Very High Fire Hazard Severity Zone (VHFHSZ) based on the City of San Diego Fire-Rescue Department Official Very High Fire Hazard Severity Zone Map (Grids 29 and 30). The Project design will include considerations for building standards as identified in Chapter 7A of the California Building Code (CBC), as adopted and amended by the City of San Diego, and the additional building standards identified in Chapter 14 Article 5 Division 38 of the San Diego Municipal Code.

The proposed 230kV gen tie will be designed, constructed, and maintained in accordance with GO-95, which establishes clearances from other constructed and natural structures and tree-trimming requirements to mitigate fire hazards. In the event that trees are encountered along the gen tie corridor, those trees will be trimmed or removed to ensure mitigation of these hazards before or during construction of the gen tie. However, it is unlikely that any vegetation management will be required because the entire proposed route is over scrubland. Following construction, SDG&E will maintain the gen tie corridor and immediate area in accordance with accepted industry practices that will include identification and abatement of any fire hazards to ensure safe operation of the line.

2.7.2 Emergency Systems and Safety Precautions

This subsection discusses the fire protection systems, emergency medical services, and safety precautions to be used by project personnel. Section 4.6, Socioeconomics, includes additional information on area medical services, and Section 4.10, Worker Health and Safety, includes additional information on safety for workers. Appendices B1 through B7 contain the design practices and codes applicable to safety design for the Project. Compliance with these requirements will minimize project effects on public and employee safety.

2.7.2.1 Fire Protection Systems

The Project will rely on both onsite fire protection systems (as described in Section 2.3.11) and local fire protection services. The proposed Project is located within an area that San Diego County has designated as Very High Severity Hazard zone for brush fires. A brush fire burned in the vicinity of the Project in 2008. Section 4.6, Socioeconomics, provides information on local fire protection capability.

A comprehensive Fire Protection Plan will be prepared for the Project that will be approved by the Fire Marshal. If the Fire Protection Plan requires more stringent design requirements than described herein, then the more stringent requirements will be incorporated in the final plant design.

The vegetation within the overall Project site will be maintained in a manner to reduce the risk of a brush fire reaching the facilities.

Local Fire Protection Services. In the event of a major fire, the plant personnel will be able to call upon the local Fire Department for assistance. The Hazardous Materials Risk Management Plan M for the plant will include all information necessary to permit all firefighting and other emergency response agencies to plan and implement safe responses to fires, spills, and other emergencies. Section 4.9, Hazardous Materials Handling, includes more information on the Hazardous Materials Risk Management Plan and Section 4.6 Socioeconomics describes local fire services including response times.

Personnel Safety Program. The Project will develop an Injury and Illness Prevention Program (IIPP) in compliance with Title 8 CCR Section 3203. The plant will operate in compliance with federal and state occupational safety and health program requirements. Compliance with these programs will minimize project effects on employee safety. These programs are described in Section 4.10, Worker Health and Safety.

2.7.3 Project Quality Control

The Quality Control Program for the Project is summarized in this subsection. The objective of the Quality Control Program is to ensure that all systems and components have the appropriate quality measures applied, whether it is during design, procurement, fabrication, construction, or plant operations. The goal of the Quality Control Program is to achieve the desired levels of safety, reliability, availability, operability, constructability, and maintainability for the generation of electricity. The required quality assurance for a system will be obtained by applying controls to various activities, according to the activity being performed. For example, the appropriate controls for design work will be checking and review, and the appropriate controls for manufacturing and construction will be inspection and testing. Appropriate controls will be applied to each of the various activities for the Project.

2.7.3.1 Project Stages

For quality assurance planning purposes, the Project activities will be divided into the following 10 stages that apply to specific periods of time during the Project:

Conceptual Design Criteria. Design criteria will include such activities as definition of requirements, applicable codes and standards, and engineering analyses.

Preliminary Design. Preliminary design arrangements and calculations will be prepared, consistent with the conceptual design criteria.

Detailed Design. Activities such as refining detailed calculations, preparing detailed drawings and lists that are needed to describe, illustrate, or define systems, structures, or components will be included. This phase will incorporate the dimensioned equipment drawings provided for major equipment and expected details for long lead time items. Cut sheet data and final vendor drawings from the procurement phase will be incorporated into the final and as-built drawings for the plant.

Procurement. Activities necessary to compile and document the contractual, technical, and quality provisions for procurement specifications for plant systems, components, or services will be conducted. This also will include actual procurement and the provision of final dimensioned equipment drawings required to complete detailed design. Appendices B1-B7 include more information on design requirements.

Manufacturer's Control and Surveillance. Activities necessary to ensure that the manufacturers conform to the provisions of the procurement specifications will be conducted.

Manufacturer Data Review. Activities required include reviewing manufacturers' drawings, data, instructions, procedures, plans, and other documents to ensure coordination of plant systems and components, and conformance to procurement specifications.

Receipt Inspection. Inspection, review, and storage of products at the time of delivery to the construction site will be conducted.

Construction/Installation. Inspection and review of storage, installation, cleaning, and initial testing of systems or components at the facility will be conducted.

System/Component Testing. Actual operation of generating facility components in a system will be conducted in a controlled manner to ensure that the performance of systems and components conform to specified requirements.

Plant Operation. As the Project progresses, the design, procurement, fabrication, erection, and checkout of each generating facility system will progress through the nine stages defined above, culminating in plant commercial operation.

2.7.3.2 Quality Control Records

The following quality control records will be maintained for review and reference:

- Project instruction manuals;
- Design calculations;
- Project design criteria, drawings, and calculations;
- Quality assurance audit reports;
- Conformance to construction record drawings;
- Procurement specifications (contract issue and change orders); and
- Purchase orders and change orders.

A list of qualified suppliers and subcontractors will be developed for equipment purchase orders. Before contracts are awarded, the subcontractors' capabilities will be evaluated by the entity making the purchase. Construction activities will encompass the last four stages of the Project: receipt inspection, construction/installation, system/component testing, and plant operations. The construction contractor will be contractually obligated to perform the work in accordance with the quality requirements specified in its contract with the Project.

The contractor's subcontractors' quality compliance will be surveyed, as appropriate, through inspections, audits, and/or administration of independent testing contracts.

A plant operation and maintenance (O&M) program, typical of a project this size, will be implemented by the Applicant and/or its plant O&M contractor to assure that proper O&M procedures and methods are employed. A specific program for this project will be defined and implemented prior to and/or during initial plant startup.

2.7.4 Reliability

The proposed Project will have the capability to operate 7 days per week, 24 hours per day. Special features are included in the Project design to ensure the power plant's reliability, including redundancy of critical components. The power plant uses 11 separate, parallel trains of generators, each with an independent engine and set of auxiliary components. This operation in parallel provides a capacity to address maintenance or repairs on individual components without interrupting the operation of the other trains.

The planned operational life of the Project is 30 years. In order for this life to be realized, and in order for the plant to operate reliably for this duration, a preventive maintenance program will be implemented. This program will begin during the engineering and procurement phase of the

Project, where the designs and specifications will be reviewed for reliability and maintainability of the plant systems and equipment. Once the plant goes into the operational phase of the Project, the preventive maintenance program will include monitoring, record keeping, and maintenance work to detect and rectify deterioration in systems and equipment before such deterioration results in a forced outage or prolonged maintenance outage. It is expected that the preventive maintenance program will result in high plant availability.

2.7.4.1 Fuel Availability

Natural gas will be provided by SDG&E and delivered to the proposed Project by pipeline. SDG&E is the major transporter of natural gas in southern California. An approximately 2,200-foot-long pipeline will extend from the interconnection point on SDG&E Line 2010 at the corner of Mast Boulevard and Sycamore Landfill Road. The new gas pipeline lateral will be routed along the north side of Sycamore Landfill Road toward the plant site. At the plant site, the natural gas will flow through gas scrubber/filtering equipment, a metering/pressure reducing/regulating station, and a fuel gas heater prior to the gas entering each reciprocating engine. The SDG&E gas delivery system is considered to be extremely reliable and, due to the availability of natural gas, the Project will have no backup supply of natural gas or other fuel.

2.7.4.2 Plant Availability

The proposed Project will operate under the terms of a PPA between SDG&E and the Applicant as an integral part of the overall generation and transmission system, and will be dispatched by SDG&E and/or the CAISO depending on system demand, generating cost, availability of other generating units, contractual agreements, and other factors. Due to the relatively high efficiency of the Project, it is anticipated that for normal operations the facility will operate as an intermediate load/peaking unit. The Project will be designed to operate between approximately 5 and 100 percent of base load to support dispatch service. While the term of the PPA is 20 years, the proposed Project will be designed for an operating life of 30 years; hence its reliability and availability projections are based on this operating life. Operation and maintenance procedures will be consistent with industry standard practices to maintain the useful life status of plant components.

The Project is projected to operate up to 3,800 hours per year (or approximately 43 percent of the time) during each of the 30 years. The projected EAF for the Project, based on the SDG&E PPA, is estimated to exceed 98 percent in the summer months (June-September), and exceed 94 percent in the non-summer months. The equivalent availability factor (EAF) considers the projected percentage of energy production capacity achievable. EAF for a given month is defined as the ratio (expressed as a percentage) of the total energy that was actually available for dispatch that month, taking into account downtime for forced outages, divided by the total energy that could have been produced during the month absent forced outages. The EAF is also weighted for the ability of the Facility to achieve 10 minute start-ups for qualification of the Facility to achieve CAISO certification for Non-Spinning Reserve. EAF differs from the "availability of a unit," which is the percentage of time that a unit is available for operation, whether at full load, partial load, or standby.

2.7.4.3 Water Availability

The Project will use on average 1 gallon per minute (1.61 acre-feet per year) of water provided by onsite storage tanks, fed by truck delivery, primarily for domestic purposes. This is an extremely small water demand that can be easily met by the trucking in the water supply.

2.8 EFFICIENCY

2.8.1 Power Plant Efficiency

The thermal efficiency expected from a natural-gas-fired reciprocating engine-based plant using the proposed Wartsila engines is approximately 39 percent on a HHV basis. This level of efficiency is estimated based on the facility operating at base-load. A key benefit provided by the Project will be its ability to largely maintain this relatively high efficiency across nearly the entire output range of the plant. This is achievable by operating individual engines at maximum capacity as they are dispatched to meet increasing demand. As a consequence, use of the eleven individual engines will allow the Project's power output to be increased or decreased in increments of roughly 5 to 10 percent of total capacity (based on either partial or full operation of each of the 11 engines), reflecting a very flexible turndown. In contrast, a comparably sized simple-cycle gas turbine plant (100 MW) would consist of substantially fewer units (such as one LMS100 or two LM6000s) and the operational turndown available from each turbine and from the overall plant would be much more limited. Thus, a plant using simple-cycle combustion turbines would be expected to operate at lower efficiencies as total plant output is reduced to match demand and output of variable generating resources, e.g., solar and wind.

The basis of the Project operations will be system dispatch within SDG&E's power generation and transmission system. The Project will provide several ancillary services necessary for reliability of the grid operated by the CAISO, which will require it to be under the direct control of CAISO's Automatic Generation Control system. Although it is expected that the Project will be primarily operated as an intermediate load/peaking facility during summer months, for the balance of the year the Project will be available for load-following or cycling service for up to 3,800 hours per year. The number of startup and shutdown cycles is expected to range between 0 and 400 per year per engine generator set.

Plant fuel consumption will depend on the operating profile of the power plant. It is estimated that the range of fuel consumed by the power plant will be from a minimum of approximately 40 MMBtu/hr at minimum plant load, to a maximum of approximately 1,009 MMBtu/hr (HHV basis) at base load. There will be minimal fuel gas consumption when the facility is shut down as there is a small, <4 MMBtu/hr consumption, when the units are off-line but in warm standby.

The net annual electrical production of the Project cannot be accurately forecasted at the present time due to uncertainties in the system load dispatching model and the associated policies, e.g., uncertainty about how evolving regulation, such as the CARB's Cap-and-Trade Regulation, will affect variable costs and consequently dispatch of existing and proposed generating units. However, due to the relatively high efficiency of the plant, its ability to maintain this efficiency across the entire load range and its flexibility to provide load-shaping power to match changing demand from variable renewable resources, it is expected that the proposed Project will be dispatched with increasing frequency as SDG&E moves to increase its reliance upon renewable resources and achieve California's ambitious RPS. The maximum annual generation possible from the facility is estimated to be approximately 379 gigawatt hours (GWh) per year.

While the plant maximum output is not expected to degrade over time, efficiency will be impacted by total run time. Degradation of the Project's efficiency over time is expected to average approximately 1.25 percent between major engine overhauls, which are recommended to occur every 16,000 operating hours. Cleaning, maintenance, or overhaul will recapture most of the efficiency loss. When the OEM recommended overhaul practices are followed over the expected 30-year life of the facility, the estimated total, non-recovered loss in efficiency is expected to be less than 3 percent.

2.9 LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

This section provides a list of LORS that apply to the engineering, design, installation, and operation of the proposed 230kV gen tie and associated interconnection facilities. Additional details regarding the design of the Project are found in Appendix B, Engineering Design Criteria. The following compilation of LORS is provided in accordance with the CEC's Rules of Practice and Procedure & Power Plant Site Certification Regulations.

2.9.1 General LORS

The following LORS are generally applicable to the Project:

Table 2.9-1 General LORS

Agency	Area	Reference in AFC
Federal Jurisdiction		
Environmental Protection Agency	40 CFR 50 (Ambient Air Quality Standards) 40 CFR 60 (Performance Standards for New Stationary Sources) 40 CFR 75 (Continuous Monitoring) 40 CFR 112 (Oil Spills) 40 CFR 122 (NPDES Permits) 40 CFR 260 (Hazardous Waste Management) 40 CFR 300 (National Oil and Hazardous Substances Pollution Contingency Plan) 40 CFR 401 (Effluent Standards and Pretreatment Standards)	4.7
Occupational Safety and Health Act	29 CFR 1910 29 CFR 1926	4.10
Federal Aviation Administration	14 CFR 77 (Objects Affecting Navigable Airspace)	4.4
California Jurisdiction		
California Occupational Safety and Health Administration (Cal-OSHA)	Title 8 CCR Division 1 Chapter 4: Subchapter 1 (Unfired Pressure Vessel Safety Orders) Subchapter 4 (Construction Safety Orders) Subchapter 7 (General Industry Safety Orders)	4.10
Department of Toxic Substances Control	Title 22 Division 4.5 (Management of Hazardous Waste)	4.8
Regional Water Quality Control Board (San Diego)	Title 23, Division 4, Chapter 1, Article 9 (San Diego Region)	4.13
California Department of Transportation (Caltrans)	Standard Specifications	4.4

Agency	Area	Reference in AFC
State Water Resources Control Board	23 CCR § 2205 (Waste Discharge Requirements)	4.13
California Energy Code	Title 24 part 6 (2008)	2.0
State Fire Marshal	Title 19 Division 1	2.0
Department of Consumer Affairs	Title 16 Division 5 and 29 (Professional Registration of Engineers and Geologists)	2.0
Department of Motor Vehicles, and California Highway Patrol	Title 13 Motor Vehicles	4.4
Local Jurisdiction		
County of San Diego		4.2
City of San Diego	Regulations and Ordinances including California Building Code – 2010 (California Title 24, includes Building, Electrical, Mechanical, Plumbing, Energy, Fire and Green Building Standards Codes)	4.2
San Diego Air Pollution Control District	Rules and Regulations	4.7

2.9.2 Local LORS

The plant site zoning is consistent with the development of a generating facility (see Section 4.2, Land Use).

The Quail Brush site is located within the city limits of the City of San Diego in an area which will require a zoning change for industrial use, and will therefore be subject to applicable regulations of the City of San Diego as discussed in detail in Section 4.2 Land Use.

2.9.3 Design and Construction

Table 2.9-4 lists the applicable LORS for the design and construction of the proposed transmission line and substations.

Table 2.9-4 Design and Construction LORS

LORS	Applicability	AFC Reference
GO-95, CPUC, "Rules for Overhead Electric Line Construction"	CPUC rule covers required clearances, grounding techniques, maintenance, and inspection requirements.	2.5.7.1
Title 8 CCR, Section 2700 et seq. "High Voltage Electrical Safety Orders"	Establishes essential requirements and minimum standards for installation, operation, and maintenance of electrical installation, and equipment to provide practical safety and freedom from danger.	2.5.7.1, 2.5.7.6
GO-128, CPUC, "Rules for Construction of Underground Electric Supply and Communications Systems"	Establishes requirements and minimum standards to be used for the station AC power and communications circuits.	2.5.7.1
GO-52, CPUC, "Construction and Operation of Power and Communication Lines"	Applies to the design of facilities to provide or mitigate inductive interference.	2.5.7.1
ANSI/IEEE 693 "IEEE Recommended Practices for Seismic Design of Substations"	Provides recommended design and construction practices.	2.5.7.1, 2.5.4

LORS	Applicability	AFC Reference
IEEE 1119 "IEEE Guide for Fence Safety Clearances in Electric-Supply Stations"	Provides recommended clearance practices to protect persons outside the facility from electric shock.	2.5.7.1, 2.5.4
IEEE 998 "Direct Lightning Stroke Shielding of Substations"	Provides recommendations to protect electrical system from direct lightning strokes.	2.5.7.1, 2.5.4
IEEE 980 "Containment of Oil Spills for Substations"	Provides recommendations to prevent release of fluids into the environment.	2.5.7.1, 2.5.4
Suggestive Practices for Raptor Protection on Power lines, April 1996	Provides guidelines to avoid or reduce raptor collision and electrocution.	2.5.7.1

2.9.4 Electric and Magnetic Fields

The applicable LORS pertaining to EMF interference are shown in Table 2.9-5.

Table 2.9-5 Electric and Magnetic Field LORS

LORS	Applicability	AFC Reference
Decision 93-11-013 of the CPUC	CPUC position on EMF reduction.	2.5.7.4
GO-131, CPUC, Rules for Planning and Construction of Electric Generation, Line, and Substation Facilities in California	CPUC construction-application requirements, including requirements related to EMF reduction.	2.5.7.4
EMF Design Guidelines for Electrical Facilities, Southern California Edison Company, EMF Research and Education, 6090 Irwindale Avenue, Irwindale, California 91702, 626-812-7545, September 2004	Large local electric utility's guidelines for EMF reduction through structure design, conductor configuration, circuit-phasing, and load balancing (in keeping with CPUC D.93-11-013 and GO-131).	2.5.7.4
EMF Design Guidelines for Electrical Facilities, Pacific Gas and Electric Company	EMF Design Guidelines adopted in conformance with CPUC Decision 06-01-042 specifying design measures to be considered for reducing EMF	2.5.7.4
ANSI/IEEE 644-1994 "Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields from AC Power Lines"	Standard procedure for measuring EMF from an electric line that is in service.	2.5.7.4

2.9.5 Hazardous Shock

Table 2.9-6 lists the LORS regarding hazardous shock protection for the Project.

Table 2.9-6 Hazardous Shock LORS

LORS	Applicability	AFC Reference
Title 8 CCR Section 2700 et seq. "High Voltage Electrical Safety Orders"	Establishes essential requirements and minimum standards for installation, operation, and maintenance of electrical equipment to provide practical safety and freedom from danger.	2.5.7.6
ANSI/IEEE 80 "IEEE Guide for Safety in AC Substation Grounding"	Presents guidelines for assuring safety through proper grounding of AC outdoor substations.	2.5.4
NESC, ANSI C2, Section 9, Article 92, Paragraph E; Article 93, Paragraph C.	Covers grounding methods for electrical supply and Communications facilities.	2.5.7.6

2.9.6 Communication Interference

The applicable LORS pertaining to communication interference are shown in Table 2.9-7.

Table 2.9-7 Communications Interference LORS

LORS	Applicability	AFC Reference
Title 8 CCR Section 2700 et seq. "High Voltage Electrical Safety Orders" Title 47 CFR Section 15.25, "Operating Requirements, Incidental Radiation"	Prohibits operations of any device emitting incidental radiation that causes interference to communications. The regulation also requires mitigation for any device that causes interference.	2.5.7.7
GO-52, CPUC	Covers all aspects of the construction, operation, and maintenance of power and communication lines and specifically applies to the prevention or mitigation of inductive interference.	2.5.7.7
CEC staff, Radio Interference and Television Interference (RI-TVI) Criteria (Kern River Cogeneration) Project 82-AFC-2, Final Decision, Compliance Plan 13-7	Prescribes the CEC's RI-TVI mitigation requirements, developed and adopted by the CEC in past siting cases.	2.5.7.7

2.9.7 Aviation Safety

Table 2.9-8 lists the aviation safety LORS that may apply to the proposed construction and operation of the Project.

Table 2.9-8 Aviation Safety LORS

LORS	Applicability	AFC Reference
Title 14 CFR Part 77 "Objects Affecting Navigable Airspace"	Describes the criteria used to determine whether a "Notice of Proposed Construction or Alteration" (NPCA, FAA Form 7460-1) is required for potential obstruction hazards.	2.5.7.8
FAA Advisory Circular No. 70/7460-1G, "Obstruction Marking and Lighting"	Describes the FAA standards for marking and lighting of obstructions as identified by FAA Part 77.	2.5.7.8
PUC, Sections 21656-21660	Discusses the permit requirements for construction of possible obstructions near aircraft landing areas, in navigable airspace, and near airport boundaries.	2.5.7.8

2.9.8 Fire Hazard

Table 2.9-9 lists the LORS governing fire hazard protection for the Project.

Table 2.9-9 Fire Hazard LORS

LORS	Applicability	AFC Reference
Title 14 CCR Sections 1250-1258, "Fire Prevention Standards for Electric Utilities"	Provides specific exemptions from electric pole and tower firebreak and electric conductor clearance standards, and specifies when and where standards apply.	2.5.7.9, 2.7.1, 2.7.2.1
ANSI/IEEE 80 "IEEE Guide for Safety in AC Substation Grounding"	Presents guidelines for assuring safety through proper grounding of AC outdoor substations.	2.5.7.9, 2.5.7.9, 2.7.1, 2.7.2.1
GO-95, CPUC, "Rules for Overhead Electric Line Construction" Section 35	CPUC rule covers all aspects of design, construction, operation, and maintenance of electrical transmission line and fire safety (hazards).	2.5.7.1, 2.5.7.9

2.9.9 Agency Jurisdiction

Table 2.9-10 identifies national, state, and local agencies with jurisdiction to issue permits or approvals, conduct inspections, and enforce the previously referenced LORS. Table 2.9-10 also identifies the associated responsibilities of these agencies as they relate to the construction and operation of Quail Brush.

Table 2.9-10 Jurisdiction

Agency or Jurisdiction	Responsibility
Federal	
FAA	Establishes regulations for notifications of construction and of new structures that may obstruct or interfere with air traffic, (14CFR77.9) marking and lighting of obstructions in navigable airspace. (AC No. 70/7460-1G).
OSHA	Establishes regulations for the protection of workers during construction and operations.
USEPA	Implements Prevention of Significant Deterioration (PSD) review/permitting program for sources locating in areas designated attainment/unclassifiable for criteria pollutants
State	
CEC	Jurisdiction over new transmission lines associated with thermal power plants that are 50 MW or more (PRC 25500). Jurisdiction of lines out of a thermal power plant to the interconnection point to the utility grid (PRC 25107). Jurisdiction over modifications of existing facilities that increase peak operating voltage or peak kilowatt capacity 25 percent (PRC 25123).
CPUC	Regulates construction and operation of overhead transmission lines (GO No. 95 and 131-D) (those not regulated by the CEC). Regulates construction and operation of power and communications lines for the prevention of inductive interference (GO No. 52).
State WRCB	Responsible for implementing 23 CCR § 2205 (Waste Discharge Requirements)
CAISO	Provides final interconnection approval.
Local	
City of San Diego	Establishes and enforces zoning regulations for specific land uses; issues variances in accordance with zoning ordinances. City-specific requirements under the California Building Code, Electrical Code and Fire Code. Jurisdiction over safety inspection of electrical installations that connect to the supply of electricity (NFPA 70).
SDAPCD	Regulates air quality emissions for construction and operations.

2.9.10 Local Agencies and Agency Contacts

Table 2.9-2 lists local agency contacts.

Table 2.9-2 Local Agencies and Agency Contacts

Agency	Contact	Title	Telephone	Email	Mailing Address
City of San Diego Fire Services	Javier Mainar	Fire Chief	619-533-4300	sdfd@sandiego.gov	1010 2nd Avenue, Suite 400 San Diego, CA 92101
City of San Diego Engineering	Afsaneh Ahmadi	Deputy Director Building Construction and Safety Department	619-446-5406	aahmadi@sandiego.gov	1222 First Avenue, MS 301 San Diego, CA 92101-4154
City of San Diego Community and Economic Development	Morris Dye	Project Manager	619-446-5201	mdye@sandiego.gov	1222 First Avenue, MS 301 San Diego, CA 92101-4154

Local Permits Required and Permit Schedule

After receipt of the approval of project design, several permits will be required. These include a Building Permit, a Grading Permit, and a Certificate of Occupancy. These permits are summarized in Table 2.9-3.

Table 2.9-3 Required Permits and Agency Contacts

Permit or Approval	Schedule	Agency Contact	Applicability
Approval of Grading Plan; issuance of construction, grading, and building permits	Minimum of 30 days prior to construction	City of San Diego	Site grading and excavation at site or along linear project features within public rights-of-way
Certificate of Occupancy	Completion of construction	City of San Diego	Occupancy of facilities once construction is completed

2.10 GUIDANCE AND REGULATORY DOCUMENTS

California Public Service Commission, General Order 52: Construction and Operation of Power and Communication Lines.

__________. General Order 95: Rules for Overhead Electric Line Construction.

__________. General Order 128: Rules for Construction of Underground Electric Supply and Communications Systems.

__________. General Order 131D: Rules for Planning and Construction of Electric Generation, Line, and Substation Facilities.

__________. Decision 93-11-013: Corona and Field Effects of AC Overhead Transmission Lines, Information for Decision Makers, IEEE Power Engineering Society, July 1985.

Electrical and Biological Effects of Transmission Lines, A Review, U.S. Department of Energy, Bonneville Power Administration, Portland, Oregon, June 1989.

EMF Design Guidelines for New Electrical Facilities: Transmission, Substation, and Distribution, SDG&E.

National Electrical Safety Code, ANSI C2.

Overhead Conductor Manual by Southwire.

SDG&E Interconnection Handbook.

Power flow cases used for the Feasibility Study as supplied by SDG&E.

Power flow cases used for the LGIP "System Impact Study" provided by SDG&E.

Power Flow Cases obtained from WECC.

SDG&E and Federal Energy Regulatory Commission (FERC) Form 715.

Transmission Line Reference Book, 230-138-kV Compact Line Design, Electric Power Research Institute, Palo Alto, California, 1978.

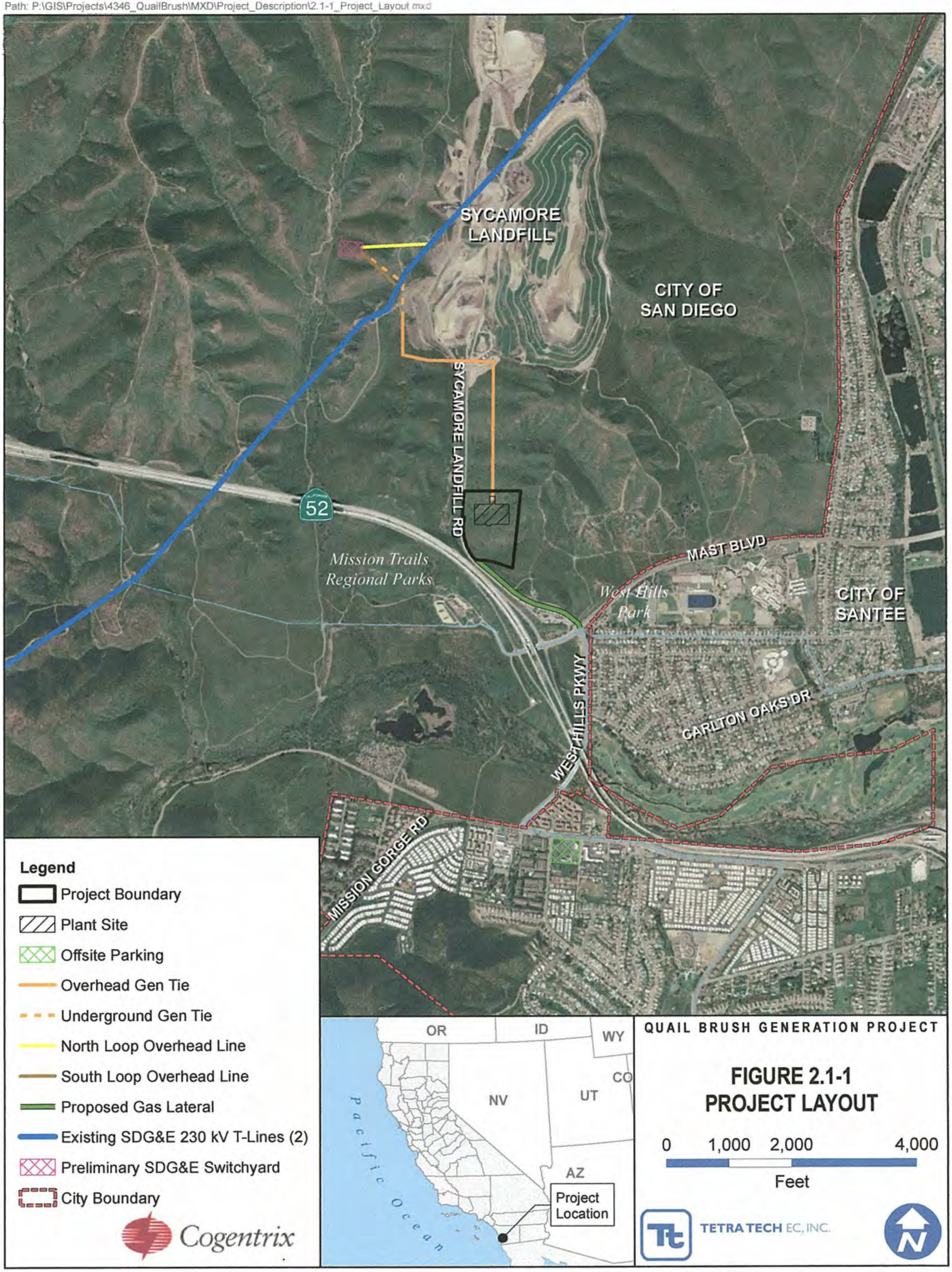
Transmission Line Reference Book, 345-kV and Above, Electric Power Research Institute, Palo Alto, California, 1975.

United States of America. 47CFR15.25—Operating Requirements, Incidental Radiation.

__________. 15CFR77—Objects Affecting Navigable Airspace.

__________. 14CFR1250—1258-Fire Prevention Standards for Electric Utilities.

FIGURES



QUAIL BRUSH GENERATION PROJECT

FIGURE 2.1-1
PROJECT LAYOUT

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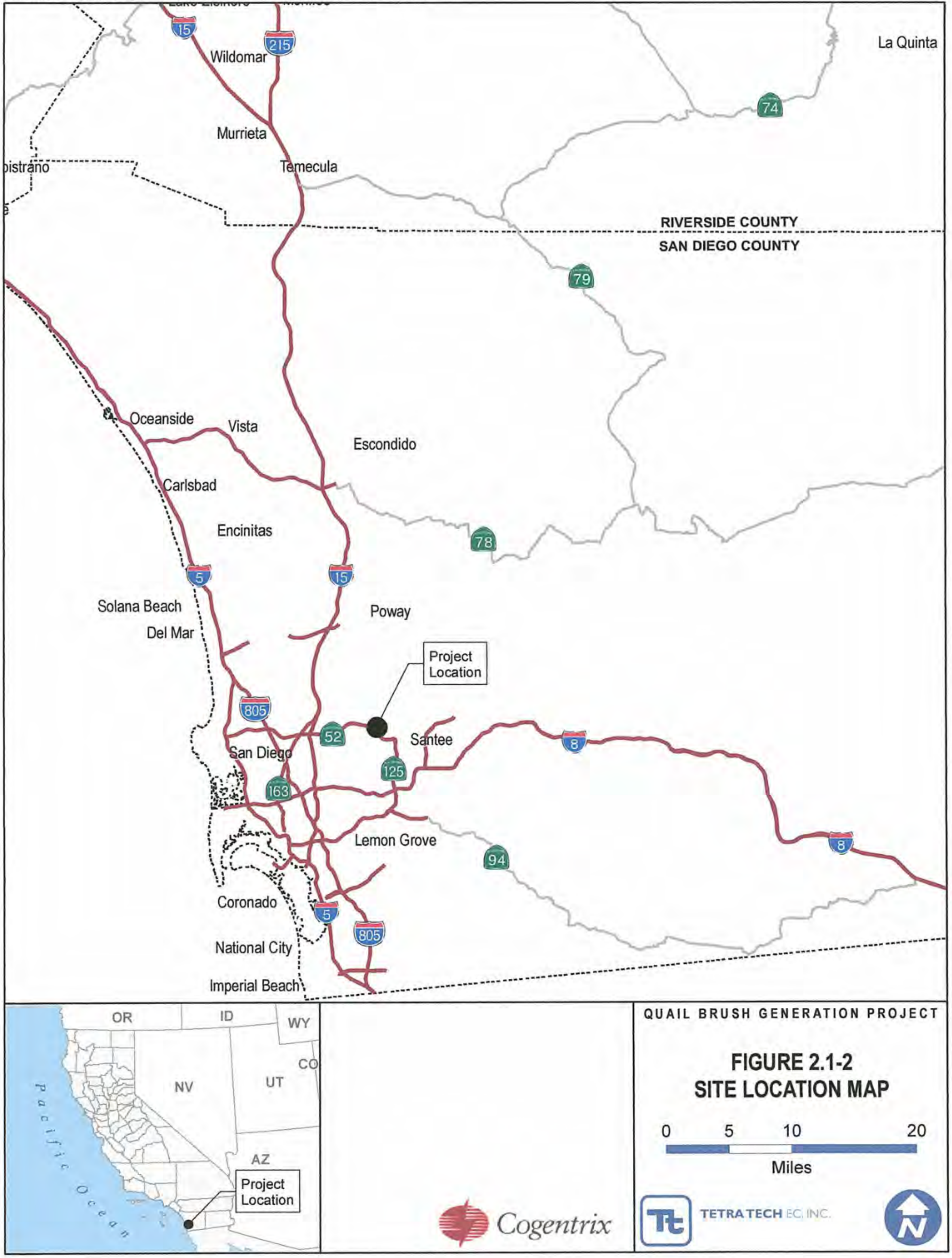

QUAIL BRUSH GENERATION PROJECT

FIGURE 2.1-2
SITE LOCATION MAP

Cogentrix

TETRA TECH EC, INC.

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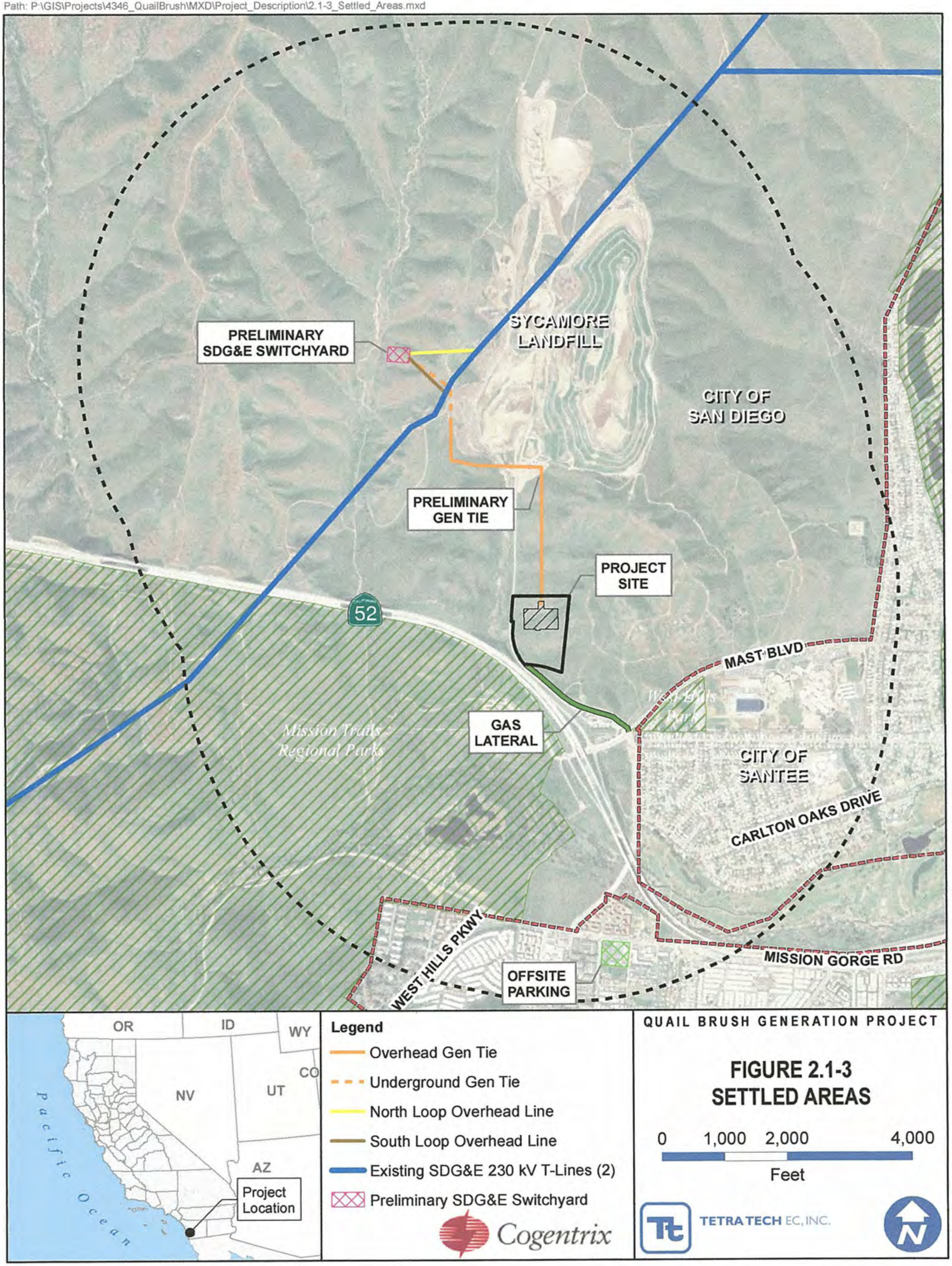
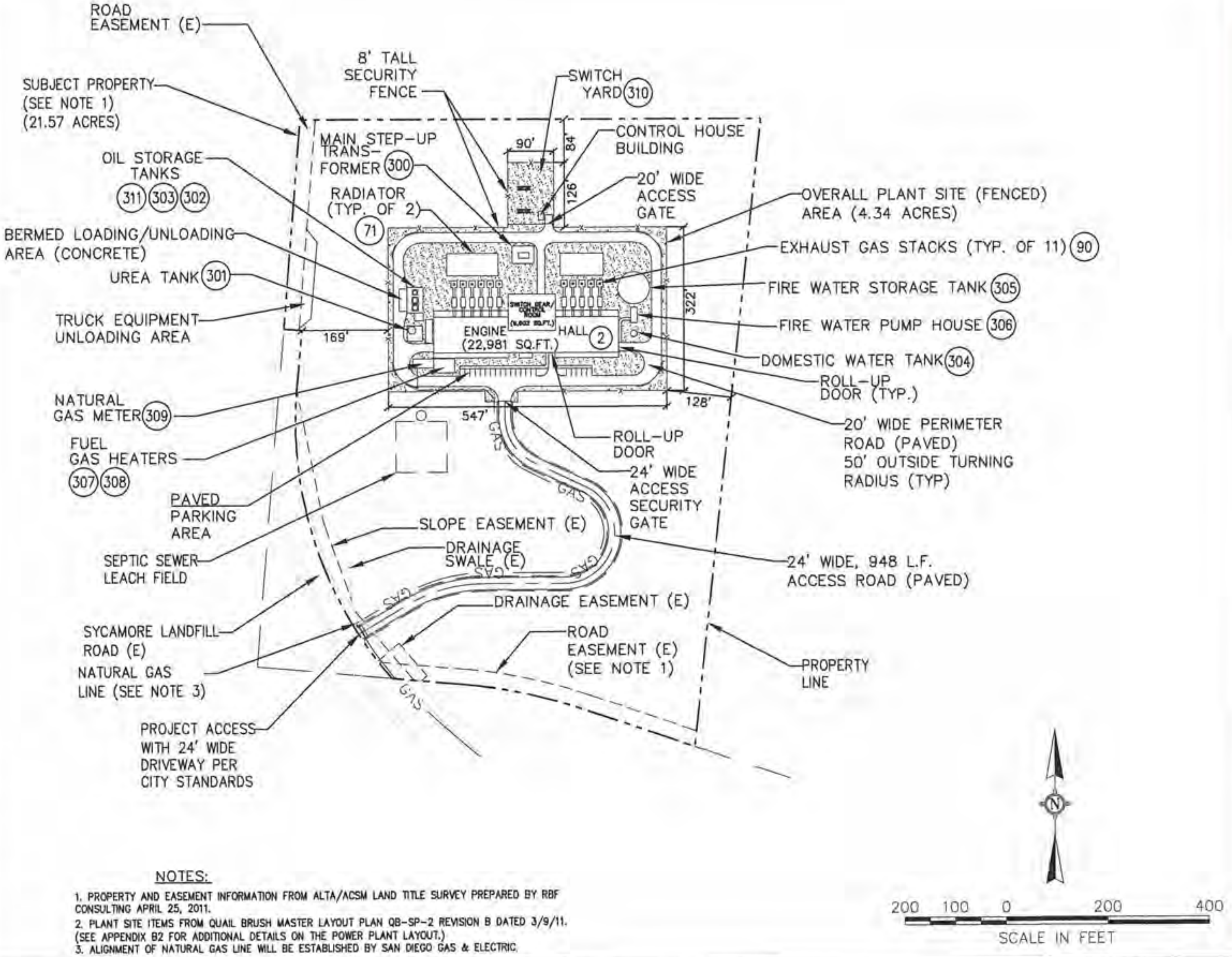


QUAIL BRUSH GENERATION PROJECT

FIGURE 2.1-3
SETTLED AREAS



NOTES:

1. PROPERTY AND EASEMENT INFORMATION FROM ALTA/ACSM LAND TITLE SURVEY PREPARED BY RBF CONSULTING APRIL 25, 2011.
2. PLANT SITE ITEMS FROM QUAIL BRUSH MASTER LAYOUT PLAN QB-SP-2 REVISION B DATED 3/9/11. (SEE APPENDIX B2 FOR ADDITIONAL DETAILS ON THE POWER PLANT LAYOUT.)
3. ALIGNMENT OF NATURAL GAS LINE WILL BE ESTABLISHED BY SAN DIEGO GAS & ELECTRIC.

P:\4346-COGENTRIX QUAIL BRUSH\CAD-ENGINEERING\SITE PLAN\CAD\SITE PLAN-COGENTRIX.DWG
PLOT/UPDATE: Aug 7, 2011 11:49:30 AM

LEGEND:

GAL.	GALLON
L.F.	LINEAR FEET
SQ.FT.	SQUARE FEET
TYP.	TYPICAL
(E)	EXISTING
(310)	ITEM NO.
▨	ASPHALT PAVEMENT
▨	GRAVEL
——x——	CHAINLINK FENCE
— - —	PARCEL BOUNDARY
— GAS —	NEW NATURAL GAS LINE

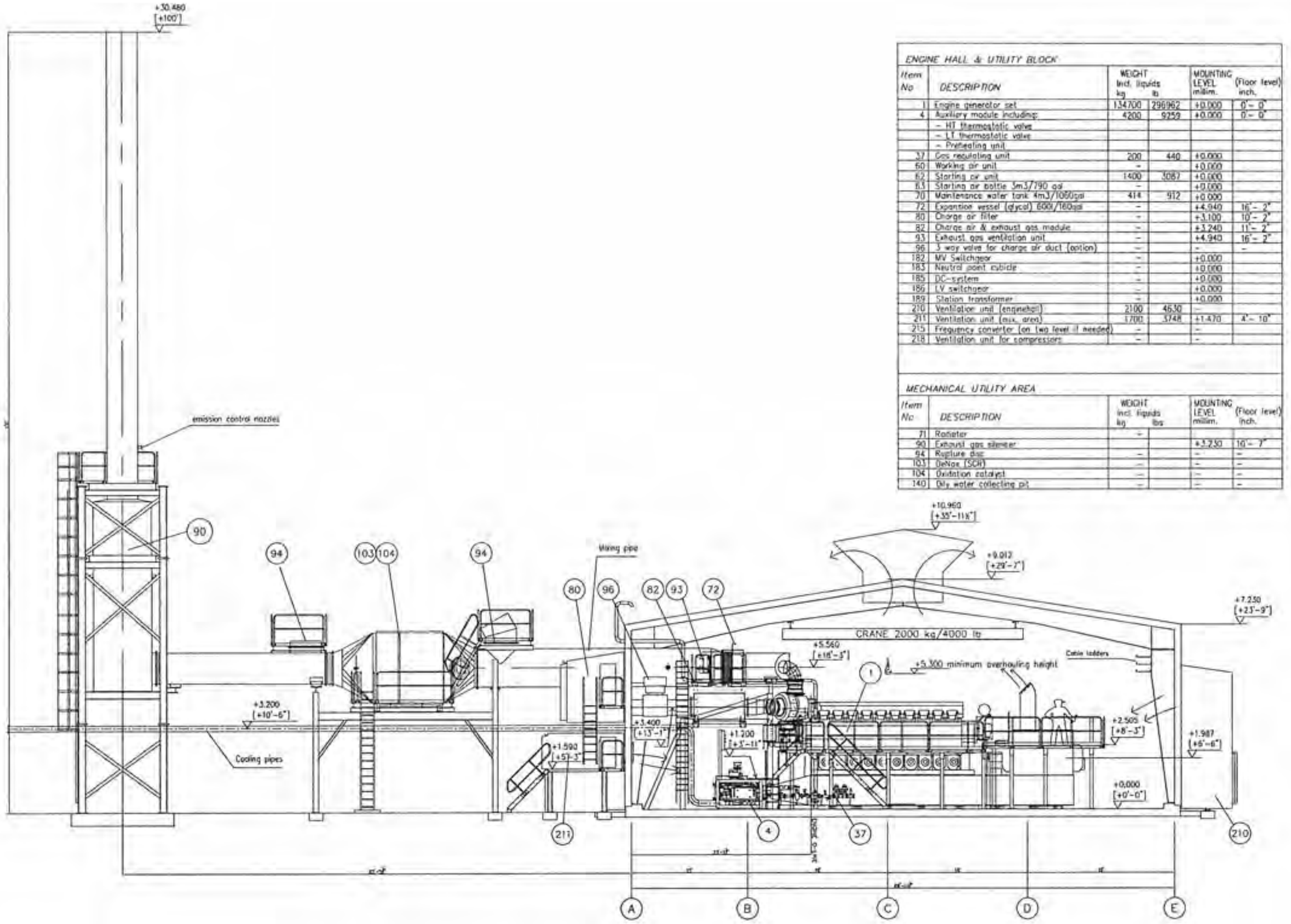
POWER PLANT EQUIPMENT (SEE NOTE 2)

Item No	Pcs.	DESCRIPTION	DESCRIPTION Dia.	Ht.	Cap.(G)
2	1	Engine Hall	–	24'	
71	2	Radiator Sets		18' H	
90	11	Exhaust gas Stack	4' ø	100' H	
300	1	Main Step-Up Transformer		30' H	
301	1	UreaTank	13' ø	22' H	20,000
302	1	Used Oil Tank	10' ø	20' H	10,000
303	1	New Oil Tank	10' ø	20' H	10,000
304	1	Domestic Water Tank	10' ø	20' H	10,000
305	1	Fire Water Tank	60' ø	30' H	500,000
306	1	Fire Water Pumphouse		STACK=30'H	
307	1	Warm Start Gas Heater		STACK=30'H	
308	1	Fuel Gas Heater		STACK=30'H	
309	1	Natural Gas Metering Station		6' H	
310	1	Facility 230kV Switchyard		52' H Mast	
311	1	Maintenance Oil Tank	8' ø	16' H	6,000

QUAIL BRUSH GENERATION PROJECT

FIGURE 2.2-1
SITE PLAN

TETRA TECH EC, INC.



ENGINE HALL & UTILITY BLOCK

Item No	DESCRIPTION	WEIGHT incl. liquids kg	lb	MOUNTING LEVEL millim.	(Floor level) inch.
1	Engine generator set	134700	296962	+0.000	0'- 0"
4	Auxiliary module including:	4200	9259	+0.000	0'- 0"
	- HT thermostatic valve				
	- LT thermostatic valve				
	- Preheating unit				
37	Gas regulating unit	200	440	+0.000	
60	Working air unit	-		+0.000	
62	Starting air unit	1400	3087	+0.000	
63	Starting air bottle 5m3/790 gal	-		+0.000	
70	Maintenance water tank 4m3/1060gal	414	912	+0.000	
72	Expantion vessel (glycol) 600l/160gal	-		+4.940	16'- 2"
80	Charge air filter	-		+3.100	10'- 2"
82	Charge air & exhaust gas module	-		+3.240	11'- 2"
93	Exhaust gas ventilation unit	-		+4.940	16'- 2"
96	3 way valve for charge air duct (option)	-		-	-
182	MV Switchgear	-		+0.000	
183	Neutral point cubicle	-		+0.000	
185	DC-system	-		+0.000	
186	LV switchgear	-		+0.000	
189	Station transformer	-		+0.000	
210	Ventilation unit (enginehall)	2100	4630	-	
211	Ventilation unit (mix. area)	1700	3748	+1.470	4'- 10"
215	Frequency converter (on two level if needed)	-		-	
218	Ventilation unit for compressors	-		-	

MECHANICAL UTILITY AREA

Item No	DESCRIPTION	WEIGHT incl. liquids kg	lbs	MOUNTING LEVEL millim.	(Floor level) inch.
71	Radiator	-			
90	Exhaust gas silencer			+3.230	10'- 7"
94	Rupture disc	-		-	-
103	DeNox (SCR)	-		-	-
104	Oxidation catalyst	-		-	-
140	Oily water collecting pit	-		-	-

LEGEND:

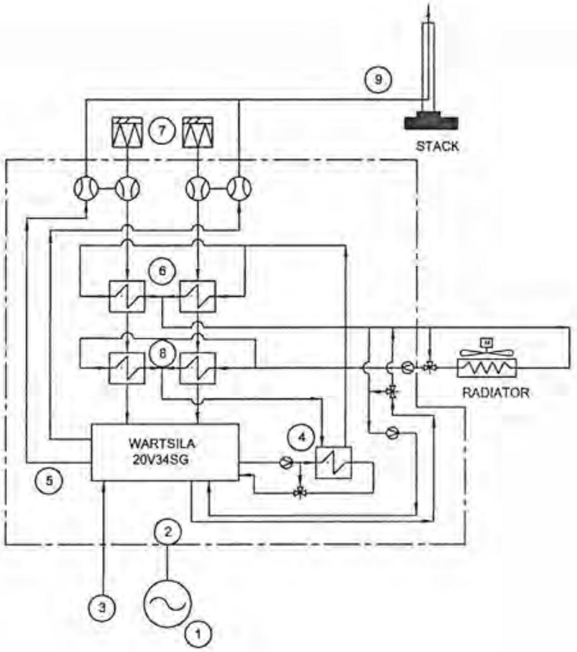
gal	GALLON
kg	KILOGRAM
lb	POUND
millim	MILLIMETERS
m^3	CUBIC METERS
①	ITEM NO.

QUAIL BRUSH GENERATION PROJECT

FIGURE 2.2-2
TYPICAL ELEVATION VIEW

TETRA TECH EC, INC.

Cogentrix



			35F / 68% RH			64F / 60% RH			81F / 48% RH			95F / 24% RH		
Stream	Load	Units	50%	75%	100%	50%	75%	100%	50%	75%	100%	50%	75%	100%
1	Generator Output	KW	4,646	6,998	9,341	4,646	6,998	9,341	4,646	6,998	9,341	4,646	6,998	9,341
2	Engine Output	KW	4,802	7,203	9,604	4,802	7,203	9,604	4,802	7,203	9,604	4,802	7,203	9,604
3	Fuel Flow (LHV)	MMBTU/Hr	39.56	55.96	72.31	39.56	55.96	72.31	39.56	55.96	72.31	39.56	55.96	72.31
		lb/hr	1,860	2,660	3,400	1,915	2,709	3,501	1,915	2,709	3,501	1,600	2,600	3,500
4	Lube Oil	MMBTU/Hr	2.62	3.39	3.86	2.62	3.39	3.86	2.62	3.39	3.88	2.64	3.43	3.92
5	Jacket Cooler	MMBTU/Hr	3.42	4.42	5.04	3.42	4.43	5.05	3.42	4.43	5.07	3.45	4.49	5.14
6	HT Charge Air Cooler	MMBTU/Hr	1.32	3.01	5.15	1.87	3.81	6.25	2.19	4.28	6.86	2.40	4.54	7.41
7	Inlet Air	lb/hr	62,940	84,940	114,300	62,949	84,981	114,428	62,950	85,000	114,800	63,300	85,800	115,800
8	LT Charge Air Cooler	MMBTU/Hr	0.28	0.69	1.46	0.33	0.80	1.69	0.36	0.87	1.83	0.38	0.91	1.77
	Miscellaneous Heat Losses	MMBTU/Hr	0.88	0.92	0.98	0.88	0.92	0.98	0.88	0.92	0.98	0.88	0.92	0.98
9	Exhaust	MMBTU/Hr	14.67	18.98	23.09	14.07	18.07	21.75	13.72	17.53	20.96	13.45	17.13	20.35
		lb/hr	64,800	87,600	117,700	64,802	87,603	117,815	64,800	87,600	118,207	65,100	88,400	119,300
10	Generator Losses	MMBTU/Hr	0.53	0.70	0.90	0.53	0.70	0.90	0.53	0.70	0.90	0.53	0.70	0.90
	Plant Gross (Note 1)	KW	51,106	76,978	12,751	51,106	76,978	102,751	51,106	76,978	12,751	51,106	76,978	102,751
	Plant Auxiliaries	KW	1,593	2,142	2,746	1,628	2,181	2,760	1,664	1,664	2,774	1,664	2,219	2,774
	Plant Net (Note 1)	KW	49,513	74,836	100,005	49,478	74,797	99,991	49,442	75,314	99,977	49,442	74,759	99,977
	Heat Rate (HHV)	BTU/KWH	9,755	9,130	8,828	9,762	9,134	8,830	9,769	9,072	8,831	9,769	9,139	8,831

NOTES:

1. TOTAL FOR ELEVEN (11) ENGINES IN SERVICE.

LEGEND:

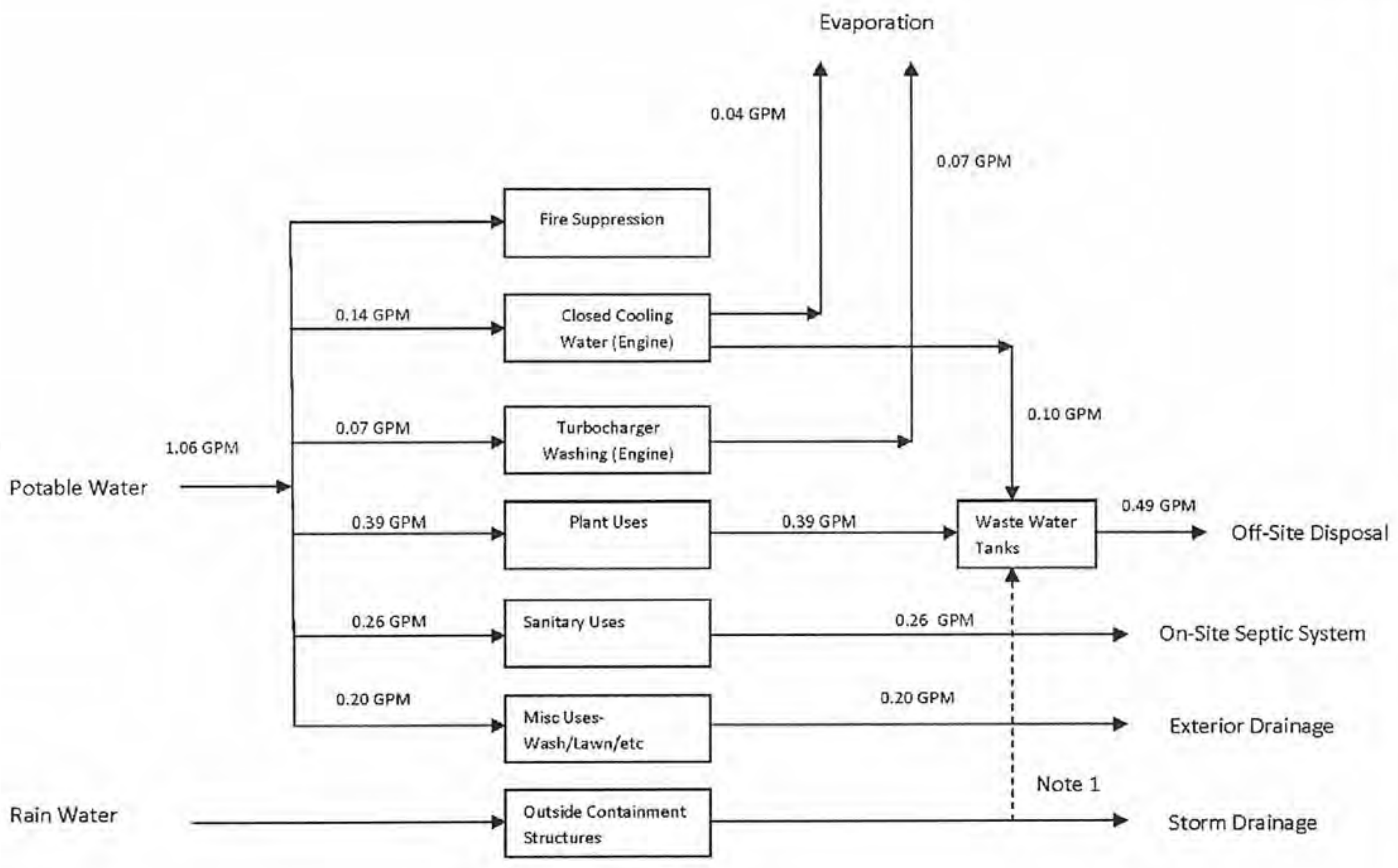
BTU	BRITISH THERMAL UNITS
F	FAHRENHEIT
HHV	HIGH HEATING VALUE
HT	HIGH TEMPERATURE
KW	KILOWATTS
KWH	KILOWATT–HOUR
lb	POUND
LHV	LOW HEATING VALUE
LT	LOW TEMPERATURE
MMBTU/Hr	MILLION BTU PER HOUR
RH	RELATIVE HUMIDITY

QUAIL BRUSH GENERATION PROJECT

FIGURE 2.2-3
HEAT AND MASS BALANCE DIAGRAM

TETRA TECH EC, INC.

Cogentrix



NOTES:

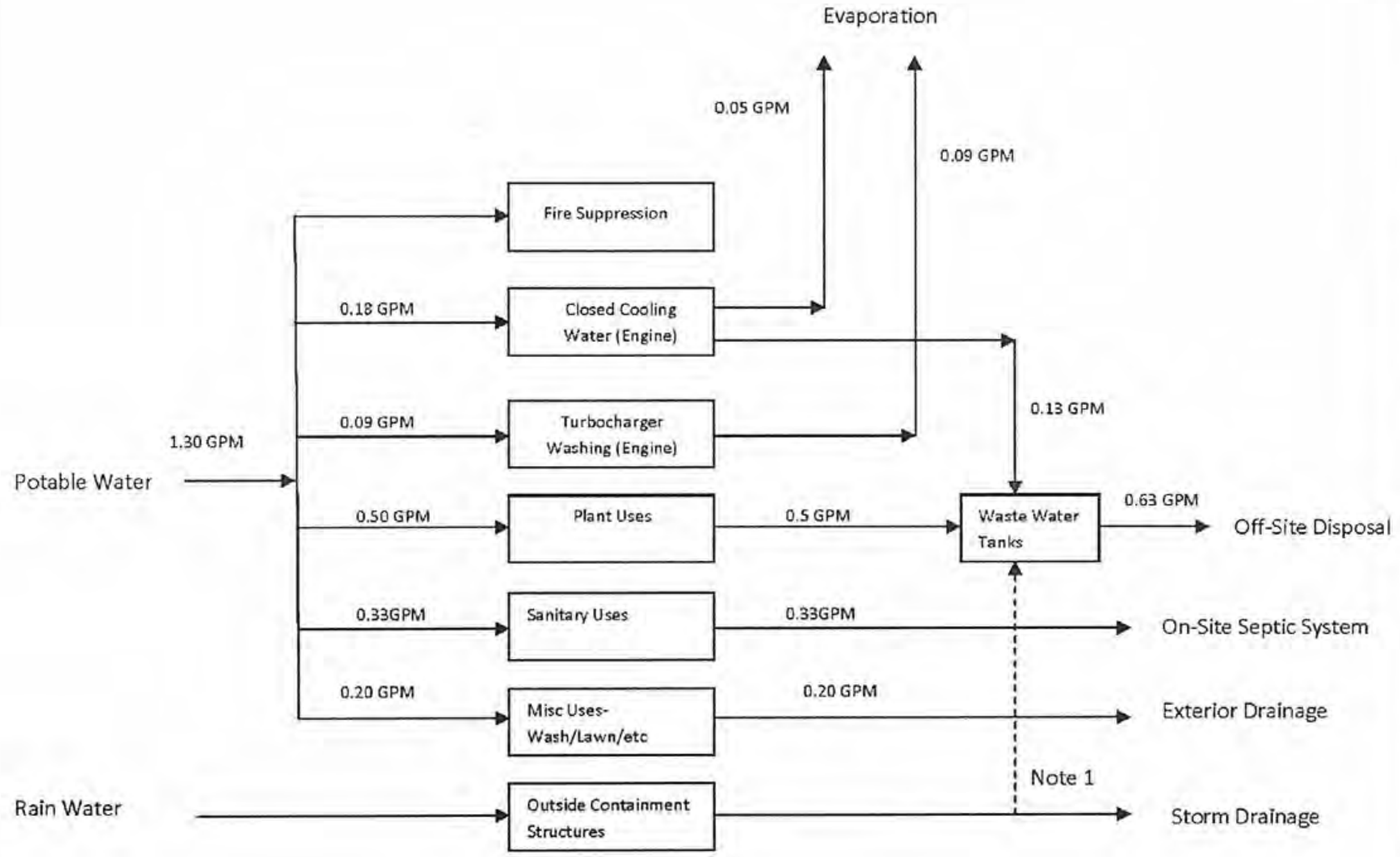
1. CONTAMINATED WATER WILL BE DIVERTED TO WASTE WATER.

QUAIL BRUSH GENERATION PROJECT

FIGURE 2.3-4A
AVERAGE ANNUAL WATER BALANCE

TETRA TECH EC, INC.

Cogentrix



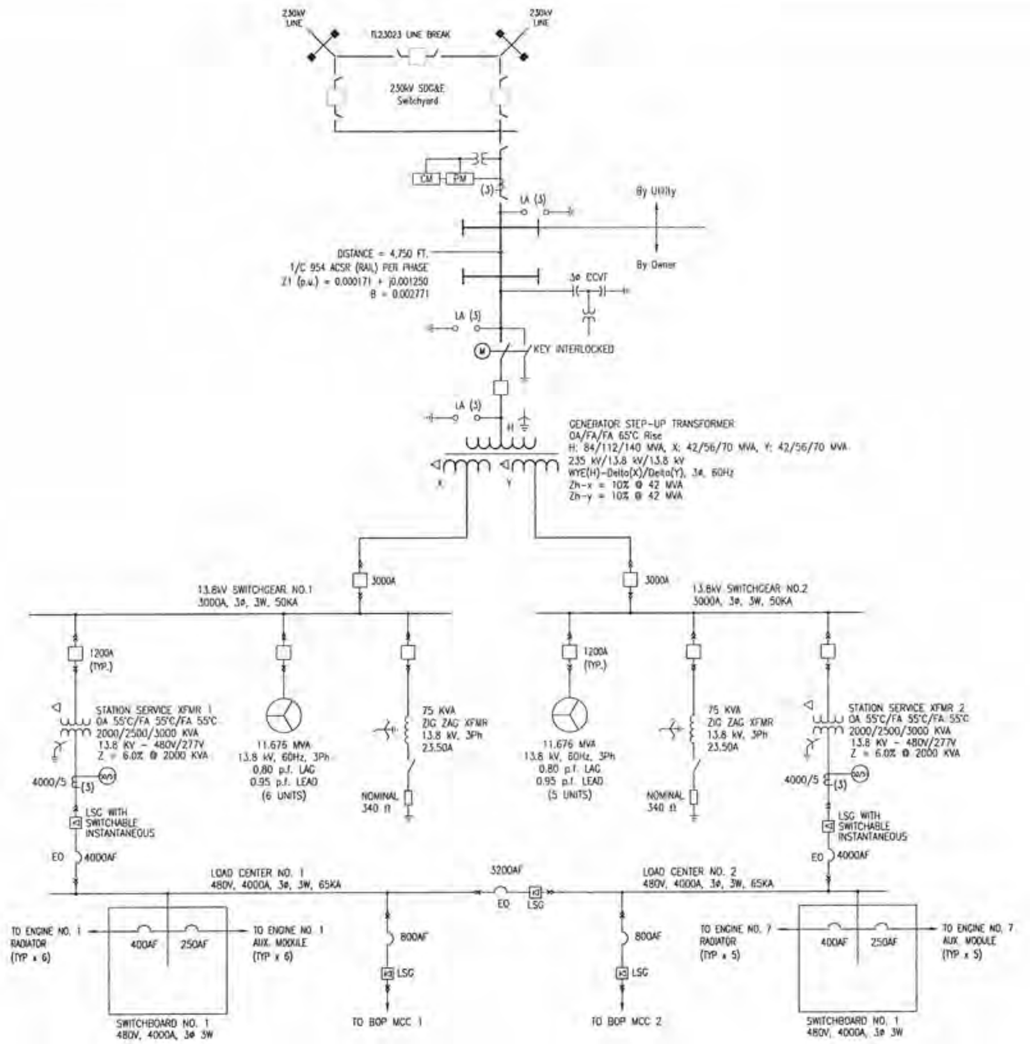
NOTES:

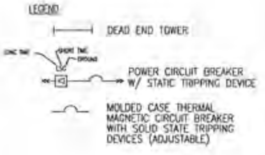
1. CONTAMINATED WATER WILL BE DIVERTED TO WASTE WATER.

QUAIL BRUSH GENERATION PROJECT

FIGURE 2.3-4B
PEAK DEMAND WATER BALANCE

TETRA TECH EC, INC Cogentrix





QUAIL BRUSH GENERATION PROJECT

FIGURE 2.5-1
ELECTRICAL ONE-LINE DIAGRAM

TETRA TECH EC, INC.

Cogentrix

Section 3

Air Quality Analysis

TABLE OF CONTENTS

TABLES

FIGURES

4.7 AIR QUALITY

4.7.1 Introduction

This section presents the methodology and results of an analysis performed to assess potential impacts of airborne emissions from the construction and routine operation of the Quail Brush Generation Project (Project). Section 4.7.1 presents the introduction, Applicant information, and applicability of the respective SDAPCD and USEPA New Source Review (NSR) and Prevention of Significant Deterioration (PSD) requirements to the proposed Project. Section 4.7.2 presents the Project description and describes both the existing site conditions and the increase in emissions attributable to the proposed Project. Section 4.7.3 presents data on the emissions of criteria and air toxic pollutants from the proposed Project. Section 4.7.4 discusses the BACT evaluation for the Project. Section 4.7.5 presents the air quality impact analysis for the proposed Project. Section 4.7.6 presents applicable laws, ordinances, regulations, and standards (LORS). Section 4.7.7 presents agency contacts, and Section 4.7.8 presents permit requirements and schedules. Section 4.7.9 contains references cited or consulted in preparing this section. The following appendices contain support information referenced in the aforementioned subsections:

Appendix F.1	Emissions Calculations and Support Data
Appendix F.2	Dispersion Modeling and Air Quality Impact Analysis Support Data
Appendix F.3	Dispersion Modeling Protocol
Appendix F.4	Health Risk Assessment Support Data
Appendix F.5	Construction Emissions Analysis and Support Data
Appendix F.6	BACT Analysis for Criteria and GHG Pollutants
Appendix F.7	Mitigation of Impacts
Appendix F.8	Cumulative Impacts Protocol and Support Data
Appendix F.9	SDAPCD Permit Application Forms
Appendix F.10	Miscellaneous Support Data

The Applicant is proposing to construct and operate the Project located on Sycamore Landfill Road in the City of San Diego and just west of the City of Santee, California. The Project will be a nominal 102.3 MW power plant utilizing natural gas-fired internal reciprocating engine technology. The engines proposed for use are Wartsila 20V34SG-C2s. Each engine is rated at approximately 9.3 MW. In addition to the power cycle engines, the plant will have a dry "radiator" cooling system, fuel gas and warm start heaters, and an emergency fire pump system.

4.7.1.1 Regulatory Items Affecting Project

Although a regulatory compliance analysis (LORS) is presented in Section 4.7.6, this section summarizes some key points concerning applicability of SDAPCD's nonattainment NSR permitting program and USEPA's PSD regulations to the proposed Project:

- SDAPCD does not, at this time, have PSD delegation; therefore, USEPA Region 9 will issue the PSD permit. (SDAPCD 2010).

- Because PSD review is triggered for the Project under the Tailoring Rule[1] due to its emissions of greenhouse gases (GHGs), the Project will also be subject to PSD review for those attainment/unclassifiable criteria pollutants emitted in quantities exceeding the PSD significant emissions rates (SERs).
- Although the Project constitutes a major stationary source subject to PSD review due to its emissions of GHGs under the Tailoring Rule, it does not constitute a major stationary source under SDAPCD's nonattainment NSR permitting program (see Rules 20.1(c)(35) and 20.2). (SDAPCD 2011).
- Based on data derived from discussions with SDAPCD staff, the APCD is classified as a Subpart 1 basic nonattainment area for ozone (O_3). But, the SDAPCD has requested a reclassification to Subpart 2 "serious" O_3 nonattainment, which could become effective prior to the CEC's and EPA's respective issuance of the license and PSD permit for the Project.
- SDAPCD Rule 20.1 defines the major source emissions thresholds for serious O_3 nonattainment areas as follows:
  - Particulate matter less than 10 microns in size (PM_{10}) 100 tons per year (TPY)
  - NO_X 50 TPY
  - Volatile organic compounds (VOCs) 50 TPY
  - Sulfur oxide (SO_x) 100 TPY
  - Carbon monoxide (CO) 100 TPY
- SDAPCD Rule 20.1 further defines NO_x and VOC as precursors to O_3. Notwithstanding this definition, the region is designated attainment for NO_2 and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) (for which NO_x is presumed to be a precursor), and as such, if emissions of NO_x exceed the 40 TPY PSD SER, the plant will be subject to PSD for NO_x (NO_2) in addition to any other applicable pollutants exceeding their respective SERs.

4.7.2 Project Description

4.7.2.1 Current Site Conditions

The proposed Project consists of the power plant site, the 8-inch gas pipeline lateral, the 230kV gen tie, and the utility switchyard. There are no stationary sources of air pollutants located on the proposed plant site at this time. The property is vacant; no buildings or structures are on the site.

The Project is located west-northwest of the City of Santee, California (San Diego County). The site is located on the north side of SR 52, and adjacent to and east of Sycamore Landfill Road. The Sycamore Landfill lies to the north of the site approximately 0.42 miles. The City of Santee lies in close proximity to the site to the northeast (1.3 miles), east (0.94 mile), and southeast (0.3 miles). The topography of the site and surrounding area is essentially low rolling hills, with elevations ranging from 250 to over 800 feet (amsl). The site elevation ranges from approximately 415 to 530 feet amsl. The site and immediate surrounding area to the north, west, and south-southwest are primarily uninhabited vacant open space in nature. The site

---

[1] Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule; Final Rule, 75 Federal Register (Fed. Reg.) 31,514 (Jun. 3, 2010).

occupies approximately 21.6 acres of presently vacant "industrial" land. The MCAS Miramar boundary is to the north of the Project approximately 1.55 miles, and the main runway complex at MCAS Miramar is 6 miles to the northwest. Gillespie Field (airport) lies approximately 3 miles to the southeast, and Montgomery Field (airport) lies 6.4 miles to the southwest.

According to the Auer (Auer 1978) land use classification scheme, a 3-kilometer (km) radius boundary around the proposed plant site yields a predominately rural classification. This is consistent with the current (City of San Diego) land use and general plan designation for the site and surrounding area as "open space," i.e., a large portion of the land surrounding the proposed site (to the southwest, west, northwest, and northeast) is vacant. The site is zoned RS-1-8 (single family residential), although it is unlikely that residential units will be built in such close proximity to the Sycamore Landfill. The Sycamore landfill, which lies to the north of the Project site is zoned "industrial employment."

4.7.2.2 Proposed Power Plant

The proposed power plant will consist of eleven (11) Wartsila 20V34SG-C2 engine generator sets, each rated at approximately 9.3 MW. These engine generator sets will incorporate lean-burn design for primary NO_x control. Each engine will have its own exhaust stack. In addition to lean burn design, each unit will be equipped with a selective catalytic reduction (SCR) system using urea as the reaction agent in the final NO_x control process, and a CO oxidation catalyst for control of CO (and VOC and VOC hazardous air pollutants (HAPs) emissions. Each stack will have a CEMS as required by the local SDAPCD regulations, as well as an exhaust gas silencer system.

Each of the engines will operate in simple-cycle mode, i.e., no heat recovery from the engine exhaust will be used to augment engine power production, and will fire natural gas only. The Wartsila 20V34SG-C2 engines are four-stroke, port injected, turbocharged, inter-cooled, spark-ignited engines, working on the Otto process, lean burn principle. The engines are classified as medium-speed units, and have been proven to be highly efficient, low polluting, power production sources for peaking and cogeneration applications. Approximately 33 seven-fan radiator banks, three banks per engine generator set, will be provided for engine cooling. (Wartsila 2005).

Other equipment to be located on the plant site that will support the combustion process is as follows: fuel gas heater, two warm start heaters, fire-pump system, engine cooling water treatment and distribution system, water storage tank and forwarding pumps, electrical switchyard area, urea storage (one 20,000-gallon aboveground storage tank) and containment area, administration building, gas compressor area, etc. Based upon a natural gas heat content of 1,019 Btu/scf (~22,900 Btu/lb), each engine will have a maximum heat rating of approximately 80.18 MMBtu/hr HHV, with gross and net heat rates of 8,600 and 8,834 Btu/kWh HHV, respectively. Each engine will consume fuel at a rate of approximately 78,685 standard cubic feet per hour at maximum rated load. The plant is being evaluated for an operational scenario of 4,032 hours per year (which includes startups and shutdown times, as well as 3,800 hours per year of normal operations). Daily operations will vary depending upon the dispatch requirements of San Diego Gas and Electric Company and CAISO.

Proposed equipment specifications are summarized as follows:

Power Cycle Engines

- Engine Manufacturer: Wartsila
- Engine Model: 20V34SG-C2
- Fuel: Natural Gas
- Nominal MW rating: 9.3 MW (~12874 hp) each
- Number of engines: 11
- Heat rating: ~80.18 MMBtu/hr (HHV) each
- Hours per year: 4,032 (each)

Fuel Heater

- Manufacturer: To be determined
- Model: To be determined
- Number of heaters: 1
- Fuel: Natural Gas
- Heat Rate: 4 MMBtu/hr (HHV)
- Hours per year: 4232
- Burner Type: Low NO_x Burner
- Fuel consumption: 3925.4 scf/hr (@1,019 Btu/scf)

Warm Start Heaters

- Manufacturer: To be determined
- Model: To be determined
- Number of heaters: 2*
- Fuel: Natural Gas
- Heat Rate: 4 MMBtu/hr (HHV)
- Hours per year: 4,928
- Burner Type: Low NO_x Burner
- Fuel consumption: 3925.4 scf/hr (@1,019 Btu/scf)

  * One of the warm start heaters is a backup, and as such, only one unit will be operated at any given time, and the total operation of both units combined will not exceed 4,928 hours per year.

Diesel Engine Fire Pump System

- Mfg: John Deere
- Model: Clarke JU4H-UFADW8
- Tier: 3

- BHP: 144
- Fuel: Diesel
- Fuel Use Rate: 10 gallons/hour (gals/hr)
- Annual operations: 50 hours/year (hrs/yr)

The only fuel to be combusted onsite by the Wartsila engine generator sets and the fuel gas and warm start heaters is Public Utilities Commission (PUC)-grade natural gas supplied by the local gas company (Sempra Utilities). The gas will have a HHV of approximately 1,019 Btu/scf, and a sulfur content that is not expected to exceed 0.25 grains/100 scf (~4 ppm). The diesel fire pump engine will fire only California-certified low-sulfur low-aromatic diesel fuel. Table 4.7-1 presents a fuel use summary for the proposed plant. Fuel use values are based on the maximum heat input rating of each system, fuel specifications, and maximum operational scenarios.

Table 4.7-1 Estimated Fuel Use Summary for the Proposed Project

System	Units	Per Hour	Per Day	Per Year
Single Engine	Million Standard Cubic Feet (MMscf)	0.078685	1.88844	317.26
All Engines	MMscf	0.865535	20.773	3489.84
Fuel Gas Heater	MMmscf	0.0039254	0.09421	16.613
Warm Start Heater(s)	MMscf	0.0039254	0.09421	19.345
Fire Pump Diesel Engine	gallons	10	10	500

Notes:

Natural gas at 1,019 Btu/scf HHV.

Daily fuel use is based on maximum operation, 24 hrs/day.

Diesel fuel use per manufacturer's specification, 50 hours per year estimated runtime. Modeling based on 1 hour per day, 1 day per week (50 weeks per year).

Table 4.7-2 presents a typical natural gas composition analysis for the San Diego regional area.

Table 4.7-2 Typical Natural Gas Fuel Analysis

Component	Analysis (Average)
Methane	96.444%
Ethane	1.652%
Propane	0.266%
Butanes, Pentanes, Hexanes	0.1204%
N_2	0.28%
CO_2	1.239%
Sulfur	0.25 grs/100scf
Btu/scf	~1019 (HHV)

Table 4.7-3 presents a typical fuel analysis for California low sulfur diesel fuel.

Table 4.7-3 Typical Diesel Fuel Analysis

Parameter	Average Data
Carbon %	85.86
Hydrogen %	13.35
Oxygen %	0.65
Nitrogen %	0.097
Sulfur %	0.0015 – 0.05
Ash %	0.01
Btu/gallon (HHV)	~138,000
Lbs/gallon	~7.05
Btu/lb	~19575

4.7.2.3 Climate and Meteorology

The City of Santee and the northeastern portion of the City of San Diego where the proposed plant site is located are in the southwestern corner of southern California. The prevailing winds and weather are tempered by the Pacific Ocean, with the result that summers are cool and winters warm in comparison with other places along the same general latitude. Temperatures of freezing or below have rarely occurred at the nearest National Weather Service meterological station in San Diego since the record began in 1871, but hot weather, 90° F or above, is more frequent.

Dry easterly winds sometimes blow in the vicinity for several days at a time, bringing temperatures in the 90s and at times even in the 100s in the eastern sections of the City of San Diego and outlying suburbs. At the National Weather Service station itself, however, there have been relatively few days on which 100 degrees or higher was reached.

As these hot winds are predominant in the fall, highest temperatures occur in the months of September and October. Records show that over 60 percent of the days with 90 degrees or higher have occurred in these two months. High temperatures are almost invariably accompanied by very low relative humidity, which often drops below 20 percent and occasionally below 10 percent.

A marked feature of the climate is the wide variation in temperature within short distances. In nearby valleys daytimes are much warmer in summer and nights noticeably cooler in winter, and freezing occurs much more frequently than in the City of San Diego. Although records show unusually small daily temperature ranges, only about 15 degrees between the highest and lowest readings, a few miles inland these ranges increase to 30 degrees or more.

Strong winds and gales associated with Pacific, or tropical storms, are infrequent due to the latitude. The seasonal rainfall is about 10 inches in the City of San Diego, but increases with elevation and distance from the coast. In the mountains to the north and east, the average is between 20 and 40 inches, depending on slope and elevation. Most of the precipitation falls in winter, except in the mountains where there is an occasional thunderstorm. Eighty-five percent of the rainfall occurs from November through March, but wide variations take place in monthly and seasonal totals. Infrequent measurable amounts of hail occur in San Diego, but snow is practically unknown at the Weather Service Office location. In each occurrence of snowfall only a trace was recorded officially, but in some locations amounts up to or slightly exceeding a half-inch fell, and remained on the ground for an hour or more.

As on the rest of the Pacific Coast, a dominant characteristic of spring and summer is the nighttime and early morning cloudiness. Low clouds form regularly and frequently extend inland over the coastal valleys and foothills, but they usually dissipate during the morning and the afternoons are generally clear.

Considerable fog occurs along the coast, but the amount decreases with distance inland. The fall and winter months are usually the foggiest. Thunderstorms are rare, averaging about three a year in the City. Visibilities are good as a rule. The sunshine is plentiful for a marine location, with a marked increase toward the interior.

Additional climate and historical meteorological data are presented in Appendix F.2 for the San Diego regional area and for the following stations: La Mesa (044735), El Cajon (042706), and San Diego AP (047740) (WRCC 2011). The meteorological data supplied by the SDAPCD as representative of the site are presented in Appendix F.2. These data were derived from the Overland Avenue monitoring station, combined with upper air data from Miramar for the period 2003 through 2005.

4.7.3 Emissions Evaluation

4.7.3.1 Current Site Emissions

The proposed plant site is vacant with no stationary sources of air pollutants located on the site. As such, the current site has a "potential to emit" of zero for all pollutants.

4.7.3.2 Proposed Plant Emissions

Installation and operation of the proposed engine generator sets and ancillary equipment will result in an increase in emissions from operations at the site. Criteria pollutant emissions from the proposed new engines, and ancillary equipment are delineated in the following sections, while emissions of HAPs are delineated in Section 4.8 (see Appendix F.1 for emissions data calculations).

4.7.3.3 Normal Operations

Operation of the proposed process and equipment systems will result in emissions to the atmosphere of both criteria pollutants and toxic air pollutants. Criteria pollutant emissions will consist primarily of NO_x, CO, VOCs, SO_x, and $PM_{10}/PM_{2.5}$. Air toxic pollutants will consist of a combination of toxic gases and toxic particulate matter species. Table 4.7-4 lists the pollutants that may potentially be emitted from the proposed plant.

Table 4.7-4 Criteria and Toxic Pollutants Potentially Emitted from the Proposed Project

NO_x	Ethylbenzene
CO	Formaldehyde
VOC	Hexane
SO_x	Naphthalene
$PM_{10}/PM_{2.5}$	Propylene
Ammonia	Biphenyl
Polycyclic Aromatic Hydrocarbons (PAHs)	Methanol
Acetaldehyde	Toluene
Acrolein	Xylene
Benzene	Diesel Particulate Matter
1,3-Butadiene	

4.7.3.4 Criteria Pollutant Emissions

Tables 4.7-5A presents worst-case Wartsila criteria pollutant emissions for a single engine based on a normal operating scenario of 100 percent load. Table 4.7-5B presents the worst-case criteria pollutant emissions for a single engine, including startup and shutdown events. Table 4.7-5C presents the combined worst-case criteria pollutant emissions expected from all eleven Wartsila power cycle engines assuming normal operations at 100 percent load and with startup and shutdown events included. The worst-case annual operational profile assumed for each engine was based on the following:

1. 4032 hr/yr/engine which includes startup and shutdown
2. 3800 hrs/yr/engine of steady state operations
3. 300 cold starts per year
4. 100 warm starts per year
5. 400 shutdowns per year
6. Cold start = 30 minutes
7. Warm start = 15 minutes

Tables 4.7-5D and 4.7-5E presents the anticipated emissions from the fuel gas and warm start heaters, respectively.

Table 4.7-5A Estimated Steady State Maximum Hourly, Daily, and Annual Criteria Pollutant Emissions for a Single Wartsila Engine

Pollutant	Max Hourly Emissions, lbs (each engine) Steady State	Max Daily Emissions, lbs (each engine) Steady State	Max Annual Emissions, tons (each engine) Steady State
NO_x	1.317	31.61	2.50
CO	1.564	37.54	2.97
VOC	1.584	38.02	3.01
SO_x	0.256	6.14	0.49
$PM_{10}/PM_{2.5}$	1.379	33.10	2.62
NH_3	1.08	25.92	2.18

Table 4.7-5B Estimated Maximum Hourly, Daily, and Annual Criteria Pollutant Emissions for a Single Wartsila Engine (including Startups and Shutdowns)

Pollutant	Max Hourly Emissions, lbs (each engine)	Max Daily Emissions, lbs (each engine)	Max Annual Emissions, tons (each engine)
NO_x	9.49	58.25	3.99
CO	13.44	74.18	4.99
VOC	7.52	57.31	4.16
SO_x	0.28	6.23	0.52
$PM_{10}/PM_{2.5}$	2.38	37.46	3.00
NH_3	1.08	25.92	2.18

Table 4.7-5C Estimated Maximum Hourly, Daily, and Annual Criteria Pollutant Emissions for All the Wartsila Engines (including Startups and Shutdowns)

Pollutant	Max Hourly Emissions, lbs (all engines)	Max Daily Emissions, lbs (all engines)	Max Annual Emissions, tons (all engines)
NO_x	104.41	640.71	43.86
CO	147.84	816.03	54.84
VOC	82.74	630.43	45.74
SO_x	3.07	68.55	5.73
$PM_{10}/PM_{2.5}$	26.23	412.07	32.98
NH_3	11.88	285.12	23.95

Table 4.7-5D Fuel Gas Heater Emissions for the Proposed Project

Pollutant	Emission Factor (lb/mmscf)	Max Hour Emissions (lbs)	Max Daily Emissions (lbs)	Max Annual Emissions (tons)
$PM_{10}/_{2.5}$*	7.13	0.028	0.672	0.0592
NO_x	49.24	0.193	4.63	0.408
CO	91.7	0.360	8.64	0.762
VOC	40.8	0.160	3.84	0.339
SO_x	0.60	0.0024	0.057	0.00498

Notes:

Natural gas at 1,019 Btu/scf (HHV).
24 hrs/day, 4,232 hrs/year. (USEPA 1985a).

Table 4.7-5E Warm Start Heater Emissions for the Proposed Project

Pollutant	Emission Factor (lb/mmscf)	Max Hour Emissions (lbs)	Max Daily Emissions (lbs)	Max Annual Emissions (tons)
$PM_{10}/_{2.5}$*	7.13	0.028	0.672	0.069
NO_x	49.24	0.193	4.63	0.476
CO	91.7	0.360	8.64	0.887
VOC	40.8	0.160	3.84	0.394
SO_x	0.60	0.0024	0.057	0.0058

Notes:

Natural gas at 1,019 Btu/scf (HHV).
24 hrs/day, 4,928 hrs/year.

Table 4.7-6 summarizes the fire pump engine emissions.

Table 4.7-6 Fire Pump Engine Emissions for the Proposed Project

Pollutant	Emission Factor grams/horsepower-hour (g/hp-hr)	Max Hour Emissions (lbs)	Max Daily Emissions (lbs)	Max Annual Emissions (tons)
$PM_{10}/_{2.5}$*	0.09	0.03	0.03	0.001
NO_x	2.8	0.89	0.89	0.023
CO	1.0	0.32	0.32	0.008
VOC	0.10	0.03	0.03	0.001
SO_x	-	0.0021	0.0021	0.0001

Notes:

* All particulate matter is classified as diesel particulate matter (DPM). 1 hr/day, 50 hrs/yr.

SO_2 emissions based on fuel S calc and fuel use rates.

Table 4.7-7 summarizes the total plant emissions.

Table 4.7-7 Summary of Plant Emissions for the Proposed Project

Pollutant	lbs/hour[a]	lbs/day[a]	tons/year[a]
NO_x	105.7	650.9	44.8
CO	148.9	833.6	56.5
VOC	83.1	638.1	46.5
SO_x	3.8	68.7	5.74
$PM_{10}/_{2.5}$	26.3	413.4	33.1
NH_3	11.9	285.1	23.95

Notes:

[a] Includes emissions from fire pump for 1 hour per week, 50 hours per year, and fuel gas and warm start heaters and includes Wartsila engine operated for 3,800 hours in normal operations and 232 hours during startup and shutdown.

Table 4.7-8 presents data on the startup and shutdown emissions for the engine generator sets. The engine manufacturer defines a cold start as one which occurs after the engine has been shut down for a period of approximately 6 hours or more. A warm start is defined as a start that occurs after the engine has been shut down for a period ranging from 2 hours to less than 6 hours. The startup/shutdown event and emissions data presented in Table 4.7-8 will also serve as the proposed BACT emissions limits for such periods.

Table 4.7-8 Plant Startup/Shutdown Emission Rates for Each Engine for the Proposed Project

Scenario	NO_x	CO	VOC	$PM_{10}/2.5$	SO_x
Cold Start, lb/event	8.82	12.57	6.614	1.54	0.137
Warm Start, lb/event	2.43	1.322	1.764	1.54	0.07
Shutdown, lb/event	0.2	0.31	0.34	0.35	0.05
Hourly Based Emissions Estimates for Startup and Shutdown Events					
Cold Start, lb/hr	9.48	13.35	7.41	2.23	0.27
Warm Start, lb/hr	3.42	2.50	2.95	2.57	0.26
Shutdown, lb/hr	1.33	1.65	1.70	1.53	0.27

Notes:

Estimates based on startup/shutdown data supplied by engine mfg.

Cold start sequence is 30 minutes, while a warm start sequence is 15 minutes or less. Note that the engines can achieve maximum capacity within 10 minutes; the additional time required is for emissions control systems to reach full abatement efficiency. The remaining part of the cold or warm startup hour would be at steady state, full control levels.

Shutdown is 8.5 minutes. The remaining part of the shutdown hour would be at steady state, full control levels.

Table 4.7-9 compares the proposed potential to emit for the new plant to the calculated potential to emit for the current site emissions profile.

Table 4.7-9 Potential to Emit Comparison of the Current Site Emissions Profile to the Proposed Project

Pollutant	Current Site TPY	Proposed Plant TPY	Difference* TPY	SDAPCD Rule 20.1, 20.2 Offset Thresholds, TPY
NO_x	0	44.8	44.8	50
CO	0	56.5	56.5	100
VOC	0	46.5	46.5	50
SO_x	0	5.74	5.74	100
PM_{10}	0	33.1	33.1	100
$PM_{2.5}$	0	33.1	33.1	100
CO_2e**	0	191,589	+191,589	n/a

Notes:

* Approximate emissions increases (+) and decreases (-).

** Stationary source emissions only, w/o 10 percent contingency (see BACT Appendix F.6).

Based on the values in Tables 4.7-7 and 4.7-9, the proposed plant will be a minor source under Rules 20.1 and 20.2. Detailed emissions data on the proposed plant are presented in Appendix F.1. The proposed plant emissions of greenhouse gases (carbon dioxide equivalent [CO_2e]) will trigger the PSD program requirements under the provisions of the Tailoring Rule adopted by USEPA. In addition, the plant will be required to undergo PSD review for the following pollutants; NO_x, VOC, PM_{10}, and $PM_{2.5}$, because each of these attainment/ unclassifiable pollutants will have annual potential to emit values above the PSD SERs. The plant will not be required to obtain emissions offset pursuant to the SDAPCD NSR rules (20.1, 20.2). The proposed criteria pollutant mitigation strategy for the Project is discussed in Appendix F.7.

4.7.3.5 Hazardous Air Pollutants

See Section 4.8 for a detailed discussion and quantification of hazardous air pollutant emissions from the proposed plant. See Appendix F.4 for the public health analysis and support materials.

4.7.3.6 Construction

Construction-related emissions are expected to be similar to other construction Projects of industrial and commercial nature due to the following:

- The site is 21.6 acres in size. Only 11 acres of the proposed site will be disturbed during the various construction phases, and only 3 acres of the 16 acres will be subject to disturbance activities on any given construction day.
- The site lies in gently rolling hills, and as such, a moderate amount of grading and cut and fill activity will be required to prepare the site for actual power plant construction.
- Construction activity is expected to last for a total of 18 months. The grading and site preparation phase is expected to last for 1.5 to 2 months, with power plant construction anticipated to last for 14 to 14.5 months. There will be some level of overlap between the two main phases of construction (most likely in month 2).

Construction-related issues and emissions at the plant site are consistent with issues and emissions encountered at any construction site. Compliance with the provisions of the following permits will generally result in minimal site emissions: (1) grading permit, (2) storm water pollution prevention plan requirements (construction site provisions), (3) use permit, (4) building permits, and (5) the air district Determination of Compliance, which will require compliance with the provisions of all applicable fugitive dust rules that pertain to the site construction phase. An analysis of construction site emissions is presented in Appendix F.5. This analysis incorporates the following mitigation measures or control strategies:

- Construction equipment exhaust emissions will comply with all applicable USEPA and California emissions standards for each equipment type and category.
- Construction equipment will use only California-certified diesel (low sulfur, low aromatic content) and gasoline fuels.
- Each piece of equipment will be included in a preventative maintenance program to ensure correct operation and to minimize exhaust emissions.
- Equipment use scheduling will minimize equipment onsite time as well as idling time once onsite.
- Water will be used as the primary fugitive dust suppression control method. Water will applied to all disturbed portions of the site, including unpaved roads, parking and laydown areas, at a minimum of three times daily.
- Track-out sites will either be swept or water flushed on a daily basis to remove track-out materials from all paved access roads.
- Vehicle speeds will be generally limited to 5 miles per hour onsite.
- Reasonable erosion control strategies will be implemented to prevent soil and silt runoff from the site.
- Disturbed areas will be revegetated as soon as practical.
- All trucks entering or leaving the site will cover all loads of soils, sands, and other loose materials, or each truck will provide a minimum freeboard height of 2 feet.
- Water or chemical surface stabilizers will be used on any storage piles or identified wind erosion areas.

Use of these mitigation measures and control strategies will ensure that the site does not cause any violations of existing air quality standards as a result of construction-related activities. (MRI 1996, SCAQMD 1993).

4.7.4 Best Available Control Technology Evaluation

4.7.4.1 Proposed Plant Best Available Control Technology

Table 4.7-10 presents the BACT summary for the proposed new engines. A detailed BACT evaluation performed in accordance with USEPA's "top-down" method is provided at Appendix F.6.

Table 4.7-10 Proposed BACT for the Power Plant Wartsila 20V34SG Engines

Pollutant	Proposed BACT Emissions Level	Proposed BACT System(s)	Meets Current BACT Requirements
NO_x	1.317 lbs/hr	Lean-burn design, Spark Ignition, Natural Gas, with SCR* and Good Combustion Practices	Yes
CO	1.564 lbs/hr	Lean-burn design, Spark Ignition, Natural Gas, with CO Catalyst and Good Combustion Practices	Yes
VOC	1.584 lbs/hr	Lean-burn design, Spark Ignition, Natural Gas, CO Catalyst, and Good Combustion Practices	Yes
SO_x	0.256 lbs/hr**	Natural Gas with total sulfur less than 0.25 gr/100 scf	Yes
PM_{10}/ $PM_{2.5}$	1.379 lbs/hr	Natural Gas with total sulfur less than 0.25 gr/100 scf	Yes
Ammonia Slip	1.08 lbs/hr 10 ppmvd @ 15% O_2	SCR catalyst with urea (ammonia) reactant*	NA

Notes:

See Tables 4.7-5A through 4.7-5C for BACT-related mass emissions values.

* Urea-based system for SCR injection.

** Includes lube oil contribution to SO_2 emissions. See Appendix F.1.

*** Ammonia is not a pollutant subject to BACT under either SDAPCD regulations or EPA PSD regulations. However it is included here for the sake of completeness and to assure that BACT for NO_x does not result in any unacceptable environmental impacts. (CARB 2011a; CARB 1999; SDAPCD 2011.)

These emissions rates, as proposed for BACT, are consistent with recent BACT determinations, as summarized in the BACT analysis in Appendix F.6.

Table 4.7-11 presents the BACT summary for GHGs. The GHG BACT analysis is presented in Appendix F.6.

Table 4.7-11 Proposed BACT Summary for GHGs for the Proposed Power Plant

Pollutant	Process	Proposed BACT
Combustion CO_2e	Power Generation Engines	Efficient lean-burn reciprocating engines. Use of natural gas fuel. Efficient design of auxiliary load-consuming equipment (fans, step-up transformer). Maintain engines per manufacturer's specifications. Perform engine tune-ups as specified by mfg's recommendations. Track engine run hours and fuel use.
Combustion CO_2e	Fire Pump Engine	Meet USEPA/ California Air Resources Board (CARB) Tier emissions standards for engine class and size. Use low sulfur diesel fuel. Tune engine according to manufacturer's specifications annually. Track engine run hours and fuel use.
Combustion CO_2e	Fuel Gas and Warm Start Heaters	Use of natural gas fuel. Maintain heater per manufacturer's specifications. Perform heater tune-ups as specified by mfg's recommendations. Track heater run hours and fuel use.
SF_6	Electrical Breakers	Utilize breakers with SF_6 fugitive leak rates less than or equal to 1% (by weight) per year.

Based on the above data, the proposed emissions levels for the new Wartsila 20V34SG-C2 engines, and ancillary processes, meet the BACT requirements of the SDAPCD and USEPA.

4.7.5 Air Quality Impact Analysis

This section describes the results, in both magnitude and spatial extent of ground level concentrations resulting from emissions from the power plant. The maximum modeled concentrations were added to the maximum background concentrations to calculate a total impact.

Potential air quality impacts were evaluated based on air quality dispersion modeling, as described in herein. All input and output modeling files are contained on a CD-ROM disk provided to CEC Staff under separate cover. All modeling analyses were performed using the techniques and methods as discussed with the SDAPCD (De Siena 2011, USEPA 1985b, 1989, 1991).

4.7.5.1 Dispersion Modeling

The USEPA dispersion models used to quantify pollutant impacts on the surrounding environment based on the emission sources operating parameters and their locations include the AERMOD modeling system (version 11103 with the associated receptor processing program AERMAP version 11103) for modeling most Plant operational and construction impacts in both simple and complex terrain, the Building Profile Input Program for PRIME (BPIP-PRIME version 04274) for determining building dimensions for downwash calculations in AERMOD, the CTSCREEN model (version 94111) for determining PM impacts in complex terrain, the

SCREEN3 model (version 96043) for determining inversion breakup, impacts, and the use of the California Health Risk Assessment models/protocols for determining toxic impacts, which includes the HARP On-Ramp program. AERMOD meteorological data were processed by SDAPCD using AERMET version 06341 and AERSURFACE, version 08009. The models were used for the following (USEPA 2005):

- Comparison of operational and construction impacts to significant impact levels (SILs), ambient monitoring significance thresholds, California Ambient Air Quality Standards (CAAQS), National Ambient Air Quality Standards (NAAQS), and PSD Increments using AERMOD and/or CTSCREEN (as needed)
- Cumulative impacts analyses with AERMOD in accordance with local/state/USEPA/ CEC requirements
- Toxics analyses using ARB algorithms as incorporated into state/CEC requirements
- Assessment of impacts to soil and vegetation
- Class II Visibility Impacts

4.7.5.2 Model Selection

The AERMET pre-processed meteorological data was provided to the Applicant by the SDAPCD. Three years (2003–2005) of hourly data collected in Kearney Mesa (Overland Avenue monitoring station) was combined with 3 years of district operated multi-level profiler data from Marine Corps Air Station Miramar for the same time period and was input into AERMET for processing by the SDAPCD.

As part of the input requirements into AERMET and AERMOD, a land use classification must be made. The area surrounding the plant site, within 3 km, can be characterized as rural, made up mostly of shrub lands and grasslands, based on review of land use/land cover data as well as recent aerial photo data. In accordance with the Auer land use classification methodology (USEPA's *Guideline on Air Quality Models*, 40 CFR Pt. 51, App. W), land use within the area circumscribed by a three km radius around the plant is greater than 50 percent rural. Therefore, in the modeling analyses supporting the permitting of the plant, no urban coefficients were assigned.

AERMOD input data options are listed below:

- Final plume rise
- Stack tip downwash
- Ozone Limiting Method for NO_2
- Regulatory default option (calm and missing meteorological data processing)
- Elevated receptor terrain heights option

Use of these options follows the USEPA's Modeling Guideline (40 CFR Pt. 51, App. W), SDAPCD guidance, and/or sound scientific practice. An explanation of these options and the rationale for their selection is provided below.

Several other USEPA models and programs were used to quantify pollutant impacts on the surrounding environment based on the emission sources operating parameters and their locations. The additional models used were Building Profile Input Program for PRIME (BPIP-PRIME, current version 04274), the SCREEN3 (version 96043) dispersion model for fumigation impacts, the VISCREEN (version 1.01) visibility screening model for assessing Class I visibility impacts, and the HARP On-Ramp Preprocessor (Version 1.4D), which is used in the health risk assessment.

In addition to AERMOD, the CTSCREEN model was used to assess the $PM_{10/2.5}$ SILs and increment consumption in the complex terrain surrounding the Project site. The CTSCREEN model, in the screening mode of CTDMPLUS, is a refined point source Gaussian air quality model for use in all stability conditions for complex terrain applications. The use of refined modeling techniques to assess air quality impacts is summarized in USEPA's Modeling Guideline, 40 CFR Part 51, Appendix W. In particular, upon revising Appendix W to adopt AERMOD as the replacement for ISC3, EPA specifically retained CTDMPLUS and CTSCREEN as appropriate models for detailed complex terrain analysis (*see* Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions; Final Rule, 70 Fed. Reg. 68,218, 68,225-26 (Nov. 9, 2005). The refined modeling analyses consists of those analytical techniques that provide more detailed treatment of physical and chemical atmospheric processes, require more detailed and precise input data, and provide more specialized concentration estimates. As a result, they provide a more refined and, at least theoretically, a more accurate estimate of source impact and the effectiveness of control strategies. These are referred to as refined techniques and models.

Complex terrain is defined as terrain with elevations above plume height, while intermediate terrain is defined as terrain with elevations between stack top and final plume rise height. Simple terrain is defined as terrain below stack height. Historically, a distinction has been made between simple, intermediate, and complex terrain because of the capability of different air quality dispersion models to effectively handle the simulation of the dispersion of pollutants in the different terrain regimes. Most of the models approved by the USEPA were originally developed either for use with simple or complex terrain. The most widely used model for simple terrain has been the ISCST3 model, which was replaced as the preferred model by AERMOD. For complex terrain, AERMOD is the preferred model, which replaced COMPLEXI. AERMOD uses algorithms similar to CTDM and RTDM.

In addition to the AERMOD model, the USEPA has approved the CTDMPLUS model for use in complex terrain modeling applications. *See id.*, 70 Fed. Reg. at 68,233. CTDMPLUS is a preferred/recommended USEPA dispersion model for terrain impacts and "provides greater resolution of concentrations about the contour of the hill feature than does AERMOD through a different plume-terrain interaction algorithm." *Id.* The challenge to using the CTDMPLUS model in many situations is the additional meteorological and terrain data that is required by the model. However, the USEPA developed a screening version of the CTDMPLUS model, called CTSCREEN. The CTSCREEN model is a refined point source Gaussian air quality model for use in all stability conditions for complex terrain applications.

CTDMPLUS in screening mode (CTSCREEN) serves several purposes in regulatory applications. When meteorological data are unavailable, "CTSCREEN can be used to obtain conservative [safely above those of refined models], yet realistic, worst-case estimates" of impacts from particular sources in complex terrain. *Id.* These estimates can be used to determine the necessity and value of obtaining on-site data for refined modeling or can simply provide conservative emission-limit estimates. In addition, CTSCREEN can be a valuable tool for designing meteorological and pollutant monitoring programs. It is important to note that CTSCREEN and the refined model, CTDMPLUS, are the same basic model. The primary difference in their make-up is in the way in which CTSCREEN obtains the meteorological conditions. For example, wind direction in CTSCREEN is calculated based on the source-terrain-dividing streamline geometry to ensure computation of the highest impacts that are likely to occur. The daytime mixed-layer heights are based on fractions of the terrain height. Other meteorological variables or parameters are chosen through a variety of possible combinations from a predetermined matrix of values.

As a result of the CTSCREEN model accounting for the dimensional nature of the plume and terrain interaction, the model requires digitized terrain of the nearby topographical features. The mathematical representation of terrain is accomplished by the terrain preprocessors, FITCON and HCRIT. CTSCREEN and CTDMPLUS are virtually the same air quality model, with the main difference between the two being the meteorological data used. The wind direction used in CTSCREEN is based on the source-terrain geometry, resulting in computation of the highest impacts likely to occur. Other meteorological variables are chosen from possible combinations from a set of predetermined values. CTSCREEN provides maximum concentration estimates that are similar to, but on the conservative side of, those that would be calculated from the CTDMPLUS model with a full year of on-site meteorological data.

CTSCREEN is appropriate for the following applications:

- Elevated point sources
- Terrain elevations above stack top
- Rural areas
- One hour to annual averaging time periods

Meteorological data used by the CTSCREEN model is internally derived by the model itself, but is similar to those 1-hour values used in the screening version of ISCST3. As well as calculating maximum 1-hour concentrations at all receptors, the CTSCREEN model is designed to provide conservative estimates of worst case 3-hour, 24-hour, and annual impacts. Scaling factors, as presented in Table 4.7-12, were used to convert calculated 1-hour concentrations to 3-hour, 24-hour, and annual estimates.

Table 4.7-12 Model Persistence Factors

Averaging Period	CTSCREEN Scaling Factor
1-hour	1.0
3-hour	0.7
8-hour	NA
24-hour	0.15
Annual	0.03

These models were used for the following:

- Comparison of impacts to significant impact levels and increments
- Compliance with state (CAAQS) and national (NAAQS) ambient air quality standards
- Calculation of health risk impacts

Federal 1-hour NO_2 NAAQS Modeling

USEPA recently established a new 1-hour NO_2 standard at a level of 100 ppb (188.68 µg/m^3), based on the 3-year average of the annual 98th percentile of the daily maximum 1-hour concentrations in addition to the existing annual secondary standard (100 µg/m^3). USEPA has also established requirements for a NO_2 monitoring network that will include monitors at locations where maximum NO_2 concentrations are expected to occur, including within 50 meters of major roadways, as well as monitors sited to measure the area-wide NO_2 concentrations that occur more broadly across communities.

To assess the Project's impacts on compliance with the federal 1-hour NO_2 Standard, the methods summarized in the Draft California Air Pollution Control Officers Association (CAPCOA) Guidance Document *Modeling Compliance of the Federal 1-hour NO_2 NAAQS* (CAPCOA, 2011) were used.

Specifically:

- First high with Ozone Limiting Method was used for significant impact levels (SILs) for 1-hour NO_2.
- Ozone Limiting Method with recommended CAPCOA in stack NO_2/NO_x ratios based on the most recent updated data provided on the SDAPCD web site.
- Three-year average of the modeled 98th percentile coupled with seasonal hour of day (3rd highest) background.
- Background Ozone and NO_2 data from Overland Avenue monitoring station.
- Missing background NO_2 and Ozone data was filled in following the CAPCOA Gap Filling Procedures.

The rationale for using the Ozone Limiting Method (OLM) was presented in the modeling protocol and is summarized below. Hourly O_3 data collected at Overland Avenue was used in the OLM analysis to calculate hourly NO_2 concentrations from hourly modeled NO_x concentrations. The 3 years of O_3 data used were for the same 3 years as the modeled meteorological data. The OLM is incorporated into the AERMOD program and involves an initial comparison of the estimated maximum NO_x concentration and the ambient O_3 concentration to determine which is the limiting factor in NO_2 formation. If the O_3 concentration is greater than the maximum NO_x concentration, total conversion is assumed. If the NO_x concentration is greater than the O_3 concentration, the formation of NO_2 is limited by the ambient O_3 concentration. In this case, the NO_2 concentration is set equal to the O_3 concentration plus a correction factor that accounts for in-stack and near-stack thermal conversion.

As summarized in the CAPCOA Guidelines as well as through the USEPA Policy Memorandum, the use of OLM was 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 Ozone Limiting Method/Plume Volume Molar Ratio Method (OLM/PVMRM) options within AERMOD focus on the treatment of NO_x 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 NO_x 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/NO_x 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 NO_x emission rate and ambient O_3 concentration, the NO_2/NO_x 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 NO_x concentration.

   Overall the PVMRM option appears to provide a more realistic treatment of the conversion of NO_x to NO_2 as a function of distance downwind from the source than OLM or the other NO_2 screening options (Hanrahan 1999a, 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/PVMRM appear to be applicable to the problem of NO_2 formation and as noted by the author provides a better estimation of the NO_2 impacts compared to other screening options (Tiers 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 seasonal background NO_2 data are hourly meteorological data, hourly O_3 data, hourly NO_2 data, and in-stack NO_2/NO_x ratios. The hourly $O_3$and meteorological data exist for the same time period at the same Overland Avenue Monitoring Station, operated by the SDAPCD.

The Overland Avenue monitoring site is located on Overland Avenue in the County Operations Center, which is in the northern section of Kearny Mesa. The site collects and records NO_x/NO_2, Ozone, CO, PM_{10}, $PM_{2.5}$ along with surface meteorology which includes wind speed, wind direction, temperature and solar radiation. The SDAPCD considers this monitoring station as representative of where reactive photochemistry will occur most extensively.

The site is an urban/commercial area and is bounded by SR 52 to the north, Interstate 805 to the west, and Interstate 15 to the east. Adjacent communities include Serra Mesa, Clairemont, and Tierrasanta. The air quality in this location is representative of a large part of the metropolitan portion of San Diego due to the diurnal onshore and offshore flow, which mixes the pollutants throughout the metropolitan region.

This monitoring station is located next to major transportation corridors and population centers, so it is able to provide representative concentration data for a significantly large area. The SDAPCD classifies the monitoring objective at this site as "Representative Concentration," which is defined to represent the air quality concentrations for a pollutant that is expected to be similar throughout a geographical area. Such monitoring stations may not always indicate the highest concentrations in the area, but review of Table 4.7-17 1-hour NO_2 data for Overland Avenue indicates that many of the high concentrations for 1-hour NO_2 have been recorded at Overland Avenue. Part of the reason for the relatively high NO_2 concentrations may be due to the location of the monitor with respect to SR 52. Based on prevailing wind direction, the Overland Avenue monitoring station appears to be directly impacted from SR 52 mobile source emissions.

For this Project, the use of the Overland Avenue monitoring station satisfies the Environmental Protection Agency's new requirements for the placement of NO_2 monitors near major roadways in urban areas in order to determine the highest concentrations in an area covered by a monitoring network. The new federal 1-hour NO_2 standard requires that monitoring networks be designed to measure the expected highest concentrations. Each of the SDAPCD monitoring stations has unique objectives that are associated with a spatial scale for each site. These spatial scales are defined in 40 CFR Part 58, Appendix D. Additionally, the desired spatial scale of a monitoring site must conform to established criteria for the distance from roadways, based on traffic volumes as defined in 40 CFR Part 58, Appendix E. The goal in siting monitoring stations is to match the spatial scale with the desired monitoring objective.

The new federal 1-hour NO_2 standard is focused on short-term peak concentrations, which may occur near roadways. As summarized in the 2009 San Diego Air Monitoring Network Plan (June 2010) and based on the last four years of 1-hour NO_2 monitoring data, the Overland Avenue monitoring objective appears to be population oriented (typical concentrations in areas of high population density in order to protect public health) and highest concentration (monitoring at locations expected to have the highest concentrations). Based on the major roadways that surround the monitoring station, the use of the Overland Avenue NO_2 monitoring data appears to satisfy the revised USEPA population and highest concentration oriented monitoring station requirements for the new 1-hour standard.

NO_2/NO_x ratios will be determined from published data provided by the San Joaquin Valley SDAPCD. Based on the recommended ratios provided by the San Joaquin Valley SDAPCD, the following are proposed:

- Wartsila Natural Gas Fired Reciprocating Engine with post-combustion controls: 1.15 percent
- Natural Gas Fired Fuel Heaters: 10 percent

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 more conservative results than PVMRM. Therefore is it assumed that OLM would also provide an unbiased estimate of the modeled NO_2 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.

Based on the above selected criteria, OLM modeled NO_2 concentrations were combined with seasonal hour of the day NO_2 background in order to assess compliance with the 1-hour federal NO_2 standard.

California State 1-hour NO_2 Standard

In order to assess compliance with the California State Standard for 1-hour NO_2, OLM was used with concurrent hourly background NO_2 and O_3 data from Overland Avenue. The time frame for the background NO_2 and O_3 monitoring data matched the meteorology used to assess the total NO_2 concentrations. The first high modeled results at each receptor were used for comparisons with the 1-hour standard.

Annual NO_2 Standard

The annual average concentrations of NO_2 were computed following the revised USEPA guidance for computing these concentrations (August 9, 1995, Federal Register, 60 FR 40465). The annual average was calculated using the ambient ratio method (ARM) with the national default value of 0.75 for the annual average NO_2/NO_x ratio.

4.7.5.3 Good Engineering Practice Stack Height Analysis

Good engineering practice (GEP) stack height is calculated as the greater of 65 meters (213 feet) or 27.4 meters (90 feet) based on existing onsite structure dimensions. The design stack height of 100 feet does not exceed GEP stack height, thus downwash effects were included in the modeling analysis.

BPIP-PRIME was used to generate the wind-direction-specific building dimensions for input into AERMOD. All onsite and the nearby offsite structures were included for analysis with BPIP-PRIME. The building location plan, located in Appendix F.2, shows the buildings included in the downwash analysis. (USEPA 1985d, 1985e)

4.7.5.4 Receptor Grid Selection and Coverage

Receptor and source base elevations were determined from the USGS National Elevation Dataset (NED) data in the GeoTIFF format at a horizontal resolution of 1/3 arc-second (approximate 10 meter spacing). Because of the format of the NED data, all coordinates (both sources and receptors) were referenced to UTM North American Datum 1983 (NAD83, Zone 11). Elevation locations in the NED dataset were interpolated by AERMAP to normal UTM locations appropriate for the receptor grid spacings shown below.

Cartesian coordinate receptor grids are 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. The receptor grids used in this analysis are as follows:

- 10-meter resolution grid along the Project fenceline.
- 20-meter resolution grid that extends outwards from the fenceline to 500 meters in all directions. This is referred to as the downwash grid.
- 50-meter resolution grid that extends outwards from the edge of the downwash grid to 1000 meters in all directions. This is referred to as the intermediate grid.
- 100-meter resolution grid that extends from the edge of the intermediate grid outwards in all directions to 2000 meters.
- 200-meter resolution grid that extends from the edge of the 100-meter grid outwards 5000 meters in all directions.
- 500-meter resolution grid that extends from the edge of the 200-meter grid outwards 10,000 meters in all directions. The 100-meter, 200-meter, and 500-meter grids are referred to as the coarse grid.
- 20-meter resolution around any location outside the downwash grid where a maximum impact is modeled. These additional receptors are referred to as refined grids.

Concentrations within the plant fenceline will not be calculated. The coarse and fine receptor grid figure, located in Appendix F.2, displays the receptors grids used in the modeling assessment. A plant boundary figure is also presented in Appendix F.2.

4.7.5.5 Meteorological Data Selection

The proposed use of the three (3) years of SDAPCD supplied surface meteorological data collected at the Kearny Mesa monitoring location 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 (CAA) in Section 165(e)(1), which requires an analysis "of the ambient air quality at the proposed site 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 (USEPA 1985c).

First, the meteorological monitoring site and proposed Project location are in close proximity (9.4 km), at approximately the same elevation and with similar topography surrounding each location. Second, the Kearny Mesa (Overland Avenue) monitoring site and proposed Project location are located roughly about the same distance and in the same orientation to significant terrain features that might influence wind flow patterns. There are two small-scale localized terrain features near the proposed Project site; Cowles and Fortuna Mountains which extend approximately 700 feet in height above both the monitoring and Project site base elevations. These terrain features are part of the same large-scale terrain features in the area that are oriented in a northeast-southwest direction. Cowles and Fortuna Mountain are bisected with passes and canyons that run in the same northeast and southwest directions as the larger terrain features in the area. Based on the small size of the terrain, it is unlikely that either of these two features will influence the predominant meteorology in the Project area. Third, as discussed below, the surface characteristics roughness length, Bowen ratio, and albedo are relatively consistent throughout the area and are nearly identical between the Project site and the meteorological monitoring location.

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.

Surface characteristics were determined with AERSURFACE using Land Use/Land Cover (LULC) data in accordance with USEPA guidance documents (*AERMOD Implementation Guide*, 1/09/08; and *AERSURFACE User's Guide*, USEPA-454/B-08-001, 1/08) as described below. AERSURFACE uses USGS National Land Cover Data 1992 archives (NLCD92) to determine 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 1 km 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). As noted above, SDAPCD executed AERMET using one 360-degree sector for roughness lengths obtained from AERSURFACE for the Kearny Mesa monitoring location

Running AERSURFACE at both the meteorological monitoring and proposed site locations produced almost identical results for both Bowen ratio and Albedo, based on the 10-km area around each location. There were some variations in land cover and roughness lengths between the two locations based on a 1-km radius, but both areas are mostly rural. Table 4.7-13 presents the AERSURFACE land use types within 1 km of the meteorological monitoring and Project locations. Based on the Auer land use classifications, both locations are classified as rural and there is good correlation of the rural characteristic land types between the two locations. Within the 1-km radius around the Kearny Mesa Monitoring Station, there is a 51.4 percent urban classification, but review of the photo aerial data suggests that most of this is due to the airport runways being classified as LULC category 23 (transportation). These areas, although including the paved runway surfaces, have low surface roughness lengths more closely comparable to rural categories than areas with commercial/industrial buildings/structures. Comparing the LULC data at the Project site to the meteorological monitoring site showed that the same general land use categories exist around the Project site and the meteorological monitoring site, with the both locations having over 75 percent associated with open, rural areas. Thus, the predominant land use in the area is made up of rural categories.

Table 4.7-13 AERSURFACE Land Cover Counts: Surface Roughness (1 km)

		Quail Brush Project Site			Kearny Mesa Monitoring Site		
LULC Category		Count	%Rural	%Urban	Count	%Rural	%Urban
11	Open Water:	9	0.3%	-	0	-	-
12	Perennial Ice/Snow:	0	-	-	0	-	-
21	Low Intensity Residential:	29	0.8%	-	145	4.2%	-
22	High Intensity Residential:	11	-	0.3%	0	-	-
23	Commercial/Industrial/Trans:	9	-	0.3%	1794	-	51.4%
31	Bare Rock/Sand/Clay:	256	7.3%	-	201	5.8%	-
32	Quarries/Strip Mines/Gravel:	0	-	-	0	-	-
33	Transitional:	0	-	-	0	-	-
41	Deciduous Forest:	121	3.5%	-	7	0.2%	-
42	Evergreen Forest:	390	11.2%	-	51	1.5%	-
43	Mixed Forest:	90	2.6%	-	105	3.0%	-
51	Shrubland:	1904	54.5%	-	1085	31.1%	-
61	Orchards/Vineyard/Other:	0	-	-	0	-	-
71	Grasslands/Herbaceous:	665	19.0%	-	66	1.9%	-
81	Pasture/Hay:	0	-	-	3	0.1%	-
82	Row Crops:	0	-	-	4	0.1%	-
83	Small Grains:	2	0.1%	-	0	-	-
84	Fallow:	0	-	-	1	0.0%	-
85	Urban/Recreational Grasses:	1	0.0%	-	27	0.8%	-

		Quail Brush Project Site			Kearny Mesa Monitoring Site		
LULC Category		Count	%Rural	%Urban	Count	%Rural	%Urban
91	Woody Wetlands:	1	0.0%	-	0	-	-
92	Emergent Herbaceous Wetlands:	5	0.1%	-	4	0.1%	-
	Total:	3493	99.4%	0.6%	3493	48.6%	51.4%

Comparing the AERSURFACE outputs in Table 4.7-14, using one 360 degree sector around each location, shows that the average surface characteristics by season are also very similar. For roughness length, the variations between the two sites are minimal. Roughness lengths are often categorized into classes between 0 (water) and 4 (urban). Open land areas, low vegetation areas, and agriculture are often assigned roughness lengths of 0.01 (class 1) to 0.16 (class 2). Thus, it is noted that there are no changes in classes between the two locations and the predominant land use activity in the Project and meteorological monitoring locations are associated with open or rural land uses.

Table 4.7-14 AERSURFACE Results/Inputs for Project and Meteorological Monitoring Locations

Parameter by Season (Month)	Quail Brush Project Site	Kearny Mesa Monitoring Site*
Surface Roughness (meters)		
Winter (none)	-	-
Spring (Mar-Apr)	0.286	0.530
Summer (May-Sept)	0.322	0.540
Fall (Oct-Feb)	0.322	0.539
Albedo		
Winter (none)	-	-
Spring (Mar-Apr)	0.17	0.17
Summer (May-Sept)	0.17	0.17
Fall (Oct-Feb)	0.17	0.17
Bowen Ratio		
Winter (none)	-	-
Spring (Mar-Apr)	0.85	0.97
Summer (May-Sept)	0.81	0.95*
Fall (Oct-Feb)	1.25	1.30
AERMOD Inputs		
Latitude/UTM-X(m)	32.851	32.83645
Longitude/UTM-Y(m)	-117.029	-117.12875
Datum	NAD83	NAD83
Source	Google Earth	Google Earth
Snow Cover	NO	NO
Arid Region	NO	NO
Airport Location	NO	NO
Surface Moisture	AVERAGE	AVERAGE
Surface Roughness Radius (km)	1.0	1.0
Number of Sectors	1 (0-360deg)	1 (0-360deg)

Notes:

*0.94 Bowen ratio in SDAPCD Stage 3 AERMOD input file is the only difference.

For these reasons, the Kearny Mesa meteorological data selected for the proposed Project are expected to satisfy the definition of representative meteorological data. Thus, it is our assessment that this meteorological data are identical to the dispersion conditions at the Project site and to the regional area. As noted above, these data have been processed by the SDAPCD using AERMET (Version 06341) based on one (1) 360-degree sector for roughness lengths in AERSURFACE based on the Kearny Mesa monitoring location.

4.7.5.6 Background Air Quality

In 1970, the United States Congress instructed the USEPA to establish standards for air pollutants, which were of nationwide concern. This directive resulted from the concern of the effects of air pollutants on the health and welfare of the public. The resulting CAA set forth air quality standards to protect the health and welfare of the public. Two levels of standards were promulgated—primary standards and secondary standards. Primary national ambient air quality standards (NAAQS) are "those which, in the judgment of the administrator [of the USEPA], based on air quality criteria and allowing an adequate margin of safety, are requisite to protect the public health (state of general health of community or population)." The secondary NAAQS are "those which in the judgment of the administrator [of the USEPA], based on air quality criteria, are requisite to protect the public welfare and ecosystems associated with the presence of air pollutants in the ambient air." To date, NAAQS have been established for seven criteria pollutants as follows: SO_2, CO, O_3, NO_2, sub 10-micron particulate matter (PM_{10}), sub 2.5-micron particulate matter ($PM_{2.5}$), and lead.

The criteria pollutants are those that have been demonstrated historically to be widespread and have a potential to cause adverse health impacts. USEPA developed comprehensive documents detailing the basis of, or criteria for, the standards that limit the ambient concentrations of these pollutants. The State of California has also established AAQS that further limit the allowable concentrations of certain criteria pollutants. Review of the established air quality standards is undertaken by both USEPA and the State of California on a periodic basis. As a result of the periodic reviews, the standards have been updated, i.e., amended, and additions, and deletions, over the ensuing years to the present.

Two basic elements comprise each federal or state AAQS: (1) a numerical limit expressed as an allowable concentration, and (2) an averaging time which specifies the period over which the concentration value is to be measured. Table 4.7-15 presents the current federal and state AAQS.

Table 4.7-15 State and Federal Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards Concentration	National Standards Concentration
Ozone	1 hr	0.09 ppm (180 $\mu g/m^3$)	-
	8 hr	0.070 ppm (137 $\mu g/m^3$)	0.08 ppm (157 $\mu g/m^3$) (3-year average of annual 4th-highest daily maximum)
Carbon Monoxide	8 hr	9.0 ppm (10,000 $\mu g/m^3$)	9 ppm (10,000 $\mu g/m^3$)
	1 hr	20 ppm (23,000 $\mu g/m^3$)	35 ppm (40,000 $\mu g/m^3$)

Pollutant	Averaging Time	California Standards Concentration	National Standards Concentration
Nitrogen dioxide	Annual Average	0.030 ppm (57 µg/m^3)	0.053 ppm (100 µg/m^3)
	1 hr	0.18 ppm (339 µg/m^3)	0.100 ppm (188 µg/m^3) (3-year average of 98th percentiles)
Sulfur dioxide	Annual Average	-	0.030 ppm (80 µg/m^3)
	24 hr	0.04 ppm (105 µg/m^3)	0.14 ppm (365 µg/m^3)
	3 hr	-	0.5 ppm (1,300 µg/m^3)
	1 hr	0.25 ppm (655 µg/m^3)	0.075 ppm (196 µg/m^3)
Respirable particulate matter (10 micron)	24 hr	50 µg/m^3	150 µg/m^3
	Annual Arithmetic Mean	20 µg/m^3	-
Fine particulate matter (2.5 micron)	Annual Arithmetic Mean	12 µg/m^3	15.0 µg/m^3 (3-year average)
	24 hr	-	35 µg/m^3 (3-year average of 98th percentiles)
Sulfates	24 hr	25 µg/m^3	-
Lead	30 day	1.5 µg/m^3	-
	Calendar Quarter	-	1.5 µg/m^3
	Rolling 3-month	-	0.15 µg/m^3

Source: CARB ADAM website (CARB 2011b); table updated 9/8/10.

Brief descriptions of health effects for the main criteria pollutants are as follows:

Ozone—Ozone is a reactive pollutant that is not emitted directly into the atmosphere, but rather is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving precursor organic compounds (VOC) and NO_x. VOC and NO_x are, therefore, known as precursor compounds for O_3 Significant O_3 production generally requires O_3 precursors to be present in a stable atmosphere with strong sunlight for approximately three hours. Ozone is a regional air pollutant because it is not emitted directly by sources, but is formed downwind of sources of VOC and NO_x under the influence of wind and sunlight. Short-term exposure to O_3 can irritate the eyes and cause constriction of the airways. In addition to causing shortness of breath, O_3 can aggravate existing respiratory diseases such as asthma, bronchitis, and emphysema.

Carbon Monoxide—Carbon monoxide is a non-reactive pollutant that is a product of incomplete combustion. Ambient carbon monoxide concentrations generally follow the spatial and temporal distributions of vehicular traffic and are also influenced by meteorological factors such as wind speed and atmospheric mixing. Under inversion conditions, carbon monoxide concentrations may be distributed more uniformly over an area out to some distance from vehicular sources. When inhaled at high concentrations, carbon monoxide combines with hemoglobin in the blood and reduces the oxygen-carrying capacity of the blood. This results in reduced oxygen reaching the brain, heart, and other body tissues. This condition is especially critical for people with cardiovascular diseases, chronic lung disease or anemia, as well as fetuses.

Particulate Matter (PM_{10} and $PM_{2.5}$)—PM_{10} consists of particulate matter that is 10 microns or less in diameter (a micron is 1 millionth of a meter), and fine particulate matter, $PM_{2.5}$, which consists of particulate matter 2.5 microns or less in diameter. Both PM_{10} and $PM_{2.5}$ represent fractions of particulate matter, which can be inhaled into the air passages and the lungs and can cause adverse health effects. Particulate matter in the atmosphere results from many kinds of dust- and fume-producing industrial and agricultural operations, combustion, and atmospheric photochemical reactions. Some of these operations, such as demolition and construction activities, contribute to increases in local PM_{10} concentrations, while others, such as vehicular traffic, affect regional PM_{10} concentrations.

NAAQS for particulate matter were first established in 1971. The standards covered total suspended particulate matter (TSP), or particles that are 30 microns or smaller in diameter. In 1987, USEPA changed the standards from TSP to PM_{10} as the new indicator. The new standards were based on a comprehensive study of information on the health effects from inhaling particulate matter. In December 1994, the USEPA began a long review process to determine if the PM_{10} standards set in 1987 provide a reasonable margin of safety, and if a new standard should be established for finer particles.

Based on numerous epidemiological studies and other health- and engineering-related information, USEPA established new standards for $PM_{2.5}$ in 1997. Before establishing the new $PM_{2.5}$ standards, discussions were conducted with the Clean Air Scientific Advisory Committee (CASAC). CASAC is a group of nationally recognized experts in the fields related to air pollution, environmental health, and engineering. CASAC reviewed and commented on the information generated by USEPA regarding proposed particulate matter standards.

Subsequent to these discussions and reviews, USEPA established $PM_{2.5}$ standards of 35 $\mu g/m^3$, 24-hour average concentration, and 15 $\mu g/m^3$, annual average concentration. USEPA also confirmed the national PM_{10} standards of 150 $\mu g/m^3$, 24-hour average, as providing an adequate margin of safety for limiting exposure to larger particles. The annual standard of 50 $\mu g/m^3$ has been deleted by USEPA. The recommendations for new $PM_{2.5}$ standards and for maintaining the PM_{10} standards were released in a staff report that presents the conclusions of the USEPA and of the CASAC review committee.

Several studies that USEPA relied on for its staff report have shown an association between exposure to particulate matter, both PM_{10} and $PM_{2.5}$, and respiratory ailments or cardiovascular disease. Other studies have related particulate matter to increases in asthma attacks. In general, these studies have shown that short-term and long-term exposure to particulate matter can cause acute and chronic health effects. $PM_{2.5}$, which can penetrate deep into the lungs, causes more serious respiratory ailments.

Nitrogen Dioxide and Sulfur Dioxide—Nitrogen dioxide (NO_2) and SO_2 are two gaseous compounds within a larger group of compounds, NO_x and SO_x, respectively, which are products of the combustion of fuel. NO_x and SO_x emission sources can elevate local NO_2 and SO_2 concentrations, and both are regional precursor compounds to particulate matter. As described above, NO_x is also an O_3 precursor compound and can affect regional visibility. (Nitrogen dioxide is the "whiskey brown-colored" gas readily visible during periods of heavy air pollution.) Elevated concentrations of these compounds are associated with increased risk of acute and chronic respiratory disease.

SO_2 and NO_x emissions can be oxidized in the atmosphere to eventually form sulfates and nitrates, which contribute to acid rain. Large power plants with high emissions of these substances because of the use of coal or oil are subject to emissions reductions under the Phase I Acid Rain Program of Title IV of the 1990 CAA Amendments. Power plants, with individual equipment capacity of 25 MW or greater that use natural gas or other fuels with low sulfur content, are subject to the Phase II Program of Title IV. The Phase II program requires plants to install CEMS in accordance with the Code of Federal Regulations (40 CFR Part 75) and report annual emissions of SO_x and NO_x.

Lead—Gasoline-powered automobile engines used to be the major source of airborne lead in urban areas. Excessive exposure to lead concentrations can result in gastrointestinal disturbances, anemia, and kidney disease, and, in severe cases, neuromuscular and neurological dysfunction. The use of lead additives in motor vehicle fuel has been eliminated in California, and lead concentrations have declined substantially as a result.

Table 4.7-16 presents the current attainment and/or nonattainment designations for San Diego County (and the Project area).

Table 4.7-16 SDAPCD Attainment Status Listing

Pollutant	Federal Status	State Status
Ozone	Nonattainment*	Nonattainment
$PM_{10}/PM_{2.5}$	Attainment	Nonattainment
CO	Attainment	Attainment
NO_2	Attainment	Attainment
SO_2	Attainment	Attainment
Lead	Attainment	Attainment

Notes:

* Federal Ozone Status Ranking = "basic," but in June of 2011 the SDAPCD expects the ranking to be upgraded to "serious."

Air quality monitoring data from several sites surrounding the proposed Project site are summarized in Table 4.7-15. Data from these sites (primarily SD-Overland Avenue) were used to establish the background levels in Table 4.7-17, and were used in the air quality impact analyses that follow:

Table 4.7-17 Air Quality Summary for Most Recent 4 Years[1]

Pollutant	Site	Average Time	2007	2008	2009	2010
Ozone, ppm	El Cajon	1 hr	.11	.107	.098	.102
	Del Mar		.11	.097	.097	.085
	Escondido		.094	.116	.093	.105
	Alpine		.134	.139	.119	.105
	SD-Overland		.088	.100	.105	.100
Ozone, ppm	El Cajon	8 hr (4th max)	.073	.093	.082	.078
	Del Mar		.072	.078	.084	.072
	Escondido		.075	.098	.080	.084
	Alpine		.086	.109	.097	.088
	SD-Overland		.076	.093	.082	.073

Pollutant	Site	Average Time	2007	2008	2009	2010
PM$_{10}$, μg/m^3	El Cajon	24 hr	61	40	55	41
	Escondido		68	82	73	42
	SD-Overland		65	41	50	33
PM$_{10}$, μg/m^3	El Cajon	Annual AM	27	27	25	21
	Escondido		24	25	25	21
	SD-Overland		22	24	25	19
PM$_{2.5}$, μg/m^3	El Cajon	24 hr (98th pctl)	42.7	30.7	56.5	27.7
	Escondido		124	44	78.3	48.4
	SD-Overland		31	27.2	25.1	18.7
PM$_{2.5}$, μg/m^3	El Cajon	Annual AM	12.8	13.4	12.1	10.8
	Escondido		13.3	13	13	12
	SD-Overland		10	12	10.5	8.7
CO, ppm	Escondido	8 hr	3.2	2.8	3.24	2.46
CO, ppm	Escondido	1 hr	5.2	4.6	ND	ND
NO$_2$, ppm	El Cajon	1 hr[2]	.065	.054	.054	.058
	SD-Overland		.087	.056	.06	.073
	Escondido		.072	.073	.073	.064
	Alpine		.057	.042	.056	.052
NO$_2$, ppm	El Cajon	Annual	.015	.016	.014	.013
	SD-Overland		.015	.014	.014	.013
	Escondido		.016	.018	.016	.014
	Alpine		.010	.008	.008	.007
SO$_2$, ppm	San Diego Beardsley	Annual	-	.003	.001	.000
SO$_2$, ppm	San Diego Beardsley	24 hr	.006	.007	.006	.002
SO$_2$, ppm	San Diego Beardsley	3 hr	.010	.014	ND	ND
SO$_2$, ppm	San Diego Beardsley	1 hr	.018	.019	ND	ND

Notes:

[1] Data from USEPA AIRS, San Diego SDAPCD, CARB ADAM (CARB 2011b).

[2] 98th percentile is the correct value to be used for federal. The 98th percentile background value is 104 μg/m^3.

[3] (CARB 2009; CARB 2011b; SDAPCD 2007; 2009.)

Table 4.7-18 shows the background air quality values based upon the data presented in Table 4.7-17. The background values (primarily SD-Overland) represent the highest or average values reported for the site during any single year of the most recent 3-year period (2008-2010). Appendix F.2 presents the background air quality data summaries.

Table 4.7-18 Estimated Background Air Quality Values

Pollutant and Averaging Time	Background Value
Ozone – 1 Hour	0.105 ppm (210 μg/m^3)
Ozone – 8 Hour	0.093 ppm (182.5 μg/m^3)
PM$_{10}$ – 24 Hour	50 μg/m^3
PM$_{10}$ – Annual	25 μg/m3
PM$_{2.5}$ – 24 Hour	23.667 μg/m^3

Pollutant and Averaging Time	Background Value
$PM_{2.5}$ – Annual	12 µg/m³
CO – 1 Hour	4.6 ppm (5290 µg/m³)
CO – 8 Hour	3.24 ppm (3600 µg/m³)
NO_2 – 1 Hour (based on 98th percentile data analysis) Federal	0.0553 ppm (104 µg/m³)
NO_2 – 1 Hour (based on 1st high data analysis) State	0.073 ppm (137.5 µg/m³)
NO_2 – Annual	0.014 ppm (26.4 µg/m³)
SO_2 – 1 hr	0.019 ppm (49.8 µg/m³)
SO_2 – 3 hr	0.014 ppm (36.4 µg/m³)
SO_2 – 24 Hour	0.007 ppm (18.4 µg/m³)
SO_2 – Annual	0.003 ppm (7.9 µg/m³)

Table 4.7-19 summarizes the federal permitting criteria and applicable evaluation thresholds.

Table 4.7-19 Federal Program Evaluation Data

Regulated Pollutant	Major Source Thresholds, tpy		Averaging Time Period	Standard Form	NAAQS				PSD Increments, µg/m³			Significant Emissions Increase	Significant Impact Levels	Monitoring *de minimis* Levels
					Primary		Secondary		Area Classifications					
	PSD	NAA			µg/m³	ppb	µg/m³	ppb	I	II	III		µg/m³	µg/m³
PM_{10}	250/100	100/70	24 hr	a	150	-	150	-	8	30	60	15	5	10
			Annual	b	-	-	-	-	4	17	34		1	-
$PM_{2.5}$	250/100	100	24 hr	c	35	-	35	-	2	9	18	10	1.2	4
			Annual	d	15	-	15	-	1	4	8		0.3	-
SO_2	250/100	100	1 hr	g	196	75	-	-	-	-	-	40	7.8*	-
			3 hr	e	-	-	1,300	500	25	512	700		25	-
			24 hr	k	365	140	-	-	5	91	182		5	13
			Annual	k	80	30	-	-	2	20	40		1	-
NO_2	250/100	100	1 hr	j	188	100	-	-	-	-	-	40	7.5	-
			Annual	f	100	53	100	53	2.5	25	50		1	14
Ozone	250/100	100/50/ 25/10	8 hr	h	147	75	147	75	-	-	-	40/25/ any	-	-
CO	250/100	100/50	1 hr	e	40,000	35,000	-	-	-	-	-	100	2,000	-
			8 hr	e	10,000	9,000	-	-	-	-	-		500	575
Lead	250/100	100	Calendar Qtr	i	1.5	-	1.5	-	-	-	-	0.6	-	0.1
TSP	250/100	-	-	n/a	-	-	-	-	-	-	-	25	-	-

Notes:

a. 99th percentile, 3 yr average
b. Annual arithmetic mean, 3 yr average
c. 98th percentile, 3 yr average
d. Annual arithmetic mean (single or multiple monitors), 3 yr average
e. Not to be exceeded more than once per calendar year
f. Annual arithmetic mean
g. 99th percentile, 3 yr average, 1 hr daily maximums
h. 3 yr average of 4th highest daily maximum 8 hr concentration
i. Maximum quarterly arithmetic mean
j. 98th percentile, daily 1 hr maximums
k. Standard will be revoked on August 3, 2011

4.7.5.7 Engine Load Screening and Refined Impact Analysis

Facility sources, including the fuel gas heaters and emergency fire pump diesel engine, were modeled in the analysis for comparisons with Significant Impact Levels (SILs) and CAAQS/NAAQS, as necessary.

Operational characteristics of the engines, such as emission rate, exit velocity, and exit temperature vary by operating load and ambient temperature. A screening modeling analysis, using AERMOD and 3 years of hourly meteorology (2003–2005) was performed for the 100 percent load, 75 percent load, and 50 percent load conditions in order to determine the engine operating condition that will result in the highest modeled concentrations for averaging periods of 24 hours or less. These conditions were considered for three ambient temperature conditions: 35°F (a cold winter day), 64°F (annual average day), 70°F, 81°F (an average summer day), and 95°F (a hot summer day). The 64°F condition was assumed to represent annual average conditions. As such, no screening analyses were performed for annual average concentrations, which were modeled later for the 64°F case at 100 percent load, which is the typical operating scenario.

The results of the load screening analysis are listed in Appendix F.2. The screening analysis shows that the worst-case load and ambient temperature condition is 100 percent load at 70°F for short-term SO_2 and NO_2 impacts, and 50 percent load at 81°F for short-term CO and $PM_{10/2.5}$ impacts. The worst case stack parameters associated for each pollutant and averaging period, based upon the screening analysis, were used in the refined impact analysis.

For the startup modeling analyses, all 11 engines were assumed to startup or shutdown simultaneously within the same hour. For longer averaging periods such as the 3-hour, 8-hour, and 24-hour averaging times, multiple startups/shutdowns along with full load operation for all engines were modeled in order to calculate the worst-case impacts. Start-up and shutdown engine $NO_{x,}$ CO, and SO_2 emissions were modeled with worst case stack characteristics based on pollutant from the load screening analysis. For 24-hour $PM_{10/2.5}$ and 24-hour SO_2 averages, the startup and shutdown emissions were automatically included in the regular modeling analyses.

Detailed emission calculations for all averaging periods are included in Appendix F.1.

The worst-case modeling input information for each pollutant and averaging period are shown in Table 4.7-20 for normal operating conditions and engine startup/shutdown conditions. As discussed above, the combustion engine stack parameters used in modeling the impacts for each pollutant and averaging period reflected the worst-case operating condition for that pollutant and averaging period identified in the engine load screening analysis. Stack parameters associated with operation at 100 percent load at the average temperature of 64°F were used in modeling annual average impacts.

Table 4.7-20 Stack Parameters and Emission Rates for Refined AERMOD Modeling

Equipment/ Input Data	Stack Parameters				Emission Rates (g/s)[a]			
	Stack Height (m)	Stack Diameter (m)	Stack Temp. (deg K)	Exhaust Velocity meters per second (m/s)	NO_X	SO_2	CO	$PM_{10/2.5}$
Averaging Period: 1-hour for Normal Operating Conditions								
Engines (each) – SO_2/NO_X	30.48	1.219/1.2192	663.150	24.983	0.1659	0.03226	n/a	n/a
Engines (each) – CO	30.48	1.2192	712.039	14.771	n/a	n/a	0.19706	n/a
Fire Pump Engine[b]	9.144	0.1016	833.150	43.077	0.1121	2.646E-4	0.04032	n/a

Equipment/ Input Data	Stack Parameters				Emission Rates (g/s)[a]			
	Stack Height (m)	Stack Diameter (m)	Stack Temp. (deg K)	Exhaust Velocity meters per second (m/s)	NO_X	SO_2	CO	$PM_{10/2.5}$
Fuel Gas Heater	9.144	0.5969	819.261	3.783	0.0243	3.024E-4	0.04536	n/a
Warm Start Heater	9.144	0.5969	819.261	3.783	0.0243	3.024E-4	0.04536	n/a
Averaging Period: 3 hours for Normal Operating Conditions								
Engines (each)	30.48	1.219	663.150	24.983	n/a	0.03226	n/a	n/a
Fire Pump Engine	9.144	0.1016	833.150	43.077	n/a	8.820E-5	n/a	n/a
Fuel Gas Heater	9.144	0.5969	819.261	3.783	n/a	3.024E-4	n/a	n/a
Warm Start Heater	9.144	0.5969	819.261	3.783	n/a	3.024E-4	n/a	n/a
Averaging Period: 8 hours for Normal Operating Conditions								
Engines (each)	30.48	1.2192	712.039	14.771	n/a	n/a	0.19706	n/a
Fire Pump Engine	9.144	0.1016	833.150	43.077	n/a	n/a	5.04E-3	n/a
Fuel Gas Heater	9.144	0.5969	819.261	3.783	n/a	n/a	0.04536	n/a
Warm Start Heater	9.144	0.5969	819.261	3.783	n/a	n/a	0.04536	n/a
Averaging Period: 24 hours for Normal Operating Conditions								
Engines (each) – SO_2	30.48	1.219	663.150	24.983	n/a	0.03270	n/a	n/a
Engines (each) – PM	30.48	1.2192	712.039	14.771	n/a	n/a	n/a	0.1967
Fire Pump Engine	9.144	0.1016	833.150	43.077	n/a	1.1025E-5	n/a	1.575E-4
Fuel Gas Heater	9.144	0.5969	819.261	3.783	n/a	3.024E-4	n/a	3.528E-3
Warm Start Heater	9.144	0.5969	819.261	3.783	n/a	3.024E-4	n/a	3.528E-3
Averaging Period: Annual for Normal Operating Conditions[c]								
Engines (each)	30.48	1.2192	663.706	25.009	0.1147	0.0150	n/a	0.0862
Fire Pump Engine	9.144	0.1016	833.150	43.077	6.6567E-4	1.5707E-6	n/a	2.2438E-5
Fuel Gas Heater	9.144	0.5969	819.261	3.783	0.0117	1.4609E-4	n/a	1.7044E-3
Warm Start Heater	9.144	0.5969	819.261	3.783	0.0137	1.7012E-4	n/a	1.9847E-3
Averaging Period: 1-hour for Engine Start-up/Shutdown Conditions								
Engines (each) – SO_2/NO_X	30.48	1.219/1.2192	663.150	24.983	1.195740	0.04284	n/a	n/a
Engines (each) – CO	30.48	1.2192	712.039	14.771	n/a	n/a	1.69344	n/a
Fuel Gas Heater	9.144	0.5969	819.261	3.783	0.024318	3.024E-4	0.04536	n/a
Warm Start Heater	9.144	0.5969	819.261	3.783	0.024318	3.024E-4	0.04536	n/a
Averaging Period: 3-hour for Engine Start-up/Shutdown Conditions								
Engines (each)	30.48	1.219	663.150	24.983	n/a	0.03343	n/a	n/a
Fire Pump Engine	9.144	0.1016	833.150	43.077	n/a	8.820E-5	n/a	n/a
Fuel Gas Heater	9.144	0.5969	819.261	3.783	n/a	3.024E-4	n/a	n/a
Warm Start Heater	9.144	0.5969	819.261	3.783	n/a	3.024E-4	n/a	n/a
Averaging Period: 8 hours for Engine Start-up/Shutdown Conditions								
Engines (each)	30.48	1.2192	712.039	14.771	n/a	n/a	0.39989	n/a
Fire Pump Engine	9.144	0.1016	833.150	43.077	n/a	n/a	5.04E-3	n/a
Fuel Gas Heater	9.144	0.5969	819.261	3.783	n/a	n/a	0.04536	n/a
Warm Start Heater	9.144	0.5969	819.261	3.783	n/a	n/a	0.04536	n/a

Notes:

[a] Modeled emission rates based on estimated hours of operation (see Appendix F.1).

[b] Due to infrequent operations of firepump testing, the firepump engine is not included in the 1-hour NO_2 modeling for NAAQS assessment based on USEPA guidance.

[c] Annual averaging periods include startup/shutdown emissions, where applicable.

4.7.5.8 Normal Operations Impact Analysis

AERMOD was initially used in order to determine the magnitude and location of the maximum impacts for each pollutant and averaging period for comparison with the SILs. Table 4.7-21 summarizes maximum modeled concentrations for each criteria pollutant and associated averaging periods. In order to assess the significance of the modeled concentrations, the maximum first high concentrations were compared to the Class II PSD SILs. The SILs were exceeded for the following pollutants and averaging periods: 1-hour NO_2, 24 hour PM_{10} and $PM_{2.5}$, annual $PM_{2.5}$, and 1-hour SO_2.

Based on the locations of the maximum impacts, several refined 20-meter resolution receptor grids were developed. The refined receptor grids were prepared for the following pollutants and averaging periods:

- 1-hour NO_2 startup and commissioning (federal and state standards)
- 1-hour NO_2 base load operation (federal standard)
- 24-hour SO_2, PM_{10}, and $PM_{2.5}$ base load operation (federal and state standards)
- 8-hour CO startup (state standard)
- 1- and 8-hour CO commissioning (state standard)
- Annual SO_2, PM_{10}, and $PM_{2.5}$ (federal standard)

The results of the refined grid modeling are presented in Table 4.7-21 as well as Table 4.7-24 (startup and shutdown impacts). Commissioning impacts are delineated in the text below. Thus, comparisons with the appropriate SILs and state and federal ambient air quality standards were all based on 20-meter receptor grids in order to calculate the maximum impact from the proposed Project.

The AERMOD results for the refined grid indicate that the "Project-only" $PM_{2.5}$ 24-hour concentration could exceed the available $PM_{2.5}$ increment. If the background concentration were added to this modeled impact, the result would also exceed the 24-hour NAAQS. Additionally, the Project-only 24-hour PM_{10} concentration exceeds the 24-hour SIL, which could trigger PM offset requirements as per SDAPCD Rule 20.2. All of these modeled locations where concentrations were predicted in excess of the relevant increment, NAAQS or SIL were located in the complex terrain surrounding the Project site. To provide a more accurate estimate of the Project's potential impacts in this complex terrain, the CTSCREEN model was used to model the Project's impacts at these locations. The use of CTSCREEN and the results are discussed in more detail below. The results of the CTSCREEN modeling, which are shown in parentheses in Table 4.7-21 below, clearly demonstrate that the 24-hour $PM_{2.5}$ NAAQS and increment will not be exceeded and that the 24-hour PM_{10} SIL will also not be exceeded.

Table 4.7-21 Air Quality Impact Summary for Normal Operating Conditions

Pollutant	Avg. Period	Maximum Concentration (μg/m^3)	Background (μg/m^3)	Total (μg/m^3)	Class II Significance Level (μg/m^3)	Ambient Air Quality CAAQS/NAAQS	
						(μg/m^3)	(μg/m^3)
NO_2[a]	1-hour Federal	132.4	(included by AERMOD)	132.4	7.5	-	188
	1-hour State	265.3	(included by AERMOD)	265.3	-	339	-
	Annual	0.91	26.4	27.3	1	57	100
PM_{10}	24-hour	21.9 (3.77)*	50	71.9	5	50	150
	Annual	0.74	25.0	25.7	1	20	-
$PM_{2.5}$	24-hour	18.3 (3.77)*	23.7	42.0 (27.5)*	1.2	-	35
	Annual	0.74	12.0	12.7	0.3	12	15.0
CO	1-hour	261.2	5290	5551	2000	23,000	40,000
	8-hour	58.4	3600	3658	500	10,000	10,000
SO_2	1-hour	18.5	49.8	68.3	7.8	655	196
	3-hour	9.0	36.4	45.4	25	-	1,300
	24-hour	3.0	18.4	21.4	5	105	365
	Annual	0.13	7.9	8.0	1	-	80

Notes

[a] Ambient Ratio Method (ARM) used for annual NO_2 impacts with 75 percent ratio and Ozone Limiting Method (OLM) used for 1-hour NO_2 impacts, with Kearny Mesa NO_2 background included in the modeling results (USEPA-default 2008–2010 hourly-seasonal background used for 1-hour federal NAAQS and SDAPCD-provided 2003–2005 hourly NO_2 concurrent with meteorological data used for 1-hour state CAAQS. The 1-hour SIL is an interim value.

*The maximum modeled 24-hour PM_{10} and $PM_{2.5}$ impact locations were remodeled with CTSCREEN.

Based on the above modeling results, emissions from the proposed Project will not significantly affect the attainment status of the airshed, cause any new exceedances or consume excess increment.

4.7.5.9 Commissioning Impacts Analysis – Power Cycle Engines

There are several scenarios that are possible during commissioning, which are expected to result in NO_x, CO, and VOC emissions that may be greater than during normal operations. (During commissioning, fuel related emissions such as SO_2 and $PM_{10/2.5}$ are expected to be no greater than full load operations.) Typically, these commissioning activities occur prior to the installation of the abatement equipment, e.g., SCR and oxidation catalyst, while the engines are being tuned to achieve optimum performance. During engine tuning, NO_x, CO, and VOC emission control systems would not be functioning.

For the purposes of air quality modeling, NO_2 and CO impacts could be higher during commissioning than under other operating conditions already evaluated. Likewise, while undergoing equipment commissioning, although natural gas will be the sole fuel fired during commissioning, $PM_{10/2.5}$ impacts also could be higher during commissioning than under other operating conditions already evaluated.

The commissioning activities for each engine are expected to consist of several phases. Though precise emission values during the phases of commissioning cannot be provided, given the consideration for contingencies during shakedown, the emissions profile during expected commissioning-period operating loads are estimated as follows in Table 4.7-22. The engine manufacturer provided ppm values at 15 percent O_2, by volume dry, for a 20V34SG engine rated at 73 MMBtu/hr. These values were used to recalculate potential emissions for the 20V34SG-C2 engine rated at 80.18 MMBtu/hr. These revised commissioning emissions were modeled to determine their impacts.

Table 4.7-22 Commissioning Emissions Used for Modeling Analysis for Each Lean Burn Engine at Four Load Points[1]

Pollutant	100%	90%	75%	50%
NO_x	120 ppm 35.44 lbs/hr	120 ppm 31.90 lbs/hr	110 ppm 24.37 lbs/hr	100 ppm 14.77 lbs/hr
CO	260 ppm 46.74 lbs/hr	260 ppm 42.07 lbs/hr	300 ppm 40.45 lbs/hr	400 ppm 35.96 lbs/hr
$PM_{10/2.5}$	25 mg/Nm^3 3.86 lbs/hr	25 mg/Nm^3 3.47 lbs/hr	30 mg/Nm^3 3.47 lbs/hr	40 mg/Nm^3 3.09 lbs/hr

Notes:

[1] Concentration emissions in ppm and mg/normal cubic meter (Nm^3) are based on 15 percent O_2, by volume, dry, as provided by engine manufacturer.

[2] Hourly emission values were revised based on standard F-factor calculations. See Appendix F.1.

Each engine's commissioning period (prior to catalyst loading), is expected to consist of the following phases:

- **Initial load testing and checkout of an engine (typical for all 11 engines)** – Two to four operating days of unsynchronized operation, for approximately 2 to 4 hours per day, followed by approximately an average of 1 to 2 days per engine of low load checkout (low load checkout also is estimated at approximately 2 to 4 hours per day). The average operating load for this initial load testing is expected to be 5 to 10 percent, based on a range of 0 percent and 10 percent load.
- **Initial tuning** – Fifteen to thirty operating days of testing and tuning at various loads and up to full load per engine for not more than an average of 8 operating hours per day. The average operating load is expected to be 75 percent, based on a typical commissioning range of 50 percent and 100 percent load. Upon completion of this phase, the SCR and the oxidation catalyst will be loaded (about 50 to 80 operating hours after first fire of a given engine).
- **Final tuning** – Fifteen to thirty operating days of SCR and oxidation catalyst tuning and pre-witness testing performance verification at an average of not more than 10 to 12 hours per day. The average operating load is expected to be 75 percent, based on a range of 50 percent and 100 percent load.

During the commissioning period, multiple engines will be undergoing various phases of commissioning at the same time. Not all 11 engines will begin commissioning on the same day, however; typically, three engines will be tested concurrently. Although the final sequencing and schedule of commissioning for the 11 engines is not final, the following presents a general description of the worst-case scenario during commissioning for each pollutant:

- NO_x – Worst-case commissioning emissions occurs at 100 percent load
- CO – Worst-case commissioning emissions occurs at 100 percent load
- $PM_{10/2.5}$ – Worst-case commissioning emissions occurs at 100 percent load

The calculation methodology for commissioning emissions is presented in Appendix F.1

As discussed above and presented in Appendix F.1 (i.e., emission calculation methodology) and Appendix F.2 (i.e., air quality modeling support information), there are several potential scenarios under which NO_x, CO and PM_{10} impacts could be higher than under other operating conditions already evaluated.

Under these scenarios, the maximum emission impacts during commissioning with AERMOD modeling analysis, when added to background, are as follows:

NO_x emissions can be conservatively estimated to be 35.44 lb/hr per engine with three engines operating at 100 percent load. The maximum 1-hour federal NO_2 impact during commissioning was conservatively calculated to be 160.14 μg/m.^{3} The maximum 1-hour state NO_2 impact during commissioning is 223.39 μg/m^3. CO emissions can be conservatively estimated to be 46.74 lb/hr per engine with three engines operating at 100 percent load.

The maximum 1-hour and 8-hour CO impacts during commissioning were calculated to be 1,347.8 , μg/m^3 and 373.7 μg/m^3, respectively. With the maximum background 1-hour and 8-hour CO concentrati°n of 5,290 μg/m^3 and 3,600 μg/m^3 the maximum total impacts would be 6,637.8 μg/m^3 and 3,973.7 μg/m^3, respectively. These impacts are each below the state and federal standards for CO.

$PM_{10/2.5}$ emissions can be conservatively estimated to be equivalent to 3.86 lb/hr per engine with up to three engines operating at 100 percent load. Modeling was not performed for $PM_{10/2.5}$ commissioning impacts as the worst-case commissioning event would only occur for up to 8 hours per day. Normalizing the 3.86 lb/hr per engine for three engines over 8 hours results in emissions that are less than 11 engines at full load for 24 hours. Thus, the maximum 24-hour $PM_{10/2.5}$ impact during commissioning would be less than base load.

4.7.5.10 Start-up and Shutdown Impacts Analysis

Start-up and shutdown activities typically affect emissions of NO_x and CO. (During startup, PM_{10}/$PM_{2.5}$, and SO_2 emissions are expected to be no greater than for full-load operations.) A separate modeling assessment for startup emissions is presented as the startup emissions by themselves are greater than the worst-case hourly emissions. Modeling was performed with AERMOD as discussed previously for 1-hour and 8-hour CO, 1 and 3 hour SO_2, and 1-hour NO_2 concentrations. CO and NO_x emissions for 1-hour averaging times were modeled for one cold startup period, assumed to occur for the entire hour. CO emissions for 8-hour averaging times were modeled assuming one cold startup and one warm startup during the 8-hour period. The $PM_{10/2.5}$ and SO_2 emissions for 24-hour averages already contain the startup/shutdown emissions for the worst-case day. It was assumed that both fuel heaters were operational during the engine startup. It was also assumed that all 11 engines would be simultaneously started during the same hour. These emissions and stack characteristics are shown in Table 4.7-20 above. The initial maximum startup impacts for 1-hour NO_2 (both federal and state) and 8-hour

CO occurred in 50-meter intermediate grids. Thus, 20-meter resolution refined receptor grids were developed around the NO_2 and CO startup locations.

Table 4.7-23 presents a summary of the startup and shutdown emission estimates for the engines. Appendix F.1 presents more details with regards to startup/shutdown emissions and assumptions.

Table 4.7-23 Plant Startup/Shutdown Emission Rates for Each Engine for the QBGP

Scenario	NO_x	CO	VOC	$PM_{10/2.5}$	SOx
Cold Start, lb/event	8.82	12.57	6.614	1.54	0.137
Warm Start, lb/event	2.43	1.322	1.764	1.54	0.07
Shutdown, lb/event	0.2	0.31	0.34	0.35	0.05
Hourly Based Emissions Estimates for Startup and Shutdown Events					
Cold Start, lb/hr	9.48	13.35	7.41	2.23	0.27
Warm Start, lb/hr	3.42	2.50	2.95	2.57	0.26
Shutdown, lb/hr	1.33	1.65	1.70	1.53	0.27

Notes:

Estimates based on startup/shutdown data supplied by engine manufacturer.

Cold start sequence is 30 minutes, while a warm start sequence is 15 minutes or less. Time required for control systems to reach full abatement efficiency. The remaining part of the cold or warm startup hour would be at steady state, full control levels.

Shutdown is 8.5 minutes. The remaining part of the shutdown hour would be at steady state, full control levels.

Table 4.7-24 presents the results of the startup/shutdown modeling. CO concentrations due to startup/shutdown conditions are less than the Class II significance levels and modeled 1-hour NO_x impacts are less than the 1-hour state and federal standards.

Table 4.7-24 Startup and Shutdown Modeling Results

Pollutant	Avg. Period	Maximum Concentration (μg/ m^3)	Background (μg/ m^3)	Total (μg/ m^3)	Class II Significance Level (μg/ m^3)	Ambient Air Quality CAAQS/NAAQS	
						(μg/ m^3)	(μg/ m^3)
NO_2[a]	1-hour Federal	182.7	(included by AERMOD)	182.7	7.5	-	188
	1-hour State	229.8	(included by AERMOD)	229.8	-	339	-
CO	1-hour	1363	5290	6653	2000	23,000	40,000
	8-hour	95.7	3600	3696	500	10,000	10,000
SO_2	1-hour	24.6	49.8	74.4	7.8	655	196
	3-hour	9.3	36.4	45.7	25	-	1,300

Notes:

[a] Ozone Limiting Method (OLM) used for 1-hour NO_2 impacts, with Kearny Mesa NO_2 background included in the modeling results (USEPA-default 2008–2010 hourly-seasonal background used for 1-hour federal NAAQS and SDAPCD-provided 2003–2005 hourly NO_2 concurrent with meteorological data used for 1-hour state CAAQS.

Fumigation Analysis

Fumigation analyses with the USEPA Model SCREEN3 (version 96043) were conducted for inversion breakup conditions based on USEPA guidance given in *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised* (USEPA-454/R-92-019) (USEPA 1992b). The worst-case stack parameters identified in the screening analysis for the engine stacks for 1-hour CO averaging times were modeled. Shoreline fumigation impacts were not assessed.

An inversion breakup fumigation impact was predicted to occur at 4,842.35 meters from the engine stacks. These results are predicted to occur by SCREEN3 for rural conditions of F stability and 2.5 m/s wind speeds at the stack release heights. No inversion breakup fumigation impacts are predicted by SCREEN3 for the short firepump engine and heater stacks. Since the site vicinity is rural in nature, there was no need to adjust fumigation impacts for urban dispersion conditions. One-hour averaging times were evaluated first (fumigation impacts are generally expected to occur for 90 minutes or less).

For total facility inversion breakup fumigation impacts, maximum SCREEN3 impacts under rural conditions for all SCREEN3 meteorological combinations were determined for the other sources at the inversion breakup distances. These impacts were combined with the fumigation impact as shown in the following table. These maximum 1-hour total fumigation impacts are less than the SCREEN3 maxima predicted to occur under normal dispersion conditions for CO and NO_x. Since one-hour fumigation impacts are less than the maximum overall SCREEN3 one-hour impacts for these pollutants, no further analysis of additional short-term averaging times (3 hours, 8 hours, or 24 hours) is required as described in Section 4.5.3 of *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised* (USEPA-454/R-92-019) for CO and NO_x. It should be noted that the maximum 1-hour total fumigation impacts for all pollutants (NO_x, CO, and SO_2) are expected to be less than the maximum 1-hour AERMOD facility impacts as shown in Table 4.7-25, so the refined analysis impacts are conservative.

For the SO_2 impacts, where 1-hour fumigation impacts were greater than 1-hour SCREEN3 impacts, 3-hour and 24-hour fumigation impacts were calculated assuming 90-minutes of persistence of fumigation at the fumigation impact location (maximum SCREEN3 impacts under normal conditions at the fumigation impact location for the balance of the 3-hour or 24-hour period were assumed). The USEPA averaging time ratios of 0.9 and 0.4 were applied to SCREEN3 results for 3-hour and 24-hour averaging times, respectively, for the engines and heaters. Since the firepump only operates for 1-hour per day (at most and if at all), 1-hour firepump impacts were divided by 3 and 24 to obtain impacts for 3-hour and 24-hour averaging times, respectively. This gives 3-hour and 24-hour SO_2 fumigation inversion breakup impacts of 1.49 and 0.44 $\mu g/m^3$, respectively. The comparable maximum 3-hour and 24-hour SCREEN3 impacts under normal dispersion conditions for SO_2 were 1.98 and 0.87 $\mu g/m^3$, respectively, at the engine maximum impact location. These impacts are also less than the AERMOD refined modeling analysis results of 9.0 and 3.0 $\mu g/m^3$ for SO_2 for 3-hour and 24-hour averaging times, respectively.

Table 4.7-25 Fumigation Impact Summary

Pollutant/ Average Time	Engine Impacts (µg/m^3)	Heater Impacts (µg/m^3)	Firepump Impacts (µg/m^3)	Total Facility Impact (µg/m^3)	Maximum AERMOD Impact (µg/m^3)
Engine Inversion Breakup Location (4842 meters)					
NO_2 1-hour	11.644	1.970	5.866	19.480	76.44[a]
CO 1-hour	13.832	3.677	2.110	19.619	261.2
SO_2 1-hour	2.265	0.025	0.014	**2.304**	**18.5**
Engine SCREEN3 Max. Location/Normal Dispersion (777 meters)					
NO_2 1-hour	10.921	4.293	24.158	39.372	76.44[a]
CO 1-hour	12.973	8.014	8.689	29.676	261.2
SO_2 1-hour	2.124	0.053	0.057	2.234	18.5
Heaters SCREEN3 Max. Location/Normal Dispersion (32 meters)					
NO_2 1-hour	0.000	57.348	306.481	363.829	76.44[a]
CO 1-hour	0.000	107.050	110.235	217.285	261.2
SO_2 1-hour	0.000	0.714	0.723	1.437	18.5
Firepump Engine SCREEN3 Max. Location/Normal Dispersion (28 meters)					
NO_2 1-hour	0.000	57.056	320.942	**377.998**	**76.44[a]**
CO 1-hour	0.000	106.505	115.436	**221.941**	**261.2**
SO_2 1-hour	0.000	0.710	0.758	1.468	18.5

Notes:

[a] AERMOD NO2 impact (rather than NO_X) based on Ozone Limiting Method (i.e., AERMOD NO_X impacts would be expected to be higher than the SCREEN3 impacts shown above).

4.7.5.11 Significant Impact Levels

PSD Source Impact Analysis. Under USEPA's PSD regulations, an applicant must conduct a "source impact analysis," which demonstrates that "allowable emission increases from the source in conjunction with all other applicable emissions increases or reductions (including secondary emissions), would not cause or contribute to air pollution in violation of: (1) Any NAAQS in any region; or (2) Any applicable maximum allowable increase over the baseline concentration in any area." 40 CFR § 52.21(k).

Subparagraph (1) is required to ensure that the source's emissions will not cause a violation of the NAAQS, which, in this case, consist of the 24-hour and annual PM_{10} and $PM_{2.5}$ standards and the 1-hour and annual NO_2 standards. Subparagraph (2) is the "increment consumption analysis," which ensures that, in those locations currently meeting the federal NAAQS (i.e., those deemed "attainment" or "unclassifiable"), the concentration of a given pollutant cannot increase by an amount greater than the "maximum allowable increase" specified by the CAA and/or the PSD regulations for the particular pollutant.

USEPA has recently promulgated the final SILs and PSD increments for $PM_{2.5}$. USEPA has also recently proposed draft 1-hour NO_2 SILs but has not yet proposed a PSD increment.

Role of Significant Impact Levels. For purposes of the PSD program, USEPA has traditionally applied SILs as a *de minimis* value, which represents the offsite concentration predicted to result from a source's emissions that does not warrant additional analysis or mitigation.

If a source's modeled impact at any offsite location exceeds the relevant SIL, the source owner must then conduct a "multi-source" (or "cumulative") air quality analysis to determine whether or not the source's emissions will cause or contribute to a violation of the relevant NAAQS or applicable PSD increment. SILs have also been widely used in the PSD program as a screening tool for determining when a new major source or major modification that wishes to locate in an attainment or unclassifiable area must conduct a more extensive air quality analysis to demonstrate that it will not cause or contribute to a violation of the NAAQS or PSD increment in the attainment or unclassifiable area. The USEPA considers a source whose individual impact falls below a SIL to have a *de minimis* impact on air quality concentrations. Thus, a source that demonstrates its impact does not exceed a SIL at the relevant location is not required to conduct more extensive air quality analysis or modeling to demonstrate that its emissions, in combination with the emissions of other sources in the vicinity, will not cause or contribute to a violation of the NAAQS at that location.

The Class I and II SILs, increments, and NAAQS are presented in Table 4.7-19.

Based on the significant major source emission rates for NO_x, PM_{10}, and $PM_{2.5}$, the modeled concentrations of these pollutants exceeded the applicable Class II SILs for 1-hour NO_2, 24-hour PM_{10} and $PM_{2.5}$, and annual $PM_{2.5}$ thus triggering the requirements for a NAAQS and PSD increment analyses as appropriate. Figures F.2-9 through F.2-11 (Appendix F.2) present the areal extent of the SILs for 24-hour PM_{10} and 24-hour and annual $PM_{2.5}$. According to USEPA guidance, the impact area was established by taking the distance from the Project site to the farthest of these locations and then drawing a circle with that distance as its radius.

The 24-hour PM_{10} SIL radius is 5.2 km. The 24-hour $PM_{2.5}$ SIL radius is 13.8 km while the annual SIL radius is 4.5 km. The 1-hour NO_2 SIL radius is 12 km. The annual SILs for NO_2 and PM_{10} were not exceeded. While the 1-hour SO_2 interim SIL was exceeded, the Project is not a major source for this pollutant, thus no NAAQS or increment analyses are required.

NAAQS Compliance Demonstration. To demonstrate that the emissions from the proposed Projects will not cause or contribute to a violation of the 24-hour $PM_{10/2.5}$ NAAQS, the annual $PM_{2.5}$ NAAQS, or the 1-hour NO_2 NAAQS, a multi-source cumulative modeling analysis will be conducted in accordance with USEPA requirements. This analysis will consider both the existing background concentrations, as established by ambient monitoring data,[2] and the contribution from additional sources, which might not be reflected by the monitoring data, but could interact with the facility's potential impacts. Both Appendix W and the *Draft NSR*

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[2] *See Guideline on Air Quality Models*, 40 CFR Pt. 51, Appendix W (App. W), § 7.2.1.1.a. According to Appendix W, "[t]ypically, air quality data should be used to establish background concentrations in the vicinity of the source(s) under consideration." *Id.* § 8.2.1.b For comparison with the 24-hour PM2.5 NAAQS, the background concentration is based on the average of the 98th percentile 24-hour values measured over the last 3 years of available data. *Id.*, § 10.1.c. For the annual $PM_{2.5}$ NAAQS, the background is established by the 3-year average of the annual averages.

Workshop Manual require that the cumulative impacts analysis 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." 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," Appendix W leaves identification of nearby sources to the "professional judgment" of the permitting agency.

If, after adding in the background concentration, the modeled contribution from the source and any other modeled sources, the result is less than the relevant NAAQS at all locations, then no violation would occur and the cumulative impacts analysis is complete. If a violation is predicted by the model, the source may still demonstrate that it does not "cause or contribute to" a violation of the NAAQS by demonstrating that its own contribution is lower than the SIL at the particular location and time of the modeled violation.[3] This is referred to as a culpability analysis.

The Applicant will work with the SDAPCD and USEPA Region 9 to develop a cumulative source inventory for NO_2 and $PM_{10/2.5}$ and to identify nearby sources whose contribution is not already reflected by the background monitoring data.

It should be noted that initial modeling analysis using AERMOD estimated Project impacts of 18.3 $\mu g/m^3$ (3-year average of the first highest 24-hour impacts), which, when combined with the 24-hour $PM_{2.5}$ background of 23.7 $\mu g/m^3$, would indicate an exceedance of the standard of 35 $\mu g/m^3$. All locations where AERMOD predicted possible NAAQS exceedances were plotted as shown in Appendix F.2, Figure F.2-12. This included all locations where the maximum modeled $PM_{2.5}$ impact equaled or exceeded 11.3 $\mu g/m^3$ (3-year average of the first highest 24-hour impacts), which is the concentration that, when added to the background concentration of 23.7 $\mu g/m^3$, would indicate a possible exceedance of the NAAQS of 35 $\mu g/m^3$. As can be seen in Appendix F.2, Figure F.2-12, these impacts occurred along the flanks of the north and south peaks of Fortuna Mountain. To more accurately predict the Project's actual impacts in this complex terrain, a more detailed modeling assessment was conducted using CTSCREEN, which is an EPA-approved preferred model for modeling analyses in complex terrain. *See* 40 CFR Part 51, App. W, Guideline on Air Quality Models, § 4.2.1.2. According to EPA's Modeling Guideline, "CTSCREEN can be used to obtain conservative, yet realistic, worst-case estimates for receptors located on terrain above stack height." *Id.* The results from the CTSCREEN analyses described below show that maximum 24-hour $PM_{2.5}$ impacts in these complex terrain areas are significantly less than initially estimated by AERMOD and will not cause exceedances of the 24-hour $PM_{2.5}$ NAAQS.[4]

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[3] *Draft NSR Workshop Manual*, Draft October 1990, at C.52: ("The source will not be considered to cause or contribute to the violation if its own impact is not significant at any violating receptor at the time of each predicted violation.")

[4] These results will need to be confirmed upon completion of a cumulative impacts analysis that reflects the contribution from any nearby sources not already reflected by the background monitoring data. As indicated above, the Applicant will work with SDAPCD and USEPA Region 9 to develop an appropriate cumulative impacts inventory.

CTDMPLUS Terrain Feature Processing

CTDMPLUS requires construction of a mathematical representation of the complex terrain being analyzed. For each of the complex terrain regions to be modeled, the contours of the specific terrain feature of interest were digitized and used as input to the FITCON and HCRIT processing programs. The FITCON and HCRIT programs use the digitized data to develop continuous contours, complete the contours and extend the contours down to the stack base, fit a series of ellipses to these contour data, create polynomial equations that represent the fitted ellipses, and format the results so CTDMPLUS can use them. Contour data were based on 7.5-minute USGS topographic maps, and contour intervals of 100 feet or less as needed to accurately digitize the individual terrain features. Three primary terrain features were digitized as presented in Appendix F.2, Figure F.2-12.

The RECGEN receptor utility program was used to place model receptor locations on each terrain feature. Receptors were placed along the digitized contours.

CTSCREEN utilized the same $PM_{2.5}$ 24-hour stack parameters as determined from the engine load screening analysis.

CTSCREEN Results

CTSCREEN digitized terrain inputs were used to model the Project impacts at locations where AERMOD predicted possible exceedances of the 24-hour $PM_{2.5}$ NAAQS maximum impacts, i.e., where the maximum concentration predicted by AERMOD equaled or exceeded 11.3 $\mu g/m^3$ (35 - 23.7 $\mu g/m^3$). As indicated above, all these locations occurred along the flanks of the north and south peaks of Fortuna Mountain. The results from the CTSCREEN analyses described above show that maximum 24-hour $PM_{2.5}$ impacts of 3.77 $\mu g/m^3$ in these complex terrain areas are much less than initially estimated by AERMOD, as shown in Table 4.7-21. Thus, the Project by itself will not cause exceedances of the 24-hour $PM_{2.5}$ NAAQS.

CAAQS Compliance Demonstration

Based on the results presented in Tables 4.7-21 and 4.7-24 (as well as data presented in Appendix F.2), no violations of the CAAQS are expected to occur. Where the background already exceeds the CAAQS, the Project by itself will not cause new violations of the standards.

4.7.5.12 SDAPCD Rule 20.2 AQIA for PM_{10}

AERMOD and CTSCREEN were used to assess the Project's 24-hour PM_{10} concentrations for comparisons with the Rule 20.2 air quality impact assessment (AQIA) requirements. These methods were discussed with the SDAPCD.

Pursuant to SDAPCD Rule 20.2(d)(2), further analysis was performed with respect to the California 24-hour PM_{10} ambient air quality standards (AAQS). This rule requires that the Applicant demonstrate to the satisfaction of the Air Pollution Control Officer (APCO) through an AQIA that the Project will not cause additional exceedances of the CAAQS for PM_{10} anywhere the standard is already being exceeded. To perform this analysis for the Project, modeling was performed using the meteorology on specific days when monitored background PM_{10} concentrations equaled or exceeded the California standard of 50 $\mu g/m^3$. Two days were identified in the 3-year modeling period from 2003–2005 with background concentrations over 50 µg/m^3.

AERMOD modeling analyses of plant PM_{10} impacts for those two days showed a number of modeled receptors with impacts greater than the SDAPCD 24-hour significance level of 5 µg/m^3. This level is used to determine whether offsets are needed for the Project. The receptors with plant PM_{10} impacts equal to or greater than 5.0 µg/m^3 were plotted and are shown on Figure F.2-12. As can be seen, these impacts all occur in the complex terrain areas southwest of the plant site. These three complex terrain features were modeled in four CTSCREEN runs (North Fortuna Mountain Peak, South Fortuna Mountain Peak, the terrain feature south of Mission Gorge, and the terrain feature between Shepherd Canyon and Fortuna Mountain). The terrain where the 24-hour PM_{10} SILs were equaled or exceeded was digitized as described in Section 4.7.5.11.

The CTSCREEN contours for these features are shown on Figure F.2-12. CTSCREEN receptors were placed along each CTSCREEN contour above the engine stack release heights. The results of the CTSCREEN analyses demonstrate that maximum plant PM_{10} impact of 3.77 µg/m^3 during these two days are less than the 24-hour PM_{10} significance level. Thus, the Project will not contribute to violations of the CAAQS. The Projects annual modeled PM_{10} impacts are also less than significance. Thus, the requirements of SDAPCD Rule 20.2 are satisfied and no offsets are required.

4.7.5.13 Preconstruction Monitoring Data

USEPA's PSD regulations 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 "significant monitoring concentrations" (SMC), as listed in Table 4.7-19.

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, this does not necessarily mean the Applicant must install and operate a new monitor at the Project site. Rather, according to USEPA 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, USEPA guidance has emphasized consideration of three factors: monitor location, data quality, and use of most current data. The permitting agency also may approve use of data from a representative "regional" monitoring site for purposes of the NAAQS compliance demonstration.

A facility may, with the District's approval, rely on air quality monitoring data collected at District monitoring stations to satisfy the requirement for preconstruction monitoring even when the Project impact exceed the preconstruction significance levels. In such a case, in accordance with Section 2.4 of the USEPA PSD guideline, the last 3 years of ambient monitoring data may be used if they are representative of the area's air quality where the maximum impacts occur due to the proposed source.

The SDAPCD maintains air quality and meteorological monitoring stations throughout the entire air basin with sufficient resolution in order to adequately determine representative background concentrations for attainment/nonattainment determinations. Most monitored pollutants impact the air basin on a regional level, thus adding additional monitors in areas already served by existing monitoring stations does not provide any additional benefit. As such, the Applicant proposes that the existing monitoring data collected at the Overland Avenue site over the last three most recent years satisfies USEPA requirement for exemption of preconstruction monitoring. As such, no monitoring is proposed for this Project.

4.7.5.14 Class I Area Impacts

The closest Class I area is the Agua Tibia National Wilderness, located approximately 62 km north of the Project site. Additionally, San Jacinto Wilderness is located 103 km north-northeast of the Project site. To assess the potential for Class I increment consumption, which is a separate requirement from the air quality related value (AQRV) analysis, receptors were placed within the boundaries of Agua Tibia and are displayed in Figure F.2-13. Receptors were also placed within the boundaries of San Jacinto Wilderness and are displayed in Figure F.2-14. (USDAFS 2002)

The Agua Tibia modeled impacts are summarized in Table 4.7-26 and the San Jacinto modeled impacts are summarized in Table 4.7-27, which are then compared to the Class I significance levels. The modeled concentrations of $PM_{2.5}$ at both Class I areas are less than the USEPA's Class I SILs for $PM_{2.5}$, which are 0.07 and 0.04 µg/m^3 (as a 24-hour and annual average concentration, respectively). Similarly, the PM_{10} and NO_X impacts are also less than the Class I SILs. USEPA has stated that its decision to set the Class I SILs at 4 percent of the proposed Class I increments was based on its belief that, "where a proposed source contributes less than 4 percent to the Class I increment, concentrations are sufficiently low so as not to warrant a detailed analysis of the combined effects of the proposed source and all other increment-consuming emissions." *See* 72 Fed. Reg. at 54140. *Id.* In conclusion, the analysis demonstrates that no significant impacts on Class I areas are expected as a result of the Project.

Table 4.7-26 PM_{10}, $PM_{2.5}$, and NO_2 Class I SILs and Increments for the Agua Tibia National Wilderness Class I Area

Pollutant	Averaging Interval	Maximum Modeled Impact (µg/m^3)	Class I Significant Impact Level (µg/m^3)	Class I PSD Increment (µg/m^3)
PM_{10}	24-Hour	0.0198	0.3	10
	Annual	0.00085	0.2	5
$PM_{2.5}$	24-Hour	0.0158	0.07	2
	Annual	0.00085	0.04	1
NO_2	Annual	0.00115	0.1	2.5

Table 4.7-27 PM_{10}, $PM_{2.5}$, and NO_2 Class I SILs and Increments for the San Jacinto Wilderness Class I Area

Pollutant	Averaging Interval	Maximum Modeled Impact (µg/m^3)	Class I Significant Impact Level (µg/m^3)	Class I PSD Increment (µg/m^3)
PM_{10}	24-Hour Annual	0.0091 0.00044	0.3 0.2	10 5
$PM_{2.5}$	24-Hour Annual	0.0069 0.00044	0.07 0.04	2 1
NO_2	Annual	0.00059	0.1	2.5

4.7.5.15 PSD Increment Analysis

The PSD Source Impact Analysis also includes the "increment consumption analysis," which ensures that, in those locations currently meeting the federal NAAQS (i.e., those deemed "attainment" or "unclassifiable"), the concentration of a given pollutant cannot increase by an amount greater than the "maximum allowable increase" specified by the CAA and/or the PSD regulations for the particular pollutant.

As described above, USEPA has recently promulgated final PSD increments for $PM_{2.5}$. The proposed Project will trigger the baseline date for $PM_{2.5}$. Thus, the application for the proposed Project could be deemed the first completed PSD application received after the trigger date and would, consequently, trigger both the minor source baseline date and major source baseline date. In light of this, the Project would not need to consider any other stationary sources for purposes of its increment consumption analysis, unless such sources had increased their emissions since the date when the application was complete.

Currently there is no promulgated 1-hour NO_2 increment.

Based on the results of the 24-hour PM_{10} SILs analysis, the Project will need to perform a multi-source PM_{10} increment consumption analysis that demonstrates that the available increment is not exceeded. The Applicant will work with the SDAPCD and USEPA Region 9 to develop an applicable increment source inventory. Increment consuming sources will be identified as those sources existing within the SIL, plus a 50-km screening area beyond the maximum extent of the SIL, as per USEPA Guidance.

The increment analysis will be submitted after the necessary consultations with the SDAPCD and USEPA. (It should be noted that a complete copy of the San Diego County California Emissions Inventory Data Acquisition System (CEIDARS) emissions inventory has been requested from CARB for support of this analysis.)

Based on the $PM_{2.5}$ baseline date, the "Project only" increment consumption analysis with AERMOD produced several receptor locations where the 24-hour $PM_{2.5}$ increment was exceeded. Figure F.2-12 presents the geographical locations of the AERMOD receptors. Using the AERMOD results to identify the geographic locations of possible exceedances of the 24-hour $PM_{2.5}$ increment, the CTSCREEN model was used as a refined terrain model, as per the Appendix W Guidelines, to assess these impact locations. Specifically, all AERMOD receptors that equaled or exceeded 9 $\mu g/m^3$ were input into CTSCREEN for this analysis.

Based on the CTSCREEN results, the maximum 24-hour $PM_{2.5}$ concentration from the Project was 3.77 $\mu g/m^3$, as summarized in Table 4.2-21. Because the highest modeled concentrations from the Project are significantly below the Class II 24-hour $PM_{2.5}$ increment (9 $\mu g/m^3$), the Project, by itself, will not cause or contribute to an exceedance of a PSD increment.[5]

4.7.5.16 AQRV Analysis

Two Class I areas are within 150 km of the proposed Project. Agua Tibia National Wilderness is located approximately 62 km north of the Project site. Additionally, San Jacinto Wilderness is located 103 km north east. Following the most recent FLAG Workshop procedures (June 2010), the use of the Screening Procedure (Q/D) to determine if the Project could opt (screen) out of an Air Quality Related Value (AQRV) assessment for visibility and deposition with CALPUFF was made. Following the screening procedures in FLAG, the emissions of NO_x, SO_x, $PM_{10/2.5}$, and H_2SO_4 (not emitted from the proposed plant) were summed after adjusting the emissions to reflect 8,760 hours of operation. The screening analysis is summarized below:

- $Q = sum(NO_x+PM_{10/2.5}+SOx+H_2SO_4)*(8760/4032) = 181.72$
- $D_{agua\ tibia} = 62$ km
- $D_{san\ jacinto} = 103$ km
- (Q/D) = 2.93 for Agua Tibia National Wilderness
- (Q/D) = 1.76 for San Jacinto Wilderness

If Q/D is less than 10, then no AQRV analysis is required. Based on the ratio of Q/D, both Class I areas are less than 10 and no further analysis of AQRV is required. The screening assessment does not apply to Class I increment or NAAQS, which was assessed above.

4.7.5.17 Deposition Analysis

A deposition analysis is not required pursuant to the AQRV analysis presented in Section 4.7.5.16.

4.7.5.18 Plume Blight Analysis

A plume blight analysis was conducted for surrounding Class II area for emissions from the proposed Project. The VISCREEN model (version 1.01) was used to conduct the plume blight analysis with a background visual range of 40 km, as recommended in the *Workbook for Plume Visual Impact Screening and Analysis* (EPA-450/4-88-015).

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[5] Note that, for the 24-hour NAAQS, Appendix W instructs that the highest, second-highest increase in estimated concentration must be less than or equal to the relevant increment. 40 CFR Pt. 51, App. W, § 10.2.3.3.a. Thus, comparison of the maximum modeled impact using CTSCREEN to the increment represents a conservative and protective approach.

VISCREEN was developed to conduct visual effect evaluations of a plume as observed from a given vantage point located 10 km from the Project site. Emissions input into the model are assumed to create an infinitely long, straight plume, traveling toward the specified area. The model outputs the change in light extinction in terms of Delta E and contrast against both a terrain and sky background.

Table 4.7-28 contains the results of the Level 1 VISCREEN analysis for the surrounding Class II area. NO_x and PM emissions from the worst-case day were used for this analysis. SO_2 emissions are not required to be input because over the short distance and stable plume transport conditions typical of plume visual impact screening, secondary sulfate (SO_4) is not formed to a significant degree in plumes. Results of the VISCREEN analysis were compared to criteria provided in FLAG.

Table 4.7-28 Level 1 VISCREEN Analysis Results

Class II Area	Nearest Boarder	Furthest Boarder	Delta E				Contrast			
			Sky 10	Sky 140	Terrain 10	Terrain 140	Sky 10	Sky 140	Terrain 10	Terrain 140
Class II Visibility Analysis (inside Class II Area)	10	20	2.198	0.665	3.373	0.740	0.020	-0.018	0.039	0.027
Class II Visibility Analysis (outside Class II Area)	10	20	6.610	1.406	3.373	0.740	0.089	-0.056	0.133	0.093
Criteria[1]			2.00	2.00	2.00	2.00	0.05	0.05	0.05	0.05

Notes:

[1] Criteria for Delta E and Contrast are the default criteria suggested by FLAG.

4.7.5.19 Soils and Vegetation

Impacts on soils, vegetation, and sensitive species were determined to be “insignificant” for the following reasons:

- No soils were identified in the Project area, which are recognized to have any known sensitivity to the types or amounts (ambient concentrations) of air pollutants expected to be emitted by the proposed plant. Soil classification was made using data from the National Resources Conservation Service (NRCS) . The NRCS classified the soil on site as Diablo Clay (DaE), which makes up approximately 22 percent of the site, and Redding Cobbly Loam (RfF), which makes up the remaining 78 percent of the site. Project operations would not result in impacts to the soil from erosion or compaction. Routine vehicle traffic during Project operation would be limited to existing roads and plant operations areas, all of which will be paved. Impacts to soil resources from Project operational emissions would be less than significant. Support data for soils impacts can be found in Appendix J. In addition, Appendix K contains the geotechnical report for the Project site (including soils information).

- No vegetation or sensitive species were identified in the Project area, which are recognized to have any known sensitivity to the types or amounts (ambient concentrations) of air pollutants expected to be emitted by the proposed plant. Support data for biological and vegetation/soils impacts can be found in Sections 4.12 and 4.14, respectively. In addition, Appendix H contains support data for the analyses noted in the aforementioned sections.
- The plant emissions are expected to be in compliance with all applicable air quality rules and regulations.
- The plant impacts are not predicted to result in violations of existing air quality standards, nor will the emissions cause an exacerbation of an existing violation of any quality standard.

4.7.5.20 Growth Analysis

SDG&E provides electric service to approximately 1.3 million customers in San Diego County and the southern portion of Orange County. SDG&E also provides natural gas service to approximately 775,000 gas customers. The electric customer base comprises 89 percent residential and 11 percent commercial and industrial customers.

SDG&E's electric transmission network is comprised of 135 substations with 868 circuit miles of 69kV, 242 circuit miles of 138kV, 494 circuit miles of 230kV, and 283 miles of 500kV transmission lines. Local ("on system") generating resources are the Encina plant (connected into SDG&E's grid at 138kV and 230kV), Otay Mesa Energy Center, and the Palomar Energy Center (connected at 230kV) and a number of combustion turbine facilities located around the service area (connected at 69kV). Imported resources are received via the Miguel Substation as the delivery point for power flow on the Southwest Power Link, which is SDG&E's 500kV transmission line that runs from Arizona to San Diego along the United States/Mexico border, and via the SONGS 230kV switchyard (SDG&E 2011).

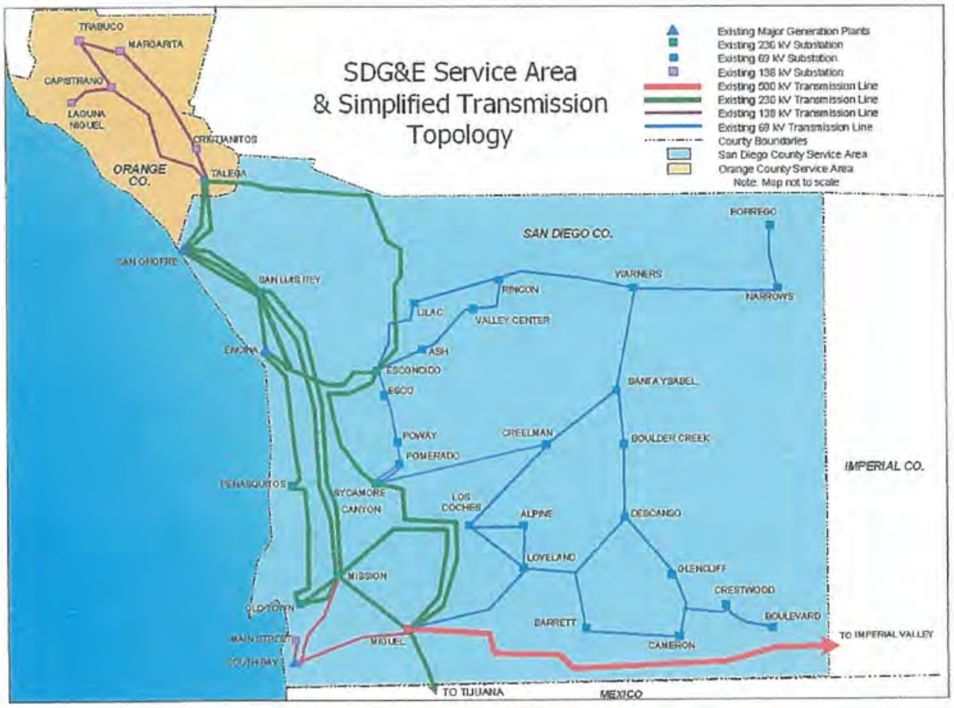
Figure 4.7-1 shows a simplified diagram of existing SDG&E's service area and the electric transmission topology in San Diego County and the southern portion of Orange County. Planned or approved transmission facilities for the future (if any) are not shown on this map.

The Project is being proposed and built in response to electricity demands within the SDG&E service area. These demands are clearly outlined in the *CEC-California Energy Demand 2008-2018 Staff Revised Forecast, CEC-200-2007-015-SF2, 11/07, Chapter 4,* which presents the historical and predicted electrical demands for the SDG&E service area (CEC 2007). Chapter 4 of the aforementioned report is present in Appendix F.10 (Miscellaneous Support Data). Based on the CEC demand analysis for future years, the Applicant concludes that the proposed Project is <u>not</u> a growth inducing project, but rather a response to both current and anticipated future electrical needs within the service area. In addition, the Applicant is not aware of any type of industrial or commercial facility that would be built in response to the construction or operation of the proposed Project.

Section 4.6 (Socioeconomic Analysis) presents data on the short- and long-term impacts of the proposed Project. Short-term impacts are related to construction activities which cover an approximate period of 18 months. Long-term impacts are associated with plant operations over the forecasted plant life of 30 years. More information on the electrical need and demand issues is presented in Section 2.5, Project Description.

Figure 4.7-1

SDG&E Service Area and Simplified Transmission Topology



4.7.6 Laws, Ordnances, Regulations, and Standards

Table 4.7-29 presents a summary of local, state, and federal LORS deemed applicable to the proposed modification.

Table 4.7-29 Applicable LORS for Air Quality

Regulation Citation	Compliance Strategy/Determination
Federal	
CAAA of 1990, 40 CFR 50	Plant operations will not cause violations of state or federal AAQS.
40 CFR 52.21	Project is subject to PSD due to GHG emissions under Tailoring Rule. Impact analysis demonstrates Project will not cause exceedance of NAAQS or increments; BACT analysis demonstrates Project will meet BACT for all PSD pollutants; PSD application has been filed with USEPA Region 9.

Regulation Citation	Compliance Strategy/Determination
40 CFR 72-75	Title IV Acid Rain – requires Title IV permit and compliance with acid rain provisions. Each lean-burn engine at the plant is connected to a generator that is less than 25 MW. The engines combust clean fuels with sulfur contents less than or equal to 0.05 percent by weight, and the engines will commence commercial operations after 11-15-90. Engines are not subject to Title IV requirements per 40 CFR 72.7 definition of affected units. Title IV is not applicable to the plant. NO_x, CO, Opacity, and O2 CEMS will be installed, certified, operated, and maintained as required per SDAPCD rules and/or 40 CFR 60.
40 CFR 60	Applicant will determine new source performance standard (NSPS) subpart applicability and comply with all emissions, monitoring, and reporting requirements. Potentially applicable subparts are: Subpart IIII, and Subpart JJJJ. Subpart IIII: Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. Plant fire pump engine (emergency fire pump) is a compression ignition engine. Engine will meet the USEPA Tier 3 requirements; engine also will meet State Air Toxics Control Measure (ATCM) requirements. Subpart JJJJ: Standards of Performance for Stationary Spark Ignition Internal Combustion Engines. Plant has lean-burn engines that are spark-ignited. Imposition of BACT as delineated in Appendix F.6 and compliance with the BACT emissions limits as stated in Table 4.7-10 will insure compliance with Subpart JJJJ.
40 CFR 70	Based on the current definitions in District Rule 1401 (a) and (b), the Applicant believes that the plant and emissions units are not currently subject to Title V for criteria pollutants or HAPs, but the plant will be subject to Title V based on GHG emissions, therefore a Title V application will be submitted within 12 months of the commencement of operations.
40 CFR 68	Applicant will evaluate substances and amounts stored, determine applicability, and comply with all program level requirements. Urea is the only identified substance potentially subject to RMP provisions at this time. See Sections 4.8 and 4.9.
40 CFR 63	Applicant will determine NESHAPs subpart applicability and comply with all emissions, monitoring, and reporting requirements. Subpart ZZZZ: National Emission Standards for HAPs for Stationary Reciprocating Internal Combustion Engines (RICE). Plant lean-burn engines are each greater than 500 hp. Plant is not a major source of HAPs; individual HAPs less than 10 tpy and total HAPs less than 25 tpy. An affected source that is a new or reconstructed stationary RICE located at an area source must meet the requirements of this part by meeting the requirements of 40 CFR part 60 subpart JJJJ. No further requirements apply for such engines under this part. (§ 63.6590(c)). Subpart is not applicable.
State	
CHSC 44300 et seq. (AB 2588)	Applicant will determine applicability, and prepare inventory plans and reports as required. SDAPCD will determine submittal schedules.
CHSC 41700	SDAPCD Authority to Construct (ATC) will ensure that no public nuisance results from operation of plant.
Local SDAPCD Regulations	
Rule 10 and Rule 14 – Permits Required	This application and the enclosed district permit forms constitute compliance with these rules. See Appendix F.9.

Regulation Citation	Compliance Strategy/Determination
Rule 11 – Exemptions from Permits	The proposed power cycle and fire pump engines are not exempt from the permitting requirements of Rules 10 and 14, but the proposed fuel gas and warm start heaters are exempt from District permitting requirements.
Rule 50 and Rule 50.1 – SDAPCD/NSPS/NESHAPs Visible Emissions	The proposed Project will comply with all applicable SDAPCD/NSPS/NESHAPs visible emissions limitations.
Rule 51 – Nuisance	The proposed Project is not expected to create any type of public nuisance.
Rule 52 – Particulate Matter	PM emissions from the combustion of natural gas in the proposed engines are not expected to exceed 0.10 grains per standard cubic feet (gr/scf). The proposed Project engines are exempt from this rule. See Appendix F.1.
Rule 52.1 – NSPS/NESHAPs PM	The proposed Project will comply with all NSPS/NESHAPs PM limitations.
Rule 53 – Specific Air Contaminants	Applicable provisions in (d)(1) and (2) are complied with through the use of natural gas fuels. This rule does not apply to liquid fueled engines. See Table 4.7-2.
Rule 53.2 – NSPS/NESHAPs Specific Contaminants	The proposed Project will comply with all NSPS/NESHAPs specific contaminant limitations.
Rule 54 – Dust and Fumes	Not applicable to fuel combustion sources.
Rule 54.1 – NSPS/NESHAPs Dust and Fumes	The proposed Project will comply with all NSPS/NESHAPs dust and fume limitations.
Rule 55 – Fugitive Dust Control	The Applicant will comply with all provisions of this rule during construction and subsequent operations. See Appendix F.5.
Rule 60 - Circumvention	The Applicant is not proposing an action in this application which could be construed as circumvention.
Rule 62 – Sulfur Content of Fuels	Use of natural gas fuels will insure compliance with the rule limits. Use of liquid fuels meeting the sulfur requirements of this rule will insure compliance. See Tables 4.7-2 and 4.7-3.
Rule 62.1 – NSPS/NESHAPs Fuel Sulfur	Use of natural gas fuels will insure compliance with all applicable NSPS/NESHAPs rule limits. See Table 4.7-2.
Rule 68 – NO_x Limits/Fuel Burning	Use of natural gas fuels and BACT will insure compliance with all applicable NO_x limits. See Appendices F.1 and F.6.
Rule 68 and 68.1 – SDAPCD/NSPS/NESHAPs NO_x Limits	Use of natural gas fuels and BACT will insure compliance with all applicable SDAPCD/NSPS/NESHAPs rule NO_x limits. See Appendices F.1 and F.6.
Rule 69.4 – IC Engines RACT	The new IC engines will comply with all rule provisions and USEPA/CARB tier standards. Rule only applicable to NO_x from affected engines at major sources. Not applicable to emergency use engines such as the proposed fire pump engine.
Rule 69.4.1 – IC Engine BARCT	The new IC engines will comply with all rule provisions and USEPA/CARB tier standards. Not applicable to emergency use engines such as the proposed fire pump engine.
Rules 20.1-20.3 – NSR	This application and support documentation demonstrates compliance with all applicable requirements of SDAPCD's New Source Review (NSR) program.
Rule 20.5 – Power Plants	This application constitutes the equivalent of an application for Authority to Construct per Rule 20.5 and will trigger SDAPCD's commencement of Determination of Compliance (DoC) review process. Upon CEC's issuance of license and confirmation that Project is complying with conditions of license and DoC, SDAPCD will then issue Permit to Operate.
Rule 1200 – Toxics NSR	Plant risk pursuant to the HRA does not exceed any SDAPCD significance thresholds. See Section 4.8, and Appendix F.4.
Rule 1210 – HRA Public Notice	Plant risks are below the public notice threshold values. See Section 4.8 and Appendix F.4.

Regulation Citation	Compliance Strategy/Determination
Regulation XIV – Title V	Based on the current definitions in District Rule 1401 (a) and (b), the Applicant believes that the plant and emissions units are not currently subject to Title V for criteria pollutants or HAPs, but the plant will be subject to Title V based on GHG emissions, therefore a Title V application will be submitted within 12 months of the commencement of operations.
Regulation XV - Conformity	Construction emissions are well below the conformity thresholds for nonattainment pollutants (and precursors). Plant operational emissions are exempt from a conformity determination due to applicability of NSR and PSD.

4.7.7 Agencies, Agency Contacts, and Jurisdiction

Table 4.7-30 presents data on the following: (1) air quality agencies that may or will exercise jurisdiction over air quality issues resulting from the proposed power plant, (2) the most appropriate agency contact for the proposed Project, (3) contact address and phone information, and (4) the agency involvement in required permits or approvals.

Table 4.7-30 Agencies, Contacts, Jurisdictional Involvement, and Required Permits for Air Quality

Agency	Contact	Phone	Email	Mailing Address	Jurisdictional Area	Permit Status
California Energy Commission	Eric Solorio, Project Manager	(916) 651-0966	Esolorio @energy.state.ca.us	1516 Ninth Street Sacramento, CA 95814	Primary reviewing and certification agency.	Will certify the proposed Project under the energy siting regulations and CEQA. Certification will contain a variety of conditions pertaining to emissions and operation.
California Energy Commission	Gerald R. Bemis, CEC Staff Analyst	(916) 654-4960	Gbemis @energy.state.ca.us	1516 Ninth Street Sacramento, CA 95814	Primary reviewing and certification agency.	Will certify the proposed Project under the energy siting regulations and CEQA. Certification will contain a variety of conditions pertaining to emissions and operation.
San Diego Air Pollution Control District	Tom Weeks, Chief, Engineering Division	(858) 586-2715	tom.weeks @sdcounty.ca.gov	10124 Old Grove Road. San Diego, CA 92131	Prepares Determination of Compliance (DoC) for CEC; upon CEC issuance of license and confirmation that Project compliance with license and DOC, issues SDAPCD Permit to Operate; primary air regulatory and enforcement agency.	DoC will be prepared subsequent to AFC submittal. Although AFC considered to be equivalent of application for Authority to Construct (ATC) per Rule 20.5, separate ATC application submitted to SDAPCD concurrent with AFC.

Agency	Contact	Phone	Email	Mailing Address	Jurisdictional Area	Permit Status
California Air Resources Board	Mike Tollstrup, Chief, Project Assessment Branch	(916) 322-6026	Mtollstr @arb.ca.gov	1001 I Street, 6th Floor Sacramento, CA 95814	Provides guidance on SDAPCD implementation of its stationary source permitting and enforcement program.	CARB staff may provide comments on applicable AFC sections affecting air quality and public health. CARB staff will also have opportunity to comment on preliminary DoC.
Environmental Protection Agency, Region IX	Gerardo Rios, Chief, Permits Section USEPA-Region 9	(415) 972-3974	rios.gerardo @epa.gov	75 Hawthorne Street San Francisco, CA 94105	Oversight of SDAPCD NSR permitting program and rules approved as part of California State Implementation Plan (SIP); PSD permitting authority.	USEPA Region 9 staff will receive a copy of the AFC and DoC. USEPA Region 9 will process and issue the required PSD permit.

4.7.8 Required Permits and Permitting Schedules

Although SDAPCD rules otherwise require an applicant to obtain an Authority to Construct prior to construction of any emissions source (*see* SDAPCD Rule 10(a)), State law provides that the CEC's issuance of license shall be in lieu of any permit or similar document required by any other state or local agency (Cal. Health & Saf. Code § 25500). Accordingly, SDAPCD Rule 20.5(d) provides that, for power plants subject to the CEC's jurisdiction, the Air Pollution Control Officer shall consider the AFC to be equivalent to an application for an Authority to Construct during the Determination of Compliance review, and shall apply all provisions of the District rules and regulations which apply to applications for an Authority to Construct. SDAPCD Rule 20.5(i) provides that, upon CEC's issuance of license and confirmation that the source complies with all license and Determination of Compliance conditions, the source shall be issued a Permit to Operate. In addition, a PSD application will be filed with USEPA Region 9 concurrent with submittal of the AFC to the CEC. The SDAPCD and PSD permit applications will consist of a complete copy of the AFC, required agency application forms, and any support analyses required as identified prior to submittal.

The San Diego SDAPCD permitting application forms are presented in Appendix F.9.

4.7.9 References

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DATA ADEQUACY WORKSHEETS

Section 4

Public Health Analysis

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4.8 PUBLIC HEALTH

This section presents the methodology and results of a human health risk assessment performed to assess potential impacts and public exposure associated with airborne emissions from the routine operation of the proposed Quail Brush Generation Project. Section 4.8.1 describes the affected environment, Section 4.8.2 discusses the environmental consequences from the operation of the power plant and associated facilities, Section 4.8.3 discusses cumulative impacts. Section 4.8.4 discusses mitigation measures, Section 4.8.5 presents applicable LORS, Section 4.8.6 presents permit requirements and schedules, and Section 4.8.7 presents agency contacts. Section 4.8.8 contains references cited or consulted in preparing this section. The following appendices contain supporting information referenced in the aforementioned subsections:

Appendix F.1	Emissions Calculations and Support Data
Appendix F.2	Dispersion Modeling and Air Quality Impact Analysis Support Data
Appendix F.3	Dispersion Modeling Protocol
Appendix F.4	Health Risk Assessment Support Data
Appendix F.5	Construction Emissions Analysis and Support Data
Appendix F.6	BACT Analysis for Criteria and GHG Pollutants
Appendix F.7	Mitigation of Impacts
Appendix F.8	Cumulative Impacts Protocol and Support Data
Appendix F.9	San Diego APCD Permit Application Forms
Appendix F.10	Miscellaneous Support Data

Air will be the dominant pathway for public exposure to chemical substances released by the power plant. Emissions to the air will consist primarily of combustion by-products produced by the natural gas-fired internal combustion engines (ICEs), and combustion products from the emergency generator engine. Potential health risks from combustion emissions will occur almost entirely by direct inhalation. To be conservative, additional pathways were included in the health risk modeling; however, direct inhalation is considered the most likely exposure pathway. The risk assessment was conducted in accordance with guidance established by the California Office of Environmental Health Hazard Assessment (OEHHA) and the CARB.

Combustion byproducts with established CAAQS or NAAQS, including oxides of NO_x, carbon monoxide, and fine particulate matter are addressed in Section 4.7, Air Quality. However, some discussion of the potential health risks associated with these substances is presented in this section. Human health risks potentially associated with accidental releases of stored acutely hazardous materials at the proposed plant (if any) is discussed in Section 4.9, Hazardous Materials Handling.

4.8.1 Affected Environment

The existing plant site is located west and northwest of the City of Santee, California (San Diego County). The site is located on the north side of SR 52, adjacent to and east of Sycamore Landfill Road. The Sycamore Landfill lies to the north of the site approximately 0.42 miles. The City of Santee lies in close proximity to the site to the northeast (1.3 miles), east (0.94 miles), and southeast (0.3 miles). The topography of the plant site and surrounding area is essentially low rolling hills, with elevations ranging from 250 to over 800 feet amsl. The plant site elevation ranges from approximately 415 to 530 feet amsl. The site and immediate surrounding area to the north, west, and south-southwest are primarily uninhabited vacant open space. The site occupies approximately 11 acres within a 21.6-acre parcel of presently vacant "open space" land. The MCAS Miramar boundary is to the north of the plant site approximately 1.55 miles, and the main runway complex at MCAS Miramar is 6 miles to the northwest. Gillespie Field (airport) lies approximately 3 miles to the southeast, and Montgomery Field (airport) lies 6.4 miles to the southwest.

Per the 2000 census tract map (Appendix F.4, Figure F.4-1), the plant site is situated in a non-numerated census tract. Based on the revised census tract map (Figure 4.8-1), a majority of the site is located in tract #0095.04, with a small portion of the southern extent of the site potentially lying within tract #0166.06. Figure 4.8-1 shows the site and surrounding census tracts within the same 6-mile radius. The Census Findings table (Appendix F.4) presents a summary of data for each identified census tract within the 6-mile radius.

According to the Auer land use classification scheme, a 3-kilometer radius boundary around the proposed plant site yields a predominately rural classification. This is consistent with the current City of San Diego land use and general plan designation for the site and surrounding area as "open space," i.e., a large portion of the land surrounding the proposed site (to the southwest, west, northwest, and northeast) is vacant. The site is zoned RS-1-8 (single family residential), although it is unlikely that residential units will be built in such close proximity to the Sycamore Landfill. The Sycamore Landfill, which lies to the north of the plant site, is zoned "industrial employment" (SANDAG 2007).

Sensitive receptors are defined as groups of individuals that may be more susceptible to health risks due to chemical exposure. Schools (public and private), day care facilities, convalescent homes, and hospitals are of particular concern. The 10 nearest sensitive receptors closest to the plant site are listed in Table 4.8-1. Appendix F.4 contains a list of all sensitive receptors within a radius of 6 miles from the site. Figure 4.8-2 shows all sensitive receptors within 6 miles of the plant site.

Table 4.8-1 Ten Nearest Sensitive Receptors Closest To The Project

Receptor Type	Distance from Site, ft.	Latitude, Longitude
Hospital	2,754	-117.02216, 32.84553
Daycare	3,581	-117.02179, 32.84254
Daycare	4,271	-117.01870, 32.84249
Daycare	4,501	-117.01973, 32.84070
Daycare	4,770	-117.01617, 32.84312
Daycare	4,775	-117.01954, 32.83984
School	4,856	-117.01494, 32.84459

Receptor Type	Distance from Site, ft.	Latitude, Longitude
School	5,046	-117.01297, 32.84981
Daycare	5,252	-117.01524, 32.84190
Daycare	5,311	-117.01603, 32.84073

Air quality and health risk data presented by CARB in the *2009 Almanac of Emissions and Air Quality* (CARB 2009b) for the San Diego air basin shows that over the period 1990 through 2007, the average concentrations for the top ten toxic air contaminants (TACs) have been substantially reduced, and the associated health risks for the air basin are showing a steady downward trend as well. CARB-estimated emissions inventory values for the top ten TACs for 2008 and ambient concentration and associated risk values for 1990-2007 are presented in Table 4.8-2 for the air basin. Toxics emissions data presented in the SDAPCD (SDAPCD 2007:2009) Air Toxics "Hot Spots" Report indicate the following:

- Overall, local emissions of toxic air contaminants from industrial sources have decreased by approximately 89 percent since 1989.
- Most recent estimated emissions data from industrial sources for the period 2005-2008 indicate that such sources emitted approximately 2,019,775 pounds per year of the various toxic substances identified in the AB2588 program guidelines.
- Most recent estimated emissions data from mobile, area, and natural sources for the period 2005-2008 indicate that such sources emitted approximately 62,843,978 pounds per year of the various toxic substances identified in the AB2588 program guidelines.

No health studies prepared by the local San Diego County Health Department were identified for use in the plant health risk assessment which directly pertained to the Project impact region.

In addition, a review of the 2007 through 2009 air toxics inventory summaries published by the SDAPCD, indicates that the closest AB2588 reporting source to the proposed plant, i.e., the Sycamore Landfill, is not listed in any of the these toxics emissions summaries.

Table 4.8-2 Top Ten Toxic Air Contaminants for the San Diego Air Basin

TAC	Year 2008 Emissions (tons/yr)	Maximum Concentration	Predicted Cancer Risk, per million
Acetaldehyde	524	0.88 ppb	4
Benzene	770	0.373 ppb	35
1,3 Butadiene	233	0.073 ppb	27
Carbon tetrachloride	0.09	nd	nd
Chromium 6	0.06	0.034 ng/m^3	5
Para-Dichlorobenzene	122	nd	nd
Formaldehyde	1282	2.24 ppb	16
Methylene Chloride	359	0.14 ppb	<1
Perchloroethylene	422	0.03 ppb	1
Diesel Particulate Matter (DPM)	1,607	1.4 $\mu g/m^3$	420

4.8.2 Environmental Consequences

4.8.2.1 Significance Criteria

Cancer Risk

Cancer risk is the probability or chance of contracting cancer over a human life span (assumed to be 70 years). Carcinogens are not assumed to have a threshold below which there would be no human health risk. In other words, any exposure to a carcinogen is assumed to have some probability of causing cancer; the lower the exposure, the lower the cancer risk (i.e., a linear, no-threshold model). Under various state and local regulations, an incremental cancer risk greater than 10-in-one million due to a project is considered to be a significant impact on public health. For example, the 10-in-one-million risk level is used by the Air Toxics Hot Spots (AB 2588) program and California's Proposition 65 as the public notification level for air toxic emissions from existing sources.

Non-Cancer Risk

Non-cancer health effects can be either chronic or acute. In determining potential non-cancer health risks (chronic and acute) from air toxics, it is assumed there is a dose of the chemical of concern below which there would be no impact on human health. The air concentration corresponding to this dose is called the Reference Exposure Level (REL). Non-cancer health risks are measured in terms of a hazard index, which is the calculated exposure of each contaminant divided by its REL. Hazard quotients for each pollutant affecting the same target organ are typically summed with the resulting totals expressed as hazard indices for each organ system. A hazard index of less than 1.0 is considered to be an insignificant health risk. For this health risk assessment, all hazard quotients were summed regardless of target organ. This method leads to a conservative (upper bound) assessment. RELs used in the hazard quotient and index calculations were those published in the CARB/OEHHA listings dated February 2011 (CARB 2011: Appendix F.4).

Chronic toxicity is defined as adverse health effects from prolonged chemical exposure, caused by chemicals accumulating in the body. Because chemical accumulation to toxic levels typically occurs slowly, symptoms of chronic effects usually do not appear until long after exposure commences. The lowest no-effect chronic exposure level for a non-carcinogenic air toxic is the chronic REL. Below this threshold, the body is capable of eliminating or detoxifying the chemical rapidly enough to prevent its accumulation. The chronic hazard index was calculated using the hazard index's calculated with annual concentrations.

Acute toxicity is defined as adverse health effects caused by a brief chemical exposure of no more than 24 hours. For most chemicals, the air concentration required to produce acute effects is higher than the level required to produce chronic effects because the duration of exposure is shorter. Because acute toxicity is predominantly manifested in the upper respiratory system at threshold exposures, all hazard quotients are typically summed to calculate the acute hazard index. Average concentrations, for specified averaging periods, are divided by acute RELs to obtain a hazard index for health effects caused by relatively high, short-term exposure to air toxics.

4.8.2.2 Construction Phase Impacts

The construction phase of the proposed Project is expected to take approximately 18 months. No significant public health effects are expected during the construction phase. Strict construction practices that incorporate safety and compliance with applicable LORS will be followed (see Section 4.7). In addition, mitigation measures to reduce air emissions from construction impacts will be implemented as described in Section 4.7 (and Appendix F.5).

Temporary emissions from construction-related activities are discussed in Section 4.7, and quantified in Appendix F.5. Ambient air modeling for particulate matter less than 10 microns in aerodynamic diameter (PM_{10}), carbon monoxide, sulfur dioxide (SO_2) and NO_x was performed as described in Section 4.7. Construction-related emissions are temporary and localized, resulting in no long-term impacts to the public.

Small quantities of hazardous waste may be generated during the construction phase of the Project. Hazardous waste management plans will be in place so the potential for public exposure is minimal. Refer to Section 4.11 (Waste Management) for more information. No acutely hazardous materials will be used or stored onsite during construction (see Section 4.9, Hazardous Materials Handling). To ensure worker safety during construction, safe work practices will be followed (see Section 4.10, Worker Safety).

4.8.2.3 Operations Phase Impacts

Environmental consequences potentially associated with operations of the power plant are potential human exposure to chemical substances emitted into the air. The human health risks potentially associated with these chemical substances were evaluated in a health risk assessment. The chemical substances potentially emitted to the air from the proposed plant include ammonia (as ammonia slip from the SCR NOx control system), volatile organic compounds (VOCs) and PAHs from the combustion engines, and DPM from the emergency fire pump engine. These chemical substances are listed in Table 4.8-3.

Table 4.8-3 Chemical Substances Potentially Emitted to the Air from the Project

Criteria Pollutants	Noncriteria Pollutants (Continued)
Carbon monoxide	Benzene*
NO_X	Ethylbenzene*
Particulate matter	Formaldehyde*
SO_X	Hexane*
VOCs	Propylene
Noncriteria Pollutants (Toxic Pollutants)	**Biphenyl***
Diesel PM	Toluene*
Ammonia (urea use)	Xylenes*
Acetaldehyde*	Methanol*
Acrolein*	PAHs*
1,3-Butadiene*	Naphthalene*

Notes: *Federal VOC HAP

Emissions of criteria pollutants will adhere to NAAQS or CAAQS as discussed in Section 4.7, Air Quality. The proposed plant also will include emission control technologies necessary to meet the required emission standards specified for criteria pollutants under SDAPCD rules. Offsets will not be required because the proposed plant is a non-major source under District NSR Rules 20.1 and 20.2. Finally, air dispersion modeling results (presented in Section 4.7) show that emissions will not result in concentrations of criteria pollutants in air that exceed ambient air quality standards (either NAAQS or CAAQS). These standards are intended to protect the general public with a wide margin of safety. Therefore, the Project is not anticipated to have a significant impact on public health from emissions of criteria pollutants.

Potential impacts associated with emissions of toxic pollutants to the air from the proposed power plant were addressed in a health risk assessment, presented in Appendix F.4. The risk assessment was prepared using guidelines developed by OEHHA and CARB, as implemented in the latest version of the HARP model (Version 1.4d). (CARB 2003, CARB 2009a, OEHHA/CARB 2003).

4.8.2.4 Public Health Impact Study Methods

Emissions of toxic pollutants potentially associated with the plant were estimated using emission factors derived from sources such as the SDAPCD, CARB, USEPA, and source test data on similar engines. Concentrations of these pollutants in air potentially associated with the emissions were estimated using the AERMOD dispersion modeling programs. Modeling allows the estimation of both short-term and long-term average concentrations in air for use in the risk assessment process, accounting for site-specific terrain and meteorological conditions. Health risks potentially associated with the estimated concentrations of pollutants in air were subsequently characterized in terms of excess lifetime cancer risks (for carcinogenic substances), or comparison with reference exposure levels for non-cancer health effects (for non-carcinogenic substances).

Health risks were evaluated for a hypothetical maximum exposed individual (MEI) located at the maximum impact receptor (MIR). The hypothetical MEI is an individual assumed to be located at the MIR point (assumed residential receptor) where the highest concentrations of air pollutants associated with plant emissions are predicted to occur, based on air dispersion modeling. Human health risks associated with emissions from the proposed plant are unlikely to be higher at any other location than at the location of the MIR. If there is no significant impact associated with concentrations in air at the MIR location, it is unlikely that there would be significant impacts in any location in the vicinity of the plant. The highest concentration location represents the MIR, unless this receptor location lies in an area which is clearly not appropriate for characterization of the MEI health risks, i.e., lake or river surface locations, river beds, freeway or roadway locations, airports, or land areas zoned that would preclude residential or worker occupation over the course of the power plant lifetime.

Health risks potentially associated with concentrations of carcinogenic pollutants in air were calculated as estimated excess lifetime cancer risks. The excess lifetime cancer risk for a pollutant is estimated as the product of the concentration in air and a unit risk value. The unit risk value is defined as the estimated probability of a person contracting cancer as a result of constant exposure to an ambient concentration of 1 $\mu g/m^3$ over a 70-year lifetime. In other words, it represents the increased cancer risk associated with continuous exposure to a concentration in air over a 70-year lifetime. Evaluation of potential non-cancer health effects from exposure to short-term and long-term concentrations in air were performed by comparing modeled concentrations in air with the RELs. An REL is a concentration in air at or below which no adverse health effects are anticipated. RELs are typically based on the most sensitive adverse effects reported in the medical and toxicological literature. Potential non-cancer effects were evaluated by calculating a ratio of the modeled concentration in air and the REL. This ratio is referred to as a hazard quotient. The unit risk values and RELs used to characterize health risks associated with modeled concentrations in air were obtained from the *Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values* (CARB 2011), and are presented in Table 4.8-4.

Table 4.8-4 Toxicity Values Used To Characterize Health Risks

Compound	Unit Risk Factor $(\mu g/m^3)^{-1}$	Chronic Reference Exposure Level $(\mu g/m^3)$	Acute Reference Exposure Level $(\mu g/m^3)$
Acetaldehyde	2.70E-06	1.40E+02	4.70E+02
Acrolein	--	3.50E-01	2.50E+00
Ammonia	--	2.00E+02	3.20E+03
Biphenyl	--	--	--
Benzene	2.90E-05	6.00E+01	1.30E+03
1,3-Butadiene	1.70E-04	2.00E+01	--
Diesel PM	3.00E-04	5.00E+00	--
Ethylbenzene	2.50E-06	2.00E+03	--
Formaldehyde	6.00E-06	9.00E+00	5.50E+01
Hexane	--	7.00E+03	--
Methanol	--	4.00E+03	2.80E+04
Naphthalene	3.40E-05	9.00E+00	--
PAHs (as BaP for HRA)	1.10E-03	--	--
Propylene	--	3.00E+03	--
Toluene	--	3.00E+02	3.70E+04
Xylene (mixed isomers)	--	7.00E+02	2.20E+04

Source: CARB/OEHHA 2/2011

Tables 4.8-5 and 4.8-6 delineate the maximum hourly and annual emissions of all identified air toxic pollutants from the power plant processes. Total plant HAP emissions are well below the federal major source significance levels of 10 tons per year (tpy) of any single HAP, and 25 tpy of all HAPs. As such, the plant is not a major source of HAPS or air toxic pollutants, and any NESHAPs standards under 40 CFR 63 are not applicable to the plant.

Table 4.8-5 Air Toxic Emissions Estimates

Toxic	Max Hourly Emissions (lbs)	Max Annual Emissions (lbs)
Wartsila Engines (11)		
Total PAHs w/o Naphthalene	0.0001	0.266
Naphthalene	0.0065	26.244
Ethylbenzene	0.0185	74.466
1-3 Butadiene	0.0953	384.063

Toxic	Max Hourly Emissions (lbs)	Max Annual Emissions (lbs)
Acetaldehyde	0.1374	533.798
Acrolein	0.0153	61.770
Benzene	0.0566	228.304
Formaldehyde	0.6139	2475.076
Toluene	0.0622	250.708
Biphenyl	0.0561	226.171
Hexane	0.2937	1184.196
Propylene	1.3971	5632.931
Methanol	0.6615	2667.108
Xylenes	0.1678	676.378
Ammonia	11.88	47900.2
Fuel Gas Heater		
Total PAHs w/o Naphthalene	0.00000157	0.00664
Naphthalene	0.00000118	0.00498
Ethylbenzene	0.0000373	0.158
1-3 Butadiene	0	0
Acetaldehyde	0.0000348	0.147
Acrolein	0.0000177	0.0749
Benzene	0.0000169	0.0716
Formaldehyde	0.0000667	0.282
Toluene	0.000144	0.608
Hexane	0.0000247	0.105
Propylene	0.00287	12.1
Xylenes	0.000107	0.452
Warm Start Heater		
Total PAHs w/o Naphthalene	0.00000157	0.00774
Naphthalene	0.00000118	0.0058
Ethylbenzene	0.0000373	0.184
1-3 Butadiene	0	0
Acetaldehyde	0.0000348	0.172
Acrolein	0.0000177	0.0872
Benzene	0.0000169	0.0834
Formaldehyde	0.0000667	0.329
Toluene	0.000144	0.708
Hexane	0.0000247	0.122
Propylene	0.00287	14.1
Xylenes	0.000107	0.526

Notes: See Appendix F.1 for detailed emissions data.

Table 4.8-6 Diesel Engine Exhaust Emissions

Toxic / Source	Max Hour Emissions (lb)	Max Daily Emissions (lb)	Max Annual Emissions (lb)
DPM / Fire Pump	0.03	0.03	1.43

Notes: See Appendix F.1 for detailed emissions data.

4.8.2.5 Characterization of Risks from Toxic Air Pollutants

The excess lifetime cancer risk associated with concentrations in air estimated for the power plant MIR location is estimated to be 1.53 x 10^{-6} (1.53 per one million). Excess lifetime cancer risks less than 1 x 10^{-6} are unlikely to represent significant public health impacts that require additional controls of plant emissions. Risks higher than 1 x 10^{-6} may or may not be of concern, depending upon several factors. These include the conservatism of assumptions used in risk estimation, size of the potentially exposed population, and toxicity of the risk-driving chemicals. Health effects risk thresholds are listed on Table 4.8-7. Risks associated with pollutants potentially emitted from the plant are presented in Table 4.8-8. Further description of the methodology used to calculate health risks associated with emissions to the air is presented in Appendix F.4. As described previously, human health risks associated with emissions from the proposed power plant are unlikely to be higher at any other location than at the location of the MIR. If there is no significant impact associated with concentrations in air at the MIR location, it is unlikely that there would be significant impacts in any other location in the vicinity of the plant.

The MIR location data is as follows: (Hotspots Analysis and Reporting Program [HARP] PMI Summary file)

- Receptor # : 36
- UTM Coordinates: 497427mE, 3634740mN
- Type of Receptor: Near Fenceline

The noted receptor does not lie in an area that is precluded from being used as the MIR because it is possible that someone could be at or near the fence line. As such, the noted receptor was used as the basis for the upper bound health risks associated with the plant emissions.

Table 4.8-7 Health Effects Significant Threshold Levels

	Significance Thresholds	
Risk Category	SDAPCD	State of California
Cancer Risk per million	<= 1.0 without T-BACT <= 10.0 with T-BACT	<= 1.0 without T-BACT <= 10.0 with T-BACT
Acute Hazard Index	1.0	1.0
Chronic Hazard Index	1.0	1.0
Cancer Burden	1.0	1.0

Notes: T-BACT = best available control technology for air toxic compounds

Table 4.8-8 Project Health Risk Assessment Summary

Plant Total (All Processes)		
Risk Category	**Plant Values**	**Applicable Significance Threshold**
Cancer Risk (at MIR)	1.53E -06	<= 10.0 with T-BACT
Chronic Hazard Index (at MIR)	0.00609	1.0
Acute Hazard Index (at MIR)	0.0576	1.0
Acute Hazard Index (at Acute MIR)	0.115	1.0
Cancer Burden	0.0	1.0

Notes: No acute REL has been established for diesel PM.
Acute HI at the Acute MIR may differ from the Acute HI at the Cancer MIR.

Cancer risks potentially associated with plant emissions also were assessed in terms of cancer burden. Cancer burden is defined as the hypothetical upper-bound estimate of the additional number of cancer cases that could be associated with emissions from the Project. The commonly defined zone used to estimate cancer burden is the area within the isopleth surrounding the plant where receptors have a multi-pathway cancer risk equal to or greater than 1.0×10^{-6}. Cancer burden is a hypothetical upper-bound estimate of the additional number of cancer cases that could be associated with emissions from the plant. Cancer burden is calculated as the worst-case product of the 1.0×10^{-6} excess lifetime cancer risk and the number of individuals at that risk level. A worst-case estimate of cancer burden was calculated based on the following assumptions.

The 1.0×10^{-6} cancer risk was applied to all affected portions of identified census tracts within the radius area defined by the distance to the highest 1.0×10^{-6} concentration. A detailed listing and map of affected census tracts and population estimates are provided in Appendix F.4. Figures presented in Appendix F.4 show the 6-mile radius plot in relationship to the census tract locations and site. This procedure results in a conservatively high estimate of cancer burden. The calculated cancer burden for the Project is essentially zero.

As described previously, human health risks associated with emissions from the proposed power plant are unlikely to be higher at any other location than at the location of the MIR. Therefore, the risks for all of these individuals would be lower (and in most cases, substantially lower) than 1.53×10^{-6}. The estimated cancer burden was zero, indicating that emissions from the plant would not be associated with any increase in cancer cases in the previously defined population. In addition, the cancer burden is less than the Rule 1200 threshold value of 1.0. As stated previously, the methods used in this calculation considerably overstate the potential cancer burden, further suggesting that plant emissions are unlikely to represent a significant public health impact in terms of cancer risk.

The acute non-cancer hazard quotient associated with concentrations in air is shown in Table 4.8-8. The acute non-cancer hazard quotients for all target organs fall below 1.0. As described previously, a hazard quotient less than 1.0 is unlikely to represent significant impact to public health. Further description of the methodology used to calculate health risks associated with emissions to the air is presented in Appendix F.4. As described previously, human health risks associated with emissions from the proposed plant are unlikely to be higher at any other location than at the location of the MIR. If there is no significant impact associated with concentrations in air at the MIR location, it is unlikely that there would be significant impacts in any other location in the vicinity of the plant.

Detailed risk and hazard values are provided in the HARP output presented in Health Risk Assessment CD (Appendix F.4).

The estimates of excess lifetime cancer risks and non-cancer risks associated with chronic or acute exposures fall below thresholds used for regulating emissions of toxic pollutants to the air. Historically, exposure to any level of a carcinogen has been considered to have a finite risk of inducing cancer. In other words, there is no threshold for carcinogenicity. Since risks at low levels of exposure cannot be quantified directly by either animal or epidemiological studies, mathematical models have estimated such risks by extrapolation from high to low doses. This modeling procedure is designed to provide a conservatively high estimate of cancer risks based on the most sensitive species of laboratory animal for extrapolation to humans (i.e., the assumption being that humans are as sensitive as the most sensitive animal species). Therefore, the true risk is not likely to be higher than risks estimated using unit risk factors and is most likely lower, and could even be zero.

An excess lifetime cancer risk of 1 x 10^{-6} is typically used as a screening threshold of significance for potential exposure to carcinogenic substances in air. The excess cancer risk level of 1 x 10^{-6}, which has historically been judged to be an acceptable risk, originates from efforts by the Food and Drug Administration to use quantitative risk assessment for regulating carcinogens in food additives in light of the zero tolerance provision of the Delany Amendment (Hutt 1985). The associated dose, known as a "virtually safe dose" has become a standard used by many policy makers and the lay public for evaluating cancer risks. However, a study of regulatory actions pertaining to carcinogens found that an acceptable risk level can often be determined on a case-by-case basis. This analysis of 132 regulatory decisions, found that regulatory action was not taken to control estimated risks below 1 x 10^{-6} (one-in-one million), which are called de minimis risks. De minimis risks are historically considered risks of no regulatory concern. Chemical exposures with risks above 4 x 10^{-3} (four-in-ten thousand), called de manifestis risks, were consistently regulated. De manifestis risks are typically risks of regulatory concern. The risks falling between these two extremes were regulated in some cases, but not in others (Travis et al 1987).

The estimated lifetime cancer risks to the maximally exposed individual located at the Project MIR are well below the 10 x 10^{-6} significance level (for sources equipped with T-BACT), and the aggregated cancer burden associated this risk level is less than 1.0 excess cancer case. In addition, the cancer burden is less than the Rule 1200 threshold value of 1.0. These risk estimates were calculated using assumptions that are highly health conservative. Evaluation of the risks associated with the power plant emissions should consider that the conservatism in the assumptions and methods used in risk estimation considerably overstate the risks from plant emissions. Based on the results of this risk assessment, there are no significant public health impacts anticipated from operational emissions of toxic pollutant to the air from the proposed power plant.

A screening risk calculation for construction impacts, based upon emissions of diesel particulate, and the inhalation pathway is presented in Appendix F.4, Table F.4-8. (SCAQMD 2005).

4.8.2.6 Hazardous Materials

Hazardous materials may be used and stored at the plant site. There will be no hazardous materials stored in quantities above threshold limits onsite. Descriptions of their uses are presented in Section 4.9 Hazardous Materials Handling. Use of chemicals at the proposed plant will be in accordance with standard practices for storage and management of hazardous materials. Normal use of hazardous materials, therefore, will not pose significant impacts to public health. While mitigation measures will be in place to prevent releases, accidental releases with the potential to migrate offsite could result in potential impacts to the public.

The CalARP and CFR Title 40 Part 68 under the Clean Air Act establish emergency response planning requirements for acutely hazardous materials stored at quantities above allowable thresholds. These regulations require that an offsite consequence analysis be completed and that an RMP be prepared as part of a comprehensive program to identify hazards and predict the areas that may be affected by a release of a program listed hazardous material. The Project will not store quantities above allowable thresholds onsite and hence the CalARP program does not apply.

4.8.2.7 Operation Odors

Small amounts of ammonia (from the use of urea) used to control NO_x emissions may be emitted at the exhaust stack but would not produce objectionable odors. The expected exhaust gas ammonia concentration, known as ammonia "slip," will be less than 10 ppm. After mixing with the atmosphere, the concentration at ground level will be far below the detectable odor threshold of 5 ppm that the Compressed Gas Association has determined to be acceptable, as well as being below the ACGIH Threshold Limit Value (TLV) and Short Term Exposure Limit (STEL) values of 25 and 35 ppm respectively (adopted 2003). Therefore, potential ammonia emissions are not expected to create objectionable odors. Other combustion contaminants, such as NO_x, CO, SO_x, and VOCs are not present at concentrations that could produce objectionable odors.

4.8.2.8 Electromagnetic Field Exposure

Because the gen tie does not travel through residential areas, and based on recent findings of the National Institute of Environmental Health Sciences (NIEHS 1999), electromagnetic field exposures are not expected to result in a significant impact on public health. The NIEHS report to the U.S. Congress found that "the probability that EMF exposure is truly a health hazard is currently small. The weak epidemiological associations and lack of any laboratory support for these associations provide only marginal scientific support that exposure to this agent is causing any degree of harm" (NIEHS 1999).

4.8.2.9 Summary of Impacts

Results from an air toxics risk assessment based on emissions modeling indicate that there will be no significant incremental public health risks from construction or operation of the proposed Project. Results from criteria pollutant modeling for routine operations indicate that potential ambient concentrations of NO_2, carbon dioxide, SO_2, and PM_{10} will not significantly impact air quality (see Section 4.7). Potential concentrations are below the federal and California standards established to protect public health, including the more sensitive members of the population.

4.8.3 Cumulative Impacts

The health risk assessment for the proposed Project indicates that the maximum cancer risk will be approximately 1.53 x 10^{-6} (or 1.53 in a million), versus a significance threshold of 10.0 x 10^{-6} (or 10 in one million) with T-BACT at the point of maximum exposure to air toxics from power plant emissions. This risk level is considered to be insignificant. Non-cancer chronic and acute effects will also be less than significant, i.e., HI's are less than 1. Risks below these cancer and non-cancer impact thresholds are considered de minimis. Therefore, the risk that impacts from the Project will result in a significant impact, in combination with impacts from other past, present, and reasonably foreseeable future projects, should also be very low. Existing projects are considered as air pollutant emitters in the background data that is used in health risk modeling for the air toxics risk assessment.

For the purpose of the public health cumulative analysis must also consider whether emissions from operation of the Project could potentially combine with emissions from past, present, and reasonably foreseeable projects to result in adverse health effects to the public. Cumulative impacts in the area of public health could occur if emission sources are close enough so that their plumes combine. Due to differences in emission source elevations, terrain features, wind direction, and other meteorological factors, it is unlikely that emission plumes from two or more facilities would combine unless they are located in very close proximity. Furthermore, dispersion of plumes tends to occur in parallel, preventing the mixing of plumes from separate locations. On the basis of numerous previous air dispersion modeling studies conducted by CEC staff to assess public health cumulative impacts, it has been shown repeatedly that unless two sources are within approximately 0.5 miles of each other, their cumulative health risks do not combine to turn an insignificant individual health risk into a significant one.

Only one AB2588 reporting source was noted within the 0.5 mile radius of the proposed site, i.e., the Sycamore Landfill. Toxics emitting sources at the landfill are primarily from the combustion of landfill gas in the small power plant (~4MW), the landfill gas flares, and fugitive evaporative emissions of organics from the landfill surface. Appendix F.4 contains a listing of the most recent emissions levels for the substances identified under AB2588. It is highly unlikely that these substances and the levels at which they are emitted from the landfill sources would combine with Project emissions to produce a cumulative health risk impact.

No other significant stationary sources of air toxic emissions were identified within this half-mile radius area, and as such, no cumulative impacts with respect to health impacts are expected to occur.

4.8.4 Mitigation Measures

4.8.4.1 Criteria Pollutants

Emissions of criteria pollutants will be minimized by applying BACT to the plant. BACT for the primary combustion sources (Wartsila engines, fuel gas heater, and warm start heaters) includes the combustion of natural gas.

The proposed Project location is in an area that is designated by the federal air agency (USEPA) as non-attainment for ozone, and attainment for particulate matter (PM10 and PM2.5), CO, SO_x, NO_2, and lead. Pursuant to SDAPCD Rules 20.1 and 20.2, offsets are not required for a minor source. The requirements for BACT and clean fuels will result in low emissions from the proposed plant. As a consequence the Project impacts are below relevant risk thresholds for both cancer and non-cancer public health impacts. Therefore, further mitigation of emissions is not required to protect public health.

4.8.4.2 Toxic Pollutants

Emissions of toxic pollutants to the air will be minimized through the use of natural gas as the only fuel at the proposed plant, except for the small amount of diesel fuel combusted in the emergency fire pump engine. Emissions from any tanks storing liquid organic chemicals (if any) will be minimized through the use of one or a combination of the following:

- Use of small-capacity, fixed roof tanks
- Use of low vapor pressure organic substances
- Use of exempt compounds
- Use of vapor balance and/or vapor recovery systems on a case-by-case basis as deemed appropriate

4.8.4.3 Hazardous Materials

Mitigation measures for hazardous materials are presented below and discussed in more detail in Section 4.9. Potential public health impacts from the use of hazardous materials are only expected to occur as a result of an accidental release. The plant has many safety features designed to prevent and minimize impacts from the use and accidental release of hazardous materials. The Project site will include the following design features:

- Curbs, berms, and/or secondary containment structures will be provided where accidental release of chemicals may occur.
- A fire-protection system will be included to detect, alarm, and suppress a fire, in accordance with applicable LORS.
- Construction of the urea system will be in accordance with applicable LORS (local and state building codes).

A RMP for the plant, if required, will be prepared prior to commencement of plant operations. The RMP will estimate the impacts presented by handling and storage of identified RMP substances at the plant. The RMP will include a hazard analysis, offsite consequence analysis, seismic assessment, emergency response plan, and training procedures. The RMP process will accurately identify and propose adequate mitigation measures to reduce the risk to the lowest possible level.

A safety program will be implemented and will include safety training programs for contractors and operations personnel, including instructions on: (1) the proper use of personal protective equipment, (2) safety operating procedures, (3) fire safety, and (4) emergency response actions. The safety program will also include programs on safely operating and maintaining systems that use hazardous materials. Emergency procedures for plant personnel include power plant evacuation, hazardous material spill cleanup, fire prevention, and emergency response.

Areas subject to potential leaks of hazardous materials will be paved and bermed. Incompatible materials will be stored in separate containment areas. Containment areas will be drained to either a collection sump or to holding or neutralization tanks. Also, piping and tanks exposed to potential traffic hazards will be additionally protected by traffic barriers.

4.8.5 Laws, Ordinances, Regulations, and Standards

An overview of the regulatory process for public health issues is presented in this section. The relevant LORS that affect public health and are applicable to this Project are identified in Table 4.8-9. The conformity of the Project to each of the LORS applicable to public health is also presented in this table. Table 4.8-10 summarizes the primary agencies responsible for public health, as well as the general category of the public health concern regulated by each of these agencies.

Table 4.8-9 Applicable LORS for Public Health

LORS	Public Health Concern	Primary Regulatory Agency	Project Conformance
Federal Clean Air Act Title III	Public exposure to air pollutants	USEPA Region 9 CARB SDAPCD	Based on results of risk assessment as per CARB/OEHHA guidelines, toxic contaminants do not exceed acceptable levels. Emissions of criteria pollutants will not cause or contribute to a violation of federal or California air quality standards and will be minimized by applying BACT to the plant. See AFC Section 4.7 and Appendix F.4.
Health and Safety Code 25249.5 et seq. (Safe Drinking Water and Toxic Enforcement Act of 1986—Proposition 65)	Public exposure to chemicals known to cause cancer or reproductive toxicity	OEHHA	Based on results of risk assessment as per CARB/OEHHA guidelines, toxic contaminants do not exceed thresholds that require exposure warnings. See AFC Section 4.8 and Appendix F.4.
40 CFR Part 68 (Risk Management Plan) and CalARP Program Title 19	Public exposure to acutely hazardous materials	USEPA Region 9 San Diego County Department of Health Services San Diego County Fire Department	An offsite consequence analysis is not required because the Project will not store hazardous materials in quantities above allowable thresholds. See Section 4.8.4.3.
Health and Safety Code Sections 25531 to 25541	Public exposure to acutely hazardous materials	San Diego County Department of Health Services CARB SDAPCD	An offsite consequence analysis is not required because the Project will not store hazardous materials in quantities above allowable thresholds. See Section 4.8.4.3.

LORS	Public Health Concern	Primary Regulatory Agency	Project Conformance
CHSC 25500-25542	Hazmat Inventory	State Office of Emergency Services and San Diego County Department of Environmental Health	Prepare all required HazMat plans and inventories, distribute to affected agencies. See Section 4.9.
CHSC 44300 et seq.	AB2588 Air Toxics Program	SDAPCD	Participate in the AB2588 inventory and reporting program at the District level. See Section 4.7 (LORS).
SDAPCD Rule 1200 and 1210	Toxics NSR	SDAPCD	Application of BACT and T-BACT, preparation of HRA. See Sections 4.7, 4.8, and Appendices F.4, and F.6.
CHSC 25249.5	Proposition 65	OEHHA	For potential exposure to hazardous materials that may be listed under Proposition 65, the Project will comply with all signage and notification requirements. See Section 4.9.
Health and Safety Code Sections 44360 to 44366 (Air Toxics "Hot Spots" Information and Assessment Act—AB 2588)	Public exposure to toxic air contaminants	CARB SDAPCD	Based on results of risk assessment as per CARB/OEHHA guidelines, toxic contaminants do not exceed acceptable levels. See Section 4.8 and Appendices F.1 and F.4.

4.8.6 Agencies and Agency Contacts

Table 4.8-10 provides contact information for agencies involved with Public Health.

Table 4.8-10 Agencies and Agency Contacts for Public Health

Public Health Concern	Primary Regulatory Agency	Regulatory Contact	Phone	Email	Mailing Address
Public exposure to air pollutants	USEPA Region 9 San Francisco, CA	Gerardo Rios	(415) 972-3974	rios.gerardo @epa.gov	75 Hawthorne Street San Francisco, CA 94105
	CARB Sacramento, CA	Mike Tollstrup	(916) 322-6026	Mtollstr @arb.ca.gov	1001 I Street, 6th Floor Sacramento, CA 95814
	SDAPCD San Diego, CA	Tom Weeks	(858) 586-2715	tom.weeks @sdcounty.ca.gov	10124 Old Grove Road. San Diego, CA 92131
Public exposure to chemicals known to cause cancer or reproductive toxicity	OEHHA Sacramento, CA	Cynthia Oshita	(916) 322-2068	Coshita @oehha.ca.gov	1001 I Street, 19th Floor Sacramento, CA 95814
Public exposure to acutely hazardous materials	USEPA Region 9 San Francisco, CA	Gerardo Rios	(415) 972-3974	rios.gerardo @epa.gov	75 Hawthorne Street San Francisco, CA 94105
	San Diego County Department of Health Services	Environmental Health HazMat Division Jack Miller	(858) 505-6700	jack.miller @sdcounty.ca.gov	5500 Overland Ave, Ste 110, MS 0-560 San Diego, CA 92123

4.8.7 Required Permits and Permitting Schedule

Agency-required permits or approvals related to public health include an RMP (if required) and a SDAPCD Permit to Operate.[1] These requirements are discussed in detail in Sections 4.9 Hazardous Materials Handling, and 4.7 Air Quality, respectively.

4.8.8 References

California Air Resources Board (CARB). 2003. HARP 1.4d User Guide. CalEPA-Air Resources, Revised 2011.

__________________. 2009a. HARP On-Ramp Manual, Version 1, 2/3/09.

__________________. 2009b. Almanac of Emissions and Air Quality, CARB, 2009.

__________________. 2011. Consolidated table of OEHHA/ARB approved risk assessment health values. (http://arbis.arb.ca.gov/toxics/healthval/contable.pdf), February 2011.

Hutt. P.B. 1985. Use of quantitative risk assessment in regulatory decision making under federal health and safety statutes, in Risk Quantitation and Regulatory Policy. Eds. D.G. Hoel, R.A. Merrill and F.P. Perera. Banbury Report 19, Cold Springs Harbor Laboratory.

National Institute of Environmental Health Sciences (NIEHS). 1999. Environmental Health Institute report concludes evidence is 'weak' that EMFs cause cancer. Press release. National Institute of Environmental Health Sciences, National Institutes of Health.

OEHHA/CARB. 2003. Air Toxics Hot Spots Program Risk Assessment Guidelines, CalEPA, August 2003. HARP Model, Version 1.4d, Updated 1/20/11.

SCAQMD. 2005. Supplemental Guidelines for Preparing Risk Assessments for the Air Toxics Hot Spots Information and Assessment Act (AB2588). July 2005.

SANDAG (San Diego Association of Governments). 2007 RTP, Land Use Map dated 3/15/10, City of San Diego, Planning Department.http://www.sandiego.gov/planning/genplan/pdf/generalplan/lu2wstreetsystem8x11revised031510.pdf

SDAPCD. 2007:2009. California Air Toxics Hot Spots Information and Assessment Act, Program Reports, 2007-2009, San Diego APCD, 2007-2009.

Travis, C.C., E.A.C. Crouch, R. Wilson and E.D. Klema. 1987. Cancer risk management: A review of 132 federal regulatory cases. Environ. Sci. Technol. 21:415-420.

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[1] As per SDAPCD Rule 20.5, this application shall be considered the equivalent of an application for an Authority to Construct and will trigger SDAPCD's "Determination of Compliance" (DoC) review of the proposed Project; no separate Authority to Construct will be issued. Upon the CEC's issuance of a license and SDAPCD's confirmation that the Project complies with all license and DoC conditions, SDAPCD will issue a Permit to Operate for the Project.

FIGURES

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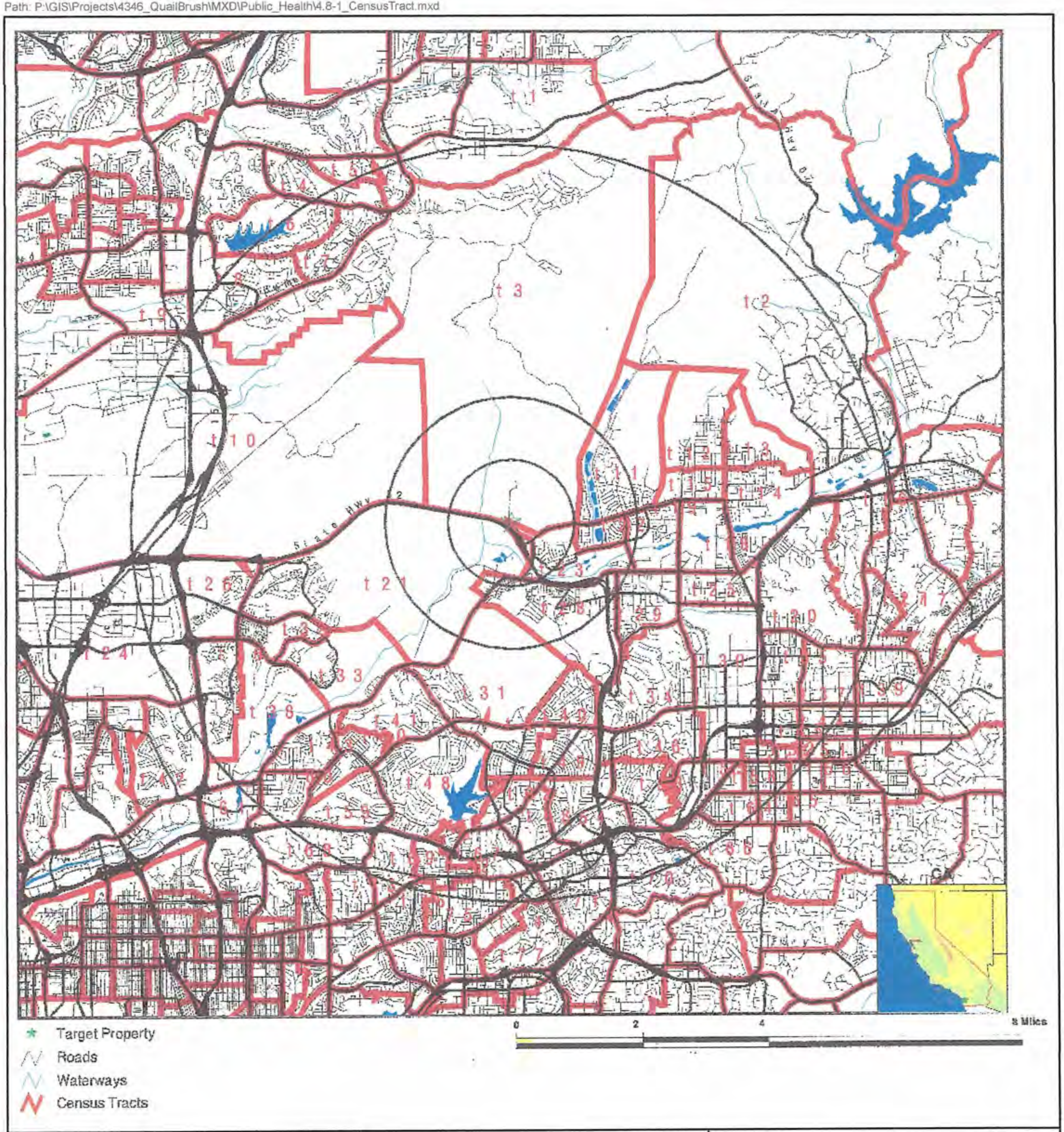

QUAIL BRUSH GENERATION PROJECT

FIGURE 4.8-1
CENSUS TRACT MAP FOR 6-MILE RADIUS

Cogentrix

TETRA TECH EC, INC.

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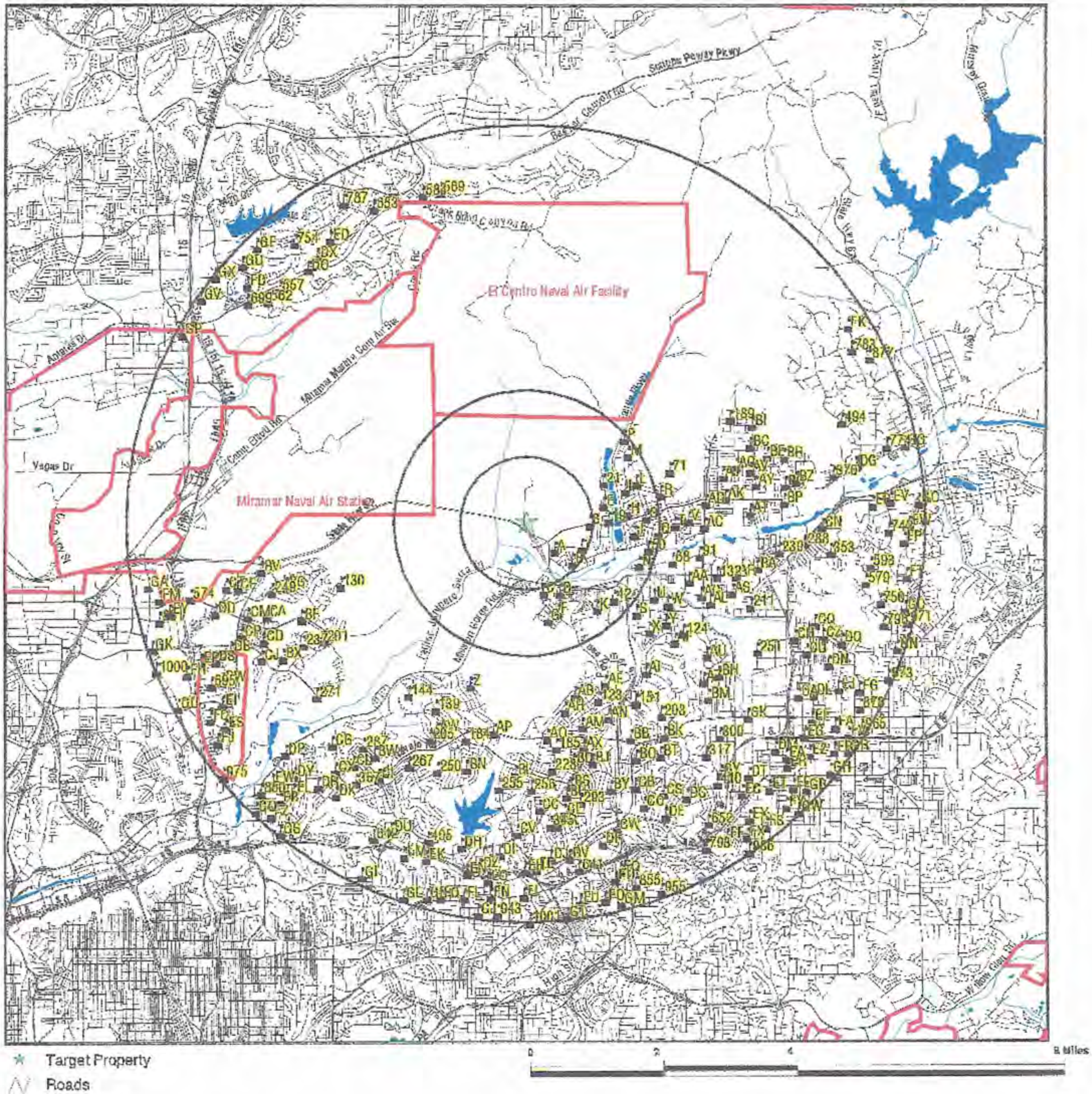

★ Target Property

/\/ Roads

/\/ Waterways

▪ Environmental or Public Receptor

/\/ Federal Lands Linear Features

/\/ Federal Lands Area

QUAIL BRUSH GENERATION PROJECT

FIGURE 4.8-2
SENSITIVE RECEPTORS MAP FOR 6-MILE RADIUS

Cogentrix

TETRA TECH EC, INC.

Section 5

Air Quality and Public Health Support Appendices

APPENDIX F.1

Calculation of Maximum Hourly, Daily, and Annual Emissions

Tables presented in this Appendix are as follows:

F.1-1	Criteria Pollutant and GHG Emissions from the Wartsila Engines
F.1-2	Wartsila Operational Case Data for QBPP
F.1-3	Criteria Pollutant and GHG Emissions from the Fuel Gas Heater
F.1-5	HAPs Emissions from the Fuel Gas Heater
F.1-6	Criteria Pollutant and GHG Emissions from the Warm Start Heater
F.1-7	HAPs Emissions from the Warm Start Heater
F.1-8	Criteria Pollutant, DPM, and GHG Emissions from the Fire Pump Engine
F.1-9	SO2 Emissions from the Wartsila Engines
F.1-10	Operational Related Truck and Employee Vehicle Emissions Estimates
F.1-11	Commissioning Emissions Estimates
F.1-12	Startup and Shutdown Emissions Estimates
F.1-13	Low Load Emissions Estimates (Steady State)

In addition to the above tables, other miscellaneous support data for the device-specific emissions calculations is also included in this Appendix.

Attachment F.1-1	Urea MSDS
Attachment F.1-2	Fire Pump Engine Specification Sheets
Attachment F.1-3	Wartsila 34SG Engine Brochure

Table F.1-1

Maximum Hourly, Daily, and Annual Emissions Calculations

Number of Identical Engines: 11

Full Load Case

Input data per unit:

Operation hrs/day	Annual Op hrs	Avg # of Cold Startups day	Avg # of Warm Startups day	Cold Startup Time hrs	Warm Startup Time hrs	Shutdown Time hrs	Cold Starts yr	Warm Starts yr	Estimated Shutdowns yr	Max Estimated Shutdowns day
24	4032	1	1	0.5	0.25	0.1417	300	100	400	2

	Cold Startup Emissions lbs/event	Warm Startup Emissions lbs/event	Shutdown Emissions lbs/event	Steady State Emissions lbs/hr *(100% Load)*	Total Cold Start hrs/yr	Total Warm Start hrs/yr	Total Shutdown hrs/yr	Annual Steady State Non SU/SD hrs/yr	Total Annual Emissions Cold Starts lbs/yr	Warm Starts lbs/yr	Shutdowns lbs/yr
NOx	8.82	2.43	0.2	1.317	150	25	56.68	3800.32	2646.0	243.0	80.0
CO	12.57	1.322	0.31	1.564					3771.0	132.2	124.0
VOC	6.614	1.764	0.34	1.584					1984.2	176.4	136.0
SOx	0.137	0.07	0.05	0.256					41.1	7.0	20.0
PM10	1.54	1.54	0.35	1.379					462.0	154.0	140.0
PM2.5	1.54	1.54	0.35	1.379					462.0	154.0	140.0

1. SU/SD emissions data and times derived from: Wartsila Emissions Data Sheet, DBAB715360, 2-27-11.
2. Cold start (CS): engine will reach steady state in 10 minutes and controls (SCR and CO Cat) will be fully operational in 30 minutes.
3. Warm start (WS): engine will reach steady state in 10 minutes and controls (SCR and CO Cat) will be fully operational in 15 minutes.
4. A warm start is defined as a start initiated within 2-6 hours after the engine has been shutdown, or when the emissions control system is at a temperature of no less than 270 C (518 F).
5. Shutdown time is optimally 8.5 minutes per Wartsila.
6. Cold start plus shutdown = 0.6417 hrs steady state = 0.3583 hrs
7. Warm start plus shutdown = 0.3917 hrs steady state = 0.6083 hrs
8. Shut down = 0.1417 hrs steady state = 0.8583 hrs
9. Steady state (SS) emissions values derived from Cogentrix/Wartsila.
10. SO2 emissions include S to SO2 from lube oil burn-off from cylinder sleeves.

Maximum Estimated Hourly Emissions **1 Hour Period**	NOx lbs/hr	CO lbs/hr	VOC lbs/hr	SOx lbs/hr	PM10 lbs/hr	PM2.5 lbs/hr		
Scenario 1	9.48	13.35	7.41	0.27	2.23	2.23	*1 Engine*	
Cold Start w/Steady State	104.26	146.87	81.47	2.92	24.52	24.52	All Engines	
Scenario 2	3.42	2.50	2.95	0.26	2.57	2.57	*1 Engine*	
Warm Start w/Steady State	37.60	27.45	32.47	2.88	28.32	28.32	All Engines	
Scenario 3	9.49	13.44	7.52	0.28	2.38	2.38	*1 Engine*	Max Hr
Cold Start, Steady State, Shutdown	104.41	147.84	82.74	3.07	26.23	26.23	All Engines	Max Hr
Scenario 4	3.43	2.58	3.07	0.28	2.73	2.73	*1 Engine*	
Warm Start, Steady State, Shutdown	37.74	28.42	33.74	3.03	30.02	30.02	All Engines	
Scenario 5	1.33	1.65	1.70	0.27	1.53	1.53	*1 Engine*	
Steady State w/Shutdown	14.63	18.18	18.70	2.97	16.87	16.87	All Engines	
Scenario 6	1.32	1.56	1.58	0.26	1.38	1.38	*1 Engine*	
Steady State	14.49	17.20	17.42	2.82	15.17	15.17	All Engines	

Maximum Estimated Annual Emissions		NOx	CO	VOC	SOx	PM10	PM2.5	
		lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	
Ops Scenario								
Cold Startups		2646.0	3771.0	1984.2	41.1	462.0	462.0	
Warm Startups		243.0	132.2	176.4	7.0	154.0	154.0	
Shutdowns		80.0	124.0	136.0	20.0	140.0	140.0	
Steady State		5005.0	5943.7	6019.7	972.9	5240.6	5240.6	
	1 Engine Totals, lbs/yr:	*7974.0*	*9970.9*	*8316.3*	*1041.0*	*5996.6*	*5996.6*	
	1 Engine Totals, tons/yr:	3.99	4.99	4.16	0.52	3.00	3.00	Max Annual
		NOx	CO	VOC	SOx	PM10	PM2.5	
		tpy	tpy	tpy	tpy	tpy	tpy	
	Total Tons/Yr All Engines:	**43.86**	**54.84**	**45.74**	**5.73**	**32.98**	**32.98**	Max Annual
EPA	PSD Significant Emissions Rates, TPY:	40	100	40	40	15	10	
SDAPCD	Air Agency Offset Trigger Levels, TPY:	50	100	50	100	100	100	

GHG Emissions Estimates

CCAR, General Reporting Protocol, Version 3.1, January 2009, Table C.6.

Fuel:	Natural Gas									
Btu/scf:	1019	HHV								
Heat Rate:	80.18	mmbtu/hr						CO2e		
Fuel Rate:	0.0787	mmscf/hr				short	IPCC SAR	short		
Emissions Factors			*Emissions*	lbs/hr	lbs/year	tons/yr	Values	tons/yr		
CO2	116.954	lbs/mmbtu		9.38E+03	3.78E+07	1.89E+04	1	1.89E+04		
CH4	0.01301	lbs/mmbtu		1.04E+00	4.21E+03	2.10E+00	21	4.42E+01		
N2O	0.0002205	lbs/mmbtu		1.77E-02	7.13E+01	3.56E-02	310	1.10E+01		
							Total CO2e:	18960	TPY	
							Total CO2e:	17236	metric TPY	1 Engine
							Total CO2e:	**189600**	**metric TPY**	11 Engines

PSD Triggered for GHGs: Yes

Maximum Estimated Daily Emissions **24 Hr Period Run Day**	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day	
Scenario 1	39.78	49.41	43.95	6.17	34.10	34.10	*1 Engine*
Cold Start, Steady State, Shutdown	437.61	543.54	483.49	67.83	375.11	375.11	All Engines
Scenario 2	33.72	38.56	39.50	6.16	34.45	34.45	*1 Engine*
Warm Start, Steady State, Shutdown	370.94	424.11	434.50	67.80	378.90	378.90	All Engines
Scenario 3	31.61	37.54	38.02	6.14	33.10	33.10	*1 Engine*
Steady State	347.69	412.90	418.18	67.58	364.06	364.06	All Engines
Scenario 4							*1 Engine*
******							All Engines

Maximum Estimated Daily Emissions **16 Hr Period Run Day**	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day	
Scenario 1	29.25	36.90	31.28	4.12	23.07	23.07	*1 Engine*
Cold Start, Steady State, Shutdown	321.72	405.90	344.10	45.31	253.76	253.76	All Engines
Scenario 2	23.19	26.04	26.83	4.12	23.41	23.41	*1 Engine*
Warm Start, Steady State, Shutdown	255.05	286.48	295.10	45.27	257.55	257.55	All Engines
Scenario 3	21.07	25.02	25.34	4.10	22.06	22.06	*1 Engine*
Steady State	231.79	275.26	278.78	45.06	242.70	242.70	All Engines
Scenario 4							*1 Engine*
******							All Engines

Maximum Estimated Daily Emissions **8 Hr Period Run Day**	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day	
Scenario 1	18.71	24.39	18.61	2.07	12.04	12.04	*1 Engine*
Cold Start, Steady State, Shutdown	205.82	268.27	204.71	22.78	132.41	132.41	All Engines
Scenario 2	12.65	13.53	14.16	2.07	12.38	12.38	*1 Engine*
Warm Start, Steady State, Shutdown	139.15	148.85	155.71	22.74	136.20	136.20	All Engines
Scenario 3	10.54	12.51	12.67	2.05	11.03	11.03	*1 Engine*
Steady State	115.90	137.63	139.39	22.53	121.35	121.35	All Engines
Scenario 4							*1 Engine*
******							All Engines

Other Misc Scenarios -based on run hour type

(CS-cold start hour, WS-warm start hour, SD-shutdown hour, SS-steady state hour)

	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day		
a - CS, SS, SD, WS, SS, SD (total ops period 12 hrs)								
	25.72	31.22	25.98	3.04	18.51	18.51	*1 Engine*	
	282.92	343.43	285.78	33.46	203.63	203.63	All Engines	
b - 3 CSs, 1 WS, 4 SDs, SS (total ops period 24 hrs)								
	58.25	74.18	57.31	6.23	37.46	37.46	*1 Engine*	Max Day
	640.71	816.03	630.43	68.55	412.07	412.07	All Engines	Max Day

50% Load Evaluation
Maximum Hourly, Daily Emissions Calculations

Number of Identical Engines: 11

Input data per unit:

Operation hrs/day	Annual Op hrs	Avg # of Cold Startups day	Avg # of Warm Startups day	Cold Startup Time hrs	Warm Startup Time hrs	Shutdown Time hrs	Cold Starts yr	Warm Starts yr	Estimated Shutdowns yr	Max Estimated Shutdowns day
24	4032	1	1	0.5	0.25	0.1417	300	100	400	2

	Cold Startup Emissions lbs/event	Warm Startup Emissions lbs/event	Shutdown Emissions lbs/event	Steady State Emissions lbs/hr ***(50% Load)***
NOx	8.82	2.43	0.2	0.921
CO	12.57	1.322	0.31	1.494
VOC	6.614	1.764	0.34	1.504
SOx	0.137	0.07	0.05	0.256
PM10	1.54	1.54	0.35	1.361
PM2.5	1.54	1.54	0.35	1.361

1. SU/SD emissions data and times derived from: Wartsila Emissions Data Sheet, DBAB715360, 2-27-11.
2. Cold start (CS): engine will reach steady state in 10 minutes and controls (SCR and CO Cat) will be fully operational in 30 minutes.
3. Warm start (WS): engine will reach steady state in 10 minutes and controls (SCR and CO Cat) will be fully operational in 15 minutes.
4. A warm start is defined as a start initiated within 2-6 hours after the engine has been shutdown, or
when the emissions control system is at a temperature of no less than 270 C (518 F).
5. Shutdown time is optimally 8.5 minutes per Wartsila.
6. Cold start plus shutdown = 0.6417 hrs steady state = 0.3583 hrs
7. Warm start plus shutdown = 0.3917 hrs steady state = 0.6083 hrs
8. Shut down = 0.1417 hrs steady state = 0.8583 hrs
9. Steady state (SS) emissions values derived from Cogentrix/Wartsila.
10. SO2 emissions include S to SO2 from lube oil burn-off from cylinder sleeves.

Maximum Estimated Hourly Emissions **1 Hour Period**	NOx lbs/hr	CO lbs/hr	VOC lbs/hr	SOx lbs/hr	PM10 lbs/hr	PM2.5 lbs/hr		
Scenario 1	9.28	13.32	7.37	0.27	2.22	2.22	*1 Engine*	
Cold Start w/Steady State	102.09	146.49	81.03	2.92	24.43	24.43	All Engines	
Scenario 2	3.12	2.44	2.89	0.26	2.56	2.56	*1 Engine*	
Warm Start w/Steady State	34.33	26.87	31.81	2.88	28.17	28.17	All Engines	
Scenario 3	9.35	13.42	7.49	0.34	2.38	2.38	*1 Engine*	Max Hr
Cold Start, Steady State, Shutdown	102.85	147.57	82.42	3.77	26.15	26.15	All Engines	Max Hr
Scenario 4	3.19	2.54	3.02	0.28	2.72	2.72	*1 Engine*	
Warm Start, Steady State, Shutdown	35.09	27.95	33.21	3.03	29.90	29.90	All Engines	
Scenario 5	0.99	1.59	1.63	0.27	1.52	1.52	*1 Engine*	
Steady State w/Shutdown	10.90	17.52	17.94	2.97	16.70	16.70	All Engines	
Scenario 6	0.92	1.49	1.50	0.26	1.36	1.36	*1 Engine*	
Steady State	10.13	16.43	16.54	2.82	14.97	14.97	All Engines	

Maximum Estimated Daily Emissions **24 Hr Period Run Day**	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day	
Scenario 1	30.53	47.78	42.08	6.17	33.68	33.68	*1 Engine*
Cold Start, Steady State, Shutdown	335.86	525.55	462.93	67.83	370.49	370.49	All Engines
Scenario 2	24.37	36.90	37.61	6.16	34.02	34.02	*1 Engine*
Warm Start, Steady State, Shutdown	268.11	405.93	413.72	67.80	374.23	374.23	All Engines
Scenario 3	22.10	35.86	36.10	6.14	32.66	32.66	*1 Engine*
Steady State	243.14	394.42	397.06	67.58	359.30	359.30	All Engines
Scenario 4							*1 Engine*
******							All Engines

Maximum Estimated Daily Emissions **16 Hr Period Run Day**	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day	
Scenario 1	23.16	35.83	30.05	4.12	22.79	22.79	*1 Engine*
Cold Start, Steady State, Shutdown	254.81	394.08	330.58	45.31	250.72	250.72	All Engines
Scenario 2	17.01	24.95	25.58	4.12	23.13	23.13	*1 Engine*
Warm Start, Steady State, Shutdown	187.06	274.46	281.37	45.27	254.46	254.46	All Engines
Scenario 3	14.74	23.90	24.06	4.10	21.78	21.78	*1 Engine*
Steady State	162.10	262.94	264.70	45.06	239.54	239.54	All Engines
Scenario 4							*1 Engine*
******							All Engines

Maximum Estimated Daily Emissions **8 Hr Period Run Day**	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day	
Scenario 1	15.80	23.87	18.02	2.07	11.90	11.90	*1 Engine*
Cold Start, Steady State, Shutdown	173.77	262.61	198.23	22.78	130.95	130.95	All Engines
Scenario 2	9.64	13.00	13.55	2.07	12.24	12.24	*1 Engine*
Warm Start, Steady State, Shutdown	106.01	142.99	149.02	22.74	134.69	134.69	All Engines
Scenario 3	7.37	11.95	12.03	2.05	10.89	10.89	*1 Engine*
Steady State	81.05	131.47	132.35	22.53	119.77	119.77	All Engines
Scenario 4							*1 Engine*
******							All Engines

Other Misc Scenarios -based on run hour type

(CS-cold start hour, WS-warm start hour, SD-shutdown hour, SS-steady state hour)

	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day		
a - CS, SS, SD, WS, SS, SD (total ops period 12 hrs)								
	21.49	30.47	25.13	3.04	18.32	18.32	*1 Engine*	
	236.38	335.20	276.38	33.46	201.52	201.52	All Engines	
b - 3 CSs, 1 WS, 4 SDs, SS (total ops period 24 hrs)								
	49.66	72.67	55.58	6.23	37.07	37.07	*1 Engine*	Max Day
	546.26	799.33	611.35	68.55	407.78	407.78	All Engines	Max Day

75% Load Evaluation
Maximum Hourly, Daily Emissions Calculations

Number of Identical Engines: 11

Input data per unit:

Operation hrs/day	Annual Op hrs	Avg # of Cold Startups day	Avg # of Warm Startups day	Cold Startup Time hrs	Warm Startup Time hrs	Shutdown Time hrs	Cold Starts yr	Warm Starts yr	Estimated Shutdowns yr	Max Estimated Shutdowns day
24	4032	1	1	0.5	0.25	0.1417	300	100	400	2

	Cold Startup Emissions lbs/event	Warm Startup Emissions lbs/event	Shutdown Emissions lbs/event	Steady State Emissions lbs/hr *(75% Load)*
NOx	8.82	2.43	0.2	1.11
CO	12.57	1.322	0.31	1.48
VOC	6.614	1.764	0.34	1.541
SOx	0.137	0.07	0.05	0.256
PM10	1.54	1.54	0.35	1.372
PM2.5	1.54	1.54	0.35	1.372

1. SU/SD emissions data and times derived from: Wartsila Emissions Data Sheet, DBAB715360, 2-27-11.
2. Cold start (CS): engine will reach steady state in 10 minutes and controls (SCR and CO Cat) will be fully operational in 30 minutes.
3. Warm start (WS): engine will reach steady state in 10 minutes and controls (SCR and CO Cat) will be fully operational in 15 minutes.
4. A warm start is defined as a start initiated within 2-6 hours after the engine has been shutdown, or
   when the emissions control system is at a temperature of no less than 270 C (518 F).
5. Shutdown time is optimally 8.5 minutes per Wartsila.
6. Cold start plus shutdown = 0.6417 hrs steady state = 0.3583 hrs
7. Warm start plus shutdown = 0.3917 hrs steady state = 0.6083 hrs
8. Shut down = 0.1417 hrs steady state = 0.8583 hrs
9. Steady state (SS) emissions values derived from Cogentrix/Wartsila.
10. SO2 emissions include S to SO2 from lube oil burn-off from cylinder sleeves.

Maximum Estimated Hourly Emissions **1 Hour Period**	NOx lbs/hr	CO lbs/hr	VOC lbs/hr	SOx lbs/hr	PM10 lbs/hr	PM2.5 lbs/hr		
Scenario 1	9.38	13.31	7.38	0.27	2.23	2.23	*1 Engine*	
Cold Start w/Steady State	103.13	146.41	81.23	2.92	24.49	24.49	All Engines	
Scenario 2	3.26	2.43	2.92	0.26	2.57	2.57	*1 Engine*	
Warm Start w/Steady State	35.89	26.75	32.12	2.88	28.26	28.26	All Engines	
Scenario 3	9.42	13.41	7.51	0.34	2.38	2.38	*1 Engine*	Max Hr
Cold Start, Steady State, Shutdown	103.59	147.51	82.57	3.77	26.20	26.20	All Engines	Max Hr
Scenario 4	3.31	2.53	3.04	0.28	2.72	2.72	*1 Engine*	
Warm Start, Steady State, Shutdown	36.36	27.86	33.46	3.03	29.97	29.97	All Engines	
Scenario 5	1.15	1.58	1.66	0.27	1.53	1.53	*1 Engine*	
Steady State w/Shutdown	12.68	17.38	18.29	2.97	16.80	16.80	All Engines	
Scenario 6	1.11	1.48	1.54	0.26	1.37	1.37	*1 Engine*	
Steady State	12.21	16.28	16.95	2.82	15.09	15.09	All Engines	

Maximum Estimated Daily Emissions **24 Hr Period Run Day**	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day	
Scenario 1	34.95	47.45	42.95	6.17	33.94	33.94	*1 Engine*
Cold Start, Steady State, Shutdown	384.42	521.95	472.44	67.83	373.31	373.31	All Engines
Scenario 2	28.84	36.57	38.48	6.16	34.28	34.28	*1 Engine*
Warm Start, Steady State, Shutdown	317.19	402.30	423.33	67.80	377.09	377.09	All Engines
Scenario 3	26.64	35.52	36.98	6.14	32.93	32.93	*1 Engine*
Steady State	293.04	390.72	406.82	67.58	362.21	362.21	All Engines
Scenario 4							*1 Engine*
******							All Engines

Maximum Estimated Daily Emissions **16 Hr Period Run Day**	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day	
Scenario 1	26.07	35.61	30.62	4.12	22.96	22.96	*1 Engine*
Cold Start, Steady State, Shutdown	286.74	391.71	336.83	45.31	252.58	252.58	All Engines
Scenario 2	19.96	24.73	26.16	4.12	23.30	23.30	*1 Engine*
Warm Start, Steady State, Shutdown	219.51	272.06	287.72	45.27	256.35	256.35	All Engines
Scenario 3	17.76	23.68	24.66	4.10	21.95	21.95	*1 Engine*
Steady State	195.36	260.48	271.22	45.06	241.47	241.47	All Engines
Scenario 4							*1 Engine*
******							All Engines

Maximum Estimated Daily Emissions **8 Hr Period Run Day**	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day	
Scenario 1	17.19	23.77	18.29	2.07	11.99	11.99	*1 Engine*
Cold Start, Steady State, Shutdown	189.06	261.47	201.22	22.78	131.84	131.84	All Engines
Scenario 2	11.08	12.89	13.83	2.07	12.33	12.33	*1 Engine*
Warm Start, Steady State, Shutdown	121.83	141.82	152.11	22.74	135.61	135.61	All Engines
Scenario 3	8.88	11.84	12.33	2.05	10.98	10.98	*1 Engine*
Steady State	97.68	130.24	135.61	22.53	120.74	120.74	All Engines
Scenario 4							*1 Engine*
******							All Engines

Other Misc Scenarios -based on run hour type

(CS-cold start hour, WS-warm start hour, SD-shutdown hour, SS-steady state hour)

	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day		
a - CS, SS, SD, WS, SS, SD (total ops period 12 hrs)								
	23.51	30.32	25.52	3.04	18.44	18.44	*1 Engine*	
	258.59	333.55	280.73	33.46	202.81	202.81	All Engines	
b - 3 CSs, 1 WS, 4 SDs, SS (total ops period 24 hrs)								
	53.76	72.36	56.38	6.23	37.31	37.31	*1 Engine*	Max Day
	591.34	795.99	620.18	68.55	410.40	410.40	All Engines	Max Day

Table F.1-2 Wartsila Engine Run Case Data

Altitude	500	ft amsl
Fuel methane number	80	
Power factor	0.8	
Coolant	13.50%	propylene glycol

																						no glycol
	Case	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Ambient air temp	F	35	35	35	35	64	64	64	64	70	70	70	70	81	81	81	81	95	95	95	95	95
Relative Humidity	%	68	68	68	68	60	60	60	60	55	55	55	55	48	48	48	48	24	24	24	24	24
Engine Load	%	30	50	75	100	30	50	75	100	30	50	75	100	30	50	75	100	30	50	75	100	100
Output	kW	2744	4646	6998	9341	2744	4646	6998	9341	2744	4646	6998	9341	2744	4646	6998	9341	2744	4646	6998	9184	9341
Heat rate	Btu/kWh LHV	10088	8514	7996	7741	10088	8514	7996	7741	10088	8514	7996	7741	10088	8514	7996	7741	10088	8514	7996	7751	7741
Fuel use	mmBTU/h LHV	27.68	39.56	55.96	72.31	27.68	39.56	55.96	72.31	27.68	39.56	55.96	72.31	27.68	39.56	55.96	72.31	27.68	39.56	55.96	71.19	72.31
Fuel use	mmBTU/h HHV	30.69	43.86	62.04	80.18	30.69	43.86	62.04	80.18	30.69	43.86	62.04	80.18	30.69	43.86	62.04	80.18	30.69	43.86	62.04	78.93	80.18
Shaft Power	hp	3862	6437	9655	12874	3862	6437	9655	12874	3862	6437	9655	12874	3862	6437	9655	12874	3862	6437	9655	12659	12847
Exhaust temp	F	831	831	822	741	825	825	816	735	824	824	815	734	822	822	813	732	819	819	810	731	730
Exhaust gas flow	lb/h	49200	64800	87600	117700	49,161	64,802	87,603	117,815	49,156	64,800	87,606	117,836	49200	64800	87600	118206.6	49300	65100	88400	117300	119300
Combustion air flow	lb/h	47860	62940	84940	114300	47,864	62,949	84,981	114,428	47,859	62,947	84,984	114,449	47860	62950	85000	114800	48000	63300	85800	113900	115800
Exhaust composition																						
O2	vol%	11.6	10.2	9.6	10	11.5	10.1	9.5	9.9	11.45	10.07	9.45	9.88	11.4	10	9.4	9.8	11.5	10.1	9.6	10	10
N2	vol%	74.4	74.2	74	74.2	73.9	73.6	73.5	73.6	73.8	73.5	73.4	73.6	73.5	73.3	73.1	73.3	73.8	73.6	73.4	73.6	73.6
Ar	vol%	0.88	0.88	0.88	0.88	0.9	0.9	0.9	0.9	0.878	0.875	0.873	0.877	0.88	0.87	0.87	0.87	0.88	0.88	0.87	0.88	0.88
CO2	vol%	4.17	4.87	5.18	5	4.16	4.86	5.16	4.98	4.16	4.86	5.16	4.98	4.16	4.85	5.15	4.96	4.15	4.83	5.11	4.92	4.92
H20	vol%	8.4	9.6	10.2	9.8	9.09	10.31	10.84	10.49	9.24	10.45	10.98	10.48	9.6	10.8	11.3	10.9	9.2	10.4	10.9	10.5	10.5
Exhaust flow	scf/s	183	241	326	438	183	242	327	440	183	242	328	440	183	242	328	442	184	243	331	438	445
Exhaust flow	acf/s*	462	611	820	1032	461	610	819	1,031	461	609	819	1,030	461	609	819	1033	461	610	823	1023	1040
Exhaust flow	acfm*	27720	36660	49200	61920	27682	36580	49159	61865	27660	36540	49140	61800	27660	36540	49140	61980	27660	36600	49380	61380	62400
Controlled emissions																						
Nox	g/kwh		0.090	0.072	0.064		0.090	0.072	0.064		0.090	0.072	0.064		0.090	0.072	0.064		0.090	0.072	0.064	0.064
CO	g/kWh		0.146	0.096	0.076		0.146	0.096	0.076		0.146	0.096	0.076		0.146	0.096	0.076		0.146	0.096	0.076	0.076
VOC	g/kWh		0.147	0.100	0.077		0.147	0.100	0.077		0.147	0.100	0.077		0.147	0.100	0.077		0.147	0.100	0.077	0.077
PM10 (tot)	g/kWh		0.133	0.089	0.067		0.133	0.089	0.067		0.133	0.089	0.067		0.133	0.089	0.067		0.133	0.089	0.067	0.067
Ammonia (10 ppm)	g/kWh		0.061	0.054	0.052		0.061	0.054	0.052		0.061	0.054	0.052		0.061	0.054	0.052		0.061	0.054	0.052	0.052
Formaldehyde	g/kWh		0.018	0.013	0.010		0.018	0.013	0.010		0.018	0.013	0.010		0.018	0.013	0.010		0.018	0.013	0.010	0.010
Nox	lb/h		0.921	1.110	1.317		0.921	1.110	1.317		0.921	1.110	1.317		0.921	1.110	1.317		0.921	1.110	1.295	1.317
CO	lb/h		1.494	1.480	1.564		1.494	1.480	1.564		1.494	1.480	1.564		1.494	1.480	1.564		1.494	1.480	1.537	1.564
VOC	lb/h		1.504	1.541	1.584		1.504	1.541	1.584		1.504	1.541	1.584		1.504	1.541	1.584		1.504	1.541	1.558	1.584
PM10 (tot)	lb/h		1.361	1.372	1.379		1.361	1.372	1.379		1.361	1.372	1.379		1.361	1.372	1.379		1.361	1.372	1.355	1.379
Ammonia (10 ppm)	lb/h		0.624	0.832	1.070		0.624	0.832	1.070		0.624	0.832	1.070		0.624	0.832	1.070		0.624	0.832	1.052	1.070
Formaldehyde	lb/h		0.184	0.200	0.206		0.184	0.200	0.206		0.184	0.200	0.206		0.184	0.200	0.206		0.184	0.200	0.202	0.206

* (actual at 60F and 14.6959psi)

Basis: Rev 6

Table F.1-3

Air Toxic and HAP Emissions from Natural Gas Fired IC Engines

Engine ID: 20V34SG-C2
NG (HHV): 1019 btu/scf
Stroke: 4
Type: Lean Burn
# of Units: 11

Max Heat Rating: 80.18 mmbtu/hr
Max Fuel Use: 78685.0 scf/hr at HHV
0.0787 mmscf/hr at HHV
Max Ops, hrs/day: 24
Max Ops, hrs/year: 4032

Max Daily Fuel use: 1.89 mmscf
Max Annual Fuel use: 317.26 mmscf
CO Oxidation Catalyst: Yes
Minimum VOC Control Eff for CO Cat: 0.7
Catalyst EF Multiplier: 0.3

	EF	EF		Single Engine				All Engines			Federal HAP
Substance/Pollutant	**lb/mmbtu**	**Source**	**lbs/hr**	**lbs/day**	**lbs/year**	**tpy**	**lbs/hr**	**lbs/day**	**lbs/year**	**tpy**	**Y/N**
Acetaldehyde	0.0005191	1	0.0125	0.2997	50.345	0.0252	0.1374	3.2964	553.798	0.2769	Y
Acrolein	0.0000579	1	0.0014	0.0334	5.615	0.0028	0.0153	0.3677	61.770	0.0309	Y
1-3 Butadiene	0.00036	1	0.0087	0.2078	34.915	0.0175	0.0953	2.2861	384.063	0.1920	Y
Benzene	0.000214	1	0.0051	0.1235	20.755	0.0104	0.0566	1.3590	228.304	0.1142	Y
Biphenyl	0.000212	2	0.0051	0.1224	20.561	0.0103	0.0561	1.3463	226.171	0.1131	Y
Ethylbenzene	0.0000698	1	0.0017	0.0403	6.770	0.0034	0.0185	0.4432	74.466	0.0372	Y
Formaldehyde	0.00232	1	0.0558	1.3393	225.007	0.1125	0.6139	14.7326	2475.076	1.2375	Y
Methanol	0.0025	2	0.0601	1.4432	242.464	0.1212	0.6615	15.8756	2667.108	1.3336	Y
n-Hexane	0.00111	1	0.0267	0.6408	107.654	0.0538	0.2937	7.0488	1184.196	0.5921	Y
Naphthalene	0.0000246	1	0.0006	0.0142	2.386	0.0012	0.0065	0.1562	26.244	0.0131	Y
PAH (total)	2.49E-07	1	0.0000	0.0001	0.024	0.0000	0.0001	0.0016	0.266	0.0001	Y
Toluene	0.000235	1	0.0057	0.1357	22.792	0.0114	0.0622	1.4923	250.708	0.1254	Y
Xylenes	0.000634	1	0.0153	0.3660	61.489	0.0307	0.1678	4.0261	676.378	0.3382	Y
Propylene	0.00528	1	0.1270	3.0481	512.085	0.2560	1.3971	33.5294	5632.931	2.8165	N
	0		0.0000	0.0000	0.000	0.0000	0.0000	0.0000	0.000	0.0000	
	0		0.0000	0.0000	0.000	0.0000	0.0000	0.0000	0.000	0.0000	
	0		0.0000	0.0000	0.000	0.0000	0.0000	0.0000	0.000	0.0000	
	0		0.0000	0.0000	0.000	0.0000	0.0000	0.0000	0.000	0.0000	
Ammonia	n/a	3	1.0800	25.9200	4354.560	2.1773	11.8800	285.1200	47900.160	23.9501	N

Total Federal HAPs: 4.40 tpy

References:

(1) CARB/CATEF Natural gas ICE, SCC 20200202, 4 stroke, lean burn, uncontrolled Efs, mean values. CATEF Database.
See Humboldt Bay GS FDOC, Table 6, NCAQMD, 4/8/08.
(2) EPA, AP-42, Section 3.2, Table 3.2-2, 7/2000.
(3) NH3 value from Wartsila data at 10 ppmvd slip.
(4) CO Catalyst control eff% for VOC is 70% per Wartsila/Cogentrix.

Table F.1-4 Fuel Gas Heater

Calculation of Criteria Pollutant Emissions for Process Heaters Firing Gaseous Fuels

Heater Operation Mode: Normal firing mode

Ops Hr/Day: 24 Worst Case

Ops Hr/Yr: 4232

# of Units: 1

Fuel Type: Nat Gas

Calculation of Criteria Pollutant Emissions from Each Identical Unit

						All Units			
Compound	Emission Factor, lbs/MMscf (1)	Maximum Hourly Emissions, lb/hr (2)	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr (3)	Maximum Hourly Emissions, lb/hr	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr
NOx	4.92E+01	1.93E-01	4.64E+00	8.18E+02	4.09E-01	1.93E-01	4.64E+00	8.18E+02	4.09E-01
CO	9.17E+01	3.60E-01	8.64E+00	1.52E+03	7.62E-01	3.60E-01	8.64E+00	1.52E+03	7.62E-01
VOC	4.08E+01	1.60E-01	3.84E+00	6.77E+02	3.39E-01	1.60E-01	3.84E+00	6.77E+02	3.39E-01
SOx	6.00E-01	2.36E-03	5.65E-02	9.97E+00	4.98E-03	2.36E-03	5.65E-02	9.97E+00	4.98E-03
PM10	7.13E+00	2.80E-02	6.72E-01	1.18E+02	5.92E-02	2.80E-02	6.72E-01	1.18E+02	5.92E-02
PM2.5	7.13E+00	2.80E-02	6.72E-01	1.18E+02	5.92E-02	2.80E-02	6.72E-01	1.18E+02	5.92E-02
NH3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	lbs/MMbtu								
CO2	1.17E+02	4.68E+02	1.12E+04	1.98E+06	9.90E+02	4.68E+02	1.12E+04	1.98E+06	9.90E+02
Methane	1.30E-02	5.20E-02	1.25E+00	2.20E+02	1.10E-01	5.20E-02	1.25E+00	2.20E+02	1.10E-01
N2O	2.21E-04	8.82E-04	2.12E-02	3.73E+00	1.87E-03	8.82E-04	2.12E-02	3.73E+00	1.87E-03
CO2e									9.93E+02
								metric tons	902.5

Notes:

(1) natural gas criteria pollutant EF factors

(2) Based on maximum hourly heater fuel use of 4 MMBtu/hr/boiler
and fuel HHV of 1019 Btu/scf gives 0.0039 MMscf/hr/boiler.

(3) Based on maximum annual heater fuel use of 16,928 MMBtu/yr/boiler
and fuel HHV of 1019 Btu/scf gives 16.6124 MMscf/yr/boiler.

(4) PM2.5 = PM10

Exh Flow	3479.00	lbs/hr
Exh Flow	2243.00	acfm
Exh Temp	1015.00	deg F
Exh Vel	12.42	ft/sec
Stk Ht	*	ft.
Stk Diam	*	in.

Refs:

(1) EFs from ETI (mfg) and AP-42, Section 1.4, 7-98.

(2) GHG Factors, General Protocol, CCAR, Ver 3.1, Jan 2009.

(3) Mfg values adjusted for LNB application.

This unit is exempt from the SDAPCD permitting requirements per Rule 11.

This unit is exempt from the SDAPCD BACT requirements per Rule 20.2.

Unit operates during main engine operation plus 200hours/yr for contingency.

*See modeling Appendix F.2 for final data.

Table F.1-5 Fuel Gas Heater Emissions

Calculation of Noncriteria Pollutant Emissions for Process Heaters Firing Gaseous Fuels

Heater Operation Mode: Normal firing mode
Ops Hr/Day: 24
Ops Hr/Yr: 4232

# of Units: 1
Fuel Type: Nat Gas

Calculation of Noncriteria Pollutant Emissions from Each Identical Unit

						All Units			
Compound	Emission Factor, lb/MMscf (1)	Maximum Hourly Emissions, lb/hr (2)	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr (3)	Maximum Hourly Emissions, lb/hr	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr
Acetaldehyde	8.87E-03	3.48E-05	8.36E-04	1.47E-01	7.37E-05	3.48E-05	8.36E-04	1.47E-01	7.37E-05
Acrolein	4.51E-03	1.77E-05	4.25E-04	7.49E-02	3.75E-05	1.77E-05	4.25E-04	7.49E-02	3.75E-05
Ammonia	(5)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	4.31E-03	1.69E-05	4.06E-04	7.16E-02	3.58E-05	1.69E-05	4.06E-04	7.16E-02	3.58E-05
1,3-Butadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethylbenzene	9.50E-03	3.73E-05	8.95E-04	1.58E-01	7.89E-05	3.73E-05	8.95E-04	1.58E-01	7.89E-05
Formaldehyde	1.70E-02	6.67E-05	1.60E-03	2.82E-01	1.41E-04	6.67E-05	1.60E-03	2.82E-01	1.41E-04
Hexane	6.30E-03	2.47E-05	5.94E-04	1.05E-01	5.23E-05	2.47E-05	5.94E-04	1.05E-01	5.23E-05
Naphthalene	3.00E-04	1.18E-06	2.83E-05	4.98E-03	2.49E-06	1.18E-06	2.83E-05	4.98E-03	2.49E-06
PAHs (4)	4.00E-04	1.57E-06	3.77E-05	6.64E-03	3.32E-06	1.57E-06	3.77E-05	6.64E-03	3.32E-06
Propylene	7.31E-01	2.87E-03	6.89E-02	1.21E+01	6.07E-03	2.87E-03	6.89E-02	1.21E+01	6.07E-03
Propylene oxide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Toluene	3.66E-02	1.44E-04	3.45E-03	6.08E-01	3.04E-04	1.44E-04	3.45E-03	6.08E-01	3.04E-04
Xylene	2.72E-02	1.07E-04	2.56E-03	4.52E-01	2.26E-04	1.07E-04	2.56E-03	4.52E-01	2.26E-04
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Notes:
(1) natural gas HAPs factors
(2) Based on maximum hourly boiler fuel use of 4 MMBtu/hr/boiler
and fuel HHV of 1019 Btu/scf gives 0.0039 MMscf/hr/boiler.
(3) Based on maximum annual boiler fuel use of 16,928 MMBtu/yr/boiler
and fuel HHV of 1019 Btu/scf gives 16.6124 MMscf/yr/boiler.
(4) PAHs - Polycyclic aromatic hydrocarbons
(5) Ammonia based SCR not proposed for this small process heater

Refs:
CARB Catef Database
SDAPCD, B17, Toxics Efs Database
SCAQMD, 6/2/2000

This unit is exempt from the SDAPCD permitting requirements per Rule 11.
This unit is exempt from the SDAPCD BACT requirements per Rule 20.2.

Table F.1-6 Warm Start Heater(s)

Calculation of Criteria Pollutant Emissions for Process Heaters Firing Gaseous Fuels

Heater Operation Mode:	Normal firing mode		# of Units:	1	*
Ops Hr/Day:	24	Worst Case	Fuel Type:	Nat Gas	
Ops Hr/Yr:	4928				

Calculation of Criteria Pollutant Emissions from Each Identical Unit

						All Units			
Compound	Emission Factor, lbs/MMscf (1)	Maximum Hourly Emissions, lb/hr (2)	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr (3)	Maximum Hourly Emissions, lb/hr	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr
NOx	4.92E+01	1.93E-01	4.64E+00	9.53E+02	4.76E-01	1.93E-01	4.64E+00	9.53E+02	4.76E-01
CO	9.17E+01	3.60E-01	8.64E+00	1.77E+03	8.87E-01	3.60E-01	8.64E+00	1.77E+03	8.87E-01
VOC	4.08E+01	1.60E-01	3.84E+00	7.88E+02	3.94E-01	1.60E-01	3.84E+00	7.88E+02	3.94E-01
SOx	6.00E-01	2.36E-03	5.65E-02	1.16E+01	5.80E-03	2.36E-03	5.65E-02	1.16E+01	5.80E-03
PM10	7.13E+00	2.80E-02	6.72E-01	1.38E+02	6.90E-02	2.80E-02	6,72E-01	1.38E+02	6.90E-02
PM2.5	7.13E+00	2.80E-02	6.72E-01	1.38E+02	6.90E-02	2.80E-02	6.72E-01	1.38E+02	6.90E-02
NH3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	lbs/MMbtu								
CO2	1.17E+02	4.68E+02	1.12E+04	2.31E+06	1.15E+03	4.68E+02	1.12E+04	2.31E+06	1.15E+03
Methane	1.30E-02	5.20E-02	1.25E+00	2.56E+02	1.28E-01	5.20E-02	1.25E+00	2.56E+02	1.28E-01
N2O	2.21E-04	8.82E-04	2.12E-02	4.35E+00	2.17E-03	8.82E-04	2.12E-02	4.35E+00	2.17E-03
CO2e									1.16E+03
								metric tons	1050.9

Notes:

(1) natural gas criteria pollutant EF factors

(2) Based on maximum hourly heater fuel use of 4 MMBtu/hr/boiler
and fuel HHV of 1019 Btu/scf gives 0.0039 MMscf/hr/boiler.

(3) Based on maximum annual heater fuel use of 19,712 MMBtu/yr/boiler
and fuel HHV of 1019 Btu/scf gives 19.3445 MMscf/yr/boiler.

(4) PM2.5 = PM10

Exh Flow	3479	lbs/hr
Exh Flow	2243	acfm
Exh Temp	1015	deg F
Exh Vel	12.42	ft/sec
Stl Ht	*	ft.
Stk Diam	*	in.

Refs:

(1) EFs from ETI (mfg) and AP-42, Section 1.4, 7-98.

(2) GHG Factors, General Protocol, CCAR, Ver 3.1, Jan 2009.

(3) Mfg Nox values adjusted for LNB application.

These units are exempt from the SDAPCD permitting requirements per Rule 11.

These units are exempt from the SDAPCD BACT requirements per Rule 20.2.

* 2 units total, but one unit is strictly a standby/backup unit, and only used when the primary unit is down.

Total hours per year for both units combined will not exceed the above noted value.

Ops hours/year includes a 200 hour/year contingency.

*See modeling Appendix F.2 for final data.

Table F.1-7 Warm Start Heater Emissions
Calculation of Noncriteria Pollutant Emissions for Process Heaters Firing Gaseous Fuels

Heater Operation Mode: Normal firing mode
Ops Hr/Day: 24
Ops Hr/Yr: 4928

# of Units: 1 *
Fuel Type: Nat Gas

Calculation of Noncriteria Pollutant Emissions from Each Identical Unit

						All Units			
Compound	Emission Factor, lb/MMscf (1)	Maximum Hourly Emissions, lb/hr (2)	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr (3)	Maximum Hourly Emissions, lb/hr	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr
Acetaldehyde	8.87E-03	3.48E-05	8.36E-04	1.72E-01	8.58E-05	3.48E-05	8.36E-04	1.72E-01	8.58E-05
Acrolein	4.51E-03	1.77E-05	4.25E-04	8.72E-02	4.36E-05	1.77E-05	4.25E-04	8.72E-02	4.36E-05
Ammonia	(5)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	4.31E-03	1.69E-05	4.06E-04	8.34E-02	4.17E-05	1.69E-05	4.06E-04	8.34E-02	4.17E-05
1,3-Butadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethylbenzene	9.50E-03	3.73E-05	8.95E-04	1.84E-01	9.19E-05	3.73E-05	8.95E-04	1.84E-01	9.19E-05
Formaldehyde	1.70E-02	6.67E-05	1.60E-03	3.29E-01	1.64E-04	6.67E-05	1.60E-03	3.29E-01	1.64E-04
Hexane	6.30E-03	2.47E-05	5.94E-04	1.22E-01	6.09E-05	2.47E-05	5.94E-04	1.22E-01	6.09E-05
Naphthalene	3.00E-04	1.18E-06	2.83E-05	5.80E-03	2.90E-06	1.18E-06	2.83E-05	5.80E-03	2.90E-06
PAHs (4)	4.00E-04	1.57E-06	3.77E-05	7.74E-03	3.87E-06	1.57E-06	3.77E-05	7.74E-03	3.87E-06
Propylene	7.31E-01	2.87E-03	6.89E-02	1.41E+01	7.07E-03	2.87E-03	6.89E-02	1.41E+01	7.07E-03
Propylene oxide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Toluene	3.66E-02	1.44E-04	3.45E-03	7.08E-01	3.54E-04	1.44E-04	3.45E-03	7.08E-01	3.54E-04
Xylene	2.72E-02	1.07E-04	2.56E-03	5.26E-01	2.63E-04	1.07E-04	2.56E-03	5.26E-01	2.63E-04
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Notes:
(1) natural gas HAPs factors
(2) Based on maximum hourly boiler fuel use of 4 MMBtu/hr/boiler
and fuel HHV of 1019 Btu/scf gives 0.0039 MMscf/hr/boiler.
(3) Based on maximum annual boiler fuel use of 19,712 MMBtu/yr/boiler
and fuel HHV of 1019 Btu/scf gives 19.3445 MMscf/yr/boiler.
(4) PAHs - Polycyclic aromatic hydrocarbons
(5) Ammonia based SCR not proposed for this small process heater

Refs:
CARB Catef Database
SDAPCD, B17, Toxics Efs Database
SCAQMD, 6/2/2000

These units are exempt from the SDAPCD permitting requirements per Rule 11.
These units are exempt from the SDAPCD BACT requirements per Rule 20.2.
* 2 units total, but one unit is strictly a standby/backup unit, and only used when the primary unit is down.
Total hours per year for both units will not exceed the above noted value.

Table F.1-8 EXPECTED INTERNAL COMBUSTION ENGINE EMISSIONS

Liquid Fuel

Emergency Fire Pump

			# of Identical Engines:	1	
Mfg:	John Deere		Exhaust Temp, F:	1040	
Engine #:	JU4H-UFADW8 (Clarke)		# of Cylinders:	4	
Kw	0	approx.	Stroke:	4	
BHP:	144		Turbocharged:	Yes	
RPM:	1760		Intercooled:		
Fuel:	#2 Diesel		Ignition:	CI	
Fuel Use:	10	Gph (1)	Exhaust Flow, acfm	740	
FuelHHV:	139000	Btu/gal			
mmbtu/hr:	1.39	HHV	Max Daily Op Hrs:	1	
EPA/CARB Tier #:	3		Max Annual Op Hrs:	50	
			Stk Ht	*	ft.
Fuel Wt:	7	Lbs/gal	Stk Diam	4	in.
Fuel S:	0.0015	% wt.			
Fuel S:	0.105	Lbs/1000 gal			
SO2:	0.21	Lbs/1000 gal			

		Single Engine				*All Engines*			
EFs (g/bhp-hr)		Lb/Hr	Lb/Day	Lbs/Yr	Tons/Yr	*Lb/Hr*	*Lb/Day*	*Lbs/Yr*	*Tons/Yr*
NOx	2.8	0.89	0.89	44.41	0.022	*0.89*	*0.89*	*44.41*	*0.02*
CO	1	0.32	0.32	15.86	0.008	*0.32*	*0.32*	*15.86*	*0.01*
VOC	0.1	0.03	0.03	1.59	0.001	*0.03*	*0.03*	*1.59*	*0.001*
PM10	0.09	0.03	0.03	1.43	0.001	*0.03*	*0.03*	*1.43*	*0.001*
SOx	NA	0.0021	0.0021	0.11	0.0001	*0.0021*	*0.0021*	*0.11*	*0.0001*
	lbs/gal								
CO2	22.38	224	224	11190	5.60	*224*	*224*	*11190*	*5.60*
Methane	0.000661	0.01	0.01	0.33	0.000	*0.01*	*0.01*	*0.33*	*0.000*
N2O	0.000221	0.00	0.00	0.11	0.0001	*0.00*	*0.00*	*0.11*	*0.0001*
CO2e					5.62				*5.62*
							CO2e metric tons/yr		*5.11*

Notes:

1. fuel consumption based on 0.055 gal/hp-hr (avg EPA and SCAQMD values) if no value given by mfg for specific engine.
2. PM10 equals PM2.5.
3. PM10 used in HRA to represent DPM emissions.
4. GHG EFs, General Protocol, CCAR, Ver 3.1, 1/09.

* See modeling Appendix F.2 for final data.

Table F.1-9 SO2 Emissions Calculations based on Fuel S Content and Lube Oil Consumption

Fuel:	NG		S to SO2:	2	Std Conv Factor	Hrs/Yr/Unit:	4032
S content:	0.25	gr S/100 scf	# of Engines:	11			
Fuel:	1019	btu/scf HHV					

Load Level	Heat Rate mmbtu/hr	Fuel Use scf/hr	Fuel Use 100 scf/hr	S in Fuel grs/hr	S in Fuel lbs/hr	SO2 lbs/hr	Lube Oil Burn-off SO2 lbs/hr	1 Engine Final SO2 lbs/hr	All Engines Final SO2 lbs/hr	All Engines Final SO2 TPY
100%	80.18	78685	786.85	196.71	0.028	0.056	0.2	0.256	2.82	5.68
90%	72.16	70816	708.16	177.04	0.025	0.051	0.18	0.231	2.54	5.11
75%	60.14	59014	590.14	147.53	0.021	0.042	0.15	0.192	2.11	4.26
50%	40.09	39342	393.42	98.36	0.014	0.028	0.1	0.128	1.41	2.84

1. lube oil burn-off rate is best estimate from Wartsila, ref. DAAB744303, at full load.
2. assumes fuel use and load factor are essentially equal.

Lube Oil Burn-off (Lube oil consumption-LOC) comments:

Lube oil burn-off refers to the oil picked up by the engine piston rings that is distributed to the pistion sleeve each time piston moves up the firing cycle. When ignition occurs a portion of the oil is combusted, and a portion is contaminated and removed from the piston sleeve wall as the cyclinder moves down the firing cycle. The contaminated oil is collected in the lube oil sump where settling takes place and oil is pumped from the sump to the filter system and back to the engine (cycle repeats). Periodically the lube oil and filters are changed.

Wartsila has estimated that approximately 0.1 lbs of S per hour is combusted and converted to 0.2 lbs SO2 per hour as a result of LOC. This value was used in the SOx emissions calculations, although it is anticipated that SO2 mass emissions will be far less than this value once compliance testing is completed.

Refs:

1. Impact of Oil Consumption Mechanisms On Diesel Exhaust Particle Size Distributions, J. Stetter, et.al., Univ of Wisconsin, 2003.
2. Prevention of Air Pollution Form Ships: DPM Reduction via Lube Oil Consumption Control, T. Miller, et.al., USCG, USN.
3. The Influence of Engine Lubricating Oil on Diesel Nanoparticle Emissions and Kinestics of Oxidation, H. Jung, et.al., Univ of Minnesota, 2003.
4. Characterization and Assessment of Diesel Engine Particulate Emissions Reduction via Lube-Oil Consumption Control, M. Jackson, et.al., MIT.

Table F.1-10 Operations Related Mobile Source Emissions

Operations Site Delivery Emissions

Maximum # Deliveries/Month:	30
Roundtrip delivery VMT:	40
VMT/month:	1200
VMT/year:	14400
VMT/day:	40

Emission Factors (Lbs/VMT)

Vehicle Type	NOx	SOx	CO	VOC	PM10	PM2.5	CO2
Passenger	0.00067	0.00001	0.00689	0.00074	0.00009	0.00009	0.95810
Delivery HDD	0.02157	0.00004	0.00681	0.00155	0.00095	0.00094	3.81160

Operations Employee Commuting Emissions

Off Season Employee #	11
Peak Season Employee #	11
Annual average employee #	11
Average roundtrip distance, miles	40
VMT/day	440
VMT/year	160600

Emissions (lbs/day)

	NOx	SOx	CO	VOC	PM10	PM2.5	CO2
Passenger	0.295	0.004	3.032	0.326	0.040	0.040	421.56
Delivery HDD	0.863	0.001	0.272	0.062	0.038	0.038	152.46
Totals	*1.158*	*0.006*	*3.304*	*0.388*	*0.078*	*0.077*	*574.03*

Emissions (tons/year)

	NOx	SOx	CO	VOC	PM10	PM2.5	CO2
Passenger	0.054	0.001	0.553	0.059	0.007	0.007	76.94
Delivery HDD	0.155	0.000	0.049	0.011	0.007	0.007	27.44
Totals	*0.209*	*0.001*	*0.602*	*0.071*	*0.014*	*0.014*	*104.38*

Assumptions:

1) Delivery Vehicles Avg Round Trip VMT estimated to be 40 miles.
2) Employee Vehicle Avg Round Trip VMT estimated to be 40 miles.
3) Emission factors reflect 2013 EMFAC data for the site location County.
Passenger vehicles = LDP/LDT, Delivery vehicles=heavy duty diesel trucks.

Dedicated Site Equipment

#	Type	HP	Daily Hrs	Annual Hrs	Annual Hp-Hrs
1	8000 lb Forklift	120	4	1460	175200

	NOx	SOx	CO	VOC	PM10	PM2.5	CO2	CH4	N2O
EFs, lbs/Hp-hr	**0.00309**	**0.000004**	**0.00201**	**0.000453**	**0.000244**	**0.0002418**	**0.317**	**0.000041**	**0**
lbs/day	1.4832	0.00192	0.9648	0.21744	0.11712	0.1160659	152.16	0.01968	0
lbs/yr	541.368	0.7008	352.152	79.3656	42.7488	42.364061	55538.4	7.1832	0
TPY	0.27	0.0004	0.18	0.04	0.02	0.02	27.8	0.004	0

Table F.1-11 Commisioning Emissions Estimates

	100% Load		*90% Load*		*75% Load*		*50% Load*	
Pollutant	*ppmvd*	*lb/hr*	*ppmvd*	*lb/hr*	*ppmvd*	*lb/hr*	*ppmvd*	*lb/hr*
Nox	120	31.86	120	28.96	110	22.68	100	14.82
CO	260	42.02	260	38.19	300	37.64	400	36.1
VOC	110	10.16	110	9.23	140	10.04	170	8.77
SOx		0.274		0.266		0.255		0.237
	mg/m3		mg/m3		mg/m3		mg/m3	
PM10/2.5	25		25		30		40	

1. vendor provided values at the stated loads for 20V34SG rated at 72 mmbtu/hr
2. ppmvd and mg/Nm3 at 15% O2, per Wartsila document DAAB714309.
3. SOx includes combustion plus lube oil addition (burn-off in cyclinder chamber), calculated based on fuel use at load

Data:	Load %	mmbtu/hr	APCD STP F:	68	at 1 atm	Calc 1
	50	40.09	molar vol:	385.3	dscf/lb-mol	385300000
	75	60.135	Mol Wts			
	90	72.162	Nox	46		
	100	80.18	CO	28		
			VOC	16	as CH4	
Ref O2%:	15		EPA Fd	8710	dscf/mmbtu at 68 F at 0% O2	
Ambt O2%:	20.9		EPA Fd	30854	dscf/mmbtu at 68 F at 15% O2	

1. assumes load and heat rates are closely related.

Calculated Commissioning Emissions Values for 20V34SG-C2 rated at 80.18 mmbtu/hr.

					lbs/hr			
Load %	*mmbtu/hr*	*DSCFH*	*DSCMH*	*Nox*	*CO*	*VOC*	*SO2*	*PM10/2.5*
50	40.09	1236940	35021	14.77	35.96	8.73	0.237	3.09
75	60.135	1855409	52531	24.37	40.45	10.79	0.255	3.47
90	72.162	2226491	63038	31.90	42.07	10.17	0.266	3.47
100	80.18	2473879	70042	35.44	46.74	11.30	0.274	3.86

Worst Case Hourly and Daily Commissioning Emissions Estimates

Pollutant	*# Engines*	*Per Engine lbs/hr*	*All Engines lbs/hr*	*Ops Period Hrs/Day*	*Per Engine lbs/day*	*All Engines lbs/day*
Nox	3	35.44	106.32	12	425.28	1275.84
CO	3	46.74	140.22	12	560.88	1682.64
VOC	3	11.3	33.9	12	135.6	406.8
SOx	3	0.274	0.822	12	3.288	9.864
PM10/2.5	3	3.86	11.58	12	46.32	138.96

1. assumes maximum of 3 engines in commissioning in any 1 hour or day
2. assumes max ops hours per any commissioning phase day is no more than 12 hours

TABLE F.1-12 Facility Startup/Shutdown Emission Rates for Each Engine for the QBPP

Scenario	NO_x	CO	VOC	PM10/2.5	SOx
Cold Start, lb/event	8.82	12.57	6.614	1.54	0.137
Warm Start, lb/event	2.43	1.322	1.764	1.54	0.07
Shutdown, lb/event	0.2	0.31	0.34	0.35	0.05

Wartsila Doc ID: DBAB715360, 2/27/11.
Estimates based on startup/shutdown data supplied by engine mfg in units of kg/per start.
Cold start sequence is 30 minutes, while a warm start sequence is 15 minutes or less, i.e., times required for control systems to reach full abatement efficiency. The remaining part of the cold or warm startup hour would be at steady state, full control levels.
Shutdown is 8.5 minutes. The remaining part of the shutdown hour would be at steady state, full control levels.
Due to rapid start capability of the engines, the engines will reach full load power production in 10 minutes.

Table F.1-13 Low Load Emissions Scenarios-Steady State Operations

Basis: Annual Avg Cases at 70F (Cases 10 and 11) Engines: 11

	Nox	CO	VOC	Sox*	PM10/2.5	NH3	
	lbs/hr						
Case 10	0.921	1.494	1.504	0.256	1.361	0.624	50% Load
Case 11	1.11	1.48	1.541	0.256	1.372	0.832	75% Load

*majority of SOx emissions from LOC.

11 Engines at 50% Load (Case 10)

	Nox	CO	VOC	Sox*	PM10/2.5	NH3
lbs/hr	10.13	16.43	16.54	2.82	14.97	6.86
lbs/8 hrs	81.05	131.47	132.35	22.53	119.77	54.91
lbs/16 hrs	162.10	262.94	264.70	45.06	239.54	109.82
lbs/24 hrs	243.14	394.42	397.06	67.58	359.30	164.74

11 Engines at 75% Load (Case 11)

	Nox	CO	VOC	Sox*	PM10/2.5	NH3
lbs/hr	12.21	16.28	16.95	2.82	15.09	9.15
lbs/8 hrs	97.68	130.24	135.61	22.53	120.74	73.22
lbs/16 hrs	195.36	260.48	271.22	45.06	241.47	146.43
lbs/24 hrs	293.04	390.72	406.82	67.58	362.21	219.65

**SU/SDs not included.

Attachment F.1-1 Urea MSDS

Material Safety Data Sheet

I. CHEMICAL PRODUCT and EMERGENCY TELEPHONE CONTACT

Product Name	Urea Solution
Chemical Family	Amide
Synonyms	Urea Liquor; Nitrogen Solution for SCR NOx Control Systems
Formula	CH4N2O + H2O
Product Use	SCR NOx Control

EMERGENCY TELEPHONE NUMBER

CHEMTREC (U.S.) 800-424-9300

II. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	**Percentage by Weight**	**CAS Number**
Urea	30 - 70%	57-13-6
Free Ammonia	0.1 - 1.0%	7664-41-7
Buiret	0.1 - 0.5%	108-19-0
Ammonium Carbamate	0.1 - 0.5%	1111-78-0
Water	28 - 69.7%	7732-18-5

Exposure Limits

Component	**TWA**	**STEL**	**PEL**	**IDLH**
Ammonia	25ppm	33ppm	50ppm	300 ppm

No limits established for urea solution, biuret, or ammonium carbamate

III. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Colorless liquid. With slight ammonia (pungent) odor. Reacts with sodium hypochlorite or calcium hypochlorite to form the explosive nitrogen trichloride. When heated, urea releases ammonia and when heated to decomposition it emits toxic fumes of nitrogen oxides (NOx), ammonia, and cyanuric acid. Use water to control fires involving urea solution if water is compatible with burning material. Urea Solution itself is non- flammable.

POTENTIAL HEALTH EFFECTS

Primary Routes of Entry: Skin contact/absorption, eye contact, and vapor inhalation.

General Acute Exposure: May cause irritation to eyes and skin. Ammonia and carbon dioxide vapors may accumulate in a confined space.

General chronic Exposure: No test data available.

Carcinogenicity:

NTP:	Not Listed
IARC:	Not Listed
OSHA:	Not Required

Medical Conditions Aggravated by Exposure: No test data available.

IV. FIRST AID MEASURES

First Aid for Eyes: Flush eyes with copious amounts of tepid water for at least 15 minutes. If irritation, pain, swelling, excessive tearing, or light sensitivity persists, the patient should be seen in a health care facility.

First Aid for Skin: If irritation occurs, flush exposed area with copious amounts of tepid water for at least 15 minutes followed by washing area thoroughly with soap and water. The patient should be seen in a health care facility if irritation or pain persists.

First Aid for Inhalation: If irritation develops, move patient to fresh air and monitor. If cough or difficulty in breathing develops, evaluate for respiratory tract irritation. If trained to do so, administer supplemental oxygen if needed. If irritation, coughing or difficulty in breathing persists, the patient should be seen in a health care facility.

First Aid for Ingestion: If conscious, give the patient large quantities of water to drink and induce vomiting. Seek medical attention.

V. FIRE FIGHTING MEASURES

Urea solution is not flammable.

Extinguishing Media: Use water to extinguish a fire involving urea solution if water is compatible with the burning material.

Special Fire Fighting Procedures:

- Positive pressure self-contained breathing apparatus (SCBA) should be used when there is a potential for inhalation of vapors and/or fumes.
- Wear full fire fighting protective equipment that is appropriate for conditions.

Caution:

- Runoff from fire control or dilution water may cause pollution.
- At elevated temperature, urea solution may decompose to form cyanuric acid, ammonia, biuret, and/or nitrogen oxides.

VI. ACCIDENTAL RELEASE MEASURES

Spill or Leak Measures: Keep unnecessary people away and isolate hazard area.

Determining Spill Size: Generally, a small spill is one that involves a single, small package (i.e. up to a 55 gallon drum), small cylinder, or a small (non-continuing) leak from a large container.

Small or Large Spill:

- Spilled urea solution may cause slippery conditions.
- Recover and use as fertilizer.
- If disposal of product or contaminated by-products is necessary, follow guidelines set forth by local, state, and federal environmental agencies.
- Runoff may cause pollution.

VII. HANDLING AND STORAGE

No unusual storage precautions are necessary.

Handling Precautions: Use proper personal protective equipment when working with or around urea solution

(See section VIII).

VIII. EXPOSURE CONTROLS, PERSONAL PROTECTION

Respiratory Protection Requirements: Urea solution may pose an inhalation hazard in confined areas due to its ability to produce ammonia and carbon dioxide vapors. If necessary to enter an area that contains urea solution, monitor for ammonia and oxygen content. Oxygen levels should be maintained between 19.5% and 23.5%, if outside of this range use appropriate precautions. If ammonia vapors are present, protect as follows:

<25ppm:	No protection required.
25 to 35 ppm:	Protection required if the daily TWA is exceeded.
35 to 50 ppm:	Protection required if exposed for more than 15 minutes.
50 to 250 ppm:	Minimum of an air-purifying respirator equipped with ammonia canister(s) or cartridge(s).
250 to 300 ppm:	Minimum of a full- face air-purifying respirator equipped with ammonia canister(s) or cartridge(s).
<300 ppm:	A fresh air supply system must be used (i.e. positive pressure self contained breathing apparatus).

Engineering Controls: Adequate ventilation should be supplied.

Skin Protection Requirements: Impervious gloves should be worn.

Eye Protection Requirements: It is recommended that safety glasses or goggles be used and if there is a potential for splashing liquid, a face shield should be used in conjunction with the safety glasses or goggles.

Other Protective Equipment: Safety shower and eyewash fountain or at least 5 gallons of accessible clean water should be provided in a urea liquid handling area.

IX. PHYSICAL AND CHEMICAL PROPERTIES

Physical Form	Liquid
Color	Colorless
Odor	Slight ammonia odor (pungent)
Boiling Point	50% urea solution boils at 223 degrees F (106 degrees C)
Melting Point	40% urea solution salts out at 33 degrees F (0.6 degrees C) 50% urea solution salts out at 64 degrees F (18 degrees C) 70% urea solution salts out at 135 degrees F(57 degrees C)
pH	9.25 @ 40% urea solution
Solubility	100%
Specific Gravity	1.11 for 40% urea solution 1.14 for 50% urea solution 1.175 for 70% urea solution
Vapor Density	No test results
Vapor Pressure	No test results
% Volatile by Volume	No test results
Molecular Weight	Not applicable
Density	9.28 lb. @ 60 degrees F per gallon for 40% solution 9.51 lb. per gallon for 50% solution 9.80 lb. per gallon for 70% solution
Critical Temperature	No test results
Critical Pressure	No test results

X. REACTIVITY

Stability:	This is a stable material
Hazardous Polymerization:	Will not occur.

Decomposition: Urea solution forms ammonia, cyanuric acid, biuret, and/or nitrogen oxides (NOx) upon decomposition.

Incompatibilities: Reacts with sodium hypochlorite or calcium hypochlorite to form nitrogen trichloride that may explode spontaneously in air. Incompatible with sodium nitrite, phosphorus pentachloride, and nitrosyl or gallium perchlorate.

XI. TOXICOLOGICAL INFORMATION

Toxicity	
Acute Oral Toxicity	
LD50, Rat:	14,300 – 15,000 mg/kg
LD50, Mouse:	11,500 – 13,000 mg/kg
LD 0, Cattle:	510 mg/kg
Repeated Dose Toxicity	
Rat:	NOAEL = 40% in ointment (24 wks; dermal)
Ecotoxicity	
Acute Toxicity to Fish	
LC50 Barillius barna	9,100 mg/L (96 hr)
Acute Toxicity to Aquatic Invertebrates	
EC50 Daphnia magna	>10,000 mg/L (DIN 38412 Part II; 24 hr)
Toxicity to Aquatic Plants	
TT Scenedesmus quadracauda	>10,000 mg/L (192 hr cell multiplication inhibition test)

Note: Data is for Urea
Source: TFI Product Testing Program April 2003

XII. ECOLOGICAL INFORMATION

Notify local health and wildlife officials and operators of any nearby water intakes of contamination or discharge into or leading to waterways.

Note: See Ecotoxicity information in section XI

XIII. DISPOSAL CONSIDERATIONS

Urea solution is not listed by the Federal EPA as a hazardous waste. Consult state and local environmental agencies for acceptable disposal methods. Recover product for use as a fertilizer, if possible.

XIV. TRANSPORTATION INFORMATION

Urea solution is not listed by any U.S. or Canadian transportation authority as a hazardous material and as such, no specific information is available.

XV. REGULATORY INFORMATION

SARA TITLE III: Not Listed
CERCLA Hazardous Substances List: Not Listed
TSCA Inventory: Listed

The information and recommendations herein are taken from data contained in independent, industry-recognized references including but not limited to NIOSH, OSHA, CHRIS, the TFI Product Testing Program, and SAX's Dangerous Properties of Industrial Materials – ninth edition. **INDUSTRIAL SOLUTION SERVICES, INC.** makes no guarantee, warranty or other representation concerning this substance, since conditions of its use are beyond the control of the company. **INDUSTRIAL SOLUTION SERVICES, INC.** disclaims any liability for loss or damage incurred in connection with the use of this substance.

Industrial Solution Services, Inc.
P.O. Box 1921 • Upland, CA 91784 • Phone 909.931.1860 • Fax 909.931.1960
sales@IndustrialSolutionServices.com

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Attachment F.1-2 Fire Pump Specification Data and CARB EO#

(5 Pages)

Rating Specific Emissions Data - John Deere Power Systems

JOHN DEERE

Nameplate Rating Information

Clarke Model	JU4H-UFADW8
Power Rating (BHP / kW)	144 / 107
Certified Speed (RPM)	1760

Rating Data

Rating	4045HFC28A
Certified Power (kW)	117
Rated Speed	1760
Vehicle Model Number	Clarke Fire Pump

Units	g/kW-hr	g/hp-hr
NOx	3.7	2.8
HC	0.1	0.1
NOx + HC	3.8	2.8
Pm	0.12	0.09
CO	1.3	1.0

Certificate Data

Engine Model Year	2011
EPA Family Name	BJDXL06.8105
EPA JD Name	350HAC
EPA Certificate Number	JDX-NRCI-11-14
CARB Executive Order	U-R-004-0429
Parent of Family	4045HF285A

Units	g/kW-hr
NOx	3.3
HC	0.1
NOx + HC	3.4
Pm	0.25
CO	1.5

* The emission data listed is measured from a laboratory test engine according to the test procedures of 40 CFR 89 or 40 CFR 1039, as applicable. The test engine is intended to represent nominal production hardware, and we do not guarantee that every production engine will have identical test results. The family parent data represents multiple ratings and this data may have been collected at a different engine speed and load. Emission results may vary due to engine manufacturing tolerances, engine operating conditions, fuels used, or other conditions beyond our control.

This information is property of Deere & Company. It is provided solely for the purpose of obtaining certification or permits of Deere powered equipment. Unauthorized distribution of this information is prohibited

CLARKE

Fire Protection Products, Inc.

JU4H-UFADW8
INSTALLATION & OPERATION DATA (I&O Data)
USA Produced

Basic Engine Description

Engine Manufacturer	John Deere Co.
Ignition Type	Compression (Diesel)
Number of Cylinders	4
Bore and Stroke - in (mm)	4.19 (106) X 5 (127)
Displacement - in^3 (L)	275 (4.5)
Compression Ratio	19.0:1
Valves per cylinder	
Intake	1
Exhaust	1
Combustion System	Direct Injection
Engine Type	In-Line, 4 Stroke Cycle
Fuel Management Control	Electronic, High Pressure Common Rail
Firing Order (CW Rotation)	1-3-4-2
Aspiration	Turbocharged
Charge Air Cooling Type	None
Rotation, viewed from front of engine, Clockwise (CW)	Standard
Engine Crankcase Vent System	Open
Installation Drawing	D630
Weight - lb (kg)	1490 (676)

Power Rating

	1760
Nameplate Power - HP (kW)	144 (107)

Cooling System - [C051386]

	1760
Engine Coolant Heat - Btu/sec (kW)	62 (65.4)
Engine Radiated Heat - Btu/sec (kW)	33 (34.8)
Heat Exchanger Minimum Flow	
60°F (15°C) Raw H_20 - gal/min (L/min)	8.9 (33.7)
95°F (35°C) Raw H_20 - gal/min (L/min)	13.3 (50.3)
Heat Exchanger Maximum Cooling Raw Water	
Inlet Pressure - psi (bar)	60 (4.1)
Flow - gal/min (L/min)	40 (151)
Typical Engine H_20 Operating Temp - °F (°C)[1]	180 (82.2) - 195 (90.6)
Thermostat	
Start to Open - °F (°C)	180 (82.2)
Fully Opened - °F (°C)	203 (95)
Engine Coolant Capacity - qt (L)	15.3 (14.5)
Coolant Pressure Cap - lb/in^2 (kPa)	15 (103)
Maximum Engine Coolant Temperature - °F (°C)	230 (110)
Minimum Engine Coolant Temperature - °F (°C)	160 (71.1)
High Coolant Temp Alarm Switch - °F (°C)[2]	235 (113) - 241 (116)

Electric System - DC

	Standard		Optional	
System Voltage (Nominal)	12		24	
Battery Capacity for Ambients Above 32°F (0°C)				
Voltage (Nominal)	12	[C07633]	24	[C07633]
Qty. Per Battery Bank	1		2	
SAE size per J537	8D		8D	
CCA @ 0°F (-18°C)	1400		1400	
Reserve Capacity - Minutes	430		430	
Battery Cable Circuit, Max Resistance - ohm	0.0012		0.0012	
Battery Cable Minimum Size				
0-120 in. Circuit Length[3]	00		00	
121-160 in. Circuit Length[3]	000		000	
161-200 in. Circuit Length[3]	0000		0000	
Charging Alternator Maximum Output - Amp,	40	[C071363]	55	[C071366]
Starter Cranking Amps, Rolling - @60°F (15°C)	345	[RE59595/RE59589]	250	[C07819/C07820]

NOTE: This engine is intended for indoor installation or in a weatherproof enclosure. [1]Engine H_2O temperature is dependent on raw water temperature and flow. [2]High Coolant Switch threshold varies with engine load. [3]Positive and Negative Cables Combined Length.

JU4H-UFADW8
INSTALLATION & OPERATION DATA (I&O Data)
USA Produced

Exhaust System	**1760**
Exhaust Flow - ft.^{3}/min (m^3/min)	740 (21)
Exhaust Temperature - °F (°C)	1040 (560)
Maximum Allowable Back Pressure - in H_20 (kPa)	30 (7.5)
Minimum Exhaust Pipe Dia. - in (mm)[4]	4 (102)

Fuel System	**1760**
Fuel Consumption - gal/hr (L/hr)	10 (37.8)
Fuel Pressure - lb/in^2 (kPa)	3 (20.7) - 6 (41.4)
Minimum Line Size - Supply - in.	.50 Schedule 40 Steel Pipe
Pipe Outer Diameter - in (mm)	0.848 (21.5)
Minimum Line Size - Return - in.	.375 Schedule 40 Steel Pipe
Pipe Outer Diameter - in (mm)	0.675 (17.1)
Maximum Allowable Fuel Pump Suction Lift with clean Filter - in H_20 (mH_20)	80 (2)
Maximum Allowable Fuel Head above Fuel pump, Supply or Return - ft (m)	6.6 (2)
Fuel Filter Micron Size	2 (Secondary)

Heater System	**Standard**	**Optional**
Engine Coolant Heater		
Wattage (Nominal)	1500	1500
Voltage - AC, 1 Phase	120 (+5%, -10%)	240 (+5%, -10%)
Part Number	[C124948]	[C124949]

Air System	**1760**	
Combustion Air Flow - ft.^{3}/min (m^3/min)	273 (7.7)	
Air Cleaner	**Standard**	**Optional**
Part Number	[C03396]	[C03327]
Type	Indoor Service Only, with Shield	Canister, Single-Stage
Cleaning method	Washable	Disposable
Air Intake Restriction Maximum Limit		
Dirty Air Cleaner - in H_20 (kPa)	12 (3)	10 (2.5)
Clean Air Cleaner - in H_20 (kPa)	6 (1.5)	5 (1.2)
Maximum Allowable Temperature (Air To Engine Inlet) - °F (°C)[5]	130 (54.4)	

Lubrication System	
Oil Pressure - normal - lb/in^2 (kPa)	40 (276) - 60 (414)
Low Oil Pressure Alarm Switch - lb/in^2 (kPa)[6]	30 (207) to 35 (241)
In Pan Oil Temperature - °F (°C)	220 (104) - 245 (118)
Total Oil Capacity with Filter - qt (L)	15.5 (14.7)

Lube Oil Heater	**Optional**	**Optional**
Wattage (Nominal)	150	150
Voltage	120V (+5%, -10%)	240V (+5%, -10%)
Part Number	C04430	C04431

Performance	**1760**
BMEP - lb/in^2 (kPa)	236 (1630)
Piston Speed - ft/min (m/min)	1467 (447)
Mechanical Noise - dB(A) @ 1m	C133364
Power Curve	C133154

[4]Based on Nominal System. Back pressure flow analysis must be done to assure maximum allowable back pressure is not exceeded. (Note: minimum exhaust Pipe diameter is based on: 15 feet of pipe, on 90° elbow, and a silencer pressure drop no greater than one half of the maximum allowable back pressure.) [5]Review for horsepower derate if ambient air entering engine exceeds 77°F (25°C). [6]Low Oil Pressure Switch threshold varies w/engine speed. [ ] indicates component reference part number.

California Environmental Protection Agency **AIR RESOURCES BOARD**	**JOHN DEERE POWER SYSTEMS**	**EXECUTIVE ORDER U-R-004-0429** New Off-Road Compression-Ignition Engines

Pursuant to the authority vested in the Air Resources Board by Sections 43013, 43018, 43101, 43102, 43104 and 43105 of the Health and Safety Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-02-003;

IT IS ORDERED AND RESOLVED: That the following compression-ignition engines and emission control systems produced by the manufacturer are certified as described below for use in off-road equipment. Production engines shall be in all material respects the same as those for which certification is granted.

MODEL YEAR	ENGINE FAMILY	DISPLACEMENT (liters)	FUEL TYPE	USEFUL LIFE (hours)
2011	BJDXL06.8105	4.5, 6.8	Diesel	8000

SPECIAL FEATURES & EMISSION CONTROL SYSTEMS	TYPICAL EQUIPMENT APPLICATION
Direct Diesel Injection, Turbocharger, Charge Air Cooler, Electronic Control Module, Smoke Puff Limiter	Loaders, Tractor, Pump, Compressor, Generator Set, Other Industrial Equipment

The engine models and codes are attached.

The following are the exhaust certification standards (STD), or family emission limit(s) (FEL) as applicable, and certification levels (CERT) for hydrocarbon (HC), oxides of nitrogen (NOx), or non-methane hydrocarbon plus oxides of nitrogen (NMHC+NOx), carbon monoxide (CO), and particulate matter (PM) in grams per kilowatt-hour (g/kw-hr), and the opacity-of-smoke certification standards and certification levels in percent (%) during acceleration (Accel), lugging (Lug), and the peak value from either mode (Peak) for this engine family (Title 13, California Code of Regulations, (13 CCR) Section 2423):

RATED POWER CLASS	EMISSION STANDARD CATEGORY		EXHAUST (g/kw-hr)					OPACITY (%)		
			HC	NOx	NMHC+NOx	CO	PM	ACCEL	LUG	PEAK
75 ≤ kW < 130	Tier 3	STD	N/A	N/A	4.0	5.0	0.30	20	15	50
		CERT	--	--	3.4	1.5	0.25	13	3	25

BE IT FURTHER RESOLVED: That for the listed engine models, the manufacturer has submitted the information and materials to demonstrate certification compliance with 13 CCR Section 2424 (emission control labels), and 13 CCR Sections 2425 and 2426 (emission control system warranty).

Engines certified under this Executive Order must conform to all applicable California emission regulations.

This Executive Order is only granted to the engine family and model-year listed above. Engines in this family that are produced for any other model-year are not covered by this Executive Order.

Executed at El Monte, California on this 6 day of December 2010.

Annette Hebert

Annette Hebert, Chief
Mobile Source Operations Division

Engine Model Summary Form

CARB EO#
U-R-004-0429

Manufacturer:	John Deere Power Systems
Engine category:	Nonroad CI
EPA Engine Family:	BJDXL06.8105
Mfr Family Name:	350HAC
Process Code:	New Submission

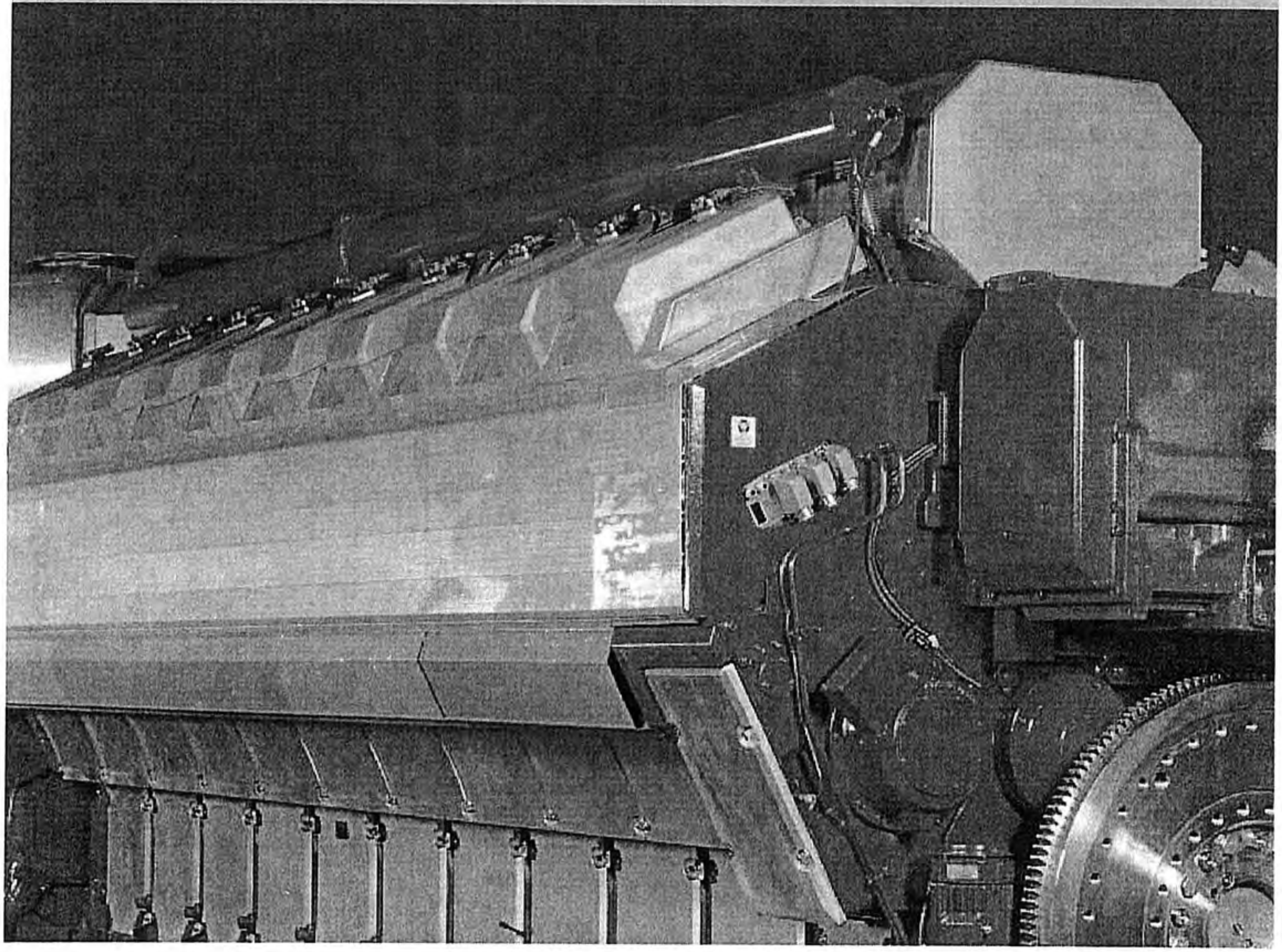
1.Engine Code	2.Engine Model	3.BHP@RPM (SAE Gross)	4.Fuel Rate: mm/stroke @ peak HP (for diesel only)	5.Fuel Rate: (lbs/hr) @ peak HP (for diesels only)	6.Torque @ RPM (SEA Gross)	7.Fuel Rate: mm/stroke@peak torque	8.Fuel Rate: (lbs/hr)@peak torque	9.Emission Control Device Per SAE J1930
4045HF268	4045H	115.33@2400	84.80@2400	45.77@2400	317.11@1600	101.1@1600	38.45@1600	EM EC SPL
4045HF285A	4045H	146.18@2400	111.50@2400	60.17@2400	413.65@1600	131.8@1600	47.40@1600	EM EC SPL
4045HFS83	4045H	158.25@1800	144.10@1800	58.32@1800				EM EC SPL
4045HFS82	4045H	126.06@1800	115.80@1800	46.90@1800				EM EC SPL
6068HRT86	6068H	151.54@2200	82.00@2200	58.65@2200	467.56@1500	105.7@1500	51.59@1500	EM EC SPL
6068HRT85B	6068H	138.13@2200	74.80@2200	53.58@2200	426.26@1500	94.9@1500	46.30@1500	EM EC SPL
6068HRT85A	6068H	127.40@2200	70.50@2200	50.27@2200	393.07@1500	92.2@1500	44.98@1500	EM EC SPL
4045HRT83A	4045H	131.43@2200	107.30@2200	53.14@2200	383.49@1650	118.6@1650	43.88@1650	EM EC SPL
4045HRT83B	4045H	120.70@2200	100.00@2200	49.39@2200	376.11@1650	118@1650	43.66@1650	EM EC SPL
4045HRT83C	4045H	111.31@2200	92.60@2200	45.64@2200	345.88@1650	107.7@1650	39.91@1650	EM EC SPL
4045HRT83D	4045H	119.36@2200	97.50@2200	48.06@2200	373.90@1650	117.4@1650	43.44@1650	EM EC SPL
4045HRT83E	4045H	108.63@2200	89.90@2200	44.54@2200	351.04@1650	110.7@1650	41.01@1650	EM EC SPL
4045HE050	4045H	124.72@2400	91.80@2400	49.56@2400	354.72@1600	111.9@1600	40.33@1600	EM EC SPL
4045HT065	4045H	127.40@2200	89.50@2200	49.01@2200	304.58@1600	131.1@1600	45.15@1600	EM EC SPL
6068HN054	6068H	173.00@2400	89.40@2400	67.91@2400	506.64@1500	104.5@1500	52.25@1500	EM EC SPL
4045HL288B	4045H	130.08@2300	98.90@2300	49.61@2300	387.17@1600	124.0@1600	43.44@1600	EM EC SPL
4045HL288A	4045H	130.08@2300	98.90@2300	49.61@2300	387.17@1600	124.0@1600	43.44@1600	EM EC SPL
4045HRW51	4045H	130.08@2300	98.90@2300	49.61@2300	387.17@1600	124.0@1600	43.44@1600	EM EC SPL
6068HL282A	6068H	140.81@2300	71.90@2300	55.78@2300	429.21@1600	92.7@1600	49.83@1600	EM EC SPL
6068HL282B	6068H	140.81@2300	71.90@2300	55.78@2300	429.21@1600	92.7@1600	49.83@1600	EM EC SPL
6068HRW84	6068H	140.81@2300	71.90@2300	55.78@2300	429.21@1600	92.7@1600	49.83@1600	EM EC SPL
6068HL283A	6068H	173.00@2100	90.50@2100	63.94@2100	575.23@1500	119.7@1500	60.41@1500	EM EC SPL
6068HL283B	6068H	173.00@2100	90.50@2100	63.94@2100	575.23@1500	119.7@1500	60.41@1500	EM EC SPL
6068HRW81	6068H	173.00@2100	90.50@2100	63.94@2100	575.23@1500	119.7@1500	60.41@1500	EM EC SPL
4045HFC28B	4045H	139.47@2400	101.10@2400	54.59@2400				EM EC SPL
4045HFC28C	4045H	139.47@2350	100.60@2350	53.14@2350				EM EC SPL
4045HFC28D	4045H	135.45@2100	108.10@2100	51.08@2100				EM EC SPL
4045HFC28A	4045H	156.90@1760	142.10@1760	56.20@1760				EM EC SPL
4045HFC28E	4045H	139.47@2400	102.10@2400	55.14@2400	387.17@1600	120.2@1600	43.33@1600	EM EC SPL

Attachment F.1-3 Wartsila 34SG Technical Brochure

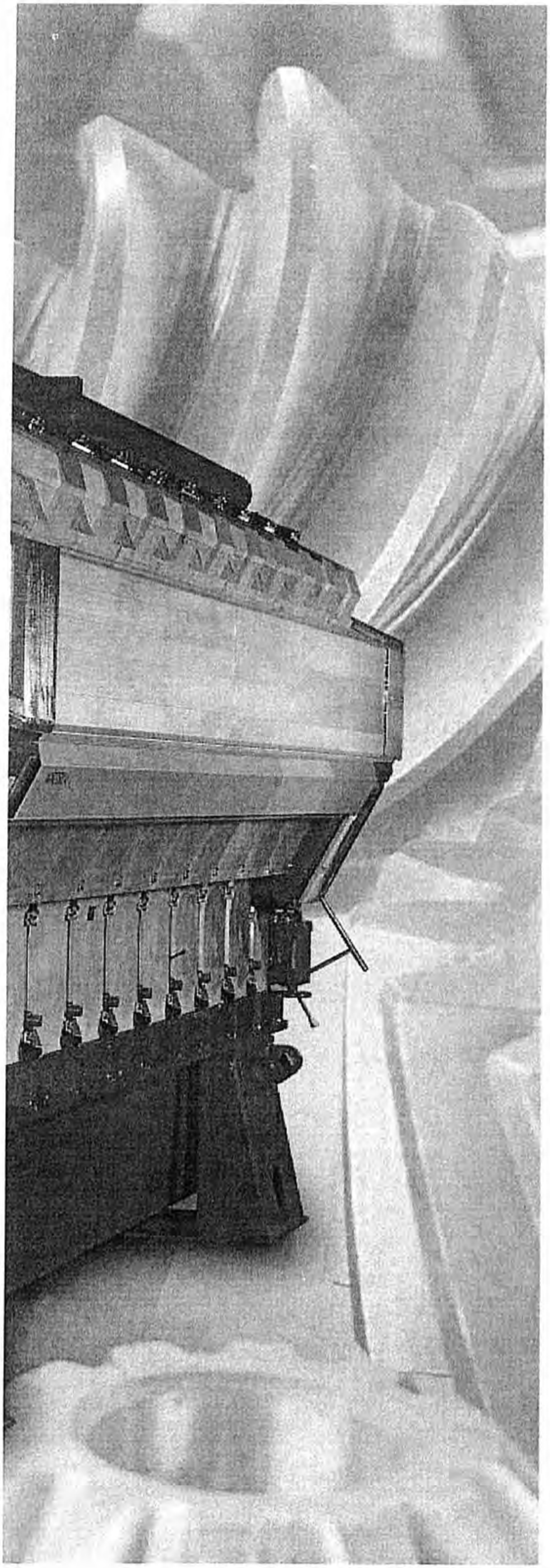
(15 Pages)

WÄRTSILÄ **34SG**

Engine technology 16 and 20V34SG

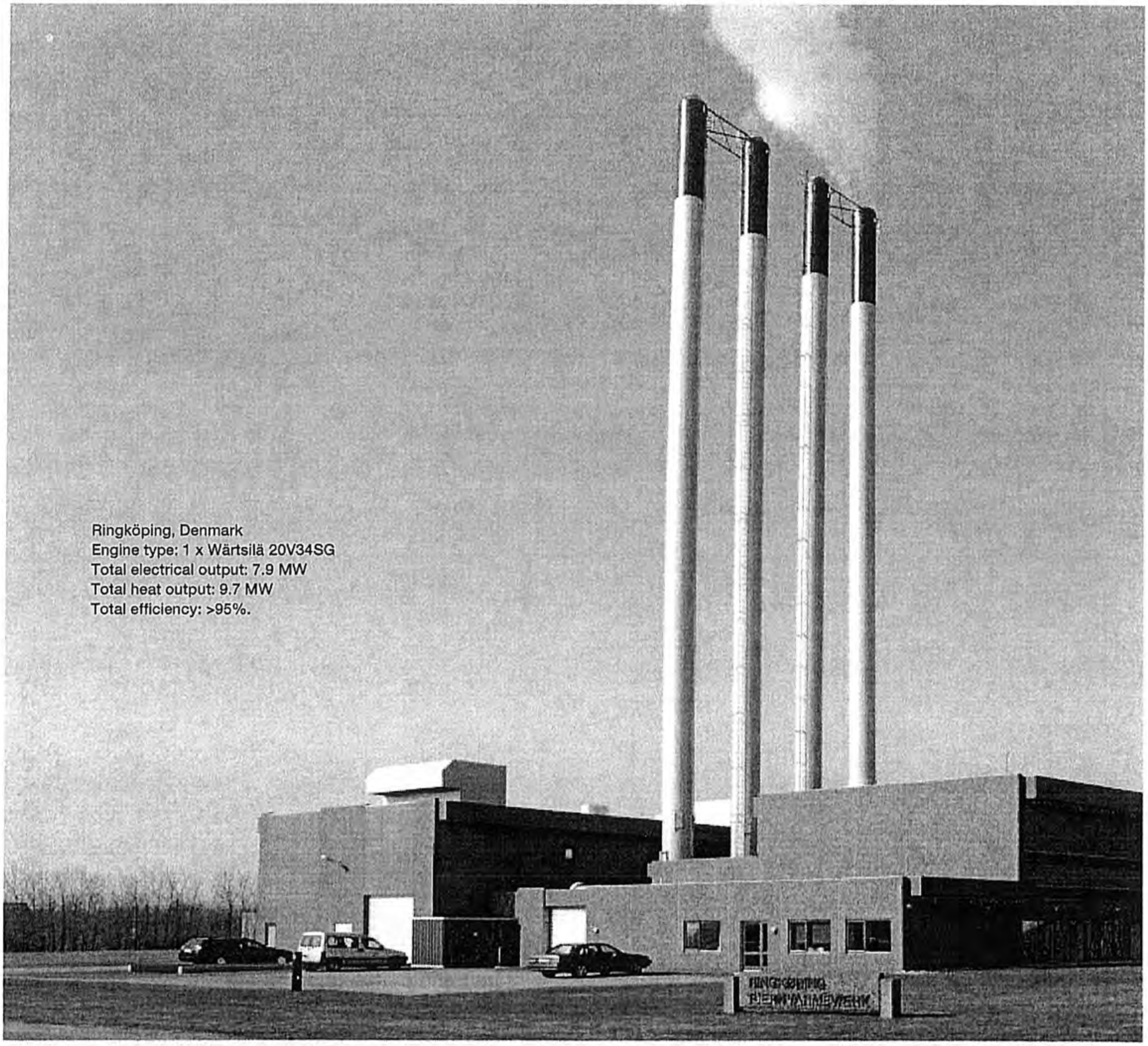


WÄRTSILÄ



WÄRTSILÄ **34SG**

Engine technology

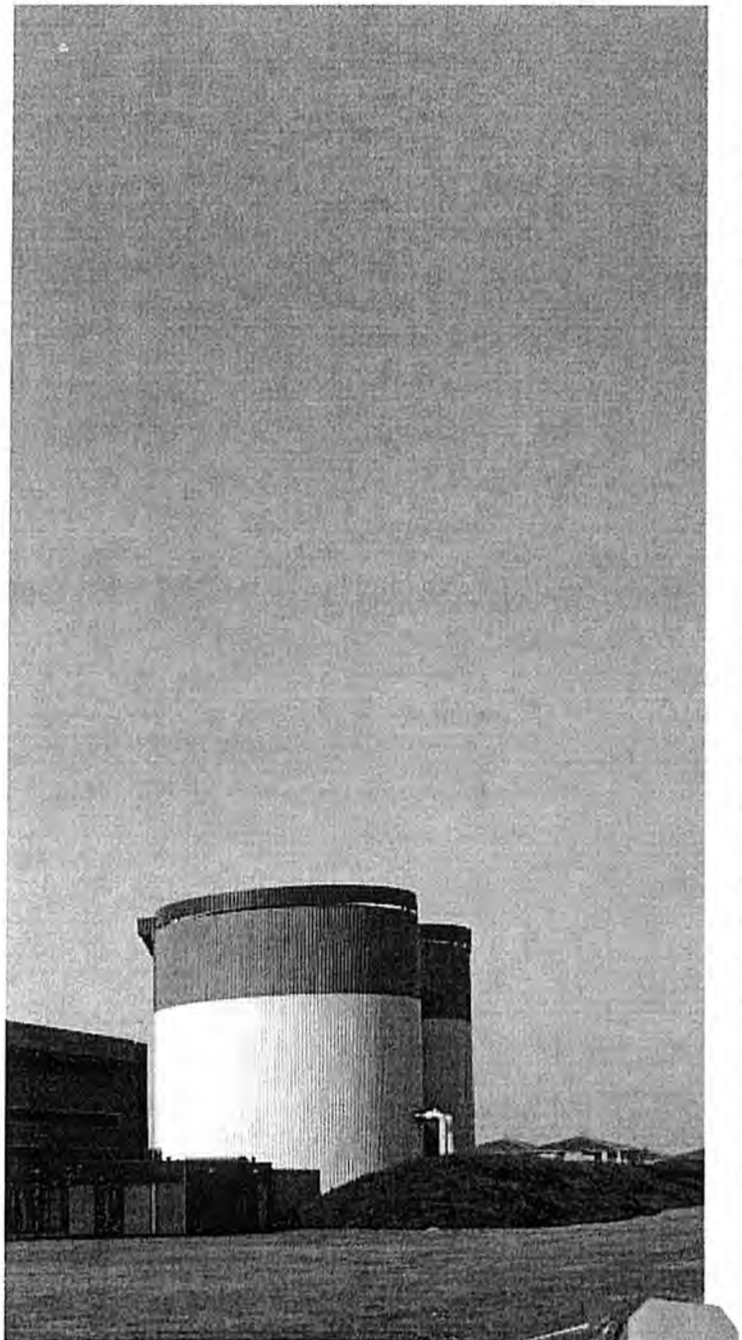


Ringköping, Denmark
Engine type: 1 x Wärtsilä 20V34SG
Total electrical output: 7.9 MW
Total heat output: 9.7 MW
Total efficiency: >95%.

In 1992, Wärtsilä started the development of lean-burn, spark-ignited Otto gas engines. The first 34SG engine was released in 1995 and now the product range of lean-burn gas engines has been expanded by introducing the new WÄRTSILÄ® 34SG. These engines take the power output of the 34SG series up to 9 MW.

The Wärtsilä 34SG is a four-stroke, spark-ignited gas engine that works according to the Otto process and the lean-burn principle. The engine has ported gas admission and a prechamber with a spark plug for ignition.

The engine runs at 720 or 750 rpm for 60 or 50 Hz applications and produces 6950 to 9000 kW of mechanical power, respectively. The efficiency of the Wärtsilä 34SG is the highest of any spark-ignited gas engines today. The natural gas fuelled, lean-burn, medium-speed engine is a reliable, high-efficiency and low-pollution power source for co-generation plants.



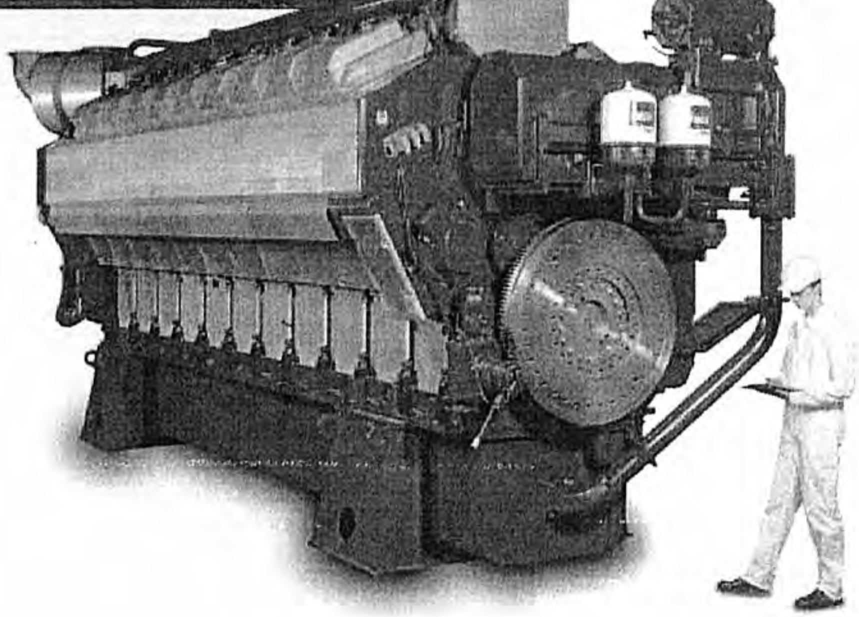
Design philosophy

The Wärtsilä 34SG was developed in response to the market need for bigger gas engines. Its design principles are based on the well-proven technology of the 18V version but with substantial improvements. The Wärtsilä 34SG lean-burn gas engine utilizes the frame of the new Wärtsilä 32 diesel/heavy fuel engine with its advanced integrated lube oil and cooling water channels. The bore has been increased to 340 mm to fully utilize the power potential of this engine block.

The Wärtsilä 34SG meets current and future requirements for overall cost of ownership. It is designed for flexible manufacturing methods and long maintenance-free operating periods. The engine is fully equipped with all essential ancillaries and a thoroughly planned interface to external systems.

The Wärtsilä 34SG combines high efficiency with low emissions. This is achieved applying state-of-the-art technology with features including:

- use of a lean gas mixture for clean combustion
- individual combustion control and monitoring, providing even load on all cylinders
- stable combustion, ensured by a high-energy ignition system and pre-combustion chamber
- self-learning and self-adjustable functions in the control system
- efficient heat recovery design
- minimal consumables.



The lean-burn concept

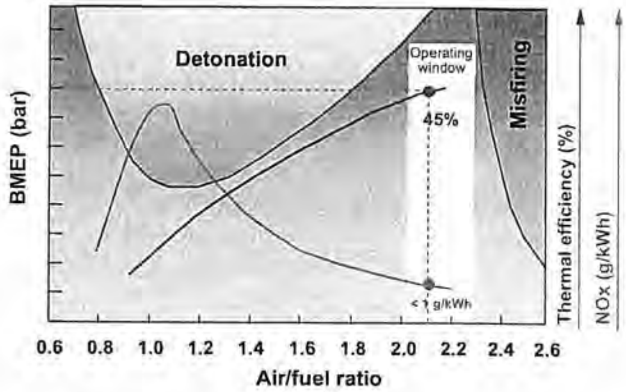
In a lean-burn gas engine, the mixture of air and gas in the cylinder is lean, i.e. more air is present in the cylinder than is needed for complete combustion. With leaner combustion, the peak temperature is reduced and less NO_X is produced. Higher output can be reached while avoiding knocking and the efficiency is increased as well, although a too lean mixture will cause misfiring.

Ignition of the lean air-fuel mixture is initiated with a spark plug located in the prechamber, giving a high-energy ignition source for the main fuel charge in the cylinder. To obtain the best efficiency and lowest emissions, every cylinder is individually controlled to ensure operation at the correct air-fuel ratio and with the correct timing of the ignition.

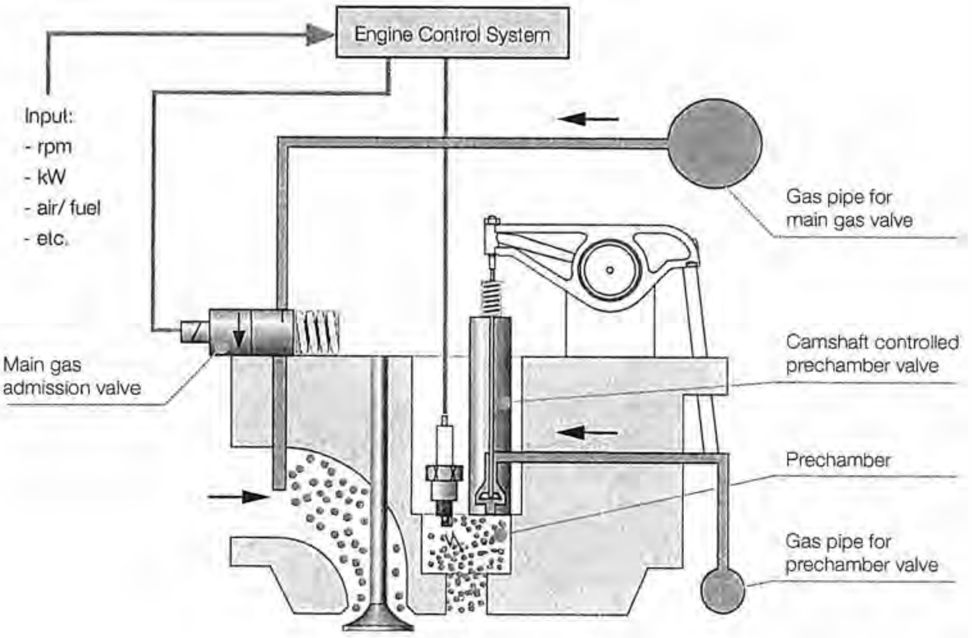
Stable and well-controlled combustion also contributes to less mechanical and thermal load on engine components. The specially developed Engine Control System is designed to control the combustion process in each cylinder, and to keep the engine within the operating window, by optimizing the efficiency and emissions level of each cylinder under all conditions.

Low emissions

The main parameters governing the rate of NO_X formation in internal combustion engines are peak temperature and residence time. The temperature is reduced by the combustion chamber air-fuel ratios: the higher the air-fuel ratio the lower the temperature and consequently the lower the NO_X emissions.



In the Wärtsilä 34SG engine, the air-fuel ratio is very high and is uniform throughout the cylinder, due to premixing of the fuel and air before introduction into the cylinders. Maximum temperatures and subsequent NO_X formation are therefore low, since the same specific heat quantity released by combustion is used to heat up a larger



mass of air. Benefiting from this unique feature of the lean-burn principle, the NO_X emissions from the Wärtsilä 34SG are extremely low, and comply with the most stringent existing NO_X legislation.

Gas admission system

The Wärtsilä 34SG engine fully controls the combustion process in each cylinder. The "brain" for controlling the combustion process and the whole engine is the Engine Control System.

The gas admission valves located immediately upstream of the inlet valve are electronically actuated and controlled to feed the correct amount of gas to each cylinder. Since the gas valve is timed independently of the inlet valve, the cylinder can be scavenged without risk of the gas escaping directly from the inlet to the exhaust. Various parameters like engine load, speed and cylinder exhaust temperatures are monitored and work as inputs to the Engine Control System. With this arrangement, each cylinder always works within the operating window for the best efficiency at the lowest emission levels.

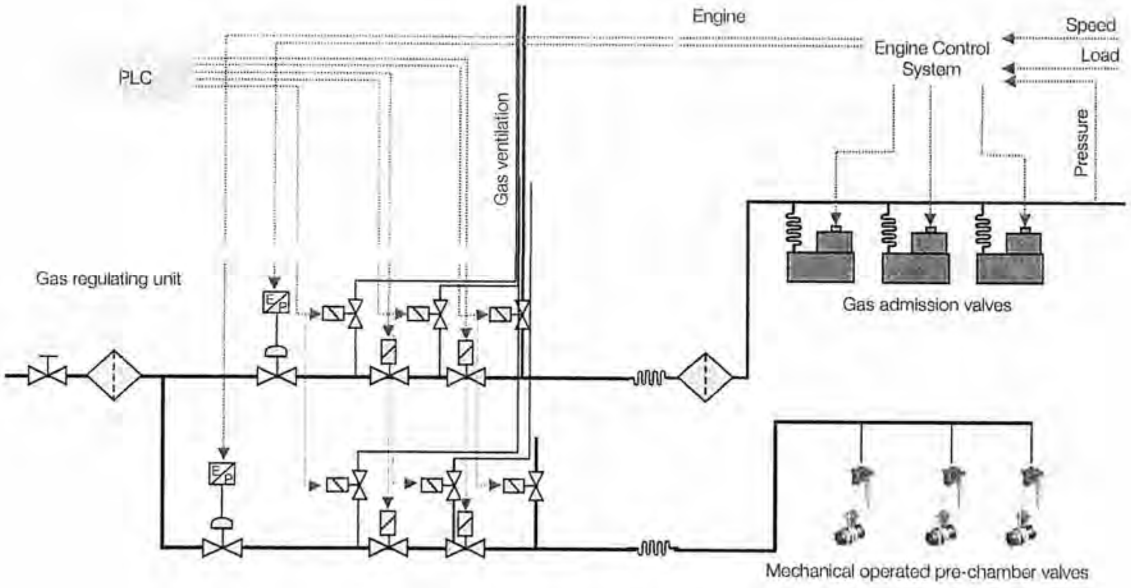
The ported gas admission concept gives:

- high efficiency
- good load response
- lower thermal loading of engine components
- no risk of backfire to the air inlet manifold.

Gas supply system

Before the natural gas is supplied to the engine it passes through a gas-regulating unit, including filter, pressure regulators, shut off valves and ventilating valves. The external pressure regulator regulates the gas pressure to the correct value under different loads; however, the maximum pressure needed is not more than 4.5 bar(a) under full load.

In the engine, the gas is supplied through common pipes running along the engine, continuing with individual feed pipes to each main gas admission valve located on each cylinder head. There are two common pipes per bank, one for the main and one for the prechamber gas supply. A filter is placed before every gas admission valve to prevent particles from entering the valve.

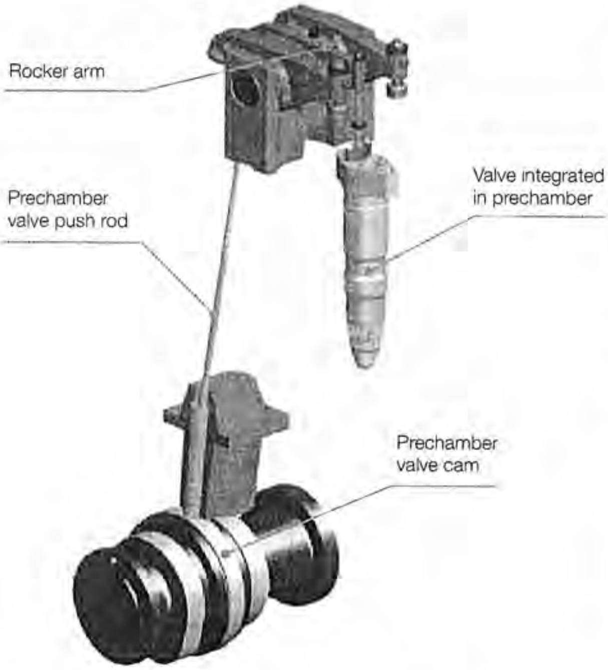


Prechamber

The prechamber is the ignition source for the main fuel charge and is one of the essential components of a lean-burn spark-ignited gas engine.

The prechamber should be as small as possible to give low NO_X values, but big enough to give rapid and reliable combustion. Some of the design parameters considered are:

- shape and size
- mixing of air and fuel
- gas velocities and turbulence at the spark plug
- cooling of the prechamber and the spark plug
- choice of material.



The prechamber of the Wärtsilä 34SG is already optimized at the design stage using advanced three-dimensional, computerized fluid dynamics. In practice, the results can be seen as:

- reliable and powerful ignition
- high combustion efficiency and stability
- extended spark plug life
- very low NO_X levels.

Gas is admitted to the prechamber through a mechanical, camshaft-driven valve. This solution has proved to be extremely reliable and gives an excellent mixture into the prechamber.

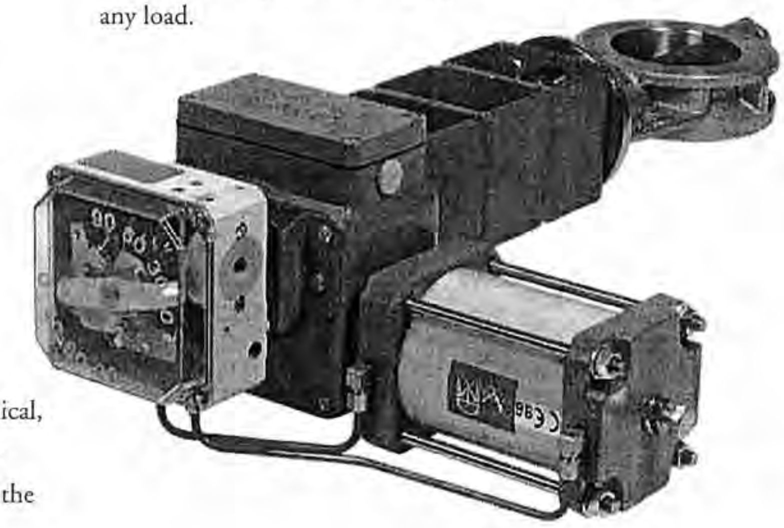
Ignition system

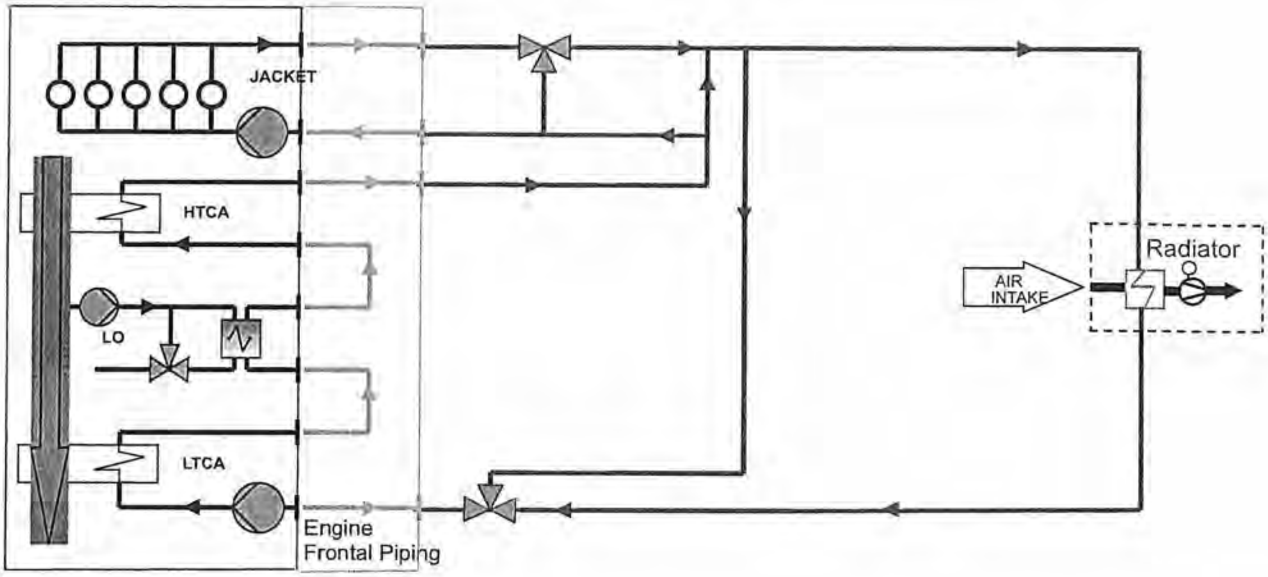
The Wärtsilä 34SG ignition system is tailor-made for the engine type and integrated in the Engine Control System. The ignition module communicates with the main control module, which determines the global ignition timing. The ignition module controls the cylinder-specific ignition timing based on the combustion quality. The cylinder-specific control ensures the optimum combustion in every cylinder with respect to reliability and efficiency.

The ignition coil is located in the cylinder cover and is integrated in the spark plug extension. The coil-on-plug design ensures a reliable solution with a minimum of joints between the spark plug and the ignition coil. The spark plug has been especially developed for long lifetime and to withstand the high cylinder pressure and temperature related to the high engine output.

Air-fuel ratio

To always ensure correct performance of the engine, it is essential to have the correct air-fuel ratio under all types of conditions. The Wärtsilä 34SG uses an exhaust gas wastegate valve to adjust the air-fuel ratio. Part of the exhaust gases bypasses the turbocharger through the waste-gate valve. This valve adjusts the air-fuel ratio to the correct value regardless of varying site conditions under any load.





Cooling system

The Wärtsilä 34SG engine is designed with a Wärtsilä open-interface cooling system for optimal cooling and heat recovery. The system has four cooling circuits: the cylinder cooling circuit (Jacket), the charge air low-temperature (LTCA) and high-temperature (HTCA) cooling circuits, and the circuit for the lube oil cooler (LO) built on the engine.

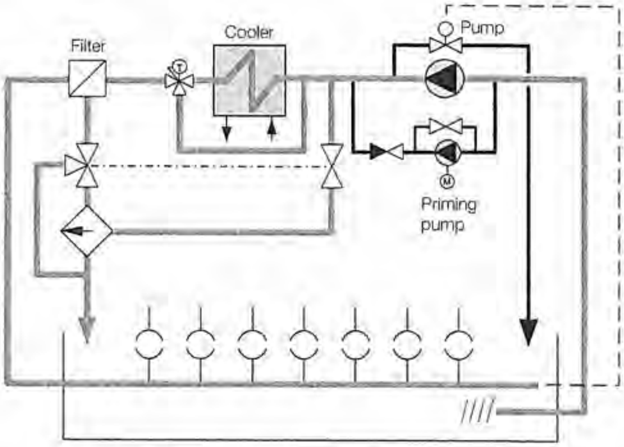
The LTCA cooling circuit and Jacket cooling circuit have water pumps integrated in the cover module at the free end of the engine. The LO circuit has its own thermostatic valve built on the engine. The water temperature into the LTCA cooler and the water temperature out from the Jacket cooling circuit are controlled by external thermostatic valves.

The default cooling system is a single-circuit radiator cooling system where the cooling circuits on the engine are connected in series. For heat recovery applications each cooler can be individually connected to an external cooling system. The open interface allows full freedom in cooling and heat recovery system design.

Lubricating oil system

The Wärtsilä 34SG is equipped with a wet oil sump, an engine-driven main pump, electrically driven pre-lubricating pump, cooler, full flow filter and centrifugal filter. The pumps, pressure regulation valves and safety valves are integrated into one module fitted at the free end of the engine. Filter, cooler and thermostatic valves make up another module.

The lube oil filtration is based on an automatic back-flushing filter requiring a minimum of maintenance. The filter elements are made of a seamless sleeve fabric with high temperature resistance. A centrifugal filter is mounted in the back-flushing line, acting as an indicator for excessive dirt in the lube oil. The engine uses a pre-lubricating system before starting to avoid wear of engine parts. For running in, provision has been made for mounting special running-in filters in front of each main bearing.



Starting system

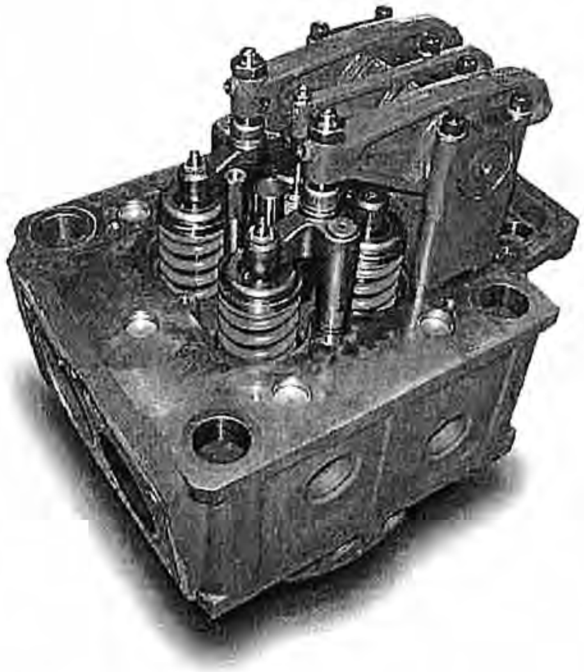
The Wärtsilä 34SG engine is provided with pneumatic starting valves in the cylinder heads of one bank. The valves are operated by air from a distributor at the end of the camshaft. A starting limiter valve prevents the engine from starting if the turning gear is engaged.

Piston

Pistons are of the low-friction, composite type with forged steel top and aluminium skirt. The design itself is tailored for an engine of this size and includes a number of innovative approaches. Long lifetime is obtained through the use of Wärtsilä's patented skirt-lubrication system, a piston crown cooled by "cocktail-shaker" cooling, induction hardened piston ring grooves and the low-friction piston ring.

Piston ring set

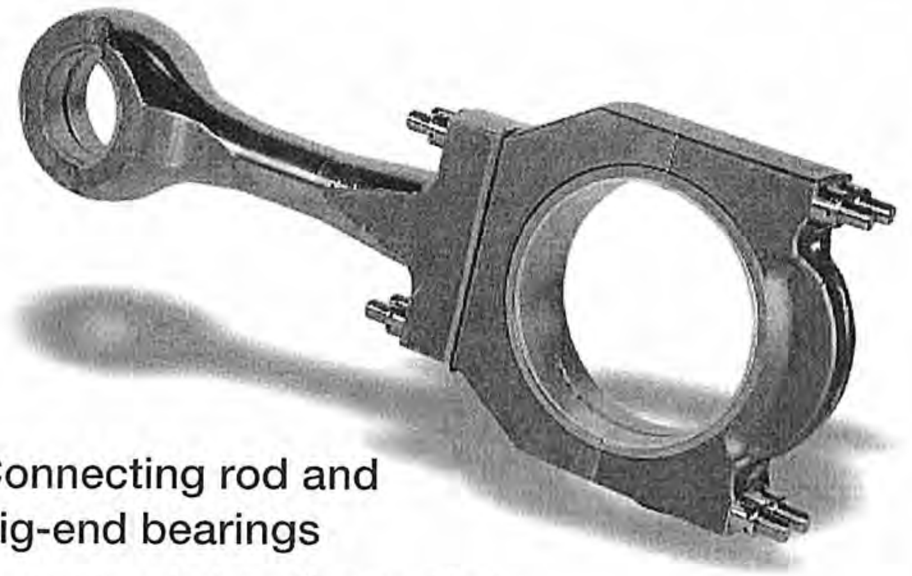
The two compression rings and the oil control ring are located in the piston crown. This three-ring concept has proved its efficiency in all Wärtsilä engines. In a three-pack, every ring is dimensioned and profiled for the task it must perform. Most of the frictional loss in a reciprocating combustion engine originates from the piston rings. A three-ring pack is thus optimal with respect to both function and efficiency.



Cylinder head

Wärtsilä successfully employs four-screw cylinder head technology. At high cylinder pressure it has proved its superiority, especially when liner roundness and dynamic behaviour are considered. In addition to easier maintenance and reliability, it provides freedom to employ the most efficient air inlet and exhaust outlet channel port configuration.

A distributed water flow pattern is used for proper cooling of the exhaust valves, cylinder head flame plate and the prechamber. This minimizes thermal stress levels and guarantees a sufficiently low exhaust valve temperature. Both inlet and exhaust valves are fitted with rotators for even thermal and mechanical loading.



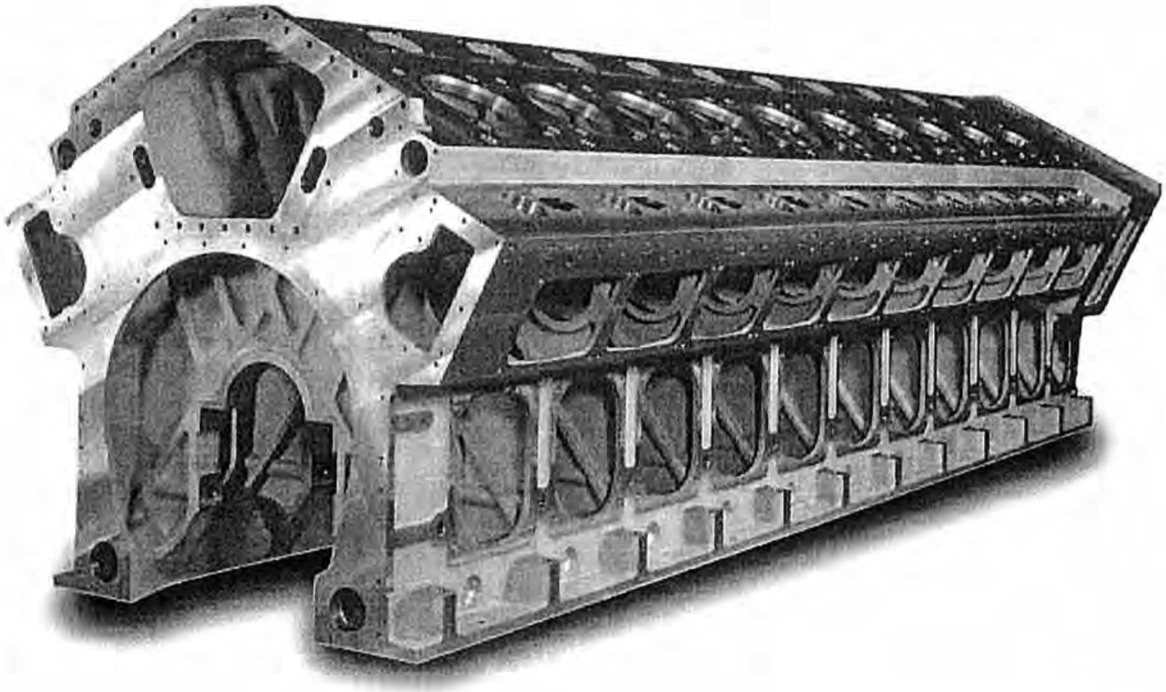
Connecting rod and big-end bearings

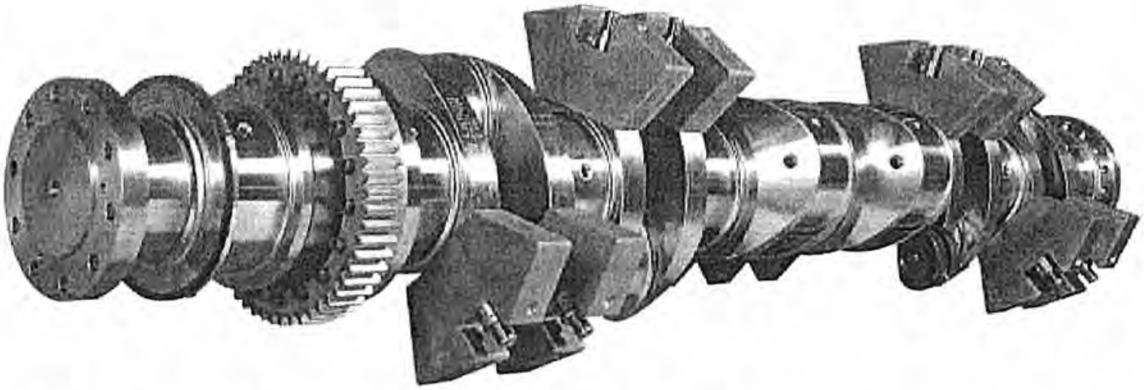
The connecting rod is designed for optimum bearing performance. It is a three-piece design, in which combustion forces are distributed over a maximum bearing area and relative movements between mating surfaces are minimized. Piston overhaul is possible without touching the big-end bearing and the big-end bearing can be inspected without removing the piston.

The three-piece design also reduces the height required for piston overhauling. The big-end bearing housing is hydraulically tightened, resulting in a distortion-free bore for the corrosion-resistant precision bearing. The three-piece connecting rod design allows variation of the compression ratio to suit gases with different knocking resistance.

Engine block

Nodular cast iron is the natural choice for engine blocks today due to its strength and stiffness properties. The Wärtsilä 34SG makes optimum use of modern foundry technology to integrate most oil and water channels. The result is a virtually pipe-free engine with a clean outer exterior. The engine has an underslung crankshaft, which imparts very high stiffness to the engine block, providing excellent conditions for main bearing performance. The engine block has large crankcase doors allowing easy maintenance.





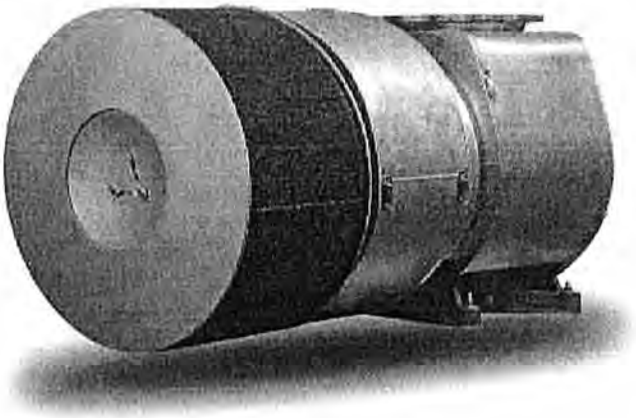
Crankshaft and bearings

The latest advance in combustion development requires a crank gear that can operate reliably at high cylinder pressures. The crankshaft must be robust and the specific bearing loads maintained at acceptable levels. Careful optimization of crankthrow dimensions and fillets achieve this.

The specific bearing loads are conservative, and the cylinder spacing, which is important for the overall length of the engine, is minimized. In addition to low bearing loads, the other crucial factor for safe bearing operation is oil film thickness. Ample oil film thickness in the main bearings is ensured by optimal balancing of rotational masses and, in the big-end bearing, by ungrooved bearing surfaces in the critical areas.

Cylinder liner and anti-polishing ring

The cylinder liner and piston designs are based on Wärtsilä's extensive expertise in tribology and wear resistance acquired over many years of pioneering work in heavy-duty diesel engine design. An integral feature is the anti-polishing ring, which reduces lube oil consumption and wear. The bore-cooled collar design of the liner ensures minimum deformation and efficient cooling. Each cylinder liner is equipped with two temperature sensors for continuous monitoring of piston and cylinder liner behaviour.



Turbocharging system

Every Wärtsilä 34SG is equipped with the Spex turbocharging system. The system is designed for minimum flow losses on both the exhaust and air sides. The interface between the engine and turbocharger is streamlined to avoid all the adaptation pieces and piping frequently used in the past. The Wärtsilä 34SG engine uses high-efficiency turbochargers with inboard plain bearings, and the engine lube oil is used for the turbocharger.

Multiduct

The multiduct replaces a number of individual components in traditional engine designs. These include:

- air transfer from the air receiver to the cylinder head
- exhaust transfer to the exhaust system
- cooling water outlet after the cylinder head
- cooling water return channel from the engine
- gas fuel mixing into the combustion air.

Additional functions are:

- introduction of an initial swirl to the inlet air for optimal part-load combustion
- insulation / cooling of the exhaust transfer duct
- support for the exhaust system and its insulation.

Automation system

The Engine Control System is an engine-mounted distributed system. The various electronic modules are dedicated to different functions and communicate with each other via a CAN databus. All parameters handled by the Engine Control System are transferred to the operator interface and the plant control system. Its features are:

- easy maintenance and high reliability due to rugged engine-dedicated connectors, CIB's (cabling interface boxes) and high quality cables
- less cabling on and around the engine
- easy interfacing with external system via a databus
- digitized signals giving immunity from electromagnetic disturbance
- built-in diagnosis for easy troubleshooting.

Main control module

The main control module, the core of the Engine Control System, reads the information sent by all the other modules. Using this information it determines reference values for the main gas admission to control the engine's speed and load.

The main control module also uses the information sent from the different distributed modules to control the global air-fuel ratio and global ignition timing in order to obtain the best performance and reliable operation in different site conditions, such as varying ambient temperature and methane number.

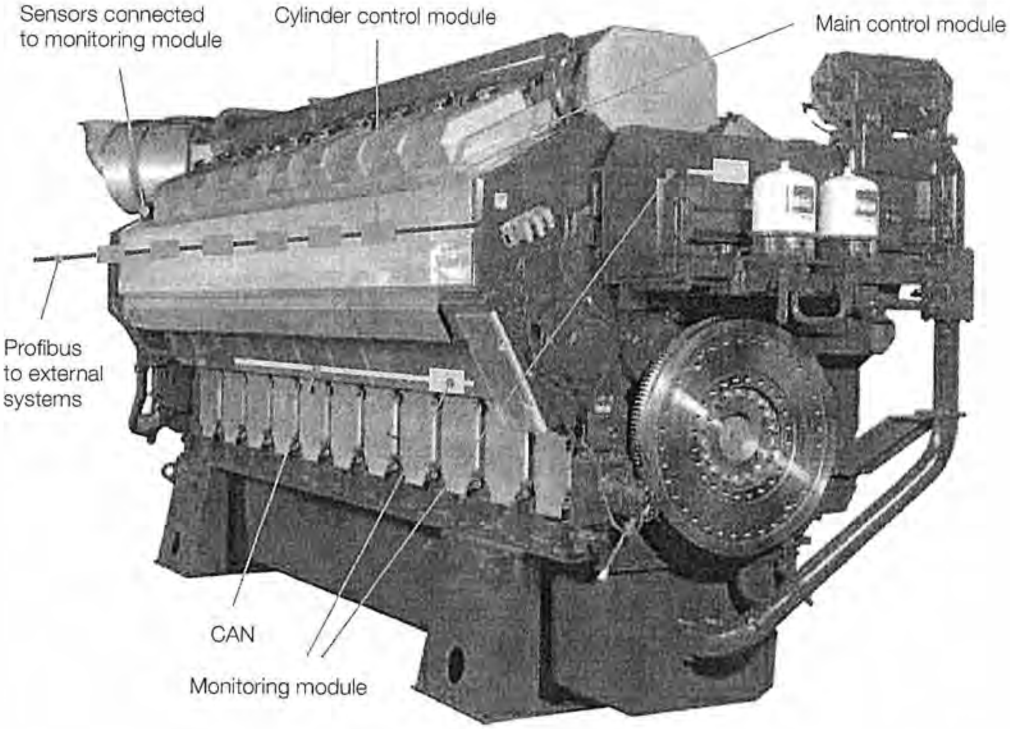
The main control module automatically controls the start and stop sequences of the engine and the engine safety. It also communicates with the plant control system (PLC).

The cylinder control module also monitors the exhaust gas and cylinder liner temperatures of all cylinders.

Cylinder control module

Each cylinder control module monitors and controls three cylinders. The cylinder control module controls the cylinder-specific air-fuel ratio by adjusting the gas admission individually for all cylinders. This ensures optimal combustion in all cylinders.

The cylinder control module also measures the knock intensity i.e. uncontrolled combustion in all cylinders. Information on knock intensity is used to adjust the cylinder-specific ignition timing by the cylinder control module. Light knocking leads to automatic adjustment of the ignition timing and air-fuel ratio. Heavy knocking leads to load reduction and ultimately to shut-down of the engine if heavy knocking does not disappear.



Monitoring modules

Several monitoring modules are located close to groups of sensors, which reduces cabling harness on the engine. The monitored signals are transmitted to the main control module and used for the engine control or safety system. The monitored values are also transferred to the operator interface and the plant control system. The cylinder control module also monitors the exhaust gas and cylinder liner temperatures of all cylinders.

Easy maintenance

The service life of Wärtsilä 34SG engine components and the time between overhauls are very long due to the purity of the gas. The design incorporates efficient and easy maintenance. In combination with the long intervals between overhauls, the hours spent on maintenance are reduced to a minimum. There is greater accessibility to all the components because the number of pipes is minimized and the components are ergonomically designed.

For ease of maintenance, the engine block has large openings to the crankcase and camshaft. All bolts requiring high tension are hydraulically tightened. Hydraulics is extensively used for many other operations as well. Since the main bearing caps are relatively heavy, each bearing cap is equipped with a permanently fitted hydraulic jack for easy manoeuvring of the cap. During delivery test runs, a running-in filter is installed to prevent the bearings from being scratched by any particles left in the oil system.

- The multiduct arrangement allows the cylinder head to be lifted without having to remove gas pipes or water pipes. The slide-in connections allow lifting of the cylinder head without the need to remove oil or air pipes.

- The water pumps are easy to replace thanks to the cassette design principle and water channel arrangement in the pump cover at the free end of the engine.
- A rigid and tight but easily removable insulating box surrounds the exhaust system.
- Easy access to the piping system is obtained by removing the insulating panels.
- The camshaft is built of identical cylinder segments bolted to intermediate bearing pieces.
- A wide range of special tools and measuring equipment specifically designed to facilitate service work are also available.
- Access to and maintenance of the spark plug and prechamber gas valve in the prechamber is easy. The prechamber does not need to be removed. For spark plug replacement, the valve cover does not need to be removed.
- Use of electrically controlled gas admission valves means few mechanical parts and less need for periodic adjustments.
- The three-piece connecting rod allows inspection of the big-end bearing without removal of the piston, and piston overhaul without dismantling the big-end bearing.

WÄRTSILÄ 34SG

Main technical data

Cylinder bore	340 mm
Piston stroke	400 mm
Speed	720 / 750 rpm
Mean effective pressure	20.0 / 19.8 bar
Piston speed	9.6 / 10 m/s
Natural gas specification for nominal load	
Lower heating value	≥ 28 MJ/m^3_N

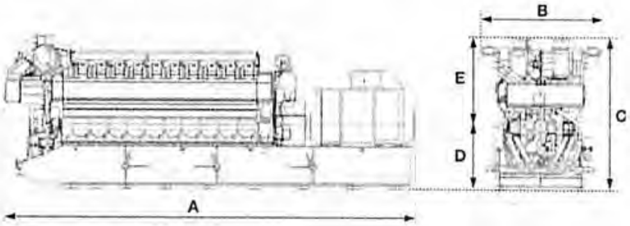
Technical data Compression ratio 12		Unit	16V34SG		20V34SG	
Speed/Hz	NO_X	mg/Nm³ at 5 % O_2	500	250	500	250
	Methane number		>80	>70	>80	>70
720 rpm 60 Hz	Electrical power	kW	6751	6751	8439	8439
	Electrical efficiency	%	46.5	45.1	46.5	45.1
750 rpm 50 Hz	Electrical power	kW	6984	6984	8730	8730
	Electrical efficiency	%	46.5	45.1	46.5	45.1

Technical data Compression ratio 11		Unit	16V34SG		20V34SG	
Speed/Hz	NO_X	mg/Nm³ at 5 % O_2	500	250	500	250
	Methane number		>65	>55	>65	>55
720 rpm 60 Hz	Electrical power	kW	6751	6751	8439	8439
	Electrical efficiency	%	45.5	44.1	45.5	44.1
750 rpm 50 Hz	Electrical power	kW	6984	6984	8730	8730
	Electrical efficiency	%	45.5	44.1	45.5	44.1

Electrical power at generator terminals, including engine-driven pumps, ISO 3046 conditions and LHV. Tolerance + 5%. Power factor 0.8.

Principal genset dimensions (mm) and weights (tonnes)

Engine type	A	B	C	D	E	Engine weight	Genset weight
16V34SG	11692	3233	4348	1998	2648	66.5	115
20V34SG	12466	3233	4348	1998	2648	76.4	137.5



For more specific information, please contact Wärtsilä.

06.2005 / Bock's office / Waasa Graphics

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Wärtsilä Finland Oy
P.O.Box 252,
FIN-65101 Vaasa, Finland

Tel: +358 10 709 0000
Fax: +358 6 356 9133

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APPENDIX F.2

Modeling Support Data

Tables presented in this Appendix are as follows:

In addition, this appendix contains the following figures:

Modeling input/output files are included in the enclosed CD's.

Table F.2.1 Building, Structure and Stack Dimensions

Structure ID	Height, ft (agl)	Length, ft.	Width, ft,	Diameter, ft.
Engine Hall	24 @ eave 29.58 @ crest	361	68.5	-
Urea Tank	22	-	-	13
Used Oil Tank	20	-	-	10
New Oil Tank	20	-	-	10
Potable Water Tank	20	-	-	10
Fire Water Tank	30	-	-	60
Maintenance Oil Tank	16	-	-	8
Radiator Set 1	18	85	43.75	-
Radiator Set 2	18	100	43.75	
SCR/CO Catalyst Housing	25	20	10	-
Warm Start Heater	21	22.5	5	-
Fuel Gas Heater	21	22.5	5	-
Stack Data				
Stack ID	**Height, ft (agl)**	**Diameter, ft.**	**~Temperature**	**~ACFM**
Wartsila Engines (11)	100	4	730-831	62400
Fuel Heater	30	2	1015	2243
Warm Start Heater	30	2	1015	2243
Fire Pump ICE	30	0.33	1040	740

Data derived from Figures F.2-2 and F.2-3.

Building coordinates are specified in the BPIP files, included on the CDs accompanying the AFC.

Table F.2-2 Quail Brush AERMOD Engine Screening Results (w/ All 11 Engines)

Regular 20/50/100/200-meter Receptor Grids and 10m Fenceline Receptors

100' Stack Heights

Case	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Load	**50**	**75**	**100**	**50**	**75**	**100**	**50**	**75**	**100**	**50**	**75**	**100**	**50**	**75**	**100**	**100**
Output kW	4646	6998	9341	4646	6998	9341	4646	6998	**9341**	**4646**	6998	9341	**4646**	6998	9184	9341
Ambient Temp, °F	35	35	35	64	64	64	70	70	**70**	**81**	81	81	**95**	95	95	95
Stack Exit Temp (deg.F)	831	822	741	825	816	735	824	815	734	822	813	732	819	810	731	730
Volumetric Flowrate ACFM	36,660	49,200	61,920	36,580	49,159	61,865	36,540	49,140	61,800	36,540	49,140	61,980	36,600	49,380	61,380	62,400
Stack Inside Diameter (ft)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Stack Height (m)	30.480	30.480	30.480	30.480	30.480	30.480	30.480	30.480	**30.480**	**30.480**	30.480	30.480	30.480	30.480	30.480	30.480
Stack Exit Temp (deg.K)	717.039	712.039	667.039	713.706	708.706	663.706	713.150	708.150	**663.150**	**712.039**	707.039	662.039	710.372	705.372	661.483	660.928
Stack Exit Velocity (m/s)	14.820	19.889	25.031	14.788	19.873	25.009	14.771	19.865	**24.983**	**14.771**	19.865	25.056	14.796	19.962	24.813	25.225
Stack Inside Diameter (m)	1.2192	1.2192	1.2192	1.2192	1.2192	1.2192	1.2192	1.2192	**1.2192**	**1.2192**	1.2192	1.2192	1.2192	1.2192	1.2192	1.2192
Normal Operations - Short-term Emissions (lb/hr)																
NOx (lb/hr/engine)	0.922	1.111	1.318	0.922	1.111	1.318	0.922	1.111	**1.318**	0.922	1.111	1.318	0.922	1.111	1.296	1.318
CO (lb/hr/engine)	1.495	1.481	1.565	1.495	1.481	1.565	1.495	1.481	1.565	**1.495**	1.481	1.565	1.495	1.481	1.539	1.565
SO2 (lb/hr/engine)	0.128	0.192	0.256	0.128	0.192	0.256	0.128	0.192	**0.256**	0.128	0.192	0.256	0.128	0.192	0.256	0.256
PM10 (lb/hr/engine)	1.362	1.373	1.380	1.362	1.373	1.380	1.362	1.373	1.380	**1.362**	1.373	1.380	1.362	1.373	1.357	1.380
Normal Operations - Unitized Impacts (ug/m3 for 1.0 g/s/engine)																
1-Hr Unitized Conc (ug/m3)	803.05544	658.01125	574.71553	805.22422	659.76946	576.47825	806.40949	660.20810	577.13585	807.17988	660.68285	576.52153	807.10865	659.24644	580.38991	574.45567
X(m)	497840.0	497840.0	497820.0	497840.0	497840.0	497820.0	497860.0	497840.0	497820.0	497860.0	497840.0	497820.0	497860.0	497840.0	497820.0	497820.0
Y(m)	3635140.0	3635160.0	3635180.0	3635140.0	3635160.0	3635180.0	3635120.0	3635160.0	3635180.0	3635120.0	3635160.0	3635180.0	3635120.0	3635160.0	3635180.0	3635180.0
Z(m)	231.1	237.3	241.5	231.1	237.3	241.5	227.9	237.3	241.5	227.9	237.3	241.5	227.9	237.3	241.5	241.5
YYMMDDHH	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603
3-Hr Unitized Conc (ug/m3)	402.97036	336.07488	289.52895	403.70791	337.08491	290.69227	404.41680	337.33578	291.12409	404.85035	337.60754	290.72327	404.81360	336.79098	293.24801	289.36720
X(m)	497780.0	497760.0	497740.0	497780.0	497760.0	497740.0	497780.0	497760.0	497740.0	497780.0	497760.0	497740.0	497780.0	497760.0	497740.0	497740.0
Y(m)	3635180.0	3635200.0	3635220.0	3635160.0	3635200.0	3635220.0	3635160.0	3635200.0	3635220.0	3635160.0	3635200.0	3635220.0	3635160.0	3635200.0	3635220.0	3635220.0
Z(m)	235.9	237.8	238.7	228.0	237.8	238.7	228.0	237.8	238.7	228.0	237.8	238.7	228.0	237.8	238.7	238.7
YYMMDDHH	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603
8-Hr Unitized Conc (ug/m3)	256.04970	223.76365	216.02881	256.85171	223.80060	216.34489	257.11685	223.80907	216.46393	257.27527	223.81775	216.34837	257.25257	223.78893	217.05245	215.96469
X(m)	495300.0	495200.0	495200.0	495300.0	495200.0	495200.0	495300.0	495200.0	495200.0	495300.0	495200.0	495200.0	495300.0	495200.0	495200.0	495200.0
Y(m)	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0
Z(m)	244.6	263.9	263.9	244.6	263.9	263.9	244.6	263.9	263.9	244.6	263.9	263.9	244.6	263.9	263.9	263.9
YYMMDDHH	04122608	04122608	04122608	04122608	04122608	04122608	04122608	04122608	04122608	04122608	04122608	04122608	04122608	04122608	04122608	04122608
24-Hr Unitized Conc (ug/m3)	118.58982	103.41288	99.97259	118.95935	103.42707	100.11615	119.08137	103.43025	100.17011	119.15449	103.43347	100.11798	119.14452	103.42265	100.43650	99.94445
X(m)	495300.0	495200.0	495200.0	495300.0	495200.0	495200.0	495300.0	495200.0	495200.0	495300.0	495200.0	495200.0	495300.0	495200.0	495200.0	495200.0
Y(m)	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0
Z(m)	244.6	263.9	263.9	244.6	263.9	263.9	244.6	263.9	263.9	244.6	263.9	263.9	244.6	263.9	263.9	263.9
YYMMDDHH	04122624	04122624	04122624	04122624	04122624	04122624	04122624	04122624	04122624	04122624	04122624	04122624	04122624	04122624	04122624	04122624
Normal Operations - Short-term Screening Emissions (g/s/engine)																
NOx (g/s/engine)	0.1162	0.1400	0.1661	0.1162	0.1400	0.1661	0.1162	0.1400	0.1661	0.1162	0.1400	0.1661	0.1162	0.1400	0.1633	0.1661
CO (g/s/engine)	0.1884	0.1866	0.1972	0.1884	0.1866	0.1972	0.1884	0.1866	0.1972	0.1884	0.1866	0.1972	0.1884	0.1866	0.1939	0.1972
SO2 (g/s/engine)	0.0161	0.0242	0.0323	0.0161	0.0242	0.0323	0.0161	0.0242	0.0323	0.0161	0.0242	0.0323	0.0161	0.0242	0.0323	0.0323
PM10 (g/s/engine)	0.1716	0.1730	0.1739	0.1716	0.1730	0.1739	0.1716	0.1730	0.1739	0.1716	0.1730	0.1739	0.1716	0.1730	0.1710	0.1739
Normal Operations - Short-term Screening Impacts (ug/m3)																
1-Hour NOx (ug/m3)	93.315	92.122	95.460	93.567	92.368	95.753	93.705	92.429	**95.862**	93.794	92.496	95.760	93.786	92.295	94.778	95.417
1-Hour CO (ug/m3)	151.296	122.785	113.334	151.704	123.113	113.682	151.928	123.195	113.811	**152.073**	123.283	113.690	152.059	123.015	112.538	113.283
8-Hour CO (ug/m3)	48.240	41.754	42.601	48.391	41.761	42.663	48.441	41.763	42.687	**48.471**	41.764	42.664	48.466	41.759	42.086	42.588
1-Hour SO2 (ug/m3)	12.929	15.924	18.563	12.964	15.966	18.620	12.983	15.977	**18.641**	12.996	15.989	18.622	12.994	15.954	18.747	18.555
3-Hour SO2 (ug/m3)	6.488	8.133	9.352	6.500	8.157	9.389	6.511	8.164	**9.403**	6.518	8.170	9.390	6.517	8.150	9.472	9.347
24-Hour SO2 (ug/m3)	1.909	2.503	3.229	1.915	2.503	3.234	1.917	2.503	**3.235**	1.918	2.503	3.234	1.918	2.503	3.244	3.228
24-Hour PM10 (ug/m3)	20.350	17.890	17.385	20.413	17.893	17.410	20.434	17.893	17.420	**20.447**	17.894	17.411	20.445	17.892	17.175	17.380

Worst-Case Operating Scenarios are **bolded**.

Table F.2-3

Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards [1]		Federal Standards [2]		
		Concentration [3]	**Method [4]**	**Primary [3,5]**	**Secondary [3,6]**	**Method [7]**
Ozone (O_3)	1 Hour	0.09 ppm (180 µg/m^3)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 µg/m^3)		0.075 ppm (147 µg/m^3)		
Respirable Particulate Matter (PM10)	24 Hour	50 µg/m^3	Gravimetric or Beta Attenuation	150 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m^3		—		
Fine Particulate Matter (PM2.5)	24 Hour	No Separate State Standard		35 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m^3	Gravimetric or Beta Attenuation	15.0 µg/m^3		
Carbon Monoxide (CO)	8 Hour	9.0 ppm (10mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	9 ppm (10 mg/m^3)	None	Non-Dispersive Infrared Photometry (NDIR)
	1 Hour	20 ppm (23 mg/m^3)		35 ppm (40 mg/m^3)		
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	—
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.030 ppm (57 µg/m3)	Gas Phase Chemiluminescence	53 ppb (100 µg/m^3) (see footnote 8)	Same as Primary Standard	Gas Phase Chemiluminescence
	1 Hour	0.18 ppm (339 µg/m^3)		100 ppb (188 µg/m^3) (see footnote 8)	None	
Sulfur Dioxide (SO_2)	24 Hour	0.04 ppm (105 µg/m^3)	Ultraviolet Fluorescence	—	—	Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)[9]
	3 Hour	—		—	0.5 ppm (1300 µg/m^3) (see footnote 9)	
	1 Hour	0.25 ppm (655 µg/m^3)		75 ppb (196 µg/m^3) (see footnote 9)	—	
Lead[10]	30 Day Average	1.5 µg/m^3	Atomic Absorption	—	—	—
	Calendar Quarter	—		1.5 µg/m^3	Same as Primary Standard	High Volume Sampler and Atomic Absorption
	Rolling 3-Month Average[11]	—		0.15 µg/m^3		
Visibility Reducing Particles	8 Hour	Extinction coefficient of 0.23 per kilometer — visibility of ten miles or more (0.07 — 30 miles or more for Lake Tahoe) due to particles when relative humidity is less than 70 percent. Method: Beta Attenuation and Transmittance through Filter Tape.		**No Federal Standards**		
Sulfates	24 Hour	25 µg/m^3	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m^3)	Ultraviolet Fluorescence			
Vinyl Chloride[10]	24 Hour	0.01 ppm (26 µg/m^3)	Gas Chromatography			

See footnotes on next page ...

For more information please call ARB-PIO at (916) 322-2990

California Air Resources Board (09/08/10)

1. California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, suspended particulate matter—PM10, PM2.5, and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2. National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than one. For PM2.5, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact U.S. EPA for further clarification and current federal policies.

3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4. Any equivalent procedure which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.

5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

7. Reference method as described by the EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the EPA.

8. To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010). Note that the EPA standards are in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national standards to the California standards the units can be converted from ppb to ppm. In this case, the national standards of 53 ppb and 100 ppb are identical to 0.053 ppm and 0.100 ppm, respectively.

9. On June 2, 2010, the U.S. EPA established a new 1-hour SO_2 standard, effective August 23, 2010, which is based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations. EPA also proposed a new automated Federal Reference Method (FRM) using ultraviolet technology, but will retain the older pararosaniline methods until the new FRM have adequately permeated State monitoring networks. The EPA also revoked both the existing 24-hour SO_2 standard of 0.14 ppm and the annual primary SO_2 standard of 0.030 ppm, effective August 23, 2010. The secondary SO_2 standard was not revised at that time; however, the secondary standard is undergoing a separate review by EPA. Note that the new standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the new primary national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.

10. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

11. National lead standard, rolling 3-month average: final rule signed October 15, 2008.

Figure F.2-1
Facility Plot Plan

Rev No	Revision	Date	Dwn	Chkd	Approved Chief Engr
A	PRELIMINARY RELEASE 3/8/11				
B	UPDATED PLANT GA 6/16/11				
C	UPDATED PLANT GA 7/12/11				

Drawing Control

Purpose	Approved By	Date	Released By	Date
For Information				
For Comment				
For Bid				
For Construction	☒			

Engineering Review

Disc	Engr	Date
Mech		
Elec		
Civil		
Arch		
I & C		
Dwn HPK	Chkd	SI

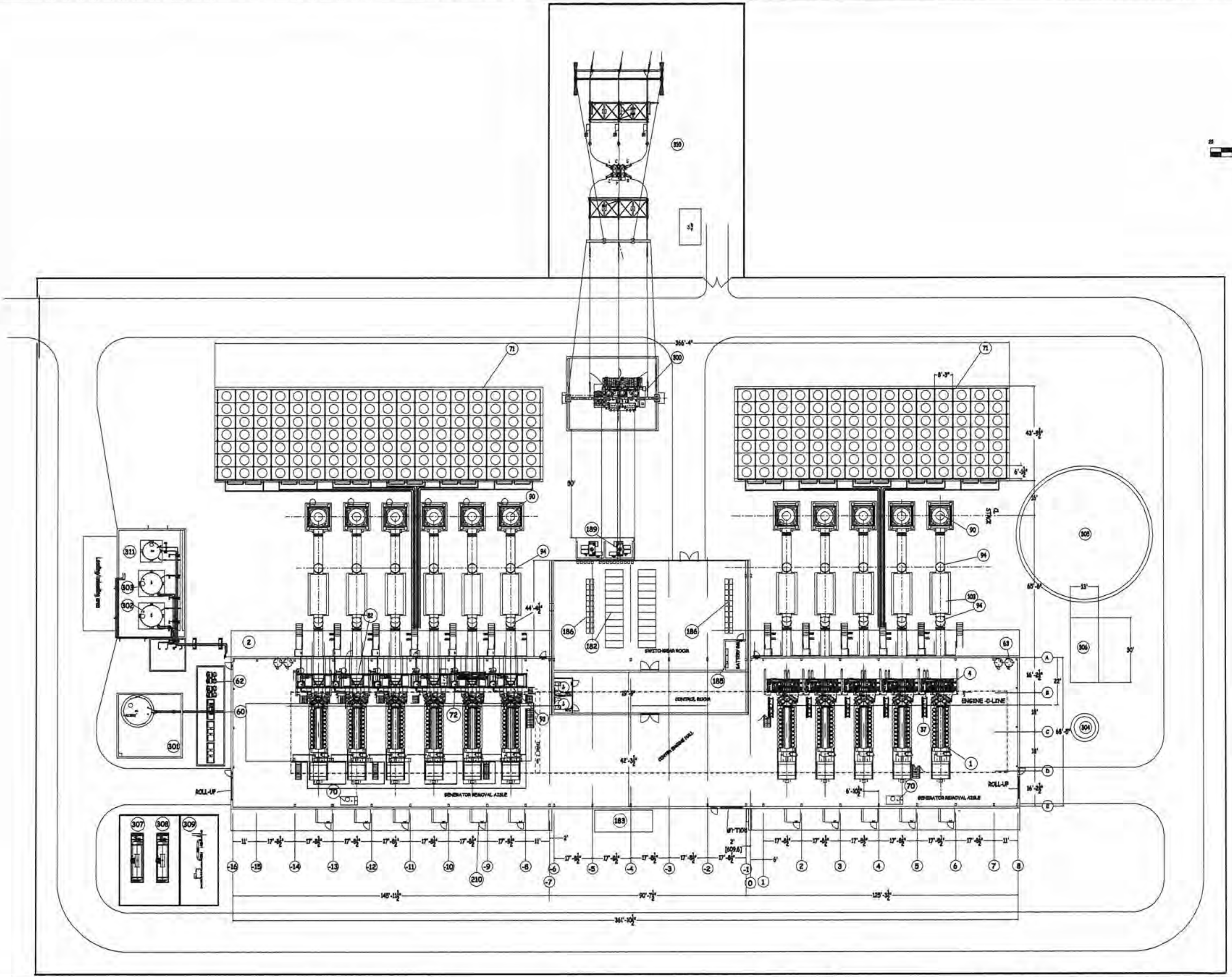
Reviewed By

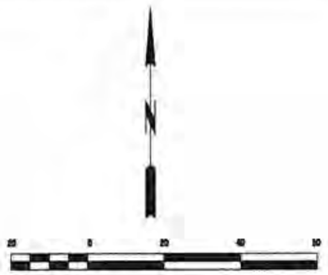
Mgr – Drafting & Design

Cogentrix

QUAIL BRUSH POWER PROJECT
PRELIMINARY OVERALL SITE PLAN

App'd for Construction	Date	Work Order	Drawing No.	Rev
Chief Engineer	3/8/11 Scale 1"=80'		QBPP-1	C





ENGINE HALL & UTILITY BLOCK					
Item No	Pcs.	DESCRIPTION	DESCRIPTION		
			Dia.	Ht.	Cap. (G)
1	11	Engine generator set			
2	1	Engine Hall	-	24'	
4	11	Auxiliary module including:			
		- HT thermostatic valve			
		- LT thermostatic valve			
		- Preheating unit			
37	11	Gas regulating unit			
60	2	Working air unit			
62	2	Starting air unit			
63	10	Starting air bottle 3m3/790 gal			
70	3	Maintenance water tank 4m3/1060gal			
71	2	Radiator Sets		18' H	
72	11	Expansion vessel (Jacket Water) 600l/160gal			
80	22	Charge air filter			
82	11	Charge air & exhaust gas module			
90	11	Exhaust gas Stack	4' Ø	70' H	
93	11	Exhaust gas ventilation unit			
94	22	Rupture disc			
103	11	DeNox (SCR)/Oxidation catalyst		25' H	
140	1	Oily water collecting pit			
182	-	MV Switchgear			
183	1	Neutral point cubicle			
185	4	DC-system			
186	-	LV switchgear			
189	2	Station transformer			
210	11	Ventilation unit (enginehall)			
300	1	Main Step-Up Transformer		30' H	
301	1	UreaTank	13' Ø	22' H	20,000
302	1	Used Oil Tank	10' Ø	20' H	10,000
303	1	New Oil Tank	10' Ø	20' H	10,000
304	1	Potable Water Tank	10' Ø	20' H	10,000
305	1	Fire Water Tank	60' Ø	30' H	600,000
306	1	Fire Water Pumphouse		11' H	
307	1	Warm Start Gas Heater		21' H	
308	1	Cold Start Gas Heater		21' H	
309	1	Natural Gas Metering Station		6' H	
310	1	Facility 230kV Switchyard		52' H Mast	
311	1	Maintenance Oil Tank	8' Ø	16' H	6,000

Figure F.2-2
Site Layout

Rev No	Revision	Date	Dwn	Chkd	Approved Chief Engr
A	Initial Issue				
B	Engineering Review and Comments 6/14/11				
C	3rd set of Radiators per Engines Added 7/11/11				

Drawing Control				
Purpose	Approved By	Date	Released By	Date
For Information				
For Comment				
For Bid				
For Construction				

Engineering Review		
Disc	Engr	Date
Mech		
Elec		
Civil		
Arch		
I & C		
Dwn HPK	Chkd	SI

Reviewed By

Mgr – Drafting & Design

Cogentrix

Quail Brush
Master Layout Plan

App'd for Construction

Chief Engineer

Date 3/9/11

Scale

Work Order

Drawing No. QB-SP-2

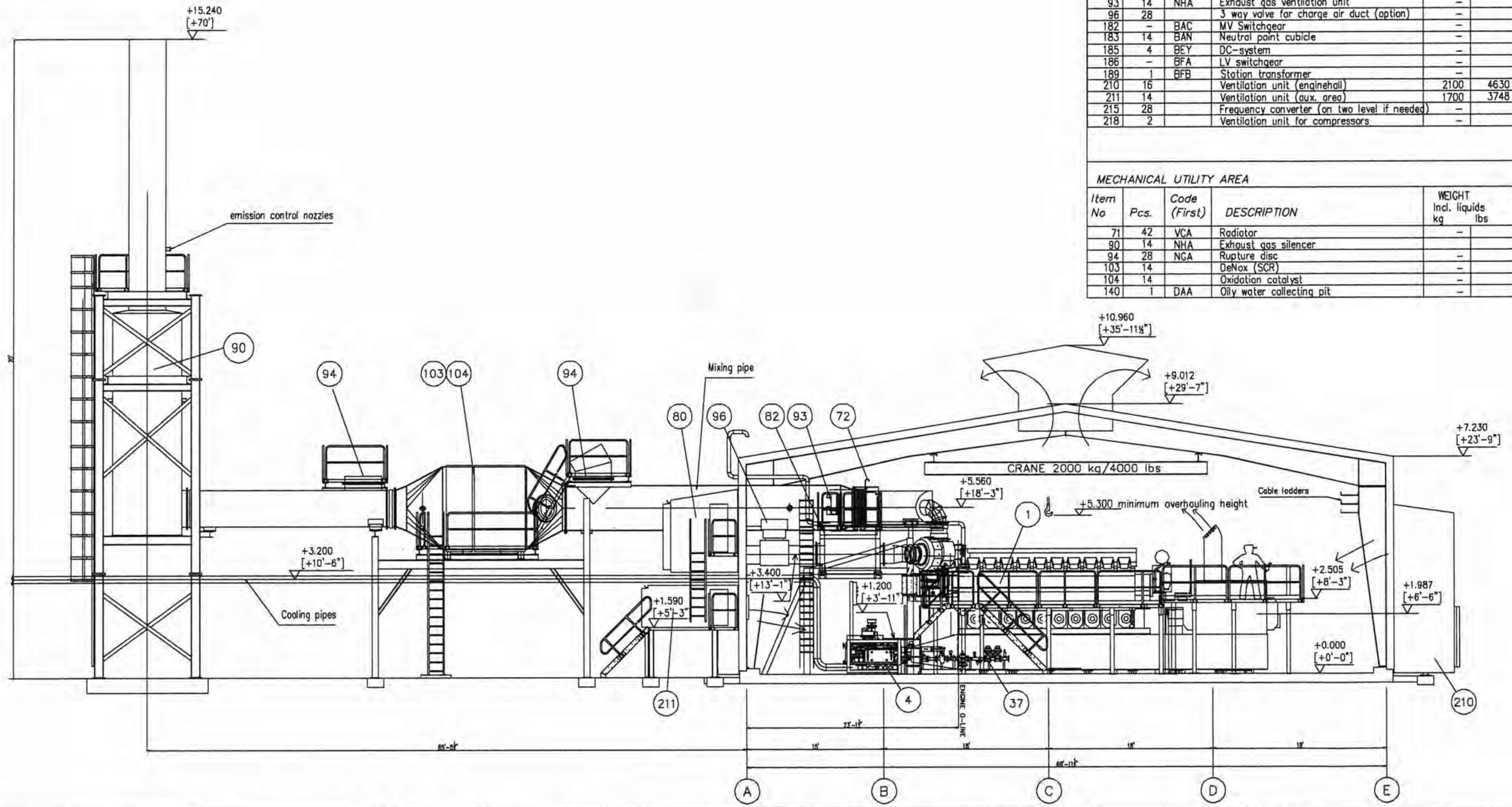
Rev C

ENGINE HALL & UTILITY BLOCK

Item No	Pcs.	Code (First)	DESCRIPTION	WEIGHT Incl. liquids kg	lb	MOUNTING LEVEL millim.	(Floor level) inch.
1	14	SQA	Engine generator set	134700	296962	+0.000	0'- 0"
4	14	QEA	Auxiliary module including:	4200	9259	+0.000	0'- 0"
			– HT thermostatic valve				
			– LT thermostatic valve				
			– Preheating unit				
37	14	ZBB	Gas regulating unit	200	440	+0.000	
60	2	TCA	Working air unit	–		+0.000	
62	2	TSA	Starting air unit	1400	3087	+0.000	
63	10	TSB	Starting air bottle 3m3/790 gal	–		+0.000	
70	3	VBA	Maintenance water tank 4m3/1060gal	414	912	+0.000	
72	14	VEA	Expansion vessel (glycol) 600l/160gal	–		+4.940	16'- 2"
80	28	NGA	Charge air filter	–		+3.100	10'- 2"
82	14		Charge air & exhaust gas module	–		+3.240	11'- 2"
93	14	NHA	Exhaust gas ventilation unit	–		+4.940	16'- 2"
96	28		3 way valve for charge air duct (option)	–		–	–
182	–	BAC	MV Switchgear	–		+0.000	
183	14	BAN	Neutral point cubicle	–		+0.000	
185	4	BEY	DC-system	–		+0.000	
186	–	BFA	LV switchgear	–		+0.000	
189	1	BFB	Station transformer	–		+0.000	
210	16		Ventilation unit (enginehall)	2100	4630	–	
211	14		Ventilation unit (aux. area)	1700	3748	+1.470	4'- 10"
215	28		Frequency converter (on two level if needed)	–		–	
218	2		Ventilation unit for compressors	–		–	

MECHANICAL UTILITY AREA

Item No	Pcs.	Code (First)	DESCRIPTION	WEIGHT Incl. liquids kg	lbs	MOUNTING LEVEL millim.	(Floor level) inch.
71	42	VCA	Radiator	–			
90	14	NHA	Exhaust gas silencer			+3.230	10'- 7"
94	28	NGA	Rupture disc	–		–	–
103	14		DeNox (SCR)	–		–	–
104	14		Oxidation catalyst	–		–	–
140	1	DAA	Oily water collecting pit	–		–	–



Rev No	Revision	Date	Dwn	Chkd	Approved Chief Engr
A	Initial Issue "For Information"				
B	Updated Per Engineering Requirements 6/17/11				

Drawing Control

Purpose	Approved By	Date	Released By	Date
For Information				
For Comment				
For Bid				
For Construction	☒			

Engineering Review

Disc	Engr	Date
Mech		
Elec		
Civil		
Arch		
I & C		
Dwn HPK	Chkd	SI

Reviewed By

Mgr – Drafting & Design

Cogentrix

Quail Brush
Preliminary Section View

App'd for Construction

Chief Engineer

Date 3/9/11

Scale

Work Order

Drawing No. QB-SV-1

Rev B

Figure F.2-3
Power Block Elevation View

Figure F.2-4e
Fall Wind Rose for Overland Avenue
2003-2005

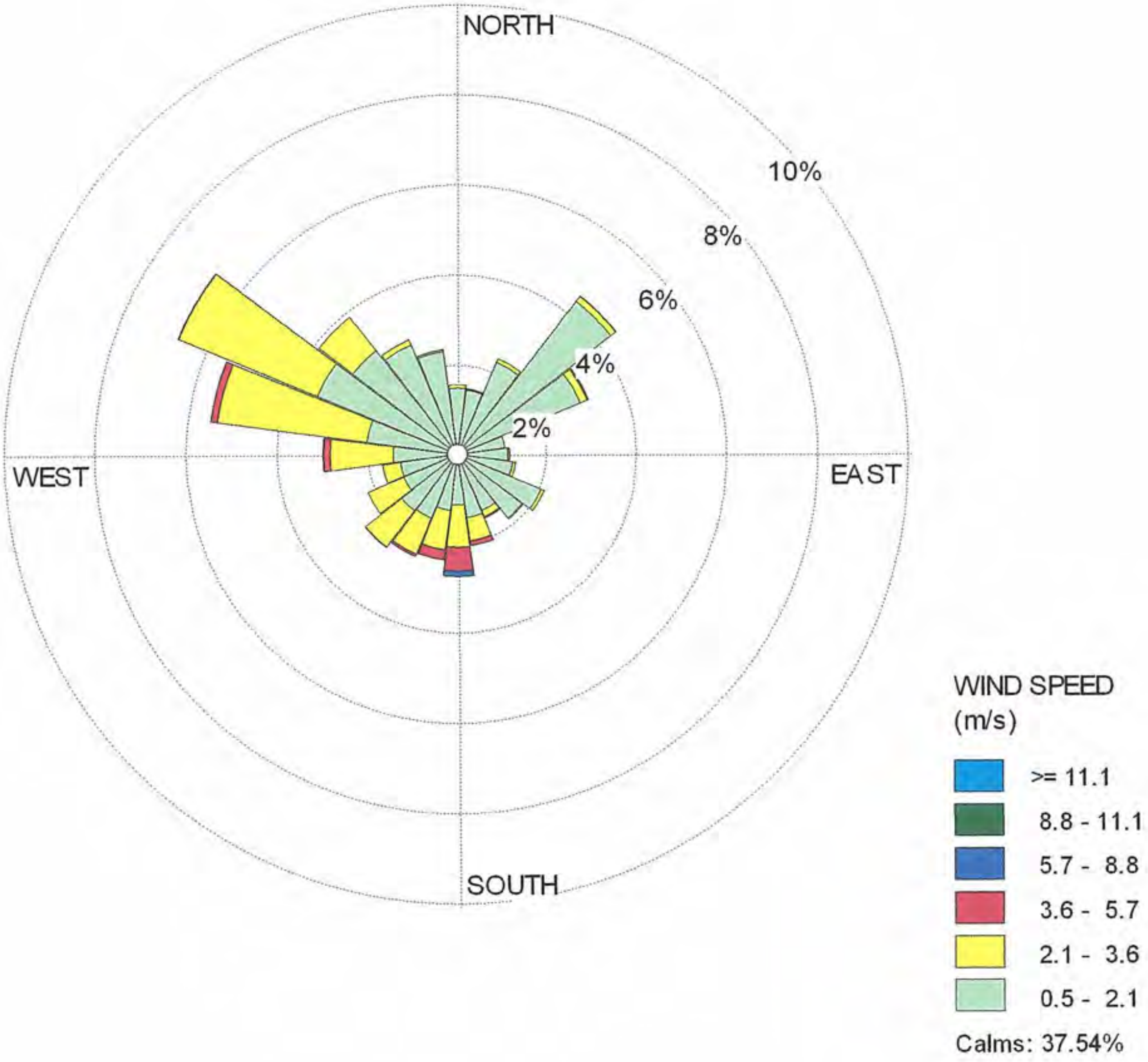
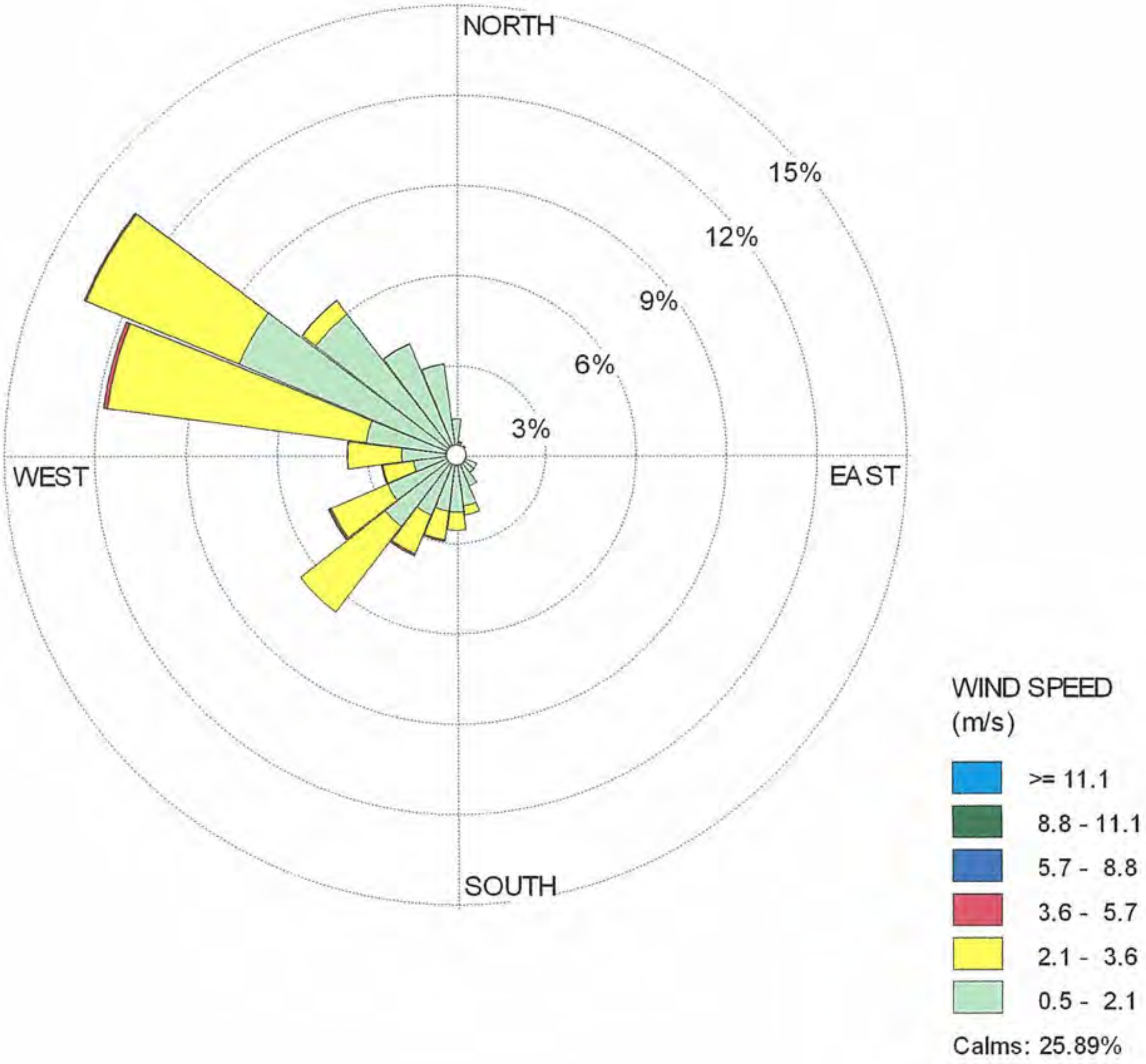


Figure F.2-4d

Summer Wind Rose for Overland Avenue

2003-2005



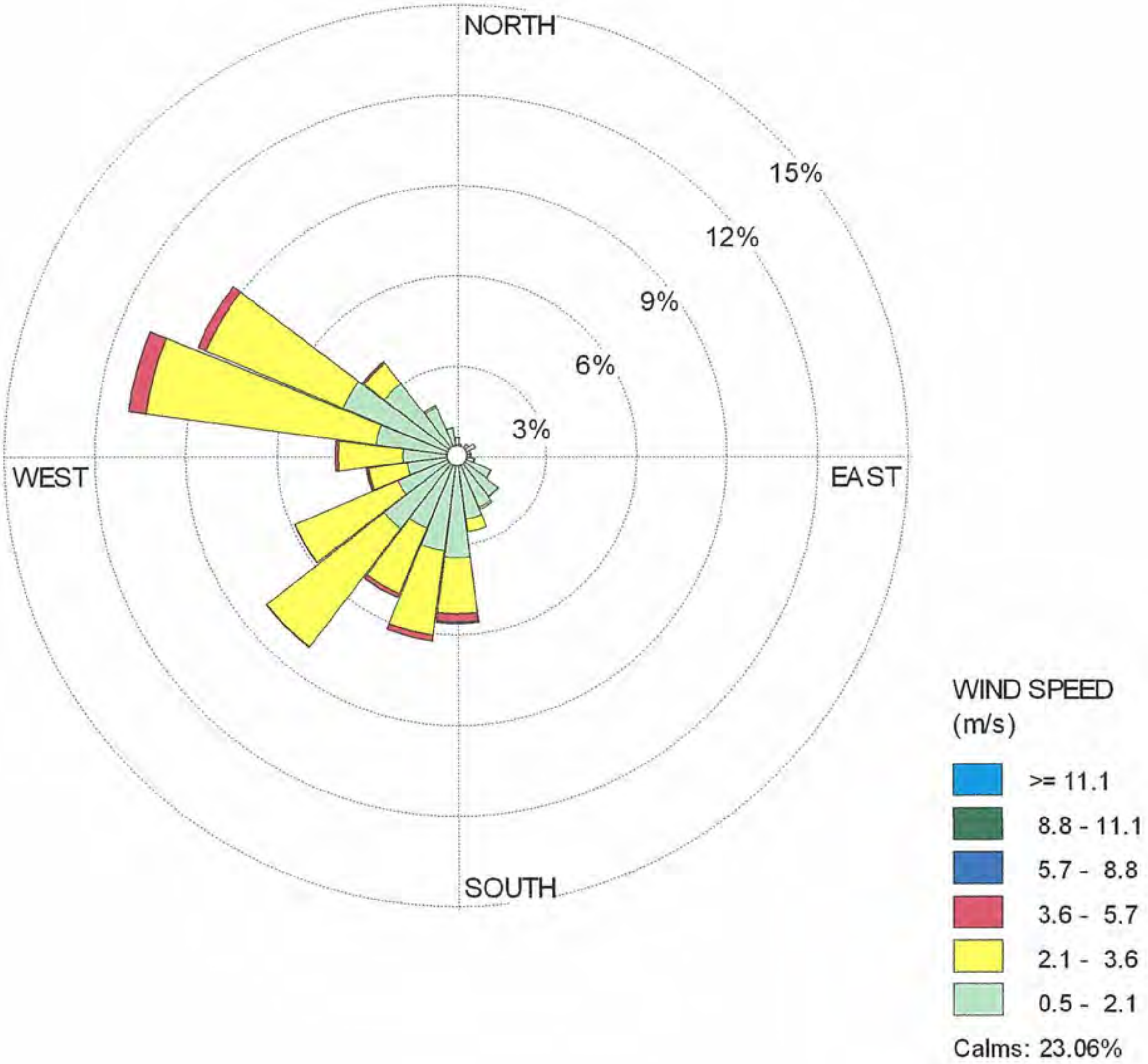


Figure F.2-4c
Spring Wind Rose for Overland Avenue
2003-2005

Figure F.2-4b
Winter Wind Rose for Overland Avenue
2003-2005

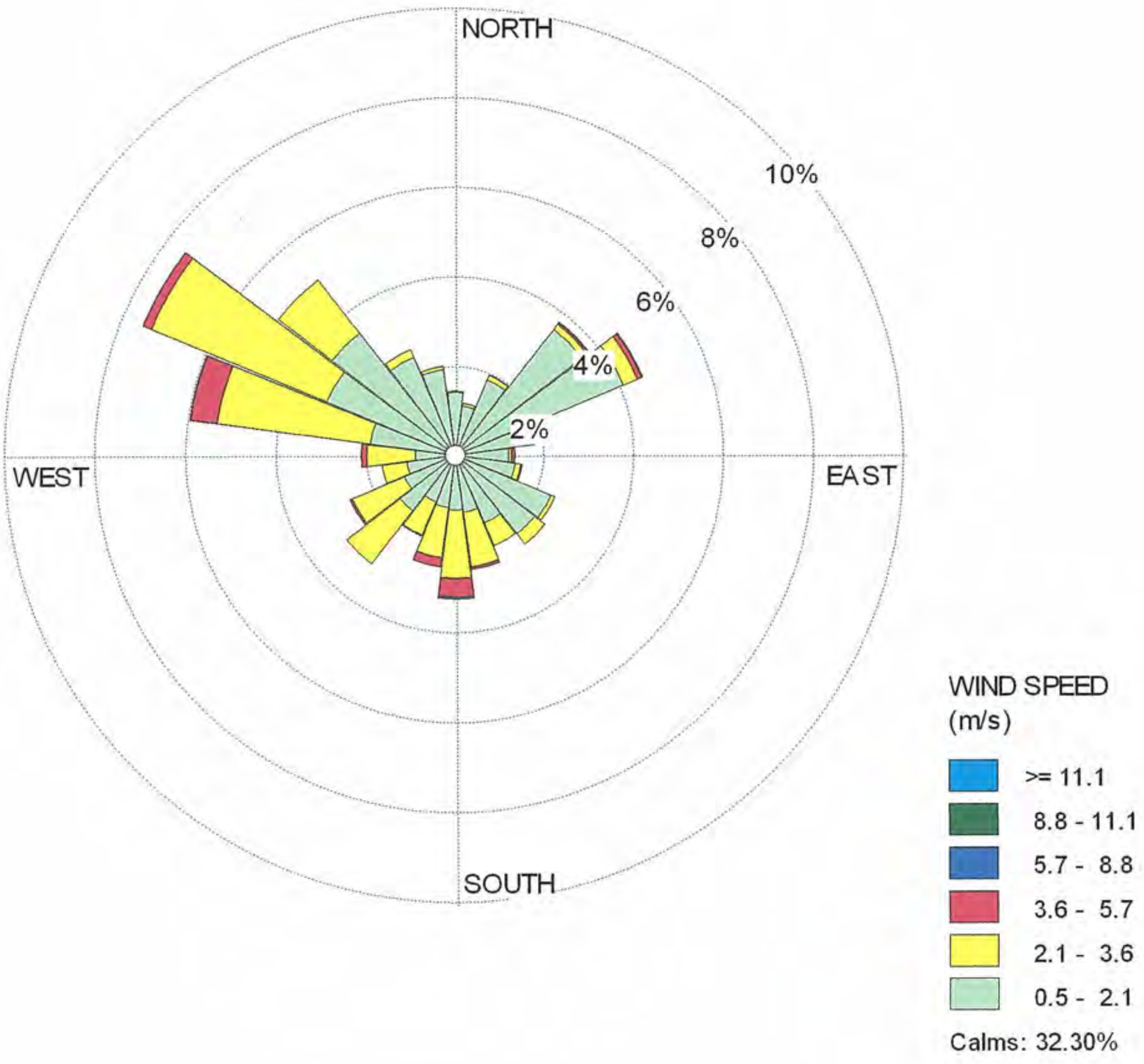


Figure F.2-4a
Annual Wind Rose for Overland Avenue
2003-2005

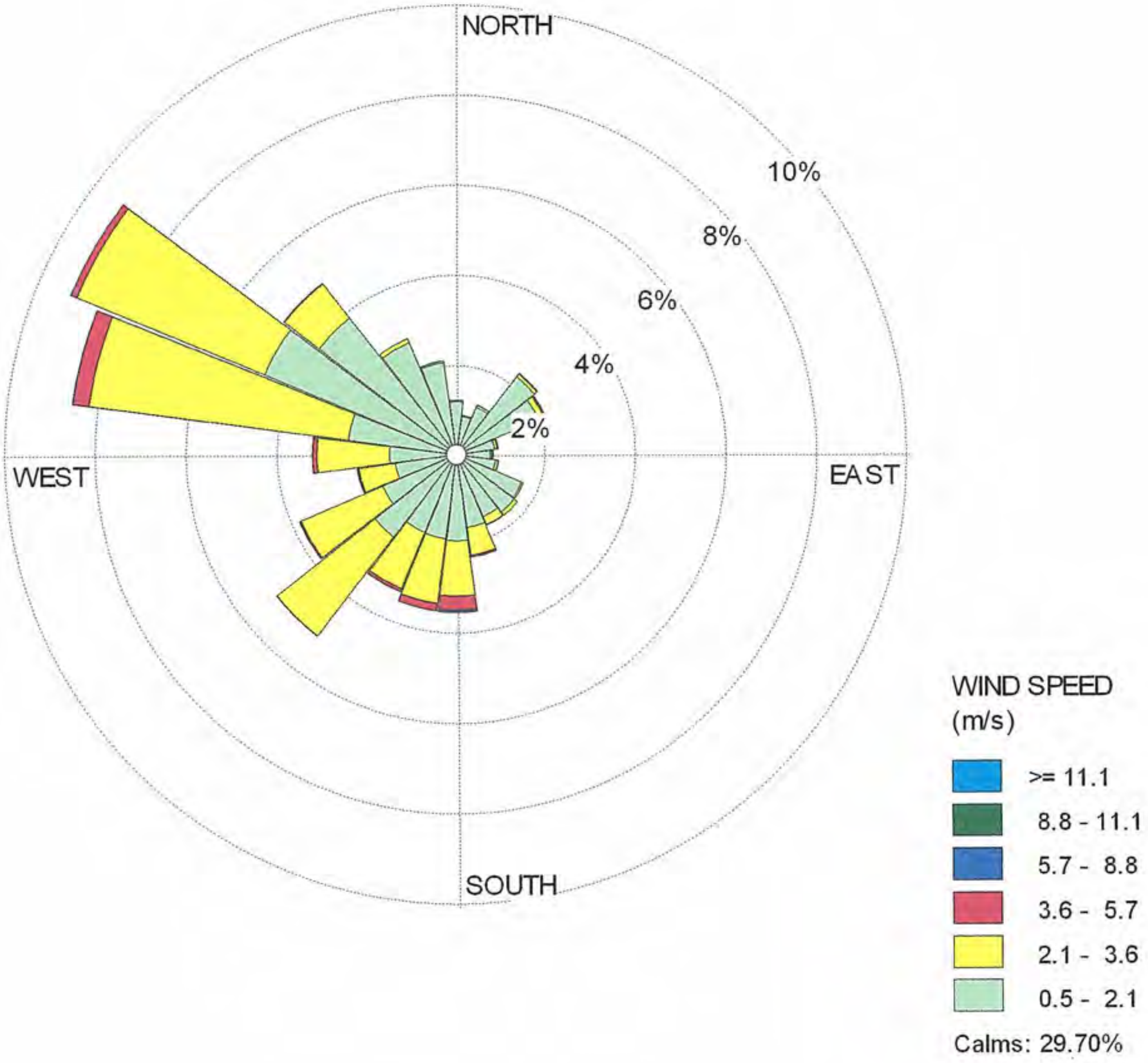
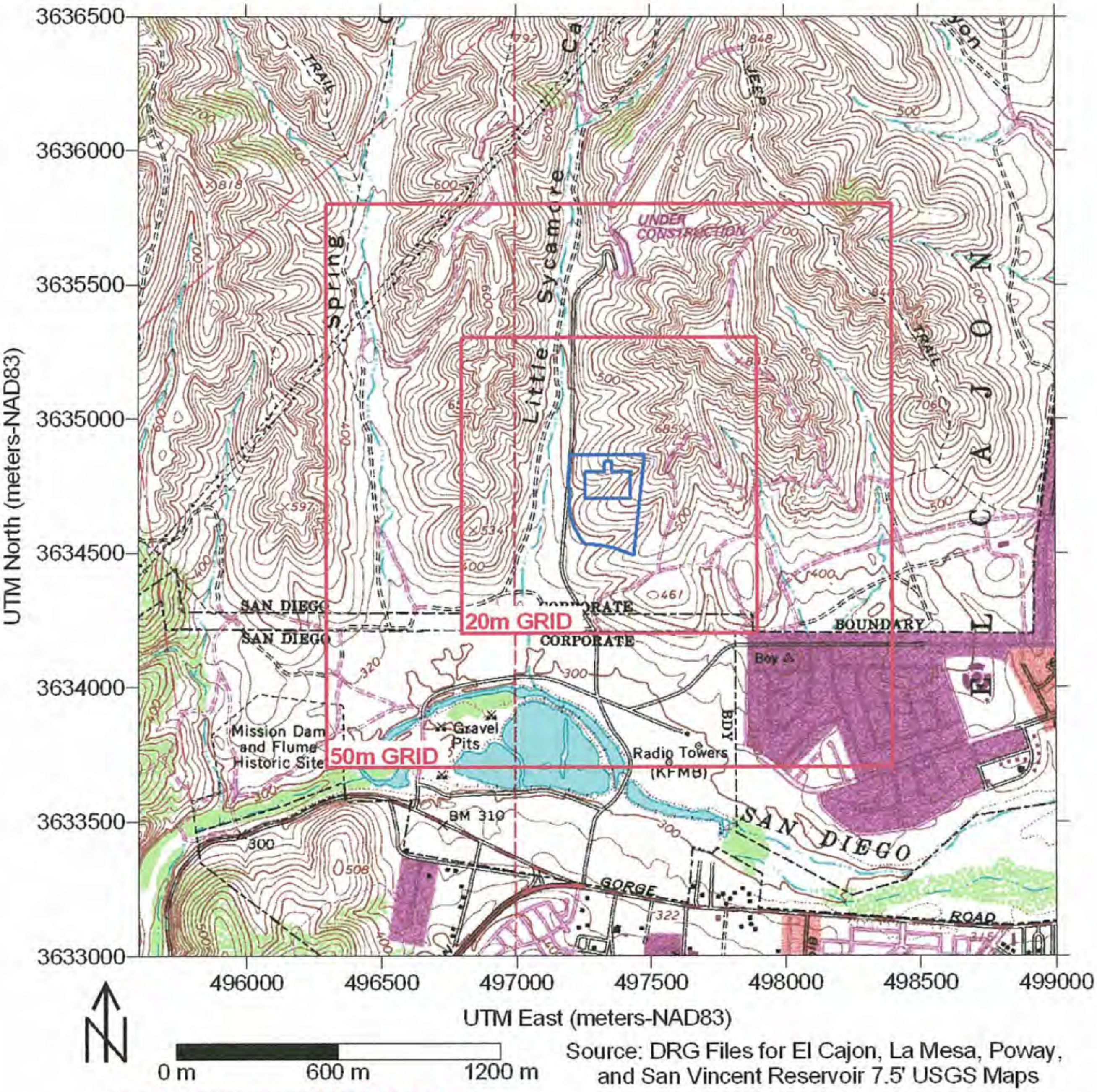


Figure F.2-5
Fine Receptor Grid Delineation

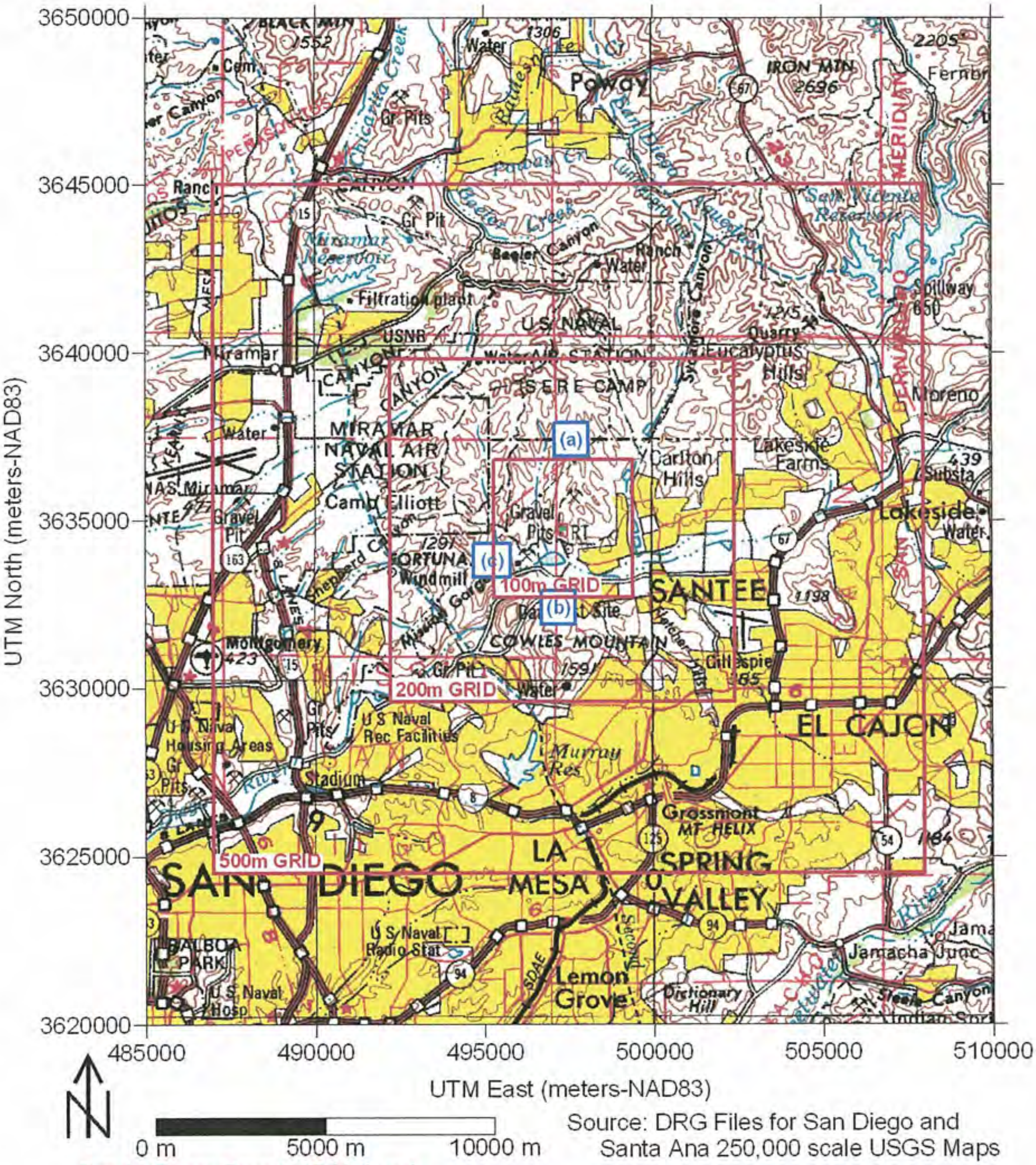


Source: DRG Files for El Cajon, La Mesa, Poway, and San Vincent Reservoir 7.5' USGS Maps

Regular Coarse Receptor Grids in red

Facility Fenceline and Property Boundary in blue

Figure F.2-6
Coarse Receptor Grid Delineation

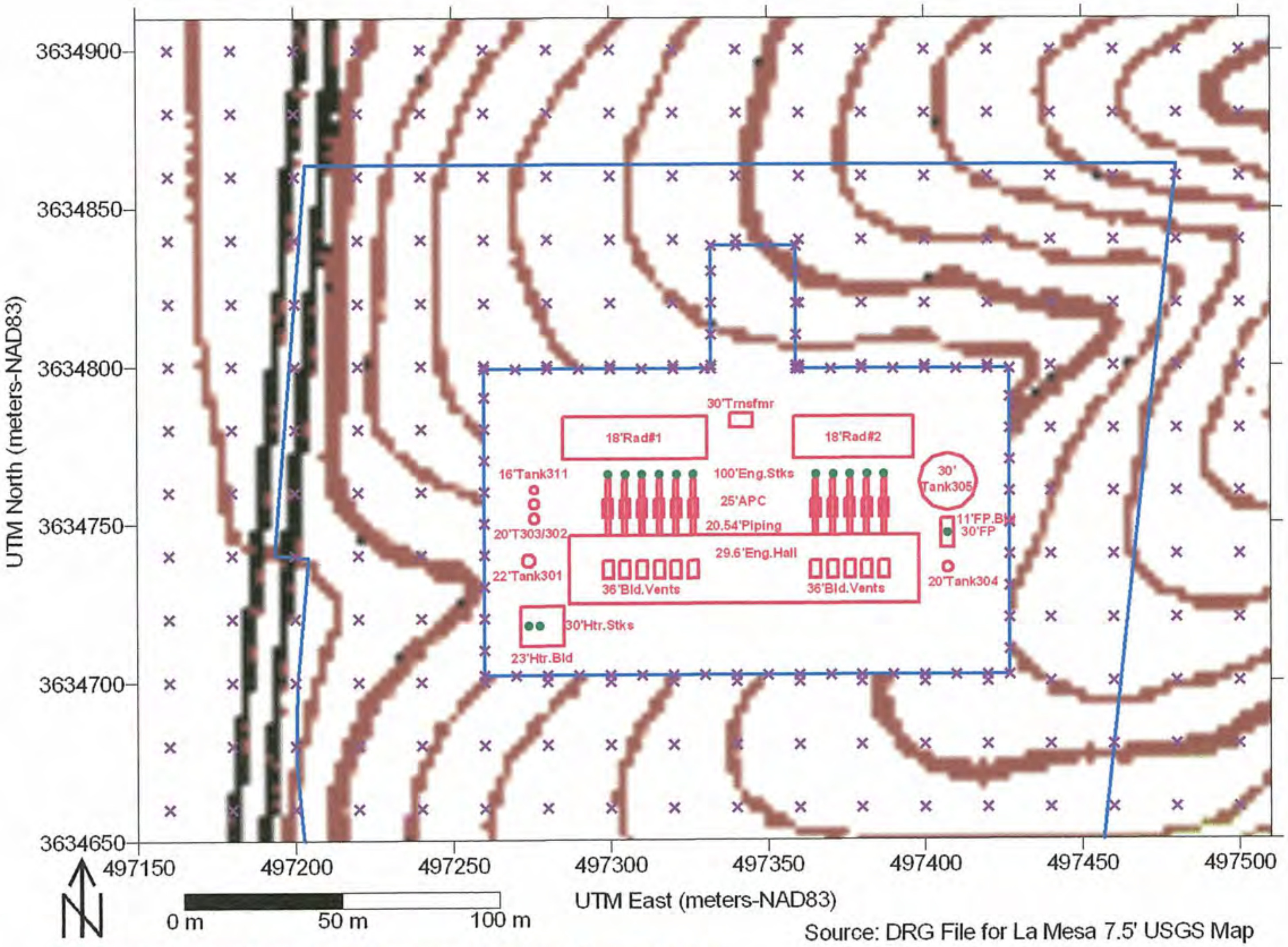


Source: DRG Files for San Diego and Santa Ana 250,000 scale USGS Maps

Regular Coarse Receptor Grids in red

Refined Receptor Grids in blue, (a) is 1-hr NO2 startup for CAAQS, (b) is 1-hr NO2 startup for NAAQS, and (c) is 1-hr NO2 for NAAQS, 8-hr CO startup, and 24-hr and Annual PM10/PM2.5/SO2 Impacts

Figure F.2-7 BPIP Site Arrangement



Source: DRG File for La Mesa 7.5' USGS Map

BPIP Structures shown in Red Facility Fenceline and Property Boundary in blue
20m and Fenceline Receptors shown in purple Stacks shown in green

Figure F.2-8

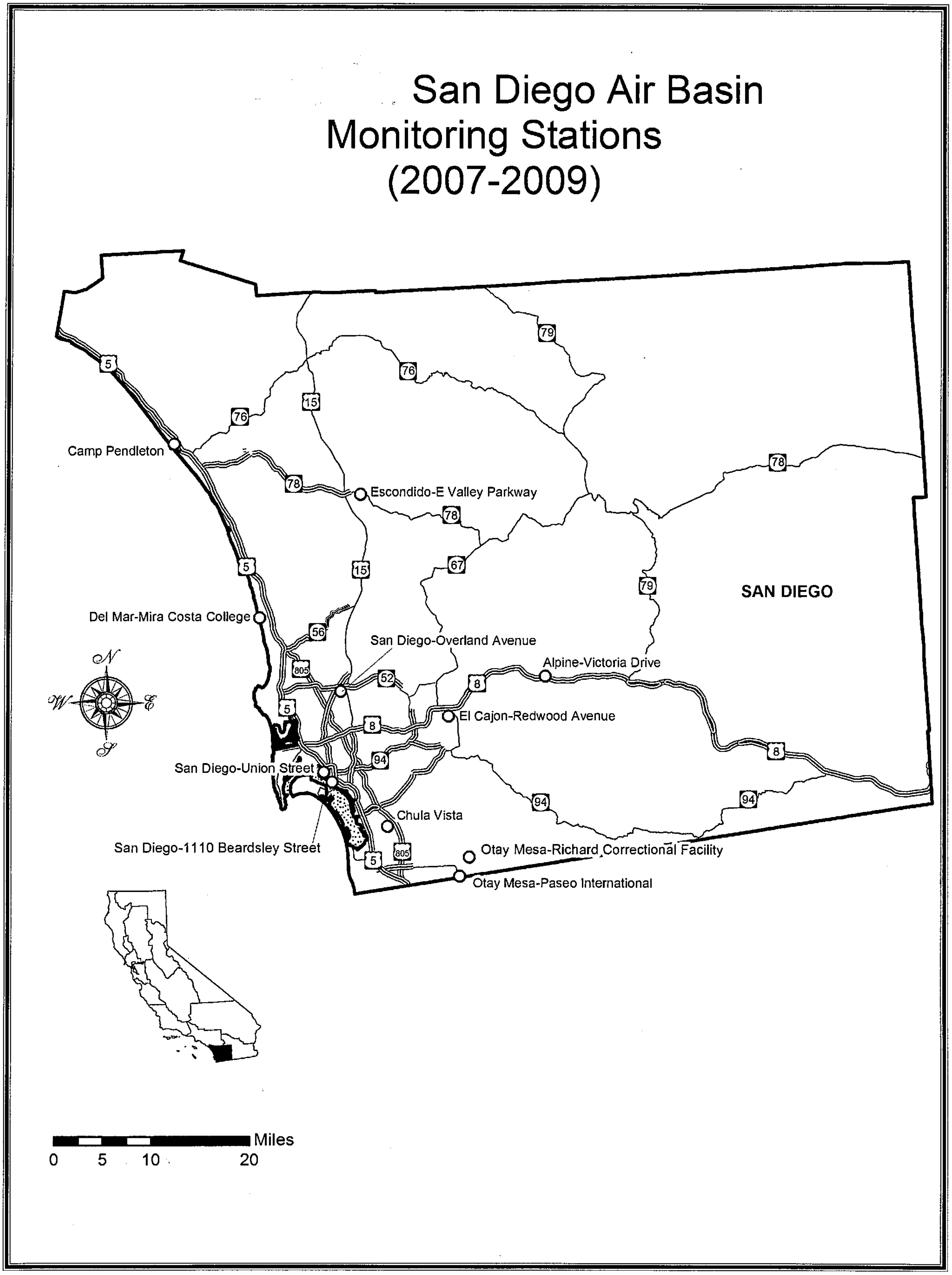
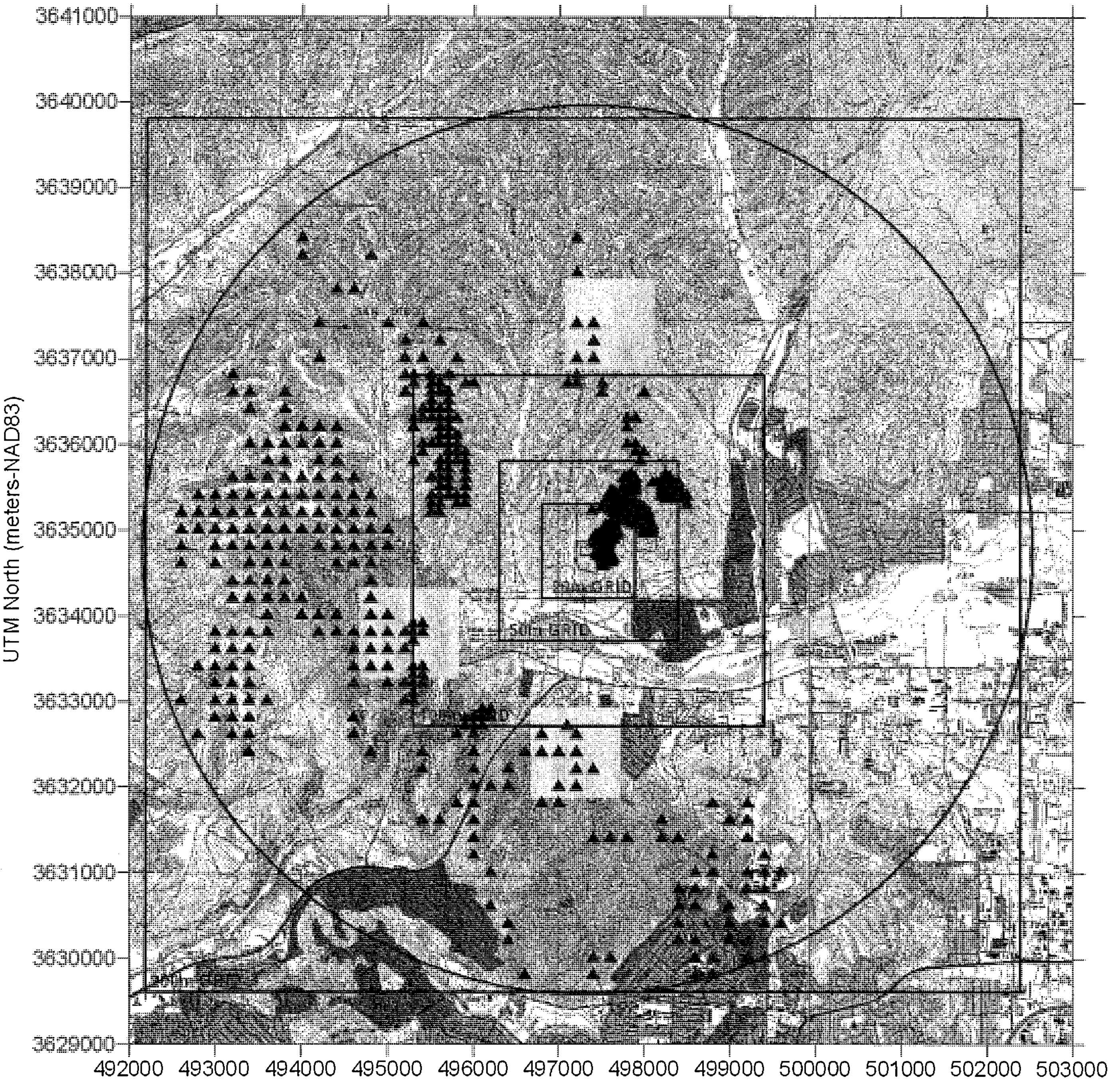

San Diego Air Basin
Monitoring Stations
(2007-2009)
5
76
15
79
Camp Pendleton
78
Escondido-E Valley Parkway
67
SAN DIEGO
Del Mar-Mira Costa College
56
San Diego-Overland Avenue
805
52
Alpine-Victoria Drive
8
El Cajon-Redwood Avenue
94
San Diego-Union Street
Chula Vista
San Diego-1110 Beardsley Street
Otay Mesa-Richard Correctional Facility
Otay Mesa-Paseo International
N
W
E
S
Miles
0
5
10
20

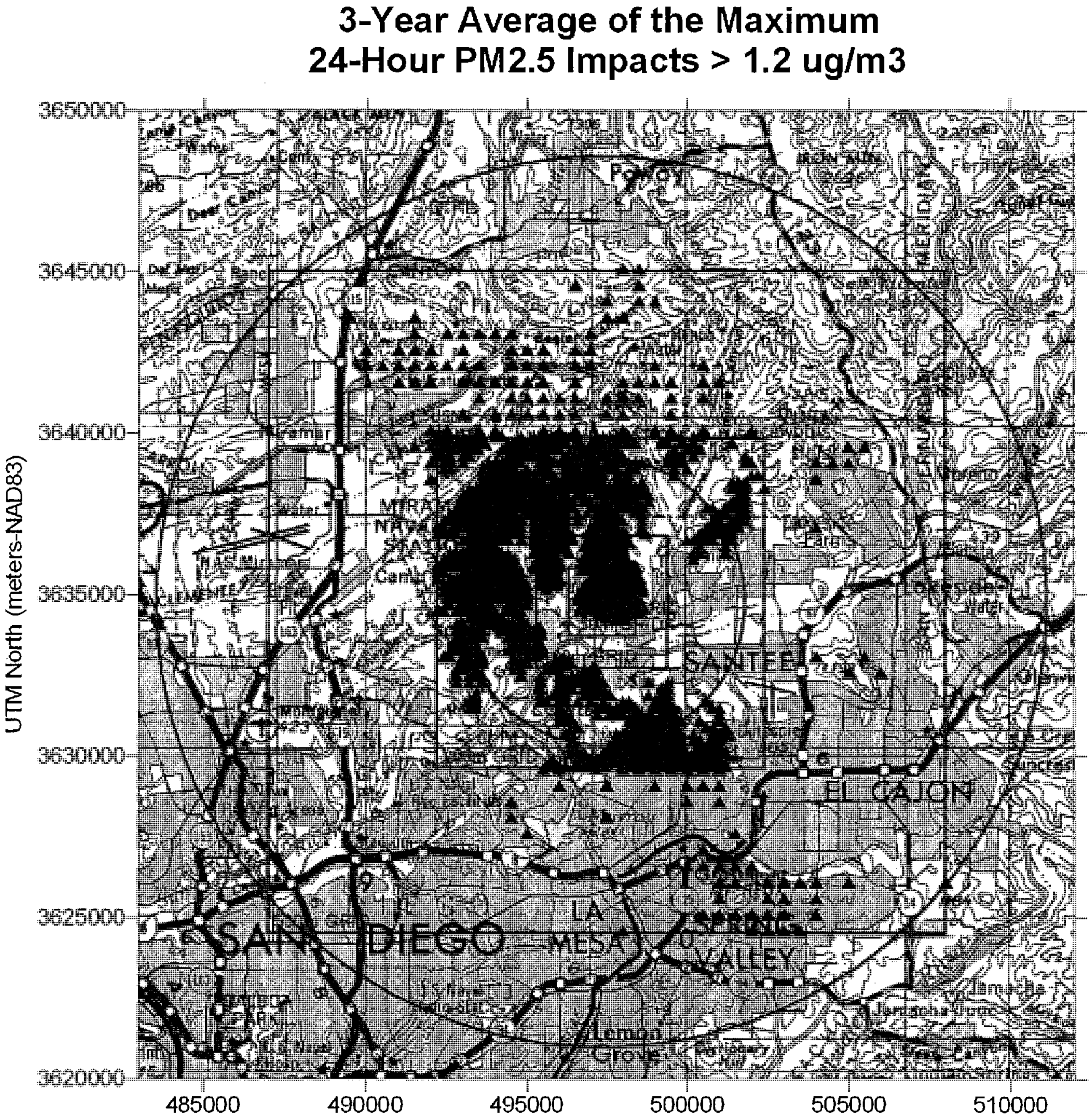
Figure F.2-9

Maximum 24-Hour PM10 Impacts > 5.0 ug/m3



Green Triangles Show Regular Receptors > 5.0 ug/m3
Green Circle defines SIA Radius of 5.19 km
Yellow Areas are Refined Receptor Grids

Figure F.2-10



Purple Triangles Show Regular Receptors > 1.2 ug/m3
Purple Circle Defines 13.8 km Radius (Actual SIA Probably Larger)
Yellow Areas are Refined Receptor Grids

Figure F.2-11

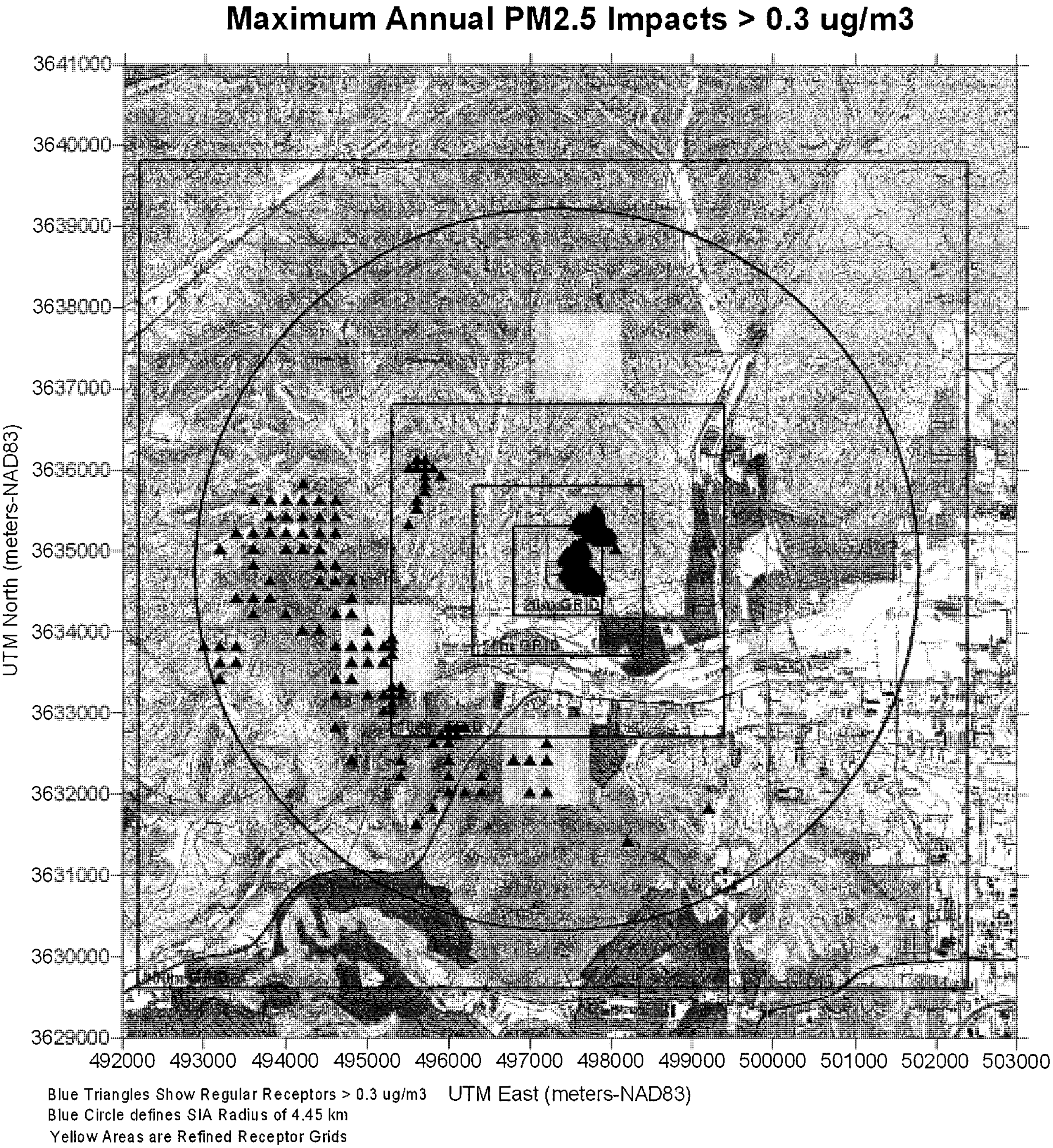
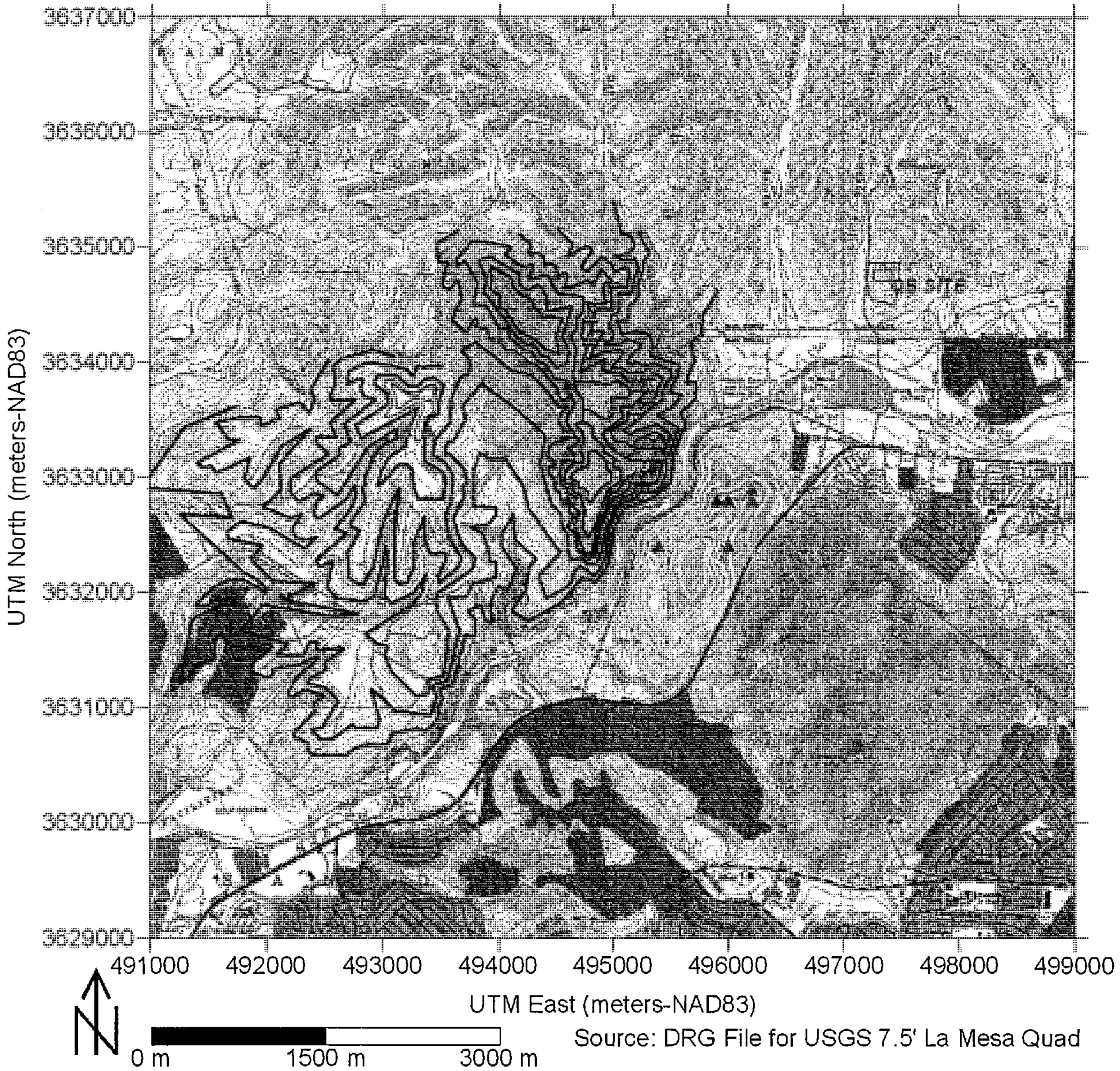

Maximum Annual PM2.5 Impacts > 0.3 ug/m3
UTM North (meters-NAD83)
3641000
3640000
3639000
3638000
3637000
3636000
3635000
3634000
3633000
3632000
3631000
3630000
3629000
492000
493000
494000
495000
496000
497000
498000
499000
500000
501000
502000
503000
UTM East (meters-NAD83)
Ultra GRID
Fine GRID
Blue Triangles Show Regular Receptors > 0.3 ug/m3
Blue Circle defines SIA Radius of 4.45 km
Yellow Areas are Refined Receptor Grids

Figure F.2-12

AERMOD 24-Hour PM10 Impacts and Associated CTSCREEN Contours



Source: DRG File for USGS 7.5' La Mesa Quad

Black Triangular Outlines = AERMOD 24-hr PM2.5 > 11.3 ug/m3
Blue Triangles = AERMOD 24-hr PM10 > 5.0 ug/m3 on 2003 Days w/ Measured Exceedances
Red, Yellow, and Purple Lines show CTSCREEN contours

Figure F.2-13

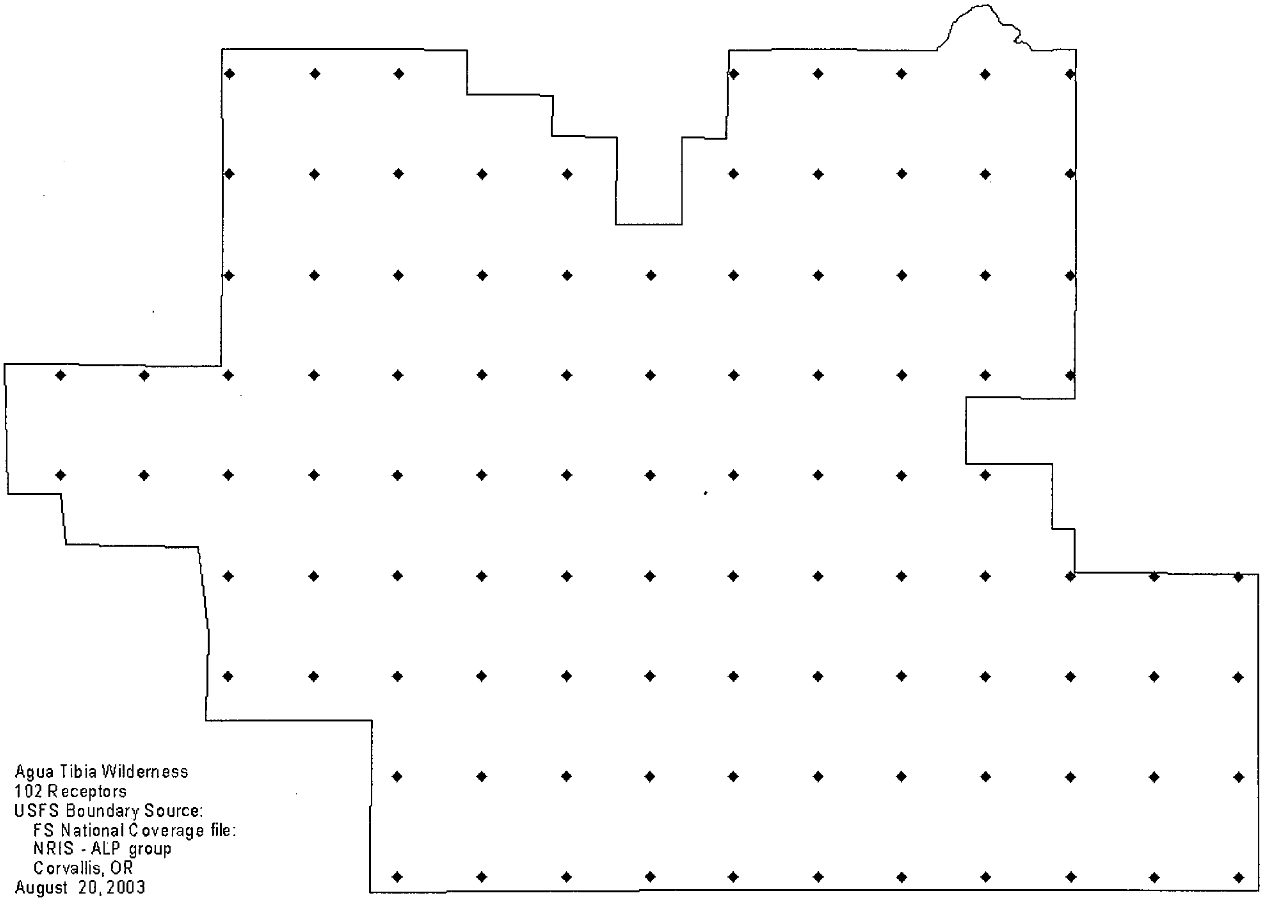
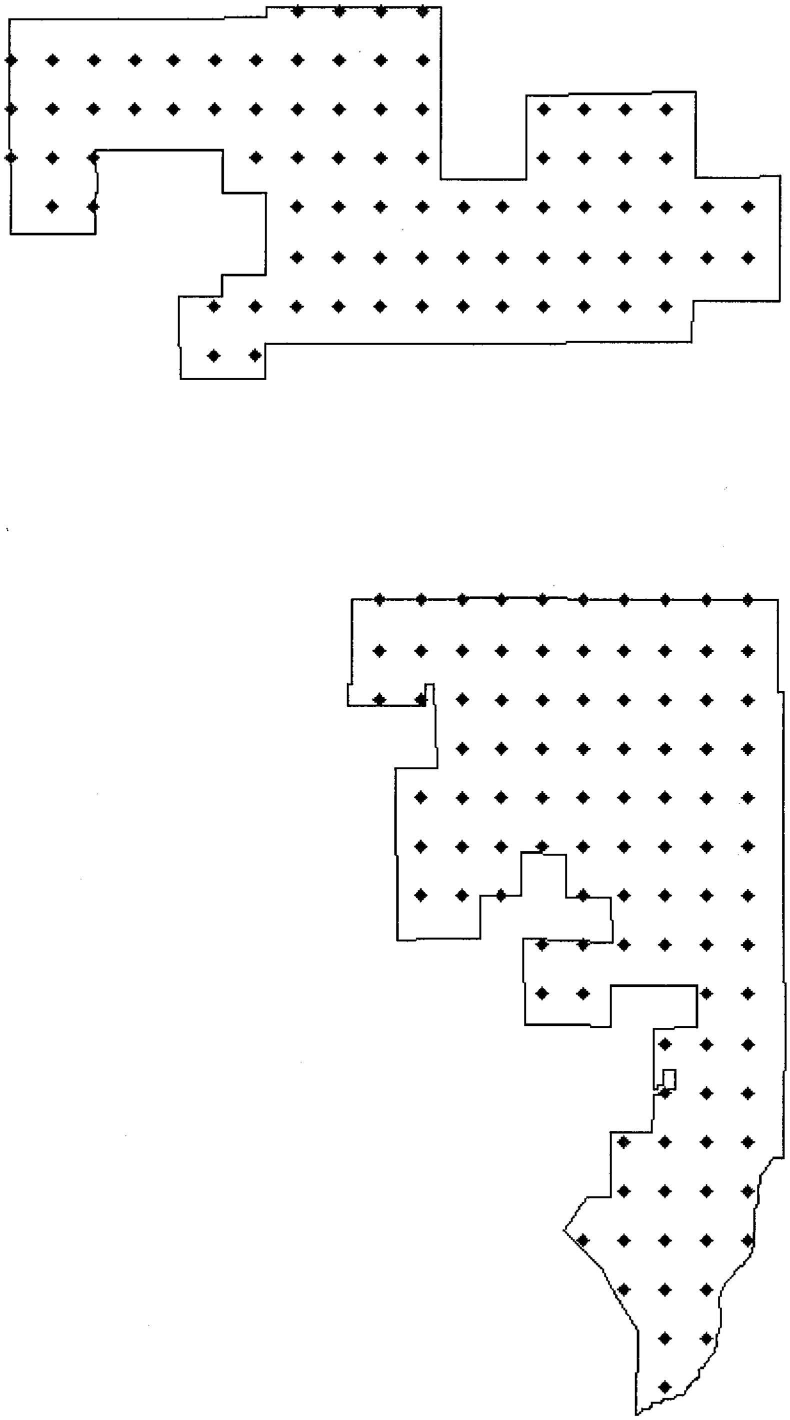

Agua Tibia Wilderness
102 Receptors
USFS Boundary Source:
FS National Coverage file:
NRIS - ALP group
Corvallis, OR
August 20, 2003

Figure F.2-14



San Jacinto Wilderness
181 Receptors
USFS Boundary Source:
  FS National Coverage file:
  NRIS - ALP group
  Corvallis, OR
August 21, 2003

Attachment F.2-1

Additional Climate and Meteorological Data for the San Diego Regional Area

Under the Köppen climate classification system, the San Diego area straddles areas of Mediterranean climate (CSa) to the north and Semi-arid climate (BSh) to the south and east. As a result, it is often described as "arid Mediterranean" and "Semi-arid Steppe". San Diego's climate is characterized by warm, dry summers and mild winters with most of the annual precipitation falling between November and March. The city has mild, mostly dry weather, with an average of 201 days above 70 °F (21 °C) and low rainfall (9-13" annually). Summer temperatures are generally warm, with average highs of 70–78 °F (21–26 °C) and lows of 55–66 °F (13–19 °C). Temperatures exceed 90 °F (32 °C) only four days a year. Winter temperatures are mild, with average high temperatures of 66–70 °F (19–21 °C) and lows of 50–56 °F (10–13 °C). Average annual temperature of the ocean is 65 °F (18 °C), from 59 °F (15 °C) in January to 72 °F (22 °C) in August. The highest recorded temperature at the official weather station is 111 °F (44 °C) on September 26, 1963. The lowest recorded temperature is 25 °F (−4 °C) on January 7, 1913.[42]

Official temperature record-keeping began in San Diego in 1872, although other weather records go back further. The city's first official weather station was located at Mission San Diego from 1849 to 1858. From August 1858 until 1940, the official weather station was located at a series of downtown buildings, and the station has been at Lindbergh Field since February 1940.

There have been only nine days with a recorded temperature of 32 °F (0 °C) or below since record-keeping began in 1872.

The climate in the San Diego area, like much of California, often varies significantly over short geographical distances resulting in microclimates. In San Diego's case this is mainly due to the city's topography (the Bay, and the numerous hills, mountains, and canyons). Frequently, particularly during the "May gray/June gloom" period, a thick "marine layer" cloud cover will keep the air cool and damp within a few miles of the coast, but will yield to bright cloudless sunshine approximately 5–10 miles (8.0–16 km) inland. Even in the absence of June gloom, inland areas tend to experience much more significant temperature variations than coastal areas, where the ocean serves as a moderating influence. Thus, for example, downtown San Diego averages January lows of 50 °F and August highs of 78 °F. The city of El Cajon, just 10 miles (16 km) northeast of downtown San Diego, averages January lows of 42 °F and August highs of 88 °F. However sometimes the June gloom can last for several days even into July causing cloudy skies for San Diego for the entire day.

Rainfall along the coast averages about 10 inches (250 mm) of precipitation annually, which occurs mainly during the cooler months of December through April. Though there are few wet days per month during the rainy period, rainfall can be heavy when it does fall. Rainfall is usually greater in the higher elevations of San Diego; some of the higher elevation areas of San Diego can receive 11–15 inches (280–380 mm) of rain a year.

Snow in the city is so rare that it has been observed only five times in the century-and-a-half that records have been kept. In 1949 and 1967, snow stayed on the ground for a few hours in higher locations like Point Loma and La Jolla. The other three occasions, in 1882, 1946, and 1987, involved flurries but no accumulation.

Climate data for San Diego (San Diego Airport)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °F (°C)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	77.0 (25)	[illegible]	[illegible]	[illegible]	[illegible]
Daily mean °F (°C)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	71.6 (22)	[illegible]	[illegible]	[illegible]	[illegible]
Average low °F (°C)	49.7 (9.83)	51.5 (10.83)	53.6 (12)	56.1 (13.56)	59.8 (15.44)	62.6 (17)	65.9 (18.83)	67.4 (19.67)	66.1 (18.94)	61.2 (16.22)	53.6 (12)	48.9 (9.39)	58.1 (14.5)
Rainfall inches (mm)	2.28 (57.9)	2.04 (51.8)	2.26 (57.4)	0.75 (19)	0.20 (5.1)	0.09 (2.3)	0.03 (0.8)	0.09 (2.3)	0.21 (5.3)	0.44 (11.2)	1.07 (27.2)	1.31 (33.3)	10.77 (273.6)
Avg. rainy days (≥ 0.01 in)	7.2	6.6	7.2	4.1	2.0	1.1	0.6	0.6	1.5	2.8	4.0	5.2	42.9
Sunshine hours	238.7	228.8	260.4	276.0	251.1	243.0	303.8	294.5	252.0	244.9	231.0	232.5	3,056.7

Source #1: NOAA (1971-2000)

Source #2: HKO (1961-1990)

LA MESA, CALIFORNIA (044735)

Period of Record Monthly Climate Summary

Period of Record : 1/ 1/1899 to 2/28/2006

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	67.1	68.1	68.7	71.7	73.9	77.5	83.1	84.5	83.7	79.0	73.5	68.7	75.0
Average Min. Temperature (F)	43.7	45.1	46.8	50.1	53.8	57.0	61.0	62.2	60.3	55.1	48.3	44.5	52.3
Average Total Precipitation (in.)	2.44	2.42	2.43	1.04	0.29	0.10	0.05	0.09	0.24	0.57	1.37	1.89	12.93
Average Total SnowFall (in.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 96.3% Min. Temp.: 95.7% Precipitation: 97% Snowfall: 97.2% Snow Depth: 97.1%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

LA MESA, CALIFORNIA

NCDC 1971-2000 Monthly Normals

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Monthly
Mean Max. Temperature (F)	68.5	69.5	69.8	73.1	74.3	78.9	83.6	85.5	84.1	79.6	73.4	68.8	75.8
Highest Mean Max. Temperature (F)	75.6	74.9	76.5	79.8	81.6	84.9	88.2	90.5	90.9	87.0	78.6	73.7	90.9
Year Highest Occurred	1986	1988	1997	1989	1997	1981	1985	1996	1997	1999	1995	1979	1997
Lowest Mean Max. Temperature (F)	62.5	64.1	64.3	66.1	69.1	72.3	78.1	81.3	77.4	73.8	68.5	61.6	61.6
Year Lowest Occurred	1979	1998	1973	1975	1977	1982	1987	1987	1986	2000	1985	1971	1971
Mean Temperature (F)	57.1	58.2	59.2	62.3	64.8	68.8	73.0	74.7	73.2	68.2	61.5	57.1	64.8
Highest Mean Temperature (F)	63.1	62.8	63.5	68.1	71.2	73.4	77.8	78.6	79.4	72.9	66.2	61.0	79.4
Year Highest Occurred	1986	1995	1997	1989	1997	1981	1984	1996	1984	1999	1995	1977	1984
Lowest Mean Temperature (F)	53.6	54.7	55.4	56.8	60.6	64.1	68.8	71.0	67.9	65.1	57.1	51.0	51.0
Year Lowest Occurred	1979	1990	1973	1975	1977	1982	1987	1975	1986	1981	1994	1971	1971
Mean Min. Temperature (F)	45.7	46.9	48.6	51.4	55.3	58.7	62.3	63.8	62.2	56.8	49.6	45.3	53.9
Highest Mean Min. Temperature (F)	50.6	53.5	52.2	56.9	61.3	61.9	67.5	67.7	68.9	62.2	53.8	51.7	68.9
Year Highest Occurred	1986	1995	1978	1992	1992	1981	1984	1992	1984	1987	1995	1977	1984
Lowest Mean Min. Temperature (F)	39.8	43.1	44.0	47.6	51.5	53.7	58.8	58.7	58.0	51.4	45.1	40.5	39.8
Year Lowest Occurred	1972	1979	1977	1975	1971	1971	1979	1975	1971	1971	1982	1971	1972
Mean Precipitation (in.)	2.89	2.52	2.98	1.05	0.33	0.11	0.06	0.10	0.29	0.58	1.32	1.52	13.75
Highest Precipitation (in.)	12.25	10.95	8.93	6.95	2.75	0.80	0.93	1.85	1.93	2.28	6.79	6.11	12.25
Year Highest Occurred	1993	1998	1983	1988	1977	1972	1991	1977	1976	1987	1985	1984	1993
Lowest Precipitation (in.)	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year Lowest													

Occurred	1976	1974	1997	1993	1999	2000	2000	1999	1999	1999	1999	1999	1976
Heating Degree Days (F)	249.	195.	193.	127.	87.	25.	4.	2.	10.	30.	138.	253.	1313.
Cooling Degree Days (F)	3.	5.	14.	45.	80.	139.	251.	302.	255.	128.	32.	7.	1261.

Western Regional Climate Center, wrcc@dri.edu

LA MESA, CALIFORNIA (044735)

1971-2000 Monthly Climate Summary

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	68.5	69.3	70.3	73.0	74.6	79.1	83.9	85.4	84.0	79.6	70.8	69.0	75.8
Average Min. Temperature (F)	45.7	46.8	48.6	51.4	55.2	58.6	62.3	63.7	61.8	56.6	47.8	45.3	53.8
Average Total Precipitation (in.)	2.75	2.78	2.64	1.11	0.37	0.11	0.05	0.15	0.24	0.58	1.35	1.73	13.85

Unofficial values based on averages/sums of smoothed daily data. Information is computed from available daily data during the 1971-2000 period. Smoothing, missing data and observation-time changes may cause these 1971-2000 values to differ from official NCDC values. This table is presented for use at locations that don't have official NCDC data. No adjustments are made for missing data or time of observation. Check NCDC normals table for official data.

Western Regional Climate Center, wrcc@dri.edu

EL CAJON, CALIFORNIA (042706)

Period of Record Monthly Climate Summary

Period of Record : 11/1/1979 to 12/31/2010

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	69.7	69.8	71.3	75.4	77.4	81.7	87.5	88.9	87.5	81.0	74.8	69.4	77.9
Average Min. Temperature (F)	42.3	44.3	47.3	50.4	55.4	58.5	62.8	64.0	61.2	54.9	46.1	41.5	52.4
Average Total Precipitation (in.)	2.41	2.77	2.31	0.82	0.15	0.08	0.09	0.02	0.16	0.66	1.28	1.72	12.49
Average Total SnowFall (in.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 91.6% Min. Temp.: 91.1% Precipitation: 91.8% Snowfall: 92.1% Snow Depth: 92%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

EL CAJON, CALIFORNIA

NCDC 1971-2000 Monthly Normals

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Monthly
Mean Max. Temperature (F)	68.2	69.3	70.1	74.1	76.4	82.0	87.0	88.1	86.5	80.2	73.5	68.3	77.0
Highest Mean Max. Temperature (F)	73.3	74.9	78.7	81.5	84.9	87.3	91.4	93.0	94.3	89.7	80.2	77.1	94.3
Year Highest Occurred	1986	1981	1997	1996	1997	1974	1980	1995	1979	1999	1995	2000	1979
Lowest Mean Max. Temperature (F)	60.5	64.0	62.5	65.0	70.2	76.3	80.4	83.2	78.2	74.9	67.5	60.1	60.1
Year Lowest Occurred	1979	1998	1973	1975	1995	1991	1987	1987	1986	1972	1994	1971	1971
Mean Temperature (F)	54.9	56.7	58.3	62.1	65.6	70.3	74.7	76.0	73.9	67.4	59.4	54.3	64.5
Highest Mean Temperature (F)	59.3	60.2	62.5	66.9	71.8	73.9	78.7	79.5	79.9	71.4	64.5	59.8	79.9
Year Highest Occurred	1986	1995	1997	1989	1997	1981	1984	1998	1984	1999	1995	1977	1984
Lowest Mean Temperature (F)	50.4	52.5	53.1	55.3	60.7	66.9	70.0	71.9	67.9	63.5	54.7	49.5	49.5
Year Lowest Occurred	1979	1990	1973	1975	1977	1991	1987	1976	1986	1971	1994	1971	1971
Mean Min. Temperature (F)	41.6	44.0	46.5	50.1	54.7	58.5	62.4	63.8	61.3	54.6	45.2	40.3	51.9
Highest Mean Min. Temperature (F)	47.8	48.8	51.3	54.5	61.4	62.0	67.5	67.2	68.1	60.6	48.7	46.7	68.1
Year Highest Occurred	1980	1995	1978	1989	1992	1981	1984	1992	1984	1987	1995	1977	1984
Lowest Mean Min. Temperature (F)	37.0	38.5	40.4	45.5	51.2	55.4	59.0	59.9	57.5	49.8	41.2	37.6	37.0
Year Lowest Occurred	1972	1990	1977	1975	1977	1980	1983	1975	1986	1971	2000	1990	1972
Mean Precipitation (in.)	2.47	2.57	2.66	0.79	0.16	0.06	0.04	0.06	0.15	0.46	1.18	1.36	11.96
Highest Precipitation (in.)	11.43	10.35	9.66	2.42	1.21	0.91	0.68	1.07	1.05	1.92	7.21	5.32	11.43
Year Highest Occurred	1993	1998	1983	1988	1998	1990	1991	1977	1997	1986	1985	1984	1993
Lowest Precipitation (in.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Year Lowest													

Occurred	2000	1989	2000	2000	1999	2000	2000	2000	2000	1999	2000	2000	2000
Heating Degree Days (F)	315.	238.	222.	131.	77.	13.	0.	0.	7.	40.	183.	334.	1560.
Cooling Degree Days (F)	0.	4.	13.	44.	94.	170.	301.	340.	275.	114.	13.	3.	1371.

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EL CAJON, CALIFORNIA (042706)

1971-2000 Monthly Climate Summary

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	69.1	70.0	71.7	75.5	77.2	81.7	87.3	88.8	86.7	81.4	71.9	69.5	77.8
Average Min. Temperature (F)	42.3	44.7	47.2	50.9	55.3	58.6	62.6	64.0	61.2	54.7	44.4	41.2	52.4
Average Total Precipitation (in.)	2.62	2.89	2.59	0.86	0.23	0.10	0.02	0.04	0.16	0.45	1.24	1.57	12.78

Unofficial values based on averages/sums of smoothed daily data. Information is computed from available daily data during the 1971-2000 period. Smoothing, missing data and observation-time changes may cause these 1971-2000 values to differ from official NCDC values. This table is presented for use at locations that don't have official NCDC data. No adjustments are made for missing data or time of observation. Check NCDC normals table for official data.

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SAN DIEGO WSO AIRPORT, CALIFORNIA (047740)

Period of Record Monthly Climate Summary

Period of Record : 1/ 1/1914 to 12/31/2010

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	64.7	65.2	65.9	67.4	68.6	70.9	74.8	76.3	75.7	73.0	70.0	65.8	69.9
Average Min. Temperature (F)	48.0	49.7	51.8	54.7	58.0	60.8	64.4	65.7	63.9	59.3	52.9	48.7	56.5
Average Total Precipitation (in.)	2.03	1.99	1.64	0.78	0.21	0.05	0.02	0.06	0.17	0.51	0.95	1.78	10.18
Average Total SnowFall (in.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 99.9% Min. Temp.: 99.9% Precipitation: 99.9% Snowfall: 83.3% Snow Depth: 83.3%
Check Station Metadata or Metadata graphics for more detail about data completeness.

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SAN DIEGO WSO AIRPORT, CALIFORNIA

NCDC 1971-2000 Monthly Normals

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Monthly
Mean Max. Temperature (F)	65.8	66.3	66.3	68.7	69.3	72.2	75.8	77.5	77.0	74.0	69.9	66.3	70.8
Highest Mean Max. Temperature (F)	70.3	71.3	70.5	73.4	74.5	78.0	81.8	82.8	83.7	78.8	76.5	71.3	83.7
Year Highest Occurred	1986	1977	1984	1992	1978	1981	1984	1983	1984	1982	1976	1976	1984
Lowest Mean Max. Temperature (F)	61.8	61.5	62.9	64.1	64.4	66.9	71.6	72.7	71.4	69.5	65.7	61.7	61.5
Year Lowest Occurred	1971	1971	1991	1975	1999	1999	1987	1999	1999	2000	1994	1971	1971
Mean Temperature (F)	57.8	58.9	60.0	62.6	64.6	67.4	70.9	72.5	71.6	67.6	61.8	57.6	64.4
Highest Mean Temperature (F)	61.3	63.5	64.3	67.0	68.7	72.9	77.2	77.4	78.9	72.2	66.8	63.3	78.9
Year Highest Occurred	1981	1980	1978	1992	1997	1981	1984	1983	1984	1983	1976	1977	1984
Lowest Mean Temperature (F)	54.3	55.2	56.5	58.7	60.5	62.8	67.1	68.0	66.9	64.3	56.4	53.9	53.9
Year Lowest Occurred	1971	1990	1991	1975	1999	1999	1987	1999	1986	1996	1994	1987	1987
Mean Min. Temperature (F)	49.7	51.5	53.6	56.4	59.8	62.6	65.9	67.4	66.1	61.2	53.6	48.9	58.1
Highest Mean Min. Temperature (F)	54.9	56.3	58.3	60.5	63.8	67.7	72.6	72.9	74.0	66.5	58.1	57.6	74.0
Year Highest Occurred	1980	1980	1978	1992	1997	1981	1984	1984	1984	1983	1983	1977	1984
Lowest Mean Min. Temperature (F)	44.9	47.1	50.1	53.1	56.5	58.7	62.5	63.3	61.9	57.1	47.1	45.5	44.9
Year Lowest Occurred	1989	1990	1991	1999	1991	1999	1987	1999	1986	1971	1994	1990	1989
Mean Precipitation (in.)	2.28	2.04	2.26	0.75	0.20	0.09	0.03	0.09	0.21	0.44	1.07	1.31	10.77
Highest Precipitation (in.)	9.09	7.65	6.96	3.71	1.79	0.87	0.24	2.13	1.04	1.74	4.92	4.55	9.09
Year Highest Occurred	1993	1998	1991	1988	1977	1990	1991	1977	1986	1987	1985	1984	1993
Lowest Precipitation (in.)	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Year Lowest													

Occurred	1976	1974	1997	1993	2000	2000	2000	1999	2000	1999	1980	2000	1976
Heating Degree Days (F)	227.	176.	160.	90.	47.	10.	0.	0.	1.	12.	109.	231.	1063.
Cooling Degree Days (F)	2.	4.	5.	17.	32.	81.	183.	230.	199.	97.	15.	1.	866.

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SAN DIEGO WSO AIRPORT, CALIFORNIA (047740)

1971-2000 Monthly Climate Summary

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	65.8	66.2	66.7	68.4	69.4	72.2	75.8	77.4	76.9	74.1	67.5	66.4	70.8
Average Min. Temperature (F)	49.7	51.5	53.6	56.4	59.7	62.6	65.9	67.3	65.9	61.1	52.1	49.1	58.1
Average Total Precipitation (in.)	2.17	2.19	2.00	0.83	0.22	0.09	0.03	0.11	0.18	0.44	1.07	1.45	10.78

Unofficial values based on averages/sums of smoothed daily data. Information is computed from available daily data during the 1971-2000 period. Smoothing, missing data and observation-time changes may cause these 1971-2000 values to differ from official NCDC values. This table is presented for use at locations that don't have official NCDC data. No adjustments are made for missing data or time of observation. Check NCDC normals table for official data.

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APPENDIX F.3

Modeling Protocol

A number of air quality related impact analyses were conducted using state-of-the-art dispersion models and modeling techniques. Modeling was used to assess impacts for the following types of issues:

- Compliance with state and federal air quality standards,
- Compliance with local air district NSR impact standards,
- Evaluation of PSD increment consumption on Class I areas,
- Evaluation of visibility impacts,
- Evaluation of depositional impacts,
- Evaluation of AQRV impacts,
- Evaluation of Class II area impacts,
- Evaluation of impacts on soils, vegetation, and sensitive biological species,
- Evaluation of cumulative impacts, and,
- Evaluation of health risk impacts.

The air quality models, and analysis techniques used in these analyses, are summarized in the enclosed Modeling Protocol, with additional support data provided in Appendices F.1, and F.2, and F.4 through F.10. The Protocol also outlines the support data that was used in the various analyses, and how the support data was acquired, processed, and quality assured. The protocol has been submitted to the various air quality agencies for review and comment.

Attachment F.3-1	Dispersion Modeling and Impact Analysis Protocol

Attachment F.3-1
Modeling Protocol

ATMOSPHERIC DYNAMICS, INC
Meteorological & Air Quality Modeling

August 2, 2011

Mr. Ralph DeSiena
San Diego Air Pollution Control District
10124 Old Grove Road
San Diego, CA. 92131-1649

Re: Air Quality Modeling Protocol for the Quail Brush Power Project

Dear Ralph:

Attached is the Air Quality Modeling Protocol for the Quail Brush Power Project (QBPP). Quail Brush Genco, LLC, is proposing to construct and operate the QBPP facility located on Sycamore Landfill Road, west of Santee, California. The project will be a nominal 102.3 MW facility utilizing natural gas-fired internal reciprocating engine technology. The engines proposed for use are Wartsila 20V34SG-C2's. Each engine is rated at approximately 9.3 MW. In addition to the power cycle engines, the facility will have a dry "radiator" cooling system, fuel gas and warm start heaters, and an emergency fire pump system.

The proposed project will be a minor new source as defined by the San Diego Air Pollution Control District (APCD or SDAPCD) Siting Regulations. The Environmental Protection Agency (EPA) Prevention of Significant Deterioration rules will apply to the proposed source for GHGs as well as NOx, PM10, and PM2.5. QBPP will not be subject to APCD requirements for emission offsets but will require an air quality modeling analyses for criteria pollutants and toxics. The APCD regulatory requirements include:

- APCD does not, at this time, have PSD delegation; therefore any required PSD permits will be issued by EPA Region 9.
- PSD applicability per the Tailoring Rule provisions for GHGs, will result in other criteria pollutants being subject to PSD by virtue of emissions exceeding the PSD significant emissions rates (SERs), which include NO_x, PM10 and PM2.5.
- PSD applicability by virtue of the GHG Tailoring Rule provisions, and subsequent imposition of PSD for other criteria pollutants will not affect the

source status, i.e., major or non-major, under the APCD NSR Rules (20.1, 20.2, 20.3).

- Based on data derived from discussions with SDAPCD staff, the APCD is classified as a "basic" nonattainment area for ozone. But, the APCD has requested a re-designation to "serious" ozone nonattainment, which will most likely be in effect at the time of submittal of this AFC and the accompanying PSD permit application.
- SDAPCD Rule 20.1 defines the major source emissions thresholds for serious ozone nonattainment areas as follows:
  - PM10 100 TPY
  - NO_x 50 TPY
  - VOCs 50 TPY
  - SO_x 100 TPY
  - CO 100 TPY
- SDAPCD Rule 20.1 further defines NOX and VOC as precursors to ozone. Notwithstanding this definition, the region is attainment for NO_2.

The applicant will submit air quality impact analyses to the SDAPCD, EPA Region 9, and the California Energy Commission (CEC). The modeling analysis, based on GHGs triggering PSD, will include impact evaluations for those pollutants shown in Table 1 and the CEC requirements for evaluation of project air quality impacts. The purpose of this document is to establish the procedure for meeting the APCD, EPA, and CEC air quality modeling requirements for the proposed project.

Table 1
PSD Significant Emissions Thresholds

Pollutant	**Cumulative Increase (tons/yr)**
NO_x	40
SO_2	40
CO	100
VOC	40
PM10/PM2.5	15/10

The project will result in emissions that will exceed PSD significant emissions thresholds for of oxides of nitrogen (NO_x), volatile organic compounds (VOC) and particulate matter (PM10/2.5). Sulfur dioxide (SO_2), carbon monoxide (CO), and are expected to be below the significant emission levels. The project will also trigger CEC modeling requirements for cumulative and construction-based impacts. Based on emissions of NO_x and PM10/2.5, the project will trigger the APCD Air Quality Impact Assessment (AQIA) requirements, which require that a new project does not cause or contribute to violations of the air quality standards. It should be noted that the project only triggers the PSD modeling requirements for NO_x and PM10/2.5 based on the project emissions of GHGs rather than the rather than the pollutants of NO_x, CO, SO_X, and PM.

As part of the major PSD source permit application, an air quality, toxics, and cumulative impacts analyses are required. At this time, modeled ambient impacts are expected to be below the levels at which preconstruction monitoring is required. The results of these analyses will be presented in detail in the AFC and the application for a Determination of Compliance.

As part of application process and in accordance with the APCD requirements, a modeling protocol is required. This modeling protocol outlines the proposed use of air dispersion modeling techniques that will be used to assess impacts from the proposed facility, and has been prepared by Atmospheric Dynamics, Inc. on behalf of QBPP. This protocol also follows modeling guidance provided by the 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 *"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), as well as additional modeling guidance.

Impacts from operation of the facility will be compared to the following in Table 2:

Table 2 Air Quality Criteria	NO_2	PM_{10}	CO	SO_2
PSD Significant Impact Levels	✓	✓		
PSD Monitoring Exemption Levels	✓	✓		
PSD Increments	✓	✓		
Ambient Air Quality Standards	✓	✓	✓	✓
Class I and Class II Visibility	✓	✓		
Impacts to Soils and Vegetation	✓	✓	✓	✓
Class I Area Acid Deposition	✓			

Concurrent with the submittal of the Application for Certification (AFC) to the California Energy Commission and the PSD application to the Environmental Protection Agency Region 9, the applicant will be applying to the SDAPCD for an Authority to Construct and a Determination of Compliance for the proposed project. Attached for your review is a description of the analytical approach that will be used to comply with District modeling requirements for the project.

We look forward to working with you. If you have any questions, please do not hesitate to call me at (831) 620-0481. Thank you for your attention in this matter.

Sincerely,

Atmospheric Dynamics, Inc.

Gregory S. Darvin
Senior Meteorologist

cc:
Carol Bohnenkamp, EPA Region 9

Mr. Gerry Bemis, P.E.

Figure F.4-1 Census Bureau Tract Map

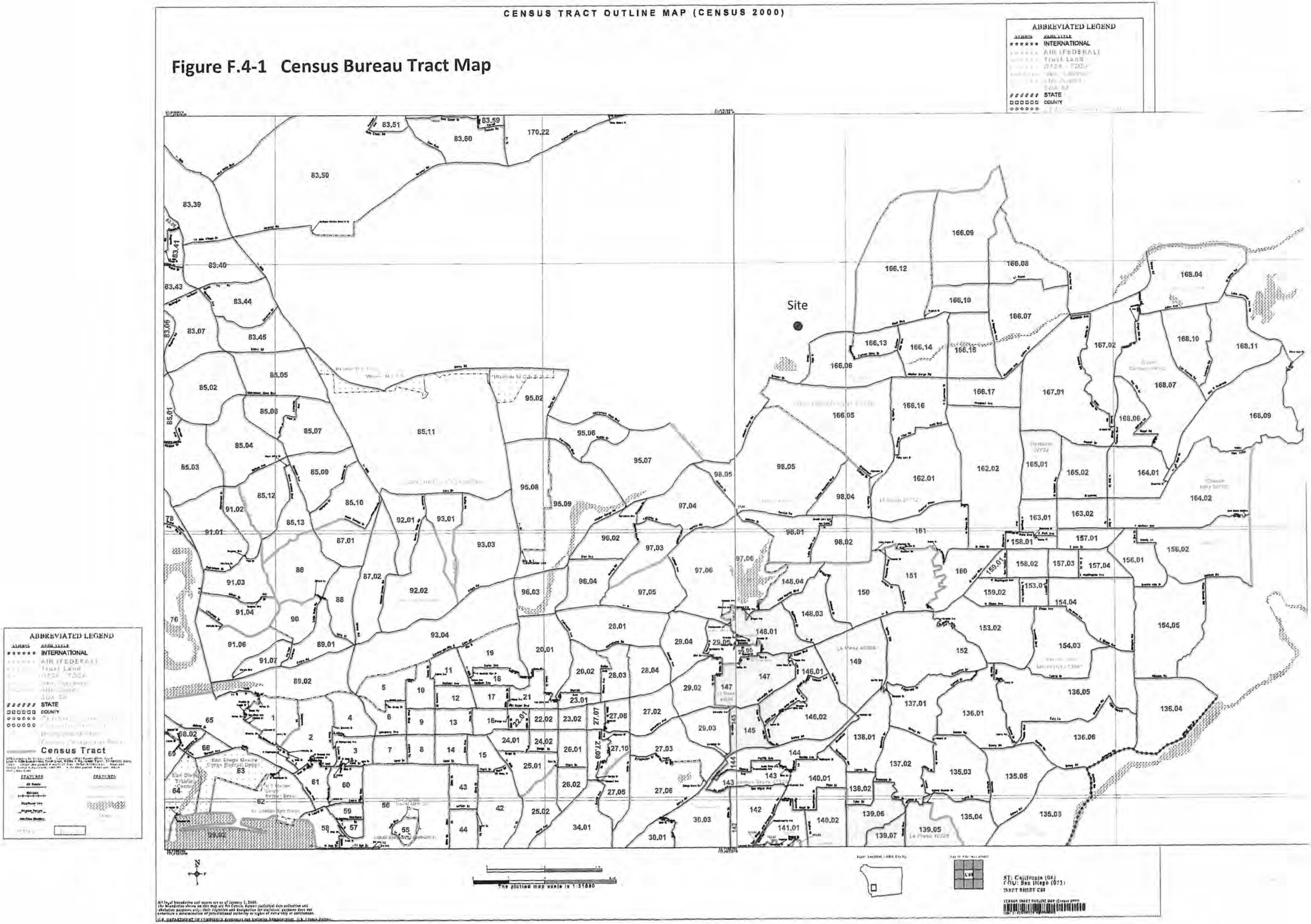

Table F.5-8 EMFAC Output (2 Pages)

```
Title     : SanDiego2013a
Version   : Emfac2007 V2.3 Nov 1 2006
Run Date  : 2011/03/23 09:46:52
Scen Year: 2013 -- All model years in the range 1969 to 2013 selected
Season    : Annual
Area      : San Diego County
I/M Stat  : Enhanced Interim (2005)
Emissions: Tons Per Day
******************************************************************************************************************************************************************************************************************
                                                                                                                                   - - - -  H e a v y  D u t y  T r u c k s  - - -
           - - - Light Duty Passenger Cars - - -    - - - - - Light Duty Trucks - - - - -    - - - - - Medium Duty Trucks - - - -     ----- Gasoline Trucks ------     Diesel  Total HD     Urban    Motor-       All
             Non-cat       Cat    Diesel     Total   Non-cat       Cat    Diesel     Total   Non-cat       Cat    Diesel     Total   Non-cat       Cat     Total    Trucks    Trucks     Buses    cycles  Vehicles
******************************************************************************************************************************************************************************************************************
Vehicles       6133.  1214610.     2903.  1223650.     4297.   762570.     8939.   775806.     1432.   256373.    16243.   274047.      872.    30905.    31777.    30116.    61893.      898.    86284.  2422580.
VMT/1000         99.    44170.       68.    44337.       82.    29044.      275.    29402.       33.    10409.      702.    11143.       10.      618.      629.     2802.     3431.      127.      813.    89252.
Trips         23814.  7616120.    15346.  7655280.    16762.  4772440.    53565.  4842760.    10360.  2623250.   199209.  2832810.    13616.   224591.   238208.   515802.   754009.     3592.   172552. 16261000.
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------
                                                                                       Total Organic Gas Emissions
Run Exh         0.75      4.01      0.01      4.78      0.64      2.71      0.02      3.38      0.33      1.83      0.19      2.35      0.08      0.43      0.51      1.97      2.47      0.13      3.15     16.26
Idle Exh        0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.05      0.00      0.06      0.00      0.01      0.01      0.21      0.22      0.00      0.00      0.28
Start Ex        0.15      3.62      0.00      3.77      0.10      2.37      0.00      2.48      0.08      1.69      0.00      1.77      0.15      0.39      0.54      0.00      0.54      0.00      0.45      9.01
             -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------
Total Ex        0.89      7.64      0.01      8.54      0.75      5.08      0.02      5.85      0.40      3.58      0.19      4.18      0.23      0.83      1.06      2.17      3.24      0.14      3.59     25.54

Diurnal         0.04      0.77      0.00      0.81      0.03      0.50      0.00      0.53      0.00      0.13      0.00      0.14      0.00      0.00      0.01      0.00      0.01      0.00      0.16      1.64
Hot Soak        0.08      1.37      0.00      1.45      0.06      0.90      0.00      0.96      0.01      0.30      0.00      0.31      0.01      0.01      0.02      0.00      0.02      0.00      0.07      2.81
Running         0.44      3.32      0.00      3.76      0.17      3.98      0.00      4.15      0.04      1.84      0.00      1.88      0.06      0.13      0.20      0.00      0.20      0.00      0.29     10.28
Resting         0.03      0.62      0.00      0.65      0.02      0.43      0.00      0.45      0.00      0.12      0.00      0.12      0.00      0.00      0.00      0.00      0.00      0.00      0.10      1.33
             -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------
Total           1.49     13.71      0.01     15.21      1.03     10.88      0.02     11.93      0.46      5.98      0.19      6.63      0.30      0.98      1.29      2.17      3.46      0.14      4.22     41.58
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------
                                                                                        Carbon Monoxide Emissions
Run Exh         8.63     89.56      0.06     98.25      7.24     75.51      0.18     82.92      5.05     33.22      0.90     39.17      1.79      7.09      8.88      8.74     17.62      0.80     31.98    270.74
Idle Exh        0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.31      0.02      0.33      0.01      0.08      0.08      0.81      0.89      0.00      0.00      1.22
Start Ex        0.78     40.77      0.00     41.55      0.56     29.82      0.00     30.38      0.56     18.49      0.00     19.05      1.17      5.93      7.10      0.00      7.10      0.03      1.85     99.97
             -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------
Total Ex        9.42    130.32      0.06    139.80      7.80    105.33      0.18    113.30      5.61     52.02      0.91     58.55      2.96     13.10     16.06      9.54     25.61      0.84     33.84    371.92
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------
                                                                                       Oxides of Nitrogen Emissions
Run Exh         0.48      9.09      0.11      9.68      0.40      9.23      0.47     10.10      0.24      4.84      2.92      7.99      0.04      1.49      1.53     28.19     29.73      1.97      1.06     60.52
Idle Exh        0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.04      0.05      0.00      0.00      0.00      2.03      2.03      0.00      0.00      2.08
Start Ex        0.04      2.61      0.00      2.65      0.03      2.69      0.00      2.72      0.02      3.43      0.00      3.44      0.02      0.78      0.80      0.00      0.80      0.01      0.06      9.68
             -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------
Total Ex        0.52     11.70      0.11     12.33      0.42     11.93      0.47     12.82      0.25      8.27      2.96     11.49      0.06      2.28      2.34     30.22     32.56      1.98      1.11     72.28
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------
                                                                                      Carbon Dioxide Emissions (000)
Run Exh         0.06     18.62      0.03     18.70      0.05     15.36      0.11     15.51      0.02      8.10      0.40      8.52      0.01      0.46      0.47      5.22      5.70      0.32      0.14     48.88
Idle Exh        0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01      0.00      0.00      0.00      0.12      0.12      0.00      0.00      0.13
Start Ex        0.01      0.60      0.00      0.61      0.00      0.47      0.00      0.48      0.00      0.24      0.00      0.25      0.00      0.01      0.01      0.00      0.01      0.00      0.01      1.35
             -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------
Total Ex        0.06     19.22      0.03     19.31      0.05     15.83      0.11     15.99      0.03      8.35      0.40      8.78      0.01      0.47      0.49      5.34      5.83      0.32      0.15     50.37
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------
                                                                                             PM10 Emissions
Run Exh         0.00      0.61      0.01      0.63      0.00      0.86      0.01      0.88      0.00      0.34      0.04      0.38      0.00      0.01      0.01      1.16      1.17      0.03      0.03      3.11
Idle Exh        0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.02      0.02      0.00      0.00      0.03
Start Ex        0.00      0.06      0.00      0.06      0.00      0.08      0.00      0.08      0.00      0.03      0.00      0.03      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.18
             -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------
Total Ex        0.00      0.67      0.01      0.69      0.00      0.94      0.01      0.96      0.00      0.37      0.04      0.41      0.00      0.01      0.01      1.19      1.20      0.03      0.03      3.31

TireWear        0.00      0.39      0.00      0.39      0.00      0.26      0.00      0.26      0.00      0.10      0.01      0.11      0.00      0.01      0.01      0.08      0.09      0.00      0.00      0.85
BrakeWr         0.00      0.61      0.00      0.61      0.00      0.40      0.00      0.41      0.00      0.14      0.01      0.15      0.00      0.01      0.01      0.07      0.08      0.00      0.01      1.26
             -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------
Total           0.01      1.67      0.01      1.69      0.01      1.60      0.02      1.62      0.00      0.61      0.06      0.67      0.00      0.02      0.02      1.33      1.36      0.04      0.04      5.42
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------
Lead            0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
SOx             0.00      0.19      0.00      0.19      0.00      0.15      0.00      0.16      0.00      0.08      0.00      0.09      0.00      0.00      0.00      0.05      0.06      0.00      0.00      0.49
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------
                                                                                      Fuel Consumption (000 gallons)
Gasoline        8.17   1990.83      0.00   1999.00      6.71   1639.01      0.00   1645.72      3.84    864.62      0.00    868.46      1.70     50.92     52.62      0.00     52.62      2.27     21.90   4589.98
Diesel          0.00      0.00      2.41      2.41      0.00      0.00      9.48      9.48      0.00      0.00     36.12     36.12      0.00      0.00      0.00    480.72    480.72     26.50      0.00    555.22
******************************************************************************************************************************************************************************************************************
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Title     : SanDiego2013
Version   : Emfac2007 V2.3 Nov 1 2006
Run Date  : 2011/03/23 09:36:00
Scen Year: 2013 -- All model years in the range 1969 to 2013 selected
Season    : Annual
Area      : San Diego County
I/M Stat  : Enhanced Interim (2005)
Emissions: Tons Per Day
**************************************************************************************************************************************************************************************************************************************************************************************************************************
            - - - Light Duty Trucks 1 (T1) - - -    - - - Light Duty Trucks 2 (T2) - - -    - - - Medium Duty Trucks (T3)  - - -    - Light-Heavy Duty Trucks 1 (T4) - -    - Light-Heavy Duty Trucks 2 (T5) - -    - Medium-Heavy Duty Trucks (T6)  - -      HH Duty      School Buses         Urban Buses         Total
             Non-cat       Cat    Diesel     Total   Non-cat       Cat    Diesel     Total   Non-cat       Cat    Diesel     Total   Non-cat       Cat    Diesel     Total   Non-cat       Cat    Diesel     Total   Non-cat       Cat    Diesel     Total Diesel Trks       Gas    Diesel       Gas    Diesel     Buses
**************************************************************************************************************************************************************************************************************************************************************************************************************************
Vehicles       2520.   198764.     8083.   209366.     1777.   563806.      857.   566440.     1278.   218550.      790.   220618.      116.    31854.     9550.    41520.       38.     5969.     5903.    11909.      776.    29388.    18803.    48967.     8517.      293.     1854.      183.      715.     4796.
VMT/1000         48.     7648.      251.     7947.       34.    21396.       24.    21454.       29.     8750.       27.     8807.        3.     1404.      433.     1840.        1.      254.      242.      496.        8.      525.     1053.     1585.     1600.       14.       88.       26.      101.      328.
Trips          9800.  1244220.    48651.  1302670.     6962.  3528220.     4914.  3540100.     5278.  1372570.     4833.  1382680.     3839.  1053300.   120128.  1177270.     1242.   197374.    74247.   272864.    11394.   165373.   438847.   615614.    43101.     1171.     7414.      733.     2859.    75551.
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                                                                                     Total Organic Gas Emissions
Run Exh         0.38      0.57      0.02      0.97      0.26      2.14      0.00      2.40      0.30      1.17      0.00      1.47      0.02      0.59      0.11      0.72      0.01      0.08      0.08      0.16      0.05      0.22      0.27      0.54      1.65      0.04      0.04      0.04      0.10      0.26
Idle Exh        0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.05      0.00      0.05      0.00      0.01      0.00      0.01      0.00      0.01      0.01      0.01      0.20      0.00      0.00      0.00      0.00      0.01
Start Ex        0.06      0.49      0.00      0.55      0.04      1.89      0.00      1.93      0.04      0.97      0.00      1.01      0.03      0.61      0.00      0.64      0.01      0.11      0.00      0.12      0.12      0.22      0.00      0.34      0.00      0.01      0.00      0.00      0.00      0.07
             -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------
Total Ex        0.44      1.06      0.02      1.52      0.31      4.02      0.00      4.33      0.34      2.14      0.00      2.48      0.05      1.24      0.11      1.40      0.01      0.20      0.08      0.30      0.17      0.45      0.27      0.89      1.84      0.05      0.05      0.04      0.10      0.35

Diurnal         0.02      0.12      0.00      0.13      0.01      0.38      0.00      0.39      0.00      0.13      0.00      0.13      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.00      0.00      0.00      0.00      0.00
Hot Soak        0.03      0.22      0.00      0.25      0.02      0.68      0.00      0.71      0.01      0.24      0.00      0.24      0.00      0.05      0.00      0.06      0.00      0.01      0.00      0.01      0.01      0.01      0.00      0.01      0.00      0.00      0.00      0.00      0.00      0.00
Running         0.10      0.92      0.00      1.02      0.07      3.06      0.00      3.13      0.01      1.00      0.00      1.02      0.02      0.70      0.00      0.72      0.01      0.14      0.00      0.14      0.05      0.10      0.00      0.15      0.00      0.00      0.00      0.00      0.00      0.03
Resting         0.01      0.10      0.00      0.12      0.01      0.32      0.00      0.33      0.00      0.12      0.00      0.12      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
             -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------
Total           0.61      2.41      0.02      3.04      0.42      8.47      0.00      8.89      0.37      3.63      0.00      3.99      0.07      2.00      0.11      2.18      0.02      0.35      0.08      0.45      0.23      0.56      0.27      1.06      1.84      0.06      0.05      0.04      0.10      0.37
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                                                                                      Carbon Monoxide Emissions
Run Exh         4.27     17.33      0.16     21.76      2.97     58.18      0.02     61.16      4.54     26.64      0.02     31.20      0.40      5.78      0.55      6.72      0.11      0.80      0.34      1.25      1.15      4.30      2.32      7.77      5.99      0.68      0.32      0.43      0.38      2.37
Idle Exh        0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.26      0.01      0.27      0.00      0.05      0.01      0.06      0.00      0.05      0.04      0.09      0.73      0.02      0.03      0.00      0.00      0.06
Start Ex        0.33      6.66      0.00      6.99      0.23     23.16      0.00     23.39      0.34     10.48      0.00     10.82      0.17      6.86      0.00      7.03      0.05      1.15      0.00      1.21      0.74      3.53      0.00      4.28      0.00      0.07      0.00      0.03      0.00      1.05
             -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------
Total Ex        4.60     23.99      0.16     28.74      3.20     81.34      0.02     84.56      4.88     37.12      0.02     42.02      0.56     12.90      0.56     14.01      0.17      2.00      0.34      2.51      1.89      7.89      2.36     12.14      6.72      0.78      0.34      0.46      0.38      3.48
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                                                                                     Oxides of Nitrogen Emissions
Run Exh         0.23      1.53      0.43      2.20      0.16      7.70      0.04      7.90      0.23      3.92      0.05      4.19      0.01      0.79      1.72      2.52      0.00      0.14      1.15      1.29      0.03      0.78      7.44      8.25     19.34      0.05      1.05      0.07      1.90      3.55
Idle Exh        0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.03      0.03      0.00      0.00      0.02      0.02      0.00      0.00      0.13      0.13      1.82      0.00      0.08      0.00      0.00      0.09
Start Ex        0.02      0.43      0.00      0.44      0.01      2.26      0.00      2.27      0.01      1.05      0.00      1.06      0.00      2.00      0.00      2.00      0.00      0.38      0.00      0.38      0.01      0.46      0.00      0.47      0.00      0.00      0.00      0.01      0.00      0.14
             -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------
Total Ex        0.25      1.96      0.43      2.64      0.17      9.96      0.04     10.18      0.24      4.97      0.05      5.25      0.01      2.80      1.75      4.55      0.00      0.51      1.17      1.68      0.04      1.25      7.57      8.85     21.16      0.05      1.13      0.08      1.90      3.78
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                                                                                    Carbon Dioxide Emissions (000)
Run Exh         0.03      4.03      0.10      4.16      0.02     11.32      0.01     11.35      0.02      6.33      0.01      6.36      0.00      1.50      0.25      1.75      0.00      0.27      0.14      0.41      0.01      0.40      1.75      2.15      3.23      0.01      0.15      0.02      0.29      0.60
Idle Exh        0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.01      0.10      0.00      0.00      0.00      0.00      0.01
Start Ex        0.00      0.12      0.00      0.13      0.00      0.35      0.00      0.35      0.00      0.19      0.00      0.19      0.00      0.05      0.00      0.05      0.00      0.01      0.00      0.01      0.00      0.01      0.00      0.01      0.00      0.00      0.00      0.00      0.00      0.00
             -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------
Total Ex        0.03      4.16      0.10      4.28      0.02     11.67      0.01     11.70      0.02      6.51      0.01      6.55      0.00      1.56      0.25      1.81      0.00      0.28      0.14      0.42      0.01      0.40      1.75      2.17      3.34      0.01      0.15      0.02      0.29      0.61
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                                                                                            PM10 Emissions
Run Exh         0.00      0.12      0.01      0.13      0.00      0.74      0.00      0.74      0.00      0.31      0.00      0.31      0.00      0.02      0.02      0.05      0.00      0.00      0.02      0.02      0.00      0.00      0.27      0.28      0.83      0.00      0.04      0.00      0.03      0.09
Idle Exh        0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.02      0.00      0.00      0.00      0.00      0.00
Start Ex        0.00      0.01      0.00      0.01      0.00      0.07      0.00      0.07      0.00      0.03      0.00      0.03      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
             -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------
Total Ex        0.00      0.13      0.01      0.15      0.00      0.81      0.00      0.81      0.00      0.33      0.00      0.34      0.00      0.03      0.02      0.05      0.00      0.01      0.02      0.02      0.00      0.00      0.27      0.28      0.85      0.00      0.05      0.00      0.03      0.10

TireWear        0.00      0.07      0.00      0.07      0.00      0.19      0.00      0.19      0.00      0.08      0.00      0.08      0.00      0.02      0.01      0.02      0.00      0.00      0.00      0.01      0.00      0.01      0.01      0.02      0.06      0.00      0.00      0.00      0.00      0.00
BrakeWr         0.00      0.11      0.00      0.11      0.00      0.30      0.00      0.30      0.00      0.12      0.00      0.12      0.00      0.02      0.01      0.03      0.00      0.00      0.00      0.01      0.00      0.01      0.01      0.02      0.05      0.00      0.00      0.00      0.00      0.00
             -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------   -------
Total           0.00      0.31      0.02      0.33      0.00      1.29      0.00      1.30      0.00      0.53      0.00      0.54      0.00      0.07      0.03      0.10      0.00      0.01      0.02      0.03      0.00      0.02      0.30      0.32      0.97      0.00      0.05      0.00      0.04      0.10
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------
Lead            0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
SOx             0.00      0.04      0.00      0.04      0.00      0.11      0.00      0.11      0.00      0.06      0.00      0.06      0.00      0.02      0.00      0.02      0.00      0.00      0.00      0.00      0.00      0.00      0.02      0.02      0.03      0.00      0.00      0.00      0.00      0.01
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                                                                                   Fuel Consumption (000 gallons)
Gasoline        3.93    429.56      0.00    433.49      2.78   1209.45      0.00   1212.23      3.20    673.56      0.00    676.76      0.49    161.86      0.00    162.35      0.15     29.20      0.00     29.35      1.21     42.80      0.00     44.01      0.00      1.41      0.00      2.27      0.00      7.12
Diesel          0.00      0.00      8.63      8.63      0.00      0.00      0.85      0.85      0.00      0.00      0.93      0.93      0.00      0.00     22.44     22.44      0.00      0.00     12.74     12.74      0.00      0.00    157.80    157.80    300.18      0.00     13.54      0.00     26.50     49.24
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Table F.5-9 Offoad 2007-Raw Data Output (13 Pages)

Equipment	Fuel	MaxHP	Class	Population	Activity	Consumption	ROG Exhaust	CO Exhaust	NOX Exhaust	CO2 Exhaust	SO2 Exhaust	PM Exhaust	N2O Exhaust	CH4 Exhaust
Off-Road Motorcycles Inactive	G2	15	Recreational Equipment	8.11E+02	2.96E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G2	25	Recreational Equipment	6.98E+02	2.55E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G2	50	Recreational Equipment	5.68E+03	2.07E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G2	120	Recreational Equipment	2.72E+03	9.91E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowmobiles Inactive	G2	25	Recreational Equipment	3.83E+00	5.94E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowmobiles Inactive	G2	50	Recreational Equipment	1.80E+01	2.80E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowmobiles Inactive	G2	120	Recreational Equipment	3.28E+01	5.09E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G2	15	Recreational Equipment	1.07E+03	3.91E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G2	25	Recreational Equipment	6.97E+02	2.54E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G2	50	Recreational Equipment	9.17E+02	3.35E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G4	15	Recreational Equipment	1.58E+03	5.77E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G4	25	Recreational Equipment	2.55E+03	9.31E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G4	50	Recreational Equipment	2.66E+03	9.70E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G4	15	Recreational Equipment	8.73E+02	3.19E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G4	25	Recreational Equipment	1.21E+04	4.43E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G4	50	Recreational Equipment	5.48E+02	2.00E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Active	G2	15	Recreational Equipment	2.02E+03	7.38E+03	2.80E+02	2.82E-01	4.40E-01	8.37E-05	9.35E-01	7.58E-04	3.42E-03	3.16E-04	1.75E-02
Off-Road Motorcycles Active	G2	25	Recreational Equipment	1.74E+03	6.35E+03	2.41E+02	2.42E-01	3.79E-01	7.20E-05	8.05E-01	1.22E-03	2.94E-03	2.72E-04	1.51E-02
Off-Road Motorcycles Active	G2	50	Recreational Equipment	1.42E+04	5.17E+04	1.96E+03	1.97E+00	3.08E+00	5.86E-04	6.55E+00	1.57E-02	2.39E-02	2.21E-03	1.23E-01
Off-Road Motorcycles Active	G2	120	Recreational Equipment	6.78E+03	2.47E+04	9.38E+02	9.44E-01	1.48E+00	2.80E-04	3.13E+00	1.11E-02	1.15E-02	1.06E-03	5.87E-02
Snowmobiles Active	G2	25	Recreational Equipment	1.10E+01	1.71E+00	1.65E+00	1.24E-03	3.63E-03	4.04E-05	5.49E-03	9.57E-08	3.80E-05	4.27E-06	7.72E-05
Snowmobiles Active	G2	50	Recreational Equipment	5.18E+01	8.05E+00	1.48E+01	1.11E-02	3.25E-02	3.62E-04	4.92E-02	8.57E-07	3.40E-04	2.83E-05	6.92E-04
Snowmobiles Active	G2	120	Recreational Equipment	9.42E+01	1.46E+01	4.32E+01	3.10E-02	9.28E-02	1.21E-03	1.53E-01	2.67E-06	1.02E-03	7.18E-05	1.93E-03
All Terrain Vehicles (ATVs) Active	G2	15	Recreational Equipment	3.53E+03	1.29E+04	4.88E+02	4.91E-01	7.67E-01	1.46E-04	1.63E+00	1.63E-03	5.96E-03	5.50E-04	3.05E-02
All Terrain Vehicles (ATVs) Active	G2	25	Recreational Equipment	2.30E+03	8.37E+03	3.17E+02	3.20E-01	4.99E-01	9.49E-05	1.06E+00	1.45E-03	3.88E-03	3.58E-04	1.99E-02
All Terrain Vehicles (ATVs) Active	G2	50	Recreational Equipment	3.02E+03	1.10E+04	4.18E+02	4.21E-01	6.57E-01	1.25E-04	1.40E+00	2.50E-03	5.10E-03	4.72E-04	2.61E-02
Golf Carts	G2	15	Recreational Equipment	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Specialty Vehicles Carts	G2	15	Recreational Equipment	7.06E+03	1.27E+03	4.66E+02	1.68E-02	1.27E+00	1.25E-02	2.43E+00	1.00E-04	9.14E-04	2.00E-03	1.04E-03
Tampers/Rammers	G2	15	Construction and Minin	3.28E+02	1.88E+02	3.79E+01	2.39E-03	1.02E-01	1.80E-03	1.96E-01	8.06E-06	1.64E-03	2.92E-04	1.48E-04
Plate Compactors	G2	15	Construction and Minin	2.81E+01	1.82E+01	3.68E+00	2.31E-04	9.94E-03	1.74E-04	1.90E-02	7.83E-07	1.59E-04	2.84E-05	1.44E-05
Other General Industrial Equipmen	G2	15	Industrial Equipment	6.42E+00	7.58E+00	2.98E+00	1.34E-04	8.11E-03	9.83E-05	1.55E-02	6.39E-07	7.22E-06	1.39E-05	8.35E-06
Lawn Mowers	G2	15	Lawn and Garden Equip	4.71E+03	4.13E+03	4.67E+02	5.29E-02	9.50E-01	1.37E-02	2.82E+00	1.16E-04	8.88E-03	3.65E-03	3.29E-03
Lawn Mowers	G2	15	Lawn and Garden Equip	3.54E+04	1.58E+03	2.22E+02	4.76E-02	5.62E-01	5.83E-03	1.08E+00	4.44E-05	3.67E-03	1.41E-03	2.96E-03
Chainsaws	G2	2	Lawn and Garden Equip	8.44E+03	9.36E+03	5.58E+02	4.67E-01	8.45E-01	7.15E-03	2.28E+00	9.40E-05	1.33E-03	3.79E-03	2.90E-02
Chainsaws	G2	2	Lawn and Garden Equip	9.50E+04	1.34E+03	7.35E+01	3.76E-02	1.53E-01	1.08E-03	3.27E-01	1.35E-05	6.59E-04	5.53E-04	2.33E-03
Chainsaws	G2	15	Lawn and Garden Equip	5.95E+03	6.60E+03	9.51E+02	7.95E-01	1.44E+00	1.22E-02	3.89E+00	1.60E-04	2.26E-03	4.27E-03	4.94E-02
Chainsaws	G2	15	Lawn and Garden Equip	6.69E+04	9.44E+02	1.20E+02	5.81E-02	2.44E-01	1.81E-03	5.56E-01	2.29E-05	1.24E-03	6.17E-04	3.61E-03
Chainsaws Preempt	G2	15	Lawn and Garden Equip	7.40E+03	8.21E+03	1.18E+03	9.90E-01	1.79E+00	1.51E-02	4.84E+00	1.99E-04	2.82E-03	5.31E-03	6.15E-02
Chainsaws Preempt	G2	15	Lawn and Garden Equip	8.33E+04	1.17E+03	1.69E+02	9.70E-02	3.63E-01	1.86E-03	6.92E-01	2.85E-05	8.67E-04	6.97E-04	6.03E-03
Trimmers/Edgers/Brush Cutters	G2	2	Lawn and Garden Equip	2.75E+04	1.28E+04	5.68E+02	3.07E-01	1.01E+00	8.54E-03	2.73E+00	1.12E-04	1.59E-03	4.82E-03	1.91E-02
Trimmers/Edgers/Brush Cutters	G2	2	Lawn and Garden Equip	3.07E+05	1.90E+04	8.06E+02	3.63E-01	1.50E+00	1.30E-02	4.05E+00	1.67E-04	2.36E-03	7.22E-03	2.26E-02
Leaf Blowers/Vacuums	G2	2	Lawn and Garden Equip	4.11E+04	3.10E+04	1.65E+03	1.14E+00	2.71E+00	2.29E-02	7.33E+00	3.02E-04	4.27E-03	1.23E-02	7.08E-02
Leaf Blowers/Vacuums	G2	2	Lawn and Garden Equip	1.06E+05	1.46E+03	7.80E+01	3.97E-02	1.62E-01	1.15E-03	3.47E-01	1.43E-05	7.00E-04	5.95E-04	2.47E-03
Shredders	G2	15	Lawn and Garden Equip	2.08E+02	1.08E+02	4.74E+01	2.67E-03	1.28E-01	2.01E-03	2.46E-01	1.01E-05	2.06E-03	2.40E-04	1.66E-04
Shredders	G2	15	Lawn and Garden Equip	7.40E+03	1.92E+01	9.45E+00	1.99E-03	2.55E-02	2.78E-04	4.36E-02	1.79E-06	3.65E-04	3.65E-05	1.23E-04
Commercial Turf Equipment	G2	15	Lawn and Garden Equip	1.10E+02	3.38E+02	1.38E+02	6.29E-03	3.77E-01	4.62E-03	7.20E-01	2.96E-05	3.35E-04	6.35E-04	3.91E-04
Commercial Turf Equipment	G2	25	Lawn and Garden Equip	5.44E+01	1.67E+02	1.48E+02	6.53E-03	4.16E-01	4.85E-03	7.50E-01	3.09E-05	3.49E-04	4.69E-04	4.06E-04
Other Lawn & Garden Equipment	G2	2	Lawn and Garden Equip	4.65E+01	1.22E+01	6.83E-01	3.36E-04	1.24E-03	1.05E-05	3.36E-03	1.38E-07	1.96E-06	5.27E-06	2.09E-05
Other Lawn & Garden Equipment	G2	2	Lawn and Garden Equip	1.43E+03	1.77E+01	1.09E+00	5.48E-04	2.27E-03	1.60E-05	4.85E-03	2.00E-07	9.79E-06	7.77E-06	3.40E-05
Other Lawn & Garden Equipment	G2	15	Lawn and Garden Equip	2.03E+01	5.33E+00	1.49E+00	7.30E-04	2.71E-03	2.29E-05	7.31E-03	3.01E-07	4.26E-06	5.41E-06	4.54E-05
Other Lawn & Garden Equipment	G2	15	Lawn and Garden Equip	6.21E+02	7.69E+00	2.28E+00	1.08E-03	4.64E-03	3.43E-05	1.06E-02	4.35E-07	2.35E-05	7.89E-06	6.72E-05
Generator Sets	G2	2	Light Commercial Equip	1.93E+02	5.53E+01	3.33E+00	7.84E-04	7.22E-03	1.31E-04	1.78E-02	7.33E-07	6.86E-05	4.02E-05	4.87E-05
Generator Sets	G2	2	Light Commercial Equip	1.52E+02	2.92E+01	1.90E+00	5.42E-04	4.39E-03	6.85E-05	9.40E-03	3.87E-07	3.87E-05	2.10E-05	3.37E-05
Generator Sets	G2	15	Light Commercial Equip	1.95E+00	5.57E-01	3.15E-01	1.83E-05	8.64E-04	1.19E-05	1.61E-03	6.65E-08	7.57E-07	1.32E-06	1.14E-06
Generator Sets	G2	15	Light Commercial Equip	1.48E+00	2.86E-01	1.73E-01	2.43E-05	4.76E-04	5.89E-06	8.27E-04	3.41E-08	9.37E-07	6.59E-07	1.51E-06
Pumps	G2	2	Light Commercial Equip	7.68E+02	4.22E+02	2.23E+01	3.24E-03	4.16E-02	9.64E-04	1.38E-01	5.67E-06	4.84E-04	3.02E-04	2.01E-04

Pumps	G2	2	Light Commercial Equip	6.03E+02	2.23E+02	1.31E+01	2.74E-03	2.72E-02	5.37E-04	7.28E-02	3.00E-06	2.73E-04	1.64E-04	1.70E-04
Pumps	G2	15	Light Commercial Equip	2.07E+02	1.14E+02	5.77E+01	3.76E-03	1.56E-01	2.77E-03	2.97E-01	1.22E-05	2.49E-03	2.91E-04	2.34E-04
Pumps	G2	15	Light Commercial Equip	1.63E+02	6.01E+01	3.11E+01	2.63E-03	8.49E-02	1.42E-03	1.57E-01	6.47E-06	1.32E-03	1.51E-04	1.64E-04
Pumps	G2	25	Light Commercial Equip	2.51E+00	1.38E+00	1.52E+00	1.00E-04	4.24E-03	6.61E-05	7.64E-03	3.15E-07	6.41E-05	5.06E-06	6.23E-06
Pumps	G2	25	Light Commercial Equip	1.95E+00	7.20E-01	8.00E-01	5.34E-05	2.24E-03	3.38E-05	4.00E-03	1.65E-07	3.35E-05	2.62E-06	3.32E-06
Off-Road Motorcycles Active	G4	15	Recreational Equipment	3.95E+03	1.44E+04	2.69E+02	1.93E-02	4.42E-01	8.43E-03	1.82E+00	1.48E-03	9.52E-04	4.91E-03	1.09E-03
Off-Road Motorcycles Active	G4	25	Recreational Equipment	6.37E+03	2.32E+04	4.33E+02	3.12E-02	7.13E-01	1.36E-02	2.94E+00	4.45E-03	1.54E-03	7.92E-03	1.75E-03
Off-Road Motorcycles Active	G4	50	Recreational Equipment	6.63E+03	2.42E+04	4.51E+02	3.25E-02	7.43E-01	1.42E-02	3.07E+00	7.34E-03	1.60E-03	8.25E-03	1.83E-03
All Terrain Vehicles (ATVs) Active	G4	15	Recreational Equipment	2.88E+03	1.05E+04	1.97E+02	1.48E-02	3.30E-01	8.02E-03	1.33E+00	1.33E-03	6.94E-04	4.13E-03	8.31E-04
All Terrain Vehicles (ATVs) Active	G4	25	Recreational Equipment	4.00E+04	1.46E+05	2.75E+03	2.06E-01	4.59E+00	1.12E-01	1.85E+01	2.52E-02	9.66E-03	5.74E-02	1.16E-02
All Terrain Vehicles (ATVs) Active	G4	50	Recreational Equipment	1.81E+03	6.59E+03	1.24E+02	9.29E-03	2.07E-01	5.04E-03	8.35E-01	1.49E-03	4.36E-04	2.59E-03	5.22E-04
Minibikes	G4	5	Recreational Equipment	1.58E+03	5.87E+02	1.31E+02	8.55E-02	5.49E-01	2.09E-03	7.43E-02	2.38E-05	2.29E-03	5.26E-04	4.85E-03
Golf Carts	G4	15	Recreational Equipment	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Specialty Vehicles Carts	G4	5	Recreational Equipment	2.19E+02	3.92E+01	1.03E+01	7.77E-04	2.74E-02	1.87E-04	5.38E-02	1.86E-06	1.27E-04	4.09E-05	4.41E-05
Specialty Vehicles Carts	G4	15	Recreational Equipment	2.96E+03	5.31E+02	2.07E+02	7.70E-03	6.00E-01	5.48E-03	1.02E+00	2.91E-05	3.84E-04	8.39E-04	4.37E-04
Specialty Vehicles Carts	G4	25	Recreational Equipment	1.63E+03	2.92E+02	3.17E+02	1.18E-02	9.50E-01	7.84E-03	1.52E+00	3.86E-05	5.72E-04	7.68E-04	6.69E-04
Asphalt Pavers	G4	15	Construction and Minin	7.15E+00	8.92E+00	5.16E+00	3.89E-04	1.48E-02	2.80E-04	2.51E-02	7.15E-07	2.10E-04	2.55E-05	2.21E-05
Asphalt Pavers	G4	25	Construction and Minin	1.22E+01	1.53E+01	2.22E+01	1.72E-03	6.55E-02	1.08E-03	1.05E-01	2.66E-06	8.79E-04	6.74E-05	9.75E-05
Asphalt Pavers	G4	50	Construction and Minin	6.29E+00	7.76E+00	1.80E+01	6.09E-04	1.91E-02	8.62E-04	1.42E-01	1.72E-06	1.08E-05	4.05E-05	3.45E-05
Asphalt Pavers	G4	120	Construction and Minin	3.46E+00	4.26E+00	1.66E+01	4.07E-04	7.68E-03	1.17E-03	1.47E-01	1.42E-06	1.14E-05	3.37E-05	2.31E-05
Tampers/Rammers	G4	15	Construction and Minin	1.51E+01	8.67E+00	4.19E+00	3.19E-04	1.20E-02	2.23E-04	2.03E-02	5.79E-07	1.70E-04	2.23E-05	1.81E-05
Plate Compactors	G4	5	Construction and Minin	5.56E+02	3.15E+02	5.70E+01	8.03E-03	1.22E-01	3.51E-03	3.28E-01	1.13E-05	1.07E-04	5.18E-04	4.56E-04
Plate Compactors	G4	15	Construction and Minin	5.89E+02	3.82E+02	1.64E+02	1.23E-02	4.68E-01	8.80E-03	7.96E-01	2.27E-05	6.67E-03	9.26E-04	6.96E-04
Rollers	G4	5	Construction and Minin	6.19E+01	1.62E+01	4.36E+00	5.23E-04	1.04E-02	2.29E-04	2.37E-02	8.20E-07	7.74E-06	3.02E-05	2.97E-05
Rollers	G4	15	Construction and Minin	1.00E+02	9.77E+01	5.30E+01	3.96E-03	1.52E-01	2.86E-03	2.58E-01	7.36E-06	2.16E-03	2.69E-04	2.25E-04
Rollers	G4	25	Construction and Minin	6.76E+01	6.60E+01	7.79E+01	5.97E-03	2.30E-01	3.76E-03	3.68E-01	9.32E-06	3.08E-03	2.59E-04	3.39E-04
Rollers	G4	50	Construction and Minin	4.43E+00	8.66E+00	2.31E+01	1.04E-03	3.05E-02	1.25E-03	1.72E-01	2.09E-06	1.31E-05	5.31E-05	5.88E-05
Rollers	G4	120	Construction and Minin	8.33E+00	1.63E+01	7.55E+01	2.58E-03	4.61E-02	6.18E-03	6.46E-01	6.24E-06	5.01E-05	1.59E-04	1.46E-04
Paving Equipment	G4	5	Construction and Minin	7.78E+02	4.16E+02	8.12E+01	1.13E-02	1.75E-01	4.94E-03	4.65E-01	1.61E-05	1.52E-04	7.08E-04	6.42E-04
Paving Equipment	G4	15	Construction and Minin	1.32E+03	8.28E+02	4.75E+02	3.55E-02	1.36E+00	2.55E-02	2.31E+00	6.60E-05	1.94E-02	2.34E-03	2.02E-03
Paving Equipment	G4	25	Construction and Minin	2.92E+01	1.84E+01	2.39E+01	1.83E-03	7.06E-02	1.15E-03	1.13E-01	2.87E-06	9.48E-04	7.60E-05	1.04E-04
Paving Equipment	G4	50	Construction and Minin	1.72E+01	9.47E+00	2.13E+01	4.04E-04	1.63E-02	6.68E-04	1.78E-01	2.17E-06	1.37E-05	3.81E-05	2.30E-05
Paving Equipment	G4	120	Construction and Minin	4.43E+00	2.44E+00	8.85E+00	1.05E-04	2.45E-03	3.55E-04	8.11E-02	7.84E-07	6.29E-06	1.30E-05	5.95E-06
Surfacing Equipment	G4	5	Construction and Minin	1.43E+02	8.99E+01	1.80E+01	2.59E-03	3.78E-02	1.13E-03	1.04E-01	3.60E-06	3.40E-05	1.58E-04	1.47E-04
Surfacing Equipment	G4	15	Construction and Minin	4.24E+02	6.72E+02	2.57E+02	2.01E-02	7.35E-01	1.45E-02	1.25E+00	3.55E-05	1.05E-02	1.57E-03	1.14E-03
Surfacing Equipment	G4	25	Construction and Minin	5.81E+00	9.19E+00	8.60E+00	6.91E-04	2.54E-02	4.35E-04	4.05E-02	1.03E-06	3.40E-04	3.27E-05	3.91E-05
Signal Boards	G4	5	Construction and Minin	1.76E+00	7.21E-01	2.33E-01	2.98E-05	5.36E-04	1.30E-05	1.30E-03	4.48E-08	4.23E-07	1.54E-06	1.69E-06
Signal Boards	G4	15	Construction and Minin	1.25E+01	1.12E+01	6.63E+00	4.92E-04	1.90E-02	3.55E-04	3.23E-02	9.20E-07	2.71E-04	3.22E-05	2.80E-05
Trenchers	G4	15	Construction and Minin	1.16E+02	1.59E+02	1.02E+02	7.80E-03	2.92E-01	5.62E-03	4.95E-01	1.41E-05	4.15E-03	4.84E-04	4.42E-04
Trenchers	G4	25	Construction and Minin	8.99E+01	1.23E+02	1.71E+02	1.34E-02	5.04E-01	8.45E-03	8.06E-01	2.04E-05	6.75E-03	5.34E-04	7.60E-04
Trenchers	G4	50	Construction and Minin	4.03E+01	5.10E+01	1.13E+02	4.35E-03	1.28E-01	6.01E-03	8.72E-01	1.06E-05	6.68E-05	2.78E-04	2.47E-04
Trenchers	G4	120	Construction and Minin	1.34E+01	1.69E+01	7.21E+01	2.07E-03	3.72E-02	5.82E-03	6.30E-01	6.08E-06	4.88E-05	1.55E-04	1.17E-04
Bore/Drill Rigs	G4	15	Construction and Minin	3.32E+00	1.30E+00	9.98E-01	7.36E-05	2.87E-03	5.14E-05	4.84E-03	1.38E-07	4.06E-05	4.19E-06	4.18E-06
Bore/Drill Rigs	G4	25	Construction and Minin	1.65E+01	6.44E+00	9.18E+00	6.89E-04	2.71E-02	4.25E-04	4.33E-02	1.10E-06	3.63E-04	2.73E-05	3.92E-05
Bore/Drill Rigs	G4	50	Construction and Minin	1.95E+00	6.57E-01	1.75E+00	5.11E-05	1.49E-03	9.08E-05	1.43E-02	1.74E-07	1.10E-06	3.84E-06	2.90E-06
Bore/Drill Rigs	G4	120	Construction and Minin	8.95E+00	3.01E+00	1.99E+01	4.16E-04	7.61E-03	1.58E-03	1.79E-01	1.73E-06	1.39E-05	3.41E-05	2.36E-05
Bore/Drill Rigs	G4	175	Construction and Minin	2.21E+00	7.46E-01	6.74E+00	8.28E-05	1.97E-03	6.15E-04	6.17E-02	6.13E-07	4.91E-06	1.07E-05	4.70E-06
Concrete/Industrial Saws	G4	5	Construction and Minin	6.09E+01	2.49E+01	6.62E+00	8.46E-04	1.52E-02	3.70E-04	3.68E-02	1.27E-06	1.20E-05	4.77E-05	4.81E-05
Concrete/Industrial Saws	G4	15	Construction and Minin	2.74E+02	2.67E+02	1.82E+02	1.36E-02	5.22E-01	9.82E-03	8.88E-01	2.53E-05	7.44E-03	8.31E-04	7.74E-04
Concrete/Industrial Saws	G4	25	Construction and Minin	8.56E+01	8.36E+01	1.11E+02	8.51E-03	3.27E-01	5.37E-03	5.25E-01	1.33E-05	4.40E-03	3.50E-04	4.83E-04
Concrete/Industrial Saws	G4	50	Construction and Minin	7.27E+00	1.40E+01	3.87E+01	4.03E-04	2.72E-02	5.76E-04	3.29E-01	4.00E-06	2.52E-05	4.61E-05	2.28E-05
Concrete/Industrial Saws	G4	120	Construction and Minin	4.16E+00	8.00E+00	3.77E+01	1.66E-04	7.42E-03	3.69E-04	3.51E-01	3.40E-06	2.72E-05	2.80E-05	9.39E-06
Cement and Mortar Mixers	G4	5	Construction and Minin	1.11E+03	3.20E+02	8.12E+01	1.01E-02	1.89E-01	4.41E-03	4.47E-01	1.54E-05	1.46E-04	5.89E-04	5.74E-04
Cement and Mortar Mixers	G4	15	Construction and Minin	1.87E+03	5.42E+02	2.64E+02	2.53E-02	7.91E-01	1.18E-02	1.21E+00	3.45E-05	9.96E-03	1.27E-03	1.43E-03
Cement and Mortar Mixers	G4	25	Construction and Minin	7.88E+00	2.28E+00	3.51E+00	3.19E-04	1.06E-02	1.40E-04	1.59E-02	4.04E-07	1.31E-04	9.27E-06	1.81E-05
Cranes	G4	50	Construction and Minin	2.21E+00	2.89E+00	5.64E+00	2.20E-04	6.44E-03	3.00E-04	4.34E-02	5.28E-07	3.33E-06	1.48E-05	1.25E-05
Cranes	G4	120	Construction and Minin	4.43E+00	5.79E+00	1.97E+01	5.71E-04	1.03E-02	1.59E-03	1.72E-01	1.66E-06	1.33E-05	4.72E-05	3.24E-05

Cranes	G4	175	Construction and Minin	1.77E-01	2.31E-01	1.24E+00	1.82E-05	4.04E-04	1.21E-04	1.13E-02	1.12E-07	8.99E-07	2.65E-06	1.03E-06
Crushing/Proc. Equipment	G4	15	Construction and Minin	3.01E+00	2.74E+00	2.03E+00	1.51E-04	5.82E-03	1.09E-04	9.91E-03	2.82E-07	8.30E-05	8.88E-06	8.59E-06
Crushing/Proc. Equipment	G4	25	Construction and Minin	1.97E+00	1.79E+00	2.44E+00	1.86E-04	7.20E-03	1.17E-04	1.15E-02	2.92E-07	9.67E-05	7.58E-06	1.06E-05
Crushing/Proc. Equipment	G4	120	Construction and Minin	2.57E+00	1.95E+00	1.53E+01	3.75E-04	6.78E-03	1.22E-03	1.36E-01	1.31E-06	1.05E-05	2.45E-05	2.13E-05
Rough Terrain Forklifts	G4	50	Construction and Minin	8.86E-01	1.15E+00	3.82E+00	1.49E-04	4.35E-03	2.04E-04	2.94E-02	3.58E-07	2.26E-06	7.81E-06	8.42E-06
Rough Terrain Forklifts	G4	120	Construction and Minin	1.26E+01	1.64E+01	8.57E+01	2.48E-03	4.46E-02	6.92E-03	7.48E-01	7.22E-06	5.79E-05	1.68E-04	1.41E-04
Rough Terrain Forklifts	G4	175	Construction and Minin	4.43E-01	5.76E-01	4.71E+00	6.90E-05	1.53E-03	4.58E-04	4.28E-02	4.25E-07	3.41E-06	8.26E-06	3.92E-06
Rubber Tired Loaders	G4	50	Construction and Minin	2.21E+00	3.57E+00	8.74E+00	3.46E-04	1.04E-02	4.51E-04	6.66E-02	8.09E-07	5.10E-06	2.02E-05	1.96E-05
Rubber Tired Loaders	G4	120	Construction and Minin	1.47E+01	2.37E+01	9.06E+01	2.68E-03	4.90E-02	6.99E-03	7.87E-01	7.60E-06	6.10E-05	1.99E-04	1.52E-04
Tractors/Loaders/Backhoes	G4	120	Construction and Minin	7.80E+00	2.14E+01	6.27E+01	1.03E-03	3.19E-02	2.38E-03	5.51E-01	5.33E-06	4.27E-05	1.05E-04	5.81E-05
Skid Steer Loaders	G4	15	Construction and Minin	5.91E+00	5.93E+00	4.69E+00	3.55E-04	1.34E-02	2.56E-04	2.28E-02	6.50E-07	1.91E-04	2.01E-05	2.02E-05
Skid Steer Loaders	G4	25	Construction and Minin	3.95E+02	3.97E+02	4.38E+02	3.40E-02	1.29E+00	2.15E-02	2.07E+00	5.25E-05	1.74E-02	1.52E-03	1.93E-03
Skid Steer Loaders	G4	50	Construction and Minin	6.04E+01	5.90E+01	1.13E+02	1.41E-03	8.79E-02	2.12E-03	9.45E-01	1.15E-05	7.24E-05	1.75E-04	8.02E-05
Skid Steer Loaders	G4	120	Construction and Minin	3.61E+01	3.53E+01	1.51E+02	9.21E-04	3.54E-02	2.50E-03	1.40E+00	1.35E-05	1.08E-04	1.41E-04	5.23E-05
Dumpers/Tenders	G4	5	Construction and Minin	5.64E+01	2.65E+01	3.55E+00	5.09E-04	7.50E-03	2.22E-04	2.05E-02	7.09E-07	6.70E-06	3.74E-05	2.89E-05
Dumpers/Tenders	G4	15	Construction and Minin	1.20E+02	5.64E+01	2.12E+01	1.97E-03	6.29E-02	1.01E-03	9.85E-02	2.81E-06	8.15E-04	1.19E-04	1.12E-04
Dumpers/Tenders	G4	25	Construction and Minin	2.23E+01	1.05E+01	8.43E+00	7.53E-04	2.54E-02	3.60E-04	3.86E-02	9.77E-07	3.19E-04	3.12E-05	4.28E-05
Dumpers/Tenders	G4	120	Construction and Minin	1.59E+00	6.38E-01	1.64E+00	3.52E-05	6.43E-04	1.30E-04	1.47E-02	1.42E-07	1.14E-06	4.37E-06	2.00E-06
Other Construction Equipment	G4	175	Construction and Minin	6.20E+00	7.24E+00	3.97E+01	1.62E-04	1.19E-02	5.70E-04	3.64E-01	3.61E-06	2.90E-05	3.21E-05	9.20E-06
Aerial Lifts	G4	15	Industrial Equipment	1.24E+00	1.46E+00	8.52E-01	6.38E-05	2.44E-03	4.60E-05	4.15E-03	1.18E-07	3.48E-05	4.19E-06	3.62E-06
Aerial Lifts	G4	25	Industrial Equipment	5.29E+01	6.25E+01	5.48E+01	4.30E-03	1.61E-01	2.71E-03	2.58E-01	6.55E-06	2.17E-03	2.12E-04	2.44E-04
Aerial Lifts	G4	50	Industrial Equipment	6.47E+01	7.35E+01	1.17E+02	1.70E-03	1.00E-01	2.58E-03	9.63E-01	1.17E-05	7.38E-05	2.12E-04	9.63E-05
Aerial Lifts	G4	120	Industrial Equipment	6.47E+01	7.35E+01	2.10E+02	1.63E-03	5.73E-02	4.64E-03	1.93E+00	1.87E-05	1.50E-04	2.67E-04	9.23E-05
Forklifts	G4	25	Industrial Equipment	1.24E+00	3.52E+00	2.42E+00	1.29E-04	7.23E-03	9.62E-05	1.15E-02	2.91E-07	6.42E-06	9.32E-06	7.27E-06
Forklifts	G4	50	Industrial Equipment	2.16E+02	1.22E+03	1.96E+03	3.86E-02	3.70E+00	7.70E-02	1.30E+01	1.58E-04	9.94E-04	4.88E-03	2.14E-03
Forklifts	G4	120	Industrial Equipment	7.57E+02	4.29E+03	9.03E+03	9.51E-02	6.29E+00	3.57E-01	7.69E+01	7.43E-04	5.96E-03	2.00E-02	5.28E-03
Forklifts	G4	175	Industrial Equipment	2.77E+01	1.57E+02	6.32E+02	4.84E-03	2.40E-01	2.39E-02	5.70E+00	5.66E-05	4.54E-04	1.01E-03	2.69E-04
Sweepers/Scrubbers	G4	15	Industrial Equipment	3.60E+01	3.06E+01	1.67E+01	8.53E-04	4.83E-02	5.95E-04	8.22E-02	2.34E-06	4.17E-05	6.77E-05	4.85E-05
Sweepers/Scrubbers	G4	25	Industrial Equipment	3.51E+01	2.98E+01	3.78E+01	1.89E-03	1.13E-01	1.40E-03	1.81E-01	4.58E-06	9.46E-05	1.05E-04	1.08E-04
Sweepers/Scrubbers	G4	50	Industrial Equipment	6.01E+01	9.77E+01	2.56E+02	3.03E-03	2.33E-01	5.93E-03	2.10E+00	2.55E-05	1.61E-04	3.93E-04	1.72E-04
Sweepers/Scrubbers	G4	120	Industrial Equipment	5.02E+01	8.16E+01	3.65E+02	1.84E-03	1.00E-01	9.99E-03	3.36E+00	3.25E-05	2.60E-04	4.80E-04	1.04E-04
Sweepers/Scrubbers	G4	175	Industrial Equipment	2.92E-01	4.74E-01	4.28E+00	1.48E-05	1.32E-03	1.21E-04	3.91E-02	3.89E-07	3.12E-06	4.12E-06	8.40E-07
Other General Industrial Equipmen	G4	15	Industrial Equipment	7.13E+01	8.42E+01	3.51E+01	1.87E-03	1.01E-01	1.30E-03	1.72E-01	4.91E-06	9.14E-05	1.65E-04	1.06E-04
Other General Industrial Equipmen	G4	25	Industrial Equipment	2.34E+01	3.16E+01	3.05E+01	1.59E-03	9.10E-02	1.19E-03	1.45E-01	3.69E-06	7.97E-05	9.94E-05	9.04E-05
Other General Industrial Equipmen	G4	50	Industrial Equipment	2.07E+01	4.64E+01	8.29E+01	1.17E-03	9.39E-02	2.29E-03	6.48E-01	7.88E-06	4.97E-05	1.65E-04	6.62E-05
Other General Industrial Equipmen	G4	120	Industrial Equipment	6.79E+00	1.52E+01	6.13E+01	4.10E-04	2.23E-02	1.91E-03	5.55E-01	5.36E-06	4.30E-05	8.96E-05	2.32E-05
Other General Industrial Equipmen	G4	175	Industrial Equipment	6.57E-01	1.47E+00	1.26E+01	5.71E-05	4.04E-03	3.98E-04	1.15E-01	1.14E-06	9.16E-06	1.31E-05	3.23E-06
Other Material Handling Equipment	G4	50	Industrial Equipment	2.92E-01	3.55E-01	8.60E-01	2.64E-05	9.82E-04	4.05E-05	6.66E-03	8.09E-08	5.10E-07	1.92E-06	1.50E-06
Other Material Handling Equipment	G4	120	Industrial Equipment	1.29E+01	1.57E+01	4.35E+01	9.57E-04	2.05E-02	3.01E-03	3.84E-01	3.71E-06	2.97E-05	1.09E-04	5.43E-05
Lawn Mowers	G4	5	Lawn and Garden Equip	2.79E+04	2.45E+04	2.89E+03	3.42E-01	6.30E+00	8.49E-02	1.67E+01	5.76E-04	5.26E-02	2.16E-02	1.95E-02
Lawn Mowers	G4	5	Lawn and Garden Equip	4.42E+05	1.97E+04	2.70E+03	2.67E-01	7.36E+00	7.41E-02	1.35E+01	4.65E-04	3.22E-02	1.75E-02	1.52E-02
Tillers	G4	5	Lawn and Garden Equip	2.90E+03	6.21E+02	8.74E+01	7.77E-03	2.19E-01	1.91E-03	4.70E-01	1.62E-05	1.24E-03	5.10E-04	4.42E-04
Tillers	G4	5	Lawn and Garden Equip	1.12E+04	5.83E+02	8.87E+01	9.51E-03	2.40E-01	2.50E-03	4.42E-01	1.53E-05	1.10E-03	5.55E-04	5.40E-04
Trimmers/Edgers/Brush Cutters	G4	5	Lawn and Garden Equip	5.09E+03	2.65E+03	8.08E+01	1.05E-02	1.83E-01	4.59E-03	4.52E-01	1.56E-05	1.47E-04	1.62E-03	5.97E-04
Trimmers/Edgers/Brush Cutters	G4	5	Lawn and Garden Equip	2.37E+04	1.47E+03	5.16E+01	7.39E-03	1.40E-01	2.16E-03	2.50E-01	8.65E-06	3.56E-04	8.20E-04	4.20E-04
Leaf Blowers/Vacuums	G4	5	Lawn and Garden Equip	1.30E+03	3.09E+02	2.03E+01	1.50E-03	5.41E-02	3.61E-04	1.05E-01	3.64E-06	2.47E-04	1.53E-04	8.54E-05
Leaf Blowers/Vacuums	G4	5	Lawn and Garden Equip	1.12E+03	1.54E+01	1.16E+00	1.08E-04	3.51E-03	2.52E-05	5.26E-03	1.81E-07	1.04E-05	8.85E-06	6.11E-06
Rear Engine Riding Mowers	G4	15	Lawn and Garden Equip	1.53E+04	1.59E+04	5.23E+03	2.43E-01	1.51E+01	1.70E-01	2.57E+01	7.34E-04	1.19E-02	2.56E-02	1.38E-02
Rear Engine Riding Mowers	G4	15	Lawn and Garden Equip	1.34E+04	1.09E+03	3.61E+02	1.81E-02	1.05E+00	1.18E-02	1.76E+00	5.02E-05	7.02E-04	1.75E-03	1.03E-03
Rear Engine Riding Mowers	G4	25	Lawn and Garden Equip	6.99E+01	7.27E+01	4.65E+01	2.09E-03	1.39E-01	1.49E-03	2.22E-01	5.64E-06	1.03E-04	1.65E-04	1.18E-04
Rear Engine Riding Mowers	G4	25	Lawn and Garden Equip	6.03E+01	4.89E+00	3.15E+00	1.56E-04	9.43E-03	9.38E-05	1.50E-02	3.79E-07	5.96E-06	1.07E-05	8.89E-06
Front Mowers	G4	15	Lawn and Garden Equip	7.00E+02	7.29E+02	3.83E+02	1.78E-02	1.11E+00	1.25E-02	1.88E+00	5.37E-05	8.74E-04	1.51E-03	1.01E-03
Front Mowers	G4	15	Lawn and Garden Equip	2.26E+04	1.84E+03	9.74E+02	4.88E-02	2.84E+00	3.18E-02	4.75E+00	1.36E-04	1.89E-03	3.79E-03	2.77E-03
Front Mowers	G4	25	Lawn and Garden Equip	5.49E+02	5.71E+02	4.03E+02	1.81E-02	1.20E+00	1.29E-02	1.93E+00	4.89E-05	8.95E-04	1.37E-03	1.03E-03
Front Mowers	G4	25	Lawn and Garden Equip	1.77E+04	1.44E+03	1.02E+03	5.09E-02	3.07E+00	3.05E-02	4.87E+00	1.23E-04	1.94E-03	3.31E-03	2.89E-03
Shredders	G4	5	Lawn and Garden Equip	5.50E+02	2.86E+02	7.76E+01	1.01E-02	1.76E-01	4.41E-03	4.34E-01	1.50E-05	1.41E-04	5.59E-04	5.73E-04
Shredders	G4	5	Lawn and Garden Equip	2.05E+04	5.30E+01	1.81E+01	1.67E-03	5.57E-02	5.22E-04	8.03E-02	2.77E-06	1.61E-04	8.16E-05	9.47E-05

Lawn & Garden Tractors	G4	15	Lawn and Garden Equip	2.80E+03	1.38E+03	8.74E+02	3.41E-02	2.54E+00	2.42E-02	4.32E+00	1.23E-04	1.69E-03	2.89E-03	1.94E-03
Lawn & Garden Tractors	G4	15	Lawn and Garden Equip	1.82E+04	7.65E+02	4.88E+02	2.18E-02	1.42E+00	1.48E-02	2.39E+00	6.82E-05	8.69E-04	1.67E-03	1.24E-03
Lawn & Garden Tractors	G4	25	Lawn and Garden Equip	1.10E+03	5.45E+02	5.48E+02	2.12E-02	1.64E+00	1.43E-02	2.63E+00	6.67E-05	1.03E-03	1.42E-03	1.20E-03
Lawn & Garden Tractors	G4	25	Lawn and Garden Equip	7.18E+03	3.02E+02	3.06E+02	1.37E-02	9.17E-01	8.34E-03	1.46E+00	3.69E-05	5.30E-04	8.00E-04	7.77E-04
Lawn & Garden Tractors	G4	50	Lawn and Garden Equip	1.60E+01	4.49E+00	6.94E+00	1.32E-04	5.28E-03	2.53E-04	5.81E-02	7.07E-07	4.45E-06	1.64E-05	7.53E-06
Wood Splitters	G4	5	Lawn and Garden Equip	9.41E+02	4.64E+02	1.35E+02	1.43E-02	3.15E-01	3.52E-03	7.58E-01	2.62E-05	2.22E-03	6.19E-04	8.11E-04
Wood Splitters	G4	5	Lawn and Garden Equip	2.35E+04	7.45E+01	2.69E+01	2.07E-03	8.30E-02	5.43E-04	1.22E-01	4.20E-06	2.17E-04	9.48E-05	1.17E-04
Chippers/Stump Grinders	G4	15	Lawn and Garden Equip	1.33E+01	6.42E+01	5.42E+01	4.27E-03	1.57E-01	3.06E-03	2.61E-01	7.43E-06	2.19E-03	2.28E-04	2.39E-04
Chippers/Stump Grinders	G4	15	Lawn and Garden Equip	2.37E+01	1.13E+00	9.90E-01	7.34E-05	2.99E-03	3.62E-05	4.57E-03	1.30E-07	3.52E-05	3.26E-06	4.17E-06
Chippers/Stump Grinders	G4	25	Lawn and Garden Equip	7.53E+01	3.65E+02	5.20E+02	4.19E-02	1.55E+00	2.63E-02	2.42E+00	6.14E-05	2.03E-02	1.62E-03	2.34E-03
Chippers/Stump Grinders	G4	25	Lawn and Garden Equip	1.34E+02	6.37E+00	9.31E+00	6.58E-04	2.87E-02	3.04E-04	4.23E-02	1.07E-06	3.26E-04	2.27E-05	3.74E-05
Commercial Turf Equipment	G4	15	Lawn and Garden Equip	9.92E+02	3.04E+03	1.62E+03	9.25E-02	4.71E+00	6.41E-02	7.92E+00	2.26E-04	4.43E-03	7.01E-03	5.21E-03
Commercial Turf Equipment	G4	25	Lawn and Garden Equip	4.89E+02	1.50E+03	1.42E+03	7.66E-02	4.25E+00	5.69E-02	6.74E+00	1.71E-04	3.77E-03	4.73E-03	4.32E-03
Commercial Turf Equipment	G4	50	Lawn and Garden Equip	1.97E+02	3.90E+02	6.47E+02	1.80E-02	9.32E-01	2.75E-02	4.71E+00	5.73E-05	3.61E-04	1.65E-03	1.02E-03
Commercial Turf Equipment	G4	120	Lawn and Garden Equip	1.30E+00	2.58E+00	6.30E+00	2.82E-05	1.52E-03	1.64E-04	5.83E-02	5.63E-07	4.52E-06	1.07E-05	1.60E-06
Other Lawn & Garden Equipment	G4	5	Lawn and Garden Equip	8.71E+02	2.29E+02	4.68E+01	4.14E-03	1.17E-01	1.01E-03	2.52E-01	8.69E-06	6.61E-04	2.29E-04	2.35E-04
Other Lawn & Garden Equipment	G4	5	Lawn and Garden Equip	2.67E+04	3.31E+02	8.01E+01	7.26E-03	2.43E-01	1.73E-03	3.63E-01	1.25E-05	7.12E-04	3.52E-04	4.12E-04
Other Lawn & Garden Equipment	G4	15	Lawn and Garden Equip	3.87E+02	1.02E+02	4.53E+01	1.79E-03	1.31E-01	1.27E-03	2.23E-01	6.37E-06	8.87E-05	1.78E-04	1.01E-04
Other Lawn & Garden Equipment	G4	15	Lawn and Garden Equip	1.19E+04	1.47E+02	6.78E+01	3.41E-03	2.03E-01	2.06E-03	3.22E-01	9.19E-06	1.11E-04	2.72E-04	1.94E-04
Other Lawn & Garden Equipment	G4	25	Lawn and Garden Equip	8.17E+00	2.15E+00	2.09E+00	8.15E-05	6.26E-03	5.53E-05	1.00E-02	2.54E-07	3.98E-06	5.52E-06	4.63E-06
Other Lawn & Garden Equipment	G4	25	Lawn and Garden Equip	2.52E+02	3.12E+00	3.14E+00	1.55E-04	9.61E-03	8.43E-05	1.46E-02	3.69E-07	5.01E-06	8.19E-06	8.79E-06
Other Lawn & Garden Equipment	G4	50	Lawn and Garden Equip	5.92E-01	9.75E-02	2.09E-01	4.35E-06	1.54E-04	8.52E-06	1.76E-03	2.14E-08	1.35E-07	4.47E-07	2.47E-07
Other Lawn & Garden Equipment	G4	120	Lawn and Garden Equip	1.42E+00	2.34E-01	1.30E+00	1.78E-05	3.90E-04	7.95E-05	1.18E-02	1.14E-07	9.16E-07	2.19E-06	1.01E-06
2-Wheel Tractors	G4	5	Agricultural Equipment	3.94E+01	1.99E+01	4.09E+00	5.62E-04	8.91E-03	2.46E-04	2.33E-02	8.05E-07	7.60E-06	3.45E-05	3.19E-05
2-Wheel Tractors	G4	15	Agricultural Equipment	4.58E+01	4.79E+01	2.31E+01	1.74E-03	6.62E-02	1.25E-03	1.13E-01	3.21E-06	9.44E-04	1.24E-04	9.87E-05
2-Wheel Tractors	G4	25	Agricultural Equipment	1.23E+00	1.29E+00	1.28E+00	9.85E-05	3.77E-03	6.22E-05	6.04E-03	1.53E-07	5.06E-05	4.63E-06	5.60E-06
Agricultural Tractors	G4	120	Agricultural Equipment	1.54E+01	2.67E+01	1.34E+02	4.36E-03	7.80E-02	1.09E-02	1.16E+00	1.12E-05	8.96E-05	2.71E-04	2.47E-04
Agricultural Tractors	G4	175	Agricultural Equipment	2.11E+00	3.65E+00	2.60E+01	4.08E-04	8.81E-03	2.59E-03	2.35E-01	2.34E-06	1.87E-05	4.96E-05	2.31E-05
Combines	G4	120	Agricultural Equipment	3.85E+00	1.52E+00	1.06E+01	7.96E-05	2.24E-03	2.69E-04	9.88E-02	9.54E-07	7.65E-06	9.14E-06	4.52E-06
Combines	G4	175	Agricultural Equipment	2.14E+00	8.43E-01	9.26E+00	4.41E-05	2.71E-03	2.61E-04	8.50E-02	8.44E-07	6.77E-06	6.83E-06	2.50E-06
Combines	G4	250	Agricultural Equipment	3.95E-01	1.56E-01	1.97E+00	8.19E-06	5.91E-04	7.25E-05	1.80E-02	1.84E-07	1.48E-06	1.78E-06	4.65E-07
Balers	G4	50	Agricultural Equipment	5.62E+01	1.20E+01	2.42E+01	6.75E-04	1.97E-02	1.25E-03	2.00E-01	2.43E-06	1.53E-05	6.02E-05	3.83E-05
Balers	G4	120	Agricultural Equipment	2.87E+01	6.15E+00	2.05E+01	4.07E-04	7.46E-03	1.62E-03	1.85E-01	1.79E-06	1.43E-05	4.81E-05	2.31E-05
Agricultural Mowers	G4	15	Agricultural Equipment	4.09E+01	2.32E+01	8.74E+00	6.86E-04	2.52E-02	4.61E-04	4.22E-02	1.20E-06	3.54E-04	5.19E-05	3.90E-05
Agricultural Mowers	G4	25	Agricultural Equipment	3.35E+01	1.90E+01	1.65E+01	1.31E-03	4.89E-02	7.82E-04	7.76E-02	1.97E-06	6.51E-04	6.26E-05	7.44E-05
Sprayers	G4	5	Agricultural Equipment	1.55E+02	4.79E+01	8.02E+00	1.08E-03	1.78E-02	4.72E-04	4.54E-02	1.57E-06	1.48E-05	7.37E-05	6.13E-05
Sprayers	G4	15	Agricultural Equipment	4.83E+01	1.49E+01	5.49E+00	5.67E-04	1.66E-02	2.37E-04	2.47E-02	7.04E-07	1.99E-04	2.95E-05	3.22E-05
Sprayers	G4	25	Agricultural Equipment	1.25E+02	3.86E+01	3.47E+01	3.36E-03	1.06E-01	1.34E-03	1.55E-01	3.93E-06	1.25E-03	1.16E-04	1.91E-04
Sprayers	G4	50	Agricultural Equipment	1.06E+01	2.66E+00	4.61E+00	1.30E-04	3.81E-03	2.39E-04	3.80E-02	4.62E-07	2.91E-06	1.23E-05	7.40E-06
Sprayers	G4	120	Agricultural Equipment	1.78E+01	4.49E+00	1.45E+01	2.92E-04	5.35E-03	1.14E-03	1.30E-01	1.26E-06	1.01E-05	3.45E-05	1.66E-05
Sprayers	G4	175	Agricultural Equipment	4.02E+00	1.01E+00	6.43E+00	7.76E-05	1.86E-03	5.84E-04	5.89E-02	5.85E-07	4.69E-06	1.20E-05	4.41E-06
Tillers	G4	15	Agricultural Equipment	5.28E+03	1.18E+03	5.99E+02	5.08E-02	1.79E+00	2.37E-02	2.78E+00	7.93E-05	1.42E-03	2.63E-03	2.89E-03
Swathers	G4	120	Agricultural Equipment	5.76E+01	1.72E+01	7.50E+01	1.54E-03	2.82E-02	5.92E-03	6.73E-01	6.50E-06	5.22E-05	1.56E-04	8.75E-05
Swathers	G4	175	Agricultural Equipment	4.41E+01	1.32E+01	8.04E+01	9.80E-04	2.34E-02	7.32E-03	7.36E-01	7.31E-06	5.86E-05	1.54E-04	5.57E-05
Hydro Power Units	G4	5	Agricultural Equipment	9.36E+00	5.16E+00	1.19E+00	1.67E-04	2.56E-03	7.29E-05	6.84E-03	2.36E-07	2.23E-06	9.63E-06	9.47E-06
Hydro Power Units	G4	15	Agricultural Equipment	1.87E+01	2.73E+01	1.19E+01	9.22E-04	3.41E-02	6.64E-04	5.79E-02	1.65E-06	4.85E-04	6.81E-05	5.23E-05
Hydro Power Units	G4	25	Agricultural Equipment	7.12E+00	1.04E+01	9.95E+00	7.89E-04	2.93E-02	4.97E-04	4.69E-02	1.19E-06	3.93E-04	3.72E-05	4.47E-05
Hydro Power Units	G4	50	Agricultural Equipment	5.27E-01	7.47E-01	1.65E+00	1.84E-05	1.32E-03	2.62E-05	1.37E-02	1.67E-07	1.05E-06	2.25E-06	1.04E-06
Hydro Power Units	G4	120	Agricultural Equipment	6.59E-02	9.34E-02	3.16E-01	1.39E-06	6.19E-05	3.08E-06	2.95E-03	2.85E-08	2.28E-07	2.74E-07	7.86E-08
Other Agricultural Equipment	G4	5	Agricultural Equipment	6.52E+00	2.98E+00	5.49E-01	7.35E-05	1.22E-03	3.21E-05	3.10E-03	1.07E-07	1.01E-06	4.82E-06	4.18E-06
Other Agricultural Equipment	G4	15	Agricultural Equipment	5.70E+00	2.60E+00	1.41E+00	1.14E-04	4.10E-03	7.27E-05	6.78E-03	1.93E-07	5.68E-05	6.98E-06	6.45E-06
Other Agricultural Equipment	G4	25	Agricultural Equipment	1.45E+00	6.64E-01	9.24E-01	7.42E-05	2.74E-03	4.26E-05	4.32E-03	1.10E-07	3.62E-05	2.77E-06	4.21E-06
Other Agricultural Equipment	G4	50	Agricultural Equipment	1.75E+00	6.82E-01	1.13E+00	2.78E-05	9.01E-04	4.85E-05	9.39E-03	1.14E-07	7.19E-07	2.75E-06	1.58E-06
Other Agricultural Equipment	G4	120	Agricultural Equipment	1.01E+01	3.95E+00	1.37E+01	2.31E-04	4.51E-03	8.45E-04	1.24E-01	1.20E-06	9.63E-06	2.64E-05	1.31E-05
Other Agricultural Equipment	G4	175	Agricultural Equipment	1.15E+00	4.50E-01	3.06E+00	3.03E-05	8.95E-04	2.15E-04	2.80E-02	2.78E-07	2.23E-06	4.62E-06	1.72E-06
Other Agricultural Equipment	G4	250	Agricultural Equipment	4.28E-01	1.67E-01	2.00E+00	1.63E-05	6.02E-04	1.26E-04	1.83E-02	1.87E-07	1.50E-06	2.41E-06	9.26E-07
Generator Sets	G4	5	Light Commercial Equip	2.54E+03	7.25E+02	1.77E+02	3.18E-02	4.18E-01	7.28E-03	9.34E-01	3.23E-05	3.22E-03	1.11E-03	1.80E-03

Generator Sets	G4	5	Light Commercial Equip	1.99E+03	3.83E+02	9.94E+01	1.88E-02	2.51E-01	3.84E-03	4.94E-01	1.70E-05	1.68E-03	5.86E-04	1.07E-03
Generator Sets	G4	15	Light Commercial Equip	6.97E+03	1.99E+03	1.20E+03	8.29E-02	3.49E+00	5.08E-02	5.77E+00	1.65E-04	3.05E-03	5.06E-03	4.71E-03
Generator Sets	G4	15	Light Commercial Equip	5.47E+03	1.05E+03	6.63E+02	5.91E-02	1.99E+00	2.61E-02	3.05E+00	8.70E-05	1.59E-03	2.63E-03	3.36E-03
Generator Sets	G4	25	Light Commercial Equip	3.74E+03	1.07E+03	1.39E+03	9.30E-02	4.16E+00	5.57E-02	6.55E+00	1.66E-04	3.46E-03	3.98E-03	5.28E-03
Generator Sets	G4	25	Light Commercial Equip	2.94E+03	5.66E+02	7.59E+02	6.31E-02	2.31E+00	2.76E-02	3.46E+00	8.77E-05	1.81E-03	2.03E-03	3.58E-03
Generator Sets	G4	50	Light Commercial Equip	1.25E+03	3.05E+02	6.93E+02	1.64E-02	5.74E-01	3.06E-02	5.73E+00	6.96E-05	4.39E-04	1.52E-03	9.32E-04
Generator Sets	G4	120	Light Commercial Equip	2.41E+02	5.89E+01	3.14E+02	5.06E-03	1.08E-01	2.08E-02	2.84E+00	2.74E-05	2.20E-04	5.65E-04	2.88E-04
Generator Sets	G4	175	Light Commercial Equip	2.27E+01	5.56E+00	5.01E+01	4.77E-04	1.45E-02	3.73E-03	4.59E-01	4.56E-06	3.65E-05	7.48E-05	2.71E-05
Pumps	G4	5	Light Commercial Equip	8.99E+02	4.94E+02	8.24E+01	1.36E-02	1.65E-01	5.53E-03	4.84E-01	1.67E-05	3.22E-04	8.15E-04	7.72E-04
Pumps	G4	5	Light Commercial Equip	7.07E+02	2.61E+02	4.81E+01	8.99E-03	1.11E-01	2.75E-03	2.56E-01	8.84E-06	4.02E-04	4.15E-04	5.11E-04
Pumps	G4	15	Light Commercial Equip	9.75E+02	5.36E+02	2.89E+02	2.25E-02	8.28E-01	1.57E-02	1.40E+00	3.99E-05	1.17E-02	1.48E-03	1.28E-03
Pumps	G4	15	Light Commercial Equip	7.66E+02	2.83E+02	1.55E+02	1.30E-02	4.51E-01	8.01E-03	7.39E-01	2.11E-05	6.15E-03	7.64E-04	7.37E-04
Pumps	G4	25	Light Commercial Equip	2.50E+02	1.37E+02	1.61E+02	1.25E-02	4.75E-01	7.88E-03	7.62E-01	1.93E-05	6.39E-03	5.41E-04	7.10E-04
Pumps	G4	25	Light Commercial Equip	1.96E+02	7.25E+01	8.57E+01	6.77E-03	2.54E-01	4.05E-03	4.02E-01	1.02E-05	3.37E-03	2.81E-04	3.85E-04
Pumps	G4	50	Light Commercial Equip	9.96E+01	4.68E+01	1.05E+02	2.54E-03	9.01E-02	4.06E-03	8.65E-01	1.05E-05	6.62E-05	2.11E-04	1.44E-04
Pumps	G4	120	Light Commercial Equip	1.26E+02	5.94E+01	3.59E+02	5.82E-03	1.21E-01	1.92E-02	3.25E+00	3.14E-05	2.52E-04	4.94E-04	3.31E-04
Pumps	G4	175	Light Commercial Equip	3.80E+00	1.79E+00	1.61E+01	1.49E-04	4.83E-03	9.94E-04	1.48E-01	1.47E-06	1.18E-05	1.98E-05	8.49E-06
Air Compressors	G4	5	Light Commercial Equip	3.25E+02	3.91E+02	8.58E+01	1.38E-02	1.63E-01	6.04E-03	5.18E-01	1.79E-05	1.69E-04	7.66E-04	7.84E-04
Air Compressors	G4	5	Light Commercial Equip	2.55E+02	2.07E+02	4.53E+01	7.29E-03	8.62E-02	3.19E-03	2.74E-01	9.46E-06	8.93E-05	4.05E-04	4.14E-04
Air Compressors	G4	15	Light Commercial Equip	1.65E+02	1.98E+02	7.56E+01	5.92E-03	2.16E-01	4.27E-03	3.67E-01	1.05E-05	3.08E-03	4.63E-04	3.36E-04
Air Compressors	G4	15	Light Commercial Equip	1.29E+02	1.05E+02	3.99E+01	3.06E-03	1.14E-01	2.20E-03	1.94E-01	5.53E-06	1.63E-03	2.42E-04	1.74E-04
Air Compressors	G4	25	Light Commercial Equip	2.22E+01	2.67E+01	2.55E+01	2.05E-03	7.52E-02	1.29E-03	1.20E-01	3.05E-06	1.01E-03	9.61E-05	1.16E-04
Air Compressors	G4	25	Light Commercial Equip	1.74E+01	1.41E+01	1.35E+01	1.06E-03	3.97E-02	6.71E-04	6.36E-02	1.61E-06	5.33E-04	5.04E-05	6.04E-05
Air Compressors	G4	50	Light Commercial Equip	3.79E+01	3.90E+01	8.55E+01	3.18E-03	9.74E-02	4.13E-03	6.60E-01	8.02E-06	5.06E-05	1.99E-04	1.80E-04
Air Compressors	G4	120	Light Commercial Equip	1.23E+02	1.26E+02	4.83E+02	1.32E-02	2.44E-01	3.45E-02	4.23E+00	4.09E-05	3.28E-04	1.01E-03	7.50E-04
Air Compressors	G4	175	Light Commercial Equip	8.26E+00	8.51E+00	5.83E+01	7.90E-04	1.89E-02	5.01E-03	5.30E-01	5.27E-06	4.22E-05	1.02E-04	4.49E-05
Welders	G4	15	Light Commercial Equip	6.35E+02	2.81E+02	1.58E+02	1.38E-02	4.62E-01	8.09E-03	7.47E-01	2.13E-05	6.16E-03	7.66E-04	7.81E-04
Welders	G4	25	Light Commercial Equip	2.30E+03	1.02E+03	8.92E+02	7.28E-02	2.65E+00	4.22E-02	4.17E+00	1.06E-04	3.49E-02	3.37E-03	4.13E-03
Welders	G4	50	Light Commercial Equip	1.98E+02	8.76E+01	2.14E+02	6.30E-03	1.92E-01	1.01E-02	1.74E+00	2.11E-05	1.33E-04	4.63E-04	3.58E-04
Welders	G4	120	Light Commercial Equip	2.02E+02	8.94E+01	3.04E+02	6.37E-03	1.18E-01	2.12E-02	2.72E+00	2.63E-05	2.11E-04	6.51E-04	3.62E-04
Welders	G4	175	Light Commercial Equip	1.39E+01	6.16E+00	3.71E+01	4.30E-04	1.11E-02	3.01E-03	3.39E-01	3.37E-06	2.70E-05	6.59E-05	2.44E-05
Pressure Washers	G4	5	Light Commercial Equip	6.81E+02	1.95E+02	6.80E+01	1.03E-02	1.43E-01	2.90E-03	3.92E-01	1.35E-05	1.34E-03	3.68E-04	5.83E-04
Pressure Washers	G4	5	Light Commercial Equip	5.35E+02	1.03E+02	4.07E+01	7.44E-03	1.00E-01	1.60E-03	2.07E-01	7.15E-06	7.02E-04	1.99E-04	4.22E-04
Pressure Washers	G4	15	Light Commercial Equip	6.08E+02	1.74E+02	1.02E+02	7.03E-03	2.96E-01	4.31E-03	4.90E-01	1.40E-05	2.59E-04	4.35E-04	3.99E-04
Pressure Washers	G4	15	Light Commercial Equip	4.77E+02	9.19E+01	5.62E+01	5.02E-03	1.69E-01	2.21E-03	2.59E-01	7.38E-06	1.35E-04	2.26E-04	2.85E-04
Pressure Washers	G4	25	Light Commercial Equip	1.14E+02	3.26E+01	5.00E+01	3.17E-03	1.49E-01	1.99E-03	2.36E-01	5.99E-06	1.24E-04	1.32E-04	1.80E-04
Pressure Washers	G4	25	Light Commercial Equip	8.96E+01	1.72E+01	2.72E+01	2.15E-03	8.24E-02	1.00E-03	1.25E-01	3.17E-06	6.50E-05	6.78E-05	1.22E-04
Pressure Washers	G4	50	Light Commercial Equip	1.11E+01	2.73E+00	6.92E+00	1.51E-04	5.24E-03	2.63E-04	5.80E-02	7.05E-07	4.44E-06	1.29E-05	8.56E-06
Cargo Tractor	G4	120	Airport Ground Support	5.96E+01	2.21E+02	1.15E+03	2.20E-02	8.28E-01	5.98E-02	9.67E+00	7.98E-05	7.49E-04	1.88E-03	1.24E-03
A/C Tug Narrow Body	G4	175	Airport Ground Support	5.69E+00	1.13E+01	1.08E+02	1.30E-03	3.73E-02	8.23E-03	9.80E-01	9.73E-06	7.80E-05	1.60E-04	7.36E-05
A/C Tug Wide Body	G4	500	Airport Ground Support	1.87E+00	2.65E+00	9.36E+01	3.74E-04	2.98E-02	2.90E-03	8.55E-01	8.74E-06	7.01E-05	4.96E-05	2.12E-05
Air Conditioner	G4	175	Airport Ground Support	1.80E-01	1.08E-02	9.56E-02	7.45E-07	2.69E-05	6.13E-06	8.78E-04	8.72E-09	6.99E-08	1.33E-07	4.23E-08
Air Start Unit	G4	175	Airport Ground Support	4.13E+00	8.55E-01	9.05E+00	7.34E-05	2.59E-03	5.87E-04	8.30E-02	8.25E-07	6.61E-06	1.16E-05	4.17E-06
Baggage Tug	G4	120	Airport Ground Support	7.66E+01	1.84E+02	9.56E+02	5.67E-03	3.55E-01	2.83E-02	8.65E+00	8.36E-05	6.70E-04	1.22E-03	3.21E-04
Belt Loader	G4	120	Airport Ground Support	3.62E+01	8.05E+01	2.29E+02	1.57E-03	8.87E-02	7.23E-03	2.06E+00	1.99E-05	1.60E-04	3.96E-04	8.88E-05
Bobtail	G4	120	Airport Ground Support	1.23E+01	2.96E+01	1.54E+02	9.12E-04	5.70E-02	4.55E-03	1.39E+00	1.34E-05	1.08E-04	1.96E-04	5.15E-05
Cargo Loader	G4	120	Airport Ground Support	9.65E+00	1.90E+01	6.32E+01	5.12E-04	2.47E-02	2.16E-03	5.69E-01	5.50E-06	4.41E-05	1.05E-04	2.90E-05
Cart	G4	15	Airport Ground Support	3.29E+00	1.35E+00	7.82E-01	4.07E-05	2.26E-03	2.85E-05	3.84E-03	1.10E-07	1.94E-06	3.12E-06	2.31E-06
Deicer	G4	120	Airport Ground Support	4.67E+00	2.82E-01	2.32E+00	2.88E-05	6.46E-04	1.37E-04	2.13E-02	2.06E-07	1.65E-06	3.18E-06	1.64E-06
Forklift	G4	50	Airport Ground Support	9.12E+00	1.82E+01	2.96E+01	3.78E-04	3.11E-02	7.51E-04	2.35E-01	2.86E-06	1.80E-05	5.94E-05	2.14E-05
Fuel Truck	G4	175	Airport Ground Support	5.64E+00	3.40E-01	1.00E+00	8.04E-06	2.81E-04	6.64E-05	9.19E-03	9.13E-08	7.32E-07	2.36E-06	4.57E-07
Ground Power Unit	G4	175	Airport Ground Support	7.18E+00	1.57E+01	1.60E+02	5.78E-04	5.05E-02	4.49E-03	1.47E+00	1.46E-05	1.17E-04	1.45E-04	3.27E-05
Lav Cart	G4	15	Airport Ground Support	2.84E-01	1.17E-01	6.77E-02	3.52E-06	1.96E-04	2.47E-06	3.33E-04	9.48E-09	1.67E-07	2.70E-07	2.00E-07
Lav Truck	G4	175	Airport Ground Support	8.78E+00	2.92E+01	8.70E+01	7.13E-04	3.11E-02	3.81E-03	7.88E-01	7.83E-06	6.28E-05	1.70E-04	4.01E-05
Lift	G4	120	Airport Ground Support	1.60E+01	1.65E+01	7.94E+01	1.55E-03	3.48E-02	5.02E-03	7.05E-01	6.81E-06	5.46E-05	1.47E-04	8.78E-05
Maint. Truck	G4	175	Airport Ground Support	1.12E+01	1.39E+01	8.20E+01	6.76E-04	2.60E-02	4.61E-03	7.48E-01	7.43E-06	5.96E-05	1.30E-04	3.83E-05
Other GSE	G4	50	Airport Ground Support	1.66E+01	8.34E+00	2.20E+01	5.16E-04	1.94E-02	9.13E-04	1.80E-01	2.19E-06	1.38E-05	4.36E-05	2.93E-05

Passenger Stand	G4	175	Airport Ground Support	7.66E+00	3.94E+00	2.64E+01	2.36E-04	7.81E-03	1.80E-03	2.41E-01	2.14E-06	1.92E-05	4.32E-05	1.34E-05
Sweeper	G4	120	Airport Ground Support	7.38E-01	7.33E-01	1.91E+00	3.66E-05	8.27E-04	1.20E-04	1.70E-02	1.40E-07	1.32E-06	4.69E-06	2.08E-06
Generator	G4	120	Airport Ground Support	4.61E-01	1.14E+00	9.55E+00	2.77E-04	6.34E-03	6.56E-04	8.12E-02	6.70E-07	6.29E-06	1.43E-05	1.57E-05
Service Truck	G4	250	Airport Ground Support	3.24E+01	7.47E+01	2.40E+02	3.13E-03	8.79E-02	1.92E-02	2.17E+00	2.22E-05	1.78E-04	6.05E-04	1.77E-04
Catering Truck	G4	250	Airport Ground Support	6.53E+00	1.82E+01	1.73E+02	2.43E-03	6.62E-02	1.42E-02	1.56E+00	1.36E-05	1.28E-04	2.67E-04	1.37E-04
Water Truck	G4	175	Airport Ground Support	2.85E+00	2.42E+00	6.60E+00	6.36E-05	2.03E-03	4.62E-04	6.03E-02	5.99E-07	4.80E-06	1.67E-05	3.61E-06
Hydrant truck	G4	175	Airport Ground Support	5.47E+00	2.29E+01	1.81E+02	3.01E-03	7.63E-02	1.58E-02	1.62E+00	1.38E-05	1.29E-04	3.14E-04	1.69E-04
Transport Refrigeration Units	G4	15	Transport Refrigeration	4.16E+02	8.57E+02	4.98E+02	2.80E-02	1.44E+00	1.94E-02	2.43E+00	6.94E-05	1.36E-03	2.06E-03	1.59E-03
Aerial Lifts	C4	15	Industrial Equipment	1.39E+00	1.64E+00	1.31E+00	3.04E-06	1.18E-03	3.21E-05	7.28E-03	0.00E+00	3.34E-06	0.00E+00	2.55E-05
Aerial Lifts	C4	25	Industrial Equipment	5.95E+01	7.02E+01	8.36E+01	2.94E-04	7.77E-02	2.14E-03	4.56E-01	0.00E+00	2.35E-04	0.00E+00	2.46E-03
Forklifts	C4	25	Industrial Equipment	5.84E-01	2.30E+00	2.25E+00	1.43E-05	2.26E-03	6.32E-05	1.18E-02	0.00E+00	7.77E-06	0.00E+00	1.20E-04
Forklifts	C4	50	Industrial Equipment	3.96E+02	2.24E+03	2.99E+03	2.36E-03	3.30E-01	1.01E-01	2.05E+01	0.00E+00	1.82E-03	0.00E+00	1.98E-02
Forklifts	C4	120	Industrial Equipment	1.39E+03	7.87E+03	1.87E+04	1.42E-02	5.56E+00	6.36E-01	1.23E+02	0.00E+00	1.09E-02	0.00E+00	1.19E-01
Forklifts	C4	175	Industrial Equipment	5.08E+01	2.88E+02	1.41E+03	6.96E-04	3.26E-01	3.41E-02	9.38E+00	0.00E+00	8.34E-04	0.00E+00	5.84E-03
Generator Sets	C4	120	Light Commercial Equip	1.79E+01	4.38E+00	2.75E+01	2.02E-05	5.78E-03	1.33E-03	1.84E-01	0.00E+00	1.64E-05	0.00E+00	1.69E-04
Generator Sets	C4	175	Light Commercial Equip	1.48E+01	3.63E+00	3.97E+01	2.31E-05	6.93E-03	1.92E-03	2.68E-01	0.00E+00	2.39E-05	0.00E+00	1.94E-04
Gas Compressors	C4	50	Light Commercial Equip	2.78E+00	6.48E+01	2.22E+02	1.26E-04	2.23E-02	4.58E-03	1.52E+00	0.00E+00	1.17E-04	0.00E+00	1.06E-03
Gas Compressors	C4	120	Light Commercial Equip	5.75E+00	1.34E+02	1.30E+03	6.88E-04	3.57E-01	2.71E-02	8.55E+00	0.00E+00	6.63E-04	0.00E+00	5.77E-03
Gas Compressors	C4	175	Light Commercial Equip	9.28E-01	2.16E+01	3.33E+02	1.92E-04	7.27E-02	7.25E-03	2.23E+00	0.00E+00	1.77E-04	0.00E+00	1.61E-03
Gas Compressors	C4	250	Light Commercial Equip	7.42E-01	1.73E+01	3.45E+02	1.48E-04	8.37E-02	7.02E-03	2.29E+00	0.00E+00	2.04E-04	0.00E+00	1.24E-03
Gas Compressors	C4	500	Light Commercial Equip	6.49E-01	1.51E+01	4.86E+02	2.08E-04	1.18E-01	9.88E-03	3.23E+00	0.00E+00	2.87E-04	0.00E+00	1.74E-03
Cargo Tractor	C4	175	Airport Ground Support	6.46E+00	2.76E+00	2.56E+01	1.38E-05	4.52E-03	1.13E-03	1.72E-01	0.00E+00	1.53E-05	0.00E+00	1.16E-04
Air Conditioner	C4	175	Airport Ground Support	1.08E+00	6.50E-02	6.97E-01	3.41E-07	1.16E-04	3.00E-05	4.72E-03	0.00E+00	4.19E-07	0.00E+00	2.86E-06
Baggage Tug	C4	120	Airport Ground Support	1.53E+01	3.47E+01	2.17E+02	3.09E-04	6.25E-02	1.16E-02	1.42E+00	0.00E+00	1.26E-04	0.00E+00	2.59E-03
Belt Loader	C4	120	Airport Ground Support	4.06E+00	6.14E+00	2.07E+01	2.34E-05	5.34E-03	1.03E-03	1.37E-01	0.00E+00	1.22E-05	0.00E+00	1.96E-04
Bobtail	C4	120	Airport Ground Support	3.48E-01	8.38E-01	5.15E+00	1.95E-06	1.23E-03	1.18E-04	3.43E-02	0.00E+00	3.05E-06	0.00E+00	1.63E-05
Cargo Loader	C4	120	Airport Ground Support	1.64E+00	4.64E+00	1.86E+01	3.03E-05	5.74E-03	1.04E-03	1.21E-01	0.00E+00	1.07E-05	0.00E+00	2.54E-04
Forklift	C4	50	Airport Ground Support	2.13E+01	4.25E+01	6.87E+01	2.34E-05	5.87E-03	1.67E-03	4.75E-01	0.00E+00	4.22E-05	0.00E+00	1.96E-04
Fuel Truck	C4	175	Airport Ground Support	7.16E-01	1.11E+00	4.31E+00	2.98E-06	8.91E-04	2.07E-04	2.89E-02	0.00E+00	2.57E-06	0.00E+00	2.50E-05
Lav Truck	C4	175	Airport Ground Support	6.42E-01	6.81E-01	2.45E+00	1.53E-06	4.75E-04	1.14E-04	1.65E-02	0.00E+00	1.46E-06	0.00E+00	1.28E-05
Lift	C4	120	Airport Ground Support	6.00E-01	5.61E-01	3.14E+00	2.84E-06	7.36E-04	1.48E-04	2.09E-02	0.00E+00	1.86E-06	0.00E+00	2.38E-05
Other	C4	50	Airport Ground Support	3.14E+00	8.76E+00	2.39E+01	3.75E-05	2.74E-03	1.58E-03	1.63E-01	0.00E+00	1.45E-05	0.00E+00	3.14E-04
Passenger Stand	C4	175	Airport Ground Support	2.77E-01	9.11E-03	9.75E-02	4.73E-08	1.62E-05	4.19E-06	6.60E-04	0.00E+00	5.87E-08	0.00E+00	3.97E-07
Sweeper	C4	50	Airport Ground Support	2.77E-01	2.11E-01	5.23E-01	3.49E-07	4.32E-05	2.56E-05	3.60E-03	0.00E+00	3.21E-07	0.00E+00	2.92E-06
Service Truck	C4	250	Airport Ground Support	3.17E+00	1.13E+01	4.55E+01	3.14E-05	1.07E-02	1.63E-03	3.03E-01	0.00E+00	2.69E-05	0.00E+00	2.63E-04
Catering Truck	C4	250	Airport Ground Support	1.21E+00	1.50E+00	1.78E+01	1.15E-05	3.53E-03	8.36E-04	1.19E-01	0.00E+00	1.06E-05	0.00E+00	9.67E-05
Pavers	D	25	Construction and Minin	1.67E+00	4.32E+00	3.67E+00	5.33E-05	1.73E-04	3.24E-04	4.03E-02	5.12E-07	1.62E-05	0.00E+00	4.81E-06
Pavers	D	50	Construction and Minin	9.73E+01	2.55E+02	3.34E+02	1.74E-02	4.58E-02	3.76E-02	3.57E+00	4.61E-05	3.93E-03	0.00E+00	1.57E-03
Pavers	D	120	Construction and Minin	1.15E+02	3.01E+02	9.55E+02	2.09E-02	7.60E-02	1.26E-01	1.04E+01	1.22E-04	1.10E-02	0.00E+00	1.89E-03
Pavers	D	175	Construction and Minin	7.13E+01	1.87E+02	1.10E+03	1.66E-02	7.27E-02	1.29E-01	1.20E+01	1.35E-04	7.20E-03	0.00E+00	1.50E-03
Pavers	D	250	Construction and Minin	8.59E+00	2.25E+01	1.99E+02	2.33E-03	6.84E-03	2.19E-02	2.19E+00	2.46E-05	8.50E-04	0.00E+00	2.10E-04
Pavers	D	500	Construction and Minin	8.81E+00	2.31E+01	2.45E+02	2.63E-03	1.07E-02	2.44E-02	2.69E+00	2.64E-05	9.44E-04	0.00E+00	2.37E-04
Plate Compactors	D	15	Construction and Minin	3.59E+01	6.79E+01	1.34E+01	1.70E-04	8.93E-04	1.07E-03	1.46E-01	2.28E-06	4.18E-05	0.00E+00	1.54E-05
Rollers	D	15	Construction and Minin	6.75E+01	1.48E+02	4.26E+01	5.43E-04	2.85E-03	3.40E-03	4.66E-01	7.25E-06	1.32E-04	0.00E+00	4.90E-05
Rollers	D	25	Construction and Minin	2.82E+01	6.18E+01	3.75E+01	4.98E-04	1.69E-03	3.16E-03	4.12E-01	5.22E-06	1.26E-04	0.00E+00	4.49E-05
Rollers	D	50	Construction and Minin	8.78E+01	1.94E+02	2.34E+02	9.94E-03	2.82E-02	2.50E-02	2.52E+00	3.25E-05	2.37E-03	0.00E+00	8.97E-04
Rollers	D	120	Construction and Minin	4.71E+02	1.04E+03	2.81E+03	5.14E-02	2.11E-01	3.25E-01	3.07E+01	3.60E-04	2.78E-02	0.00E+00	4.64E-03
Rollers	D	175	Construction and Minin	1.90E+02	4.19E+02	2.06E+03	2.61E-02	1.30E-01	2.12E-01	2.26E+01	2.54E-04	1.15E-02	0.00E+00	2.36E-03
Rollers	D	250	Construction and Minin	2.69E+01	5.94E+01	4.12E+02	3.75E-03	1.15E-02	3.90E-02	4.54E+00	5.11E-05	1.34E-03	0.00E+00	3.38E-04
Rollers	D	500	Construction and Minin	1.89E+01	4.16E+01	4.14E+02	3.44E-03	1.31E-02	3.50E-02	4.56E+00	4.47E-05	1.23E-03	0.00E+00	3.10E-04
Scrapers	D	120	Construction and Minin	4.35E+00	1.52E+01	6.56E+01	1.43E-03	5.29E-03	8.48E-03	7.15E-01	8.38E-06	7.50E-04	0.00E+00	1.29E-04
Scrapers	D	175	Construction and Minin	3.98E+01	1.39E+02	9.43E+02	1.44E-02	6.34E-02	1.09E-01	1.03E+01	1.16E-04	6.17E-03	0.00E+00	1.30E-03
Scrapers	D	250	Construction and Minin	3.88E+01	1.36E+02	1.29E+03	1.53E-02	4.35E-02	1.39E-01	1.42E+01	1.60E-04	5.37E-03	0.00E+00	1.38E-03
Scrapers	D	500	Construction and Minin	1.07E+02	3.74E+02	5.47E+03	5.95E-02	2.26E-01	5.29E-01	6.01E+01	5.90E-04	2.05E-02	0.00E+00	5.37E-03
Scrapers	D	750	Construction and Minin	4.28E+00	1.50E+01	3.78E+02	4.13E-03	1.56E-02	3.73E-02	4.15E+00	4.18E-05	1.43E-03	0.00E+00	3.73E-04
Paving Equipment	D	25	Construction and Minin	2.90E+00	7.57E+00	4.35E+00	5.78E-05	1.97E-04	3.66E-04	4.78E-02	6.06E-07	1.47E-05	0.00E+00	5.21E-06
Paving Equipment	D	50	Construction and Minin	2.45E+00	6.46E+00	7.23E+00	3.77E-04	9.85E-04	8.11E-04	7.72E-02	9.98E-07	8.50E-05	0.00E+00	3.40E-05

Paving Equipment	D	120	Construction and Minin	3.54E+01	9.31E+01	2.33E+02	5.07E-03	1.84E-02	3.05E-02	2.53E+00	2.97E-05	2.67E-03	0.00E+00	4.57E-04
Paving Equipment	D	175	Construction and Minin	1.66E+01	4.38E+01	2.02E+02	3.04E-03	1.33E-02	2.37E-02	2.21E+00	2.48E-05	1.32E-03	0.00E+00	2.74E-04
Paving Equipment	D	250	Construction and Minin	4.69E+00	1.23E+01	6.85E+01	7.87E-04	2.32E-03	7.53E-03	7.53E-01	8.48E-06	2.88E-04	0.00E+00	7.10E-05
Surfacing Equipment	D	50	Construction and Minin	2.23E+00	3.18E+00	2.08E+00	7.58E-05	2.23E-04	2.16E-04	2.24E-02	2.90E-07	1.89E-05	0.00E+00	6.84E-06
Surfacing Equipment	D	120	Construction and Minin	4.46E-01	6.36E-01	1.85E+00	3.09E-05	1.34E-04	2.07E-04	2.03E-02	2.38E-07	1.64E-05	0.00E+00	2.79E-06
Surfacing Equipment	D	175	Construction and Minin	3.35E-01	4.77E-01	1.86E+00	2.13E-05	1.13E-04	1.85E-04	2.04E-02	2.30E-07	9.35E-06	0.00E+00	1.93E-06
Surfacing Equipment	D	250	Construction and Minin	6.69E-01	9.54E-01	5.83E+00	4.88E-05	1.61E-04	5.33E-04	6.43E-02	7.23E-07	1.79E-05	0.00E+00	4.41E-06
Surfacing Equipment	D	500	Construction and Minin	5.58E+00	7.95E+00	7.97E+01	6.08E-04	2.54E-03	6.59E-03	8.78E-01	8.62E-06	2.25E-04	0.00E+00	5.49E-05
Surfacing Equipment	D	750	Construction and Minin	8.17E-01	1.16E+00	1.83E+01	1.42E-04	5.85E-04	1.55E-03	2.02E-01	2.03E-06	5.24E-05	0.00E+00	1.28E-05
Signal Boards	D	15	Construction and Minin	3.14E+02	7.41E+02	2.09E+02	2.66E-03	1.40E-02	1.67E-02	2.29E+00	3.56E-05	6.50E-04	0.00E+00	2.40E-04
Signal Boards	D	50	Construction and Minin	1.56E+00	2.63E+00	4.40E+00	1.52E-04	4.54E-04	4.49E-04	4.76E-02	6.15E-07	3.90E-05	0.00E+00	1.37E-05
Signal Boards	D	120	Construction and Minin	2.55E+01	4.30E+01	1.58E+02	2.53E-03	1.12E-02	1.68E-02	1.72E+00	2.02E-05	1.39E-03	0.00E+00	2.29E-04
Signal Boards	D	175	Construction and Minin	1.58E+01	2.67E+01	1.88E+02	2.05E-03	1.11E-02	1.78E-02	2.06E+00	2.32E-05	9.15E-04	0.00E+00	1.85E-04
Signal Boards	D	250	Construction and Minin	3.35E+00	5.64E+00	6.51E+01	4.60E-04	1.51E-03	5.63E-03	7.19E-01	8.09E-06	1.63E-04	0.00E+00	4.15E-05
Trenchers	D	15	Construction and Minin	8.37E+00	1.63E+01	6.29E+00	8.01E-05	4.20E-04	5.02E-04	6.88E-02	1.07E-06	1.96E-05	0.00E+00	7.23E-06
Trenchers	D	25	Construction and Minin	8.81E+00	1.71E+01	2.57E+01	3.40E-04	1.16E-03	2.15E-03	2.82E-01	3.58E-06	8.34E-05	0.00E+00	3.07E-05
Trenchers	D	50	Construction and Minin	3.35E+02	6.66E+02	1.03E+03	5.22E-02	1.36E-01	1.14E-01	1.10E+01	1.42E-04	1.18E-02	0.00E+00	4.71E-03
Trenchers	D	120	Construction and Minin	4.55E+02	9.03E+02	2.69E+03	5.79E-02	2.11E-01	3.55E-01	2.93E+01	3.43E-04	3.02E-02	0.00E+00	5.22E-03
Trenchers	D	175	Construction and Minin	4.98E+01	9.88E+01	6.49E+02	9.67E-03	4.26E-02	7.67E-02	7.11E+00	7.99E-05	4.20E-03	0.00E+00	8.72E-04
Trenchers	D	250	Construction and Minin	4.46E+00	8.86E+00	8.97E+01	1.04E-03	3.13E-03	9.96E-03	9.87E-01	1.11E-05	3.89E-04	0.00E+00	9.40E-05
Trenchers	D	500	Construction and Minin	5.69E+00	1.13E+01	1.60E+02	1.68E-03	7.33E-03	1.61E-02	1.76E+00	1.73E-05	6.23E-04	0.00E+00	1.52E-04
Trenchers	D	750	Construction and Minin	1.63E-01	3.25E-01	8.66E+00	9.19E-05	3.97E-04	8.87E-04	9.52E-02	9.57E-07	3.41E-05	0.00E+00	8.29E-06
Bore/Drill Rigs	D	15	Construction and Minin	1.12E+00	2.85E+00	1.34E+00	1.71E-05	8.99E-05	1.07E-04	1.47E-02	2.29E-07	4.16E-06	0.00E+00	1.55E-06
Bore/Drill Rigs	D	25	Construction and Minin	3.35E+00	8.54E+00	6.22E+00	8.25E-05	2.81E-04	5.23E-04	6.82E-02	8.66E-07	2.10E-05	0.00E+00	7.45E-06
Bore/Drill Rigs	D	50	Construction and Minin	1.46E+01	3.88E+01	5.50E+01	5.60E-04	4.42E-03	4.97E-03	6.01E-01	7.77E-06	2.32E-04	0.00E+00	5.05E-05
Bore/Drill Rigs	D	120	Construction and Minin	4.48E+01	1.19E+02	4.18E+02	2.65E-03	2.79E-02	2.72E-02	4.58E+00	5.38E-05	1.53E-03	0.00E+00	2.39E-04
Bore/Drill Rigs	D	175	Construction and Minin	1.04E+01	2.75E+01	1.77E+02	9.67E-04	1.04E-02	9.53E-03	1.94E+00	2.18E-05	4.15E-04	0.00E+00	8.73E-05
Bore/Drill Rigs	D	250	Construction and Minin	8.93E+00	2.37E+01	2.01E+02	9.39E-04	4.06E-03	9.02E-03	2.23E+00	2.50E-05	2.61E-04	0.00E+00	8.48E-05
Bore/Drill Rigs	D	500	Construction and Minin	1.99E+01	5.27E+01	7.41E+02	3.41E-03	1.45E-02	3.08E-02	8.19E+00	8.04E-05	9.49E-04	0.00E+00	3.07E-04
Bore/Drill Rigs	D	750	Construction and Minin	2.53E+00	6.72E+00	1.87E+02	8.62E-04	3.66E-03	7.85E-03	2.07E+00	2.08E-05	2.40E-04	0.00E+00	7.77E-05
Bore/Drill Rigs	D	1000	Construction and Minin	4.25E+00	7.63E+00	3.20E+02	1.59E-03	6.36E-03	2.27E-02	3.54E+00	3.56E-05	5.89E-04	0.00E+00	1.43E-04
Excavators	D	25	Construction and Minin	4.13E+00	1.81E+01	1.36E+01	1.80E-04	6.13E-04	1.14E-03	1.49E-01	1.89E-06	4.25E-05	0.00E+00	1.62E-05
Excavators	D	50	Construction and Minin	1.55E+02	6.96E+02	8.08E+02	2.84E-02	9.88E-02	8.55E-02	8.69E+00	1.12E-04	7.39E-03	0.00E+00	2.57E-03
Excavators	D	120	Construction and Minin	4.22E+02	1.89E+03	6.36E+03	1.03E-01	4.89E-01	6.42E-01	6.95E+01	8.15E-04	5.55E-02	0.00E+00	9.28E-03
Excavators	D	175	Construction and Minin	8.14E+02	3.64E+03	1.87E+04	2.20E-01	1.21E+00	1.63E+00	2.04E+02	2.30E-03	9.35E-02	0.00E+00	1.99E-02
Excavators	D	250	Construction and Minin	3.31E+02	1.48E+03	1.07E+04	9.20E-02	2.62E-01	8.43E-01	1.17E+02	1.32E-03	2.76E-02	0.00E+00	8.31E-03
Excavators	D	500	Construction and Minin	2.39E+02	1.07E+03	1.13E+04	9.27E-02	2.81E-01	7.89E-01	1.25E+02	1.23E-03	2.76E-02	0.00E+00	8.36E-03
Excavators	D	750	Construction and Minin	1.28E+00	5.73E+00	1.01E+02	8.29E-04	2.50E-03	7.23E-03	1.11E+00	1.12E-05	2.49E-04	0.00E+00	7.48E-05
Concrete/Industrial Saws	D	25	Construction and Minin	4.46E-01	8.32E-01	6.24E-01	8.26E-06	2.82E-05	5.22E-05	6.85E-03	8.69E-08	2.03E-06	0.00E+00	7.45E-07
Concrete/Industrial Saws	D	50	Construction and Minin	3.90E+00	7.13E+00	9.96E+00	3.41E-04	1.04E-03	1.02E-03	1.08E-01	1.39E-06	8.80E-05	0.00E+00	3.08E-05
Concrete/Industrial Saws	D	120	Construction and Minin	6.81E+00	1.24E+01	4.21E+01	6.63E-04	3.00E-03	4.45E-03	4.60E-01	5.40E-06	3.67E-04	0.00E+00	5.98E-05
Concrete/Industrial Saws	D	175	Construction and Minin	2.23E-01	4.07E-01	2.97E+00	3.20E-05	1.77E-04	2.77E-04	3.26E-02	3.67E-07	1.44E-05	0.00E+00	2.89E-06
Cement and Mortar Mixers	D	15	Construction and Minin	5.70E+01	5.38E+01	1.55E+01	2.00E-04	1.04E-03	1.26E-03	1.70E-01	2.65E-06	5.74E-05	0.00E+00	1.81E-05
Cement and Mortar Mixers	D	25	Construction and Minin	5.13E+00	4.85E+00	3.88E+00	6.54E-05	1.97E-04	3.66E-04	4.25E-02	5.39E-07	2.01E-05	0.00E+00	5.90E-06
Cranes	D	50	Construction and Minin	3.79E+00	1.53E+01	1.66E+01	7.77E-04	2.21E-03	1.83E-03	1.77E-01	2.29E-06	1.83E-04	0.00E+00	7.01E-05
Cranes	D	120	Construction and Minin	4.16E+01	1.68E+02	3.86E+02	7.72E-03	3.03E-02	4.62E-02	4.20E+00	4.93E-05	4.14E-03	0.00E+00	6.96E-04
Cranes	D	175	Construction and Minin	4.16E+01	1.68E+02	6.15E+02	8.66E-03	4.04E-02	6.52E-02	6.73E+00	7.58E-05	3.74E-03	0.00E+00	7.81E-04
Cranes	D	250	Construction and Minin	8.07E+01	3.25E+02	1.65E+03	1.69E-02	4.78E-02	1.62E-01	1.82E+01	2.05E-04	5.70E-03	0.00E+00	1.52E-03
Cranes	D	500	Construction and Minin	2.96E+01	1.19E+02	9.73E+02	9.23E-03	3.15E-02	8.48E-02	1.07E+01	1.05E-04	3.08E-03	0.00E+00	8.33E-04
Cranes	D	750	Construction and Minin	5.31E+00	2.14E+01	2.94E+02	2.81E-03	9.51E-03	2.63E-02	3.24E+00	3.26E-05	9.46E-04	0.00E+00	2.53E-04
Cranes	D	9999	Construction and Minin	6.67E+00	1.82E+01	8.03E+02	8.64E-03	3.03E-02	9.43E-02	8.83E+00	8.88E-05	2.90E-03	0.00E+00	7.79E-04
Graders	D	50	Construction and Minin	1.56E+00	4.67E+00	5.99E+00	2.53E-04	7.63E-04	6.48E-04	6.43E-02	8.31E-07	6.13E-05	0.00E+00	2.28E-05
Graders	D	120	Construction and Minin	1.04E+02	3.12E+02	1.07E+03	1.96E-02	8.27E-02	1.21E-01	1.17E+01	1.37E-04	1.06E-02	0.00E+00	1.77E-03
Graders	D	175	Construction and Minin	3.56E+02	1.07E+03	6.02E+03	7.83E-02	3.91E-01	5.97E-01	6.59E+01	7.42E-04	3.37E-02	0.00E+00	7.06E-03
Graders	D	250	Construction and Minin	2.21E+02	6.61E+02	5.16E+03	4.93E-02	1.43E-01	4.69E-01	5.68E+01	6.39E-04	1.63E-02	0.00E+00	4.45E-03
Graders	D	500	Construction and Minin	6.25E+00	1.87E+01	1.94E+02	1.73E-03	5.87E-03	1.57E-02	2.14E+00	2.10E-05	5.68E-04	0.00E+00	1.56E-04
Graders	D	750	Construction and Minin	8.17E-02	2.45E-01	5.38E+00	4.83E-05	1.62E-04	4.48E-04	5.93E-02	5.97E-07	1.60E-05	0.00E+00	4.35E-06

Off-Highway Trucks	D	175	Construction and Minin	7.25E+00	4.54E+01	2.59E+02	3.28E-03	1.72E-02	2.34E-02	2.84E+00	3.19E-05	1.37E-03	0.00E+00	2.96E-04
Off-Highway Trucks	D	250	Construction and Minin	5.36E+01	3.35E+02	2.53E+03	2.34E-02	6.42E-02	2.08E-01	2.79E+01	3.14E-04	6.91E-03	0.00E+00	2.12E-03
Off-Highway Trucks	D	500	Construction and Minin	7.54E+01	4.72E+02	5.82E+03	5.12E-02	1.50E-01	4.22E-01	6.42E+01	6.30E-04	1.49E-02	0.00E+00	4.62E-03
Off-Highway Trucks	D	750	Construction and Minin	1.71E+01	1.07E+02	2.15E+03	1.90E-02	5.53E-02	1.60E-01	2.37E+01	2.38E-04	5.60E-03	0.00E+00	1.71E-03
Off-Highway Trucks	D	1000	Construction and Minin	8.04E+00	3.40E+01	9.64E+02	9.33E-03	2.84E-02	1.02E-01	1.06E+01	1.07E-04	3.05E-03	0.00E+00	8.42E-04
Crushing/Proc. Equipment	D	50	Construction and Minin	1.79E+01	5.37E+01	1.10E+02	4.68E-03	1.34E-02	1.17E-02	1.18E+00	1.53E-05	1.13E-03	0.00E+00	4.22E-04
Crushing/Proc. Equipment	D	120	Construction and Minin	5.03E+01	1.51E+02	5.76E+02	1.06E-02	4.36E-02	6.47E-02	6.28E+00	7.37E-05	5.90E-03	0.00E+00	9.59E-04
Crushing/Proc. Equipment	D	175	Construction and Minin	2.13E+01	6.41E+01	4.89E+02	6.23E-03	3.08E-02	4.88E-02	5.35E+00	6.02E-05	2.77E-03	0.00E+00	5.62E-04
Crushing/Proc. Equipment	D	250	Construction and Minin	2.12E+00	6.37E+00	7.06E+01	5.89E-04	1.73E-03	6.44E-03	7.78E-01	8.76E-06	1.98E-04	0.00E+00	5.31E-05
Crushing/Proc. Equipment	D	500	Construction and Minin	1.19E+01	3.59E+01	6.07E+02	4.68E-03	1.52E-02	4.86E-02	6.70E+00	6.57E-05	1.58E-03	0.00E+00	4.22E-04
Crushing/Proc. Equipment	D	750	Construction and Minin	1.36E-01	4.09E-01	1.09E+01	8.48E-05	2.70E-04	9.09E-04	1.20E-01	1.21E-06	2.90E-05	0.00E+00	7.65E-06
Crushing/Proc. Equipment	D	9999	Construction and Minin	1.36E-01	4.09E-01	2.43E+01	2.31E-04	7.52E-04	2.72E-03	2.68E-01	2.69E-06	7.94E-05	0.00E+00	2.08E-05
Rough Terrain Forklifts	D	50	Construction and Minin	1.24E+01	4.41E+01	6.94E+01	2.61E-03	8.34E-03	7.32E-03	7.47E-01	9.65E-06	6.64E-04	0.00E+00	2.36E-04
Rough Terrain Forklifts	D	120	Construction and Minin	5.93E+02	2.11E+03	6.04E+03	1.01E-01	4.57E-01	6.34E-01	6.60E+01	7.74E-04	5.61E-02	0.00E+00	9.13E-03
Rough Terrain Forklifts	D	175	Construction and Minin	7.60E+01	2.71E+02	1.54E+03	1.83E-02	9.82E-02	1.42E-01	1.69E+01	1.90E-04	8.03E-03	0.00E+00	1.65E-03
Rough Terrain Forklifts	D	250	Construction and Minin	4.24E+00	1.51E+01	1.17E+02	9.78E-04	2.87E-03	9.80E-03	1.29E+00	1.45E-05	3.14E-04	0.00E+00	8.82E-05
Rough Terrain Forklifts	D	500	Construction and Minin	2.79E+00	9.94E+00	1.15E+02	9.06E-04	2.84E-03	8.50E-03	1.27E+00	1.25E-05	2.90E-04	0.00E+00	8.18E-05
Rubber Tired Loaders	D	25	Construction and Minin	1.56E+00	4.71E+00	3.62E+00	4.80E-05	1.64E-04	3.04E-04	3.98E-02	5.05E-07	1.18E-05	0.00E+00	4.33E-06
Rubber Tired Loaders	D	50	Construction and Minin	3.03E+01	9.31E+01	1.35E+02	5.60E-03	1.70E-02	1.45E-02	1.45E+00	1.87E-05	1.36E-03	0.00E+00	5.05E-04
Rubber Tired Loaders	D	120	Construction and Minin	8.25E+02	2.53E+03	6.83E+03	1.23E-01	5.25E-01	7.62E-01	7.45E+01	8.74E-04	6.66E-02	0.00E+00	1.11E-02
Rubber Tired Loaders	D	175	Construction and Minin	4.65E+02	1.43E+03	6.92E+03	8.85E-02	4.47E-01	6.79E-01	7.58E+01	8.53E-04	3.83E-02	0.00E+00	7.98E-03
Rubber Tired Loaders	D	250	Construction and Minin	4.62E+02	1.42E+03	9.58E+03	8.93E-02	2.61E-01	8.61E-01	1.06E+02	1.19E-03	2.96E-02	0.00E+00	8.06E-03
Rubber Tired Loaders	D	500	Construction and Minin	1.92E+02	5.91E+02	6.34E+03	5.51E-02	1.89E-01	5.07E-01	6.99E+01	6.86E-04	1.81E-02	0.00E+00	4.97E-03
Rubber Tired Loaders	D	750	Construction and Minin	3.30E+00	1.01E+01	2.23E+02	1.95E-03	6.62E-03	1.83E-02	2.45E+00	2.47E-05	6.44E-04	0.00E+00	1.76E-04
Rubber Tired Loaders	D	1000	Construction and Minin	3.54E-01	7.36E-01	1.98E+01	1.91E-04	6.76E-04	2.19E-03	2.18E-01	2.19E-06	6.60E-05	0.00E+00	1.72E-05
Rubber Tired Dozers	D	175	Construction and Minin	1.12E+00	5.72E+00	3.39E+01	6.06E-04	2.42E-03	4.45E-03	3.70E-01	4.16E-06	2.55E-04	0.00E+00	5.47E-05
Rubber Tired Dozers	D	250	Construction and Minin	2.73E+01	1.40E+02	1.17E+03	1.70E-02	4.77E-02	1.46E-01	1.28E+01	1.45E-04	6.16E-03	0.00E+00	1.54E-03
Rubber Tired Dozers	D	500	Construction and Minin	4.21E+01	2.16E+02	2.60E+03	3.45E-02	1.53E-01	2.94E-01	2.85E+01	2.80E-04	1.22E-02	0.00E+00	3.12E-03
Rubber Tired Dozers	D	750	Construction and Minin	3.62E+00	1.86E+01	3.38E+02	4.50E-03	1.98E-02	3.88E-02	3.70E+00	3.72E-05	1.59E-03	0.00E+00	4.06E-04
Rubber Tired Dozers	D	1000	Construction and Minin	2.45E-01	8.51E-01	2.30E+01	3.19E-04	1.46E-03	3.17E-03	2.52E-01	2.53E-06	1.10E-04	0.00E+00	2.88E-05
Tractors/Loaders/Backhoes	D	25	Construction and Minin	3.15E+01	9.33E+01	6.73E+01	9.09E-04	3.06E-03	5.76E-03	7.39E-01	9.38E-06	2.63E-04	0.00E+00	8.21E-05
Tractors/Loaders/Backhoes	D	50	Construction and Minin	1.88E+02	5.72E+02	8.03E+02	2.56E-02	9.15E-02	8.27E-02	8.67E+00	1.12E-04	6.82E-03	0.00E+00	2.31E-03
Tractors/Loaders/Backhoes	D	120	Construction and Minin	2.51E+03	7.65E+03	1.81E+04	2.66E-01	1.35E+00	1.75E+00	1.98E+02	2.32E-03	1.47E-01	0.00E+00	2.40E-02
Tractors/Loaders/Backhoes	D	175	Construction and Minin	1.88E+02	5.71E+02	2.64E+03	2.82E-02	1.67E-01	2.20E-01	2.89E+01	3.25E-04	1.22E-02	0.00E+00	2.55E-03
Tractors/Loaders/Backhoes	D	250	Construction and Minin	6.07E+01	1.85E+02	1.44E+03	1.11E-02	3.38E-02	1.08E-01	1.58E+01	1.78E-04	3.42E-03	0.00E+00	1.00E-03
Tractors/Loaders/Backhoes	D	500	Construction and Minin	9.80E+01	2.98E+02	4.65E+03	3.41E-02	1.11E-01	3.08E-01	5.13E+01	5.78E-04	1.04E-02	0.00E+00	3.08E-03
Tractors/Loaders/Backhoes	D	750	Construction and Minin	1.65E+01	5.01E+01	1.17E+03	8.67E-03	2.80E-02	8.01E-02	1.30E+01	1.46E-04	2.68E-03	0.00E+00	7.82E-04
Crawler Tractors	D	50	Construction and Minin	1.56E+00	5.15E+00	5.99E+00	3.03E-04	8.36E-04	6.76E-04	6.40E-02	8.27E-07	6.96E-05	0.00E+00	2.73E-05
Crawler Tractors	D	120	Construction and Minin	8.86E+02	2.92E+03	8.82E+03	1.89E-01	7.09E-01	1.12E+00	9.60E+01	1.13E-03	9.91E-02	0.00E+00	1.71E-02
Crawler Tractors	D	175	Construction and Minin	3.00E+02	9.88E+02	5.47E+03	8.28E-02	3.68E-01	6.20E-01	5.98E+01	6.73E-04	3.53E-02	0.00E+00	7.47E-03
Crawler Tractors	D	250	Construction and Minin	2.58E+02	8.49E+02	6.41E+03	7.48E-02	2.12E-01	6.78E-01	7.05E+01	7.93E-04	2.60E-02	0.00E+00	6.75E-03
Crawler Tractors	D	500	Construction and Minin	1.77E+02	5.82E+02	6.86E+03	7.39E-02	2.76E-01	6.51E-01	7.54E+01	7.40E-04	2.52E-02	0.00E+00	6.67E-03
Crawler Tractors	D	750	Construction and Minin	2.18E+00	7.18E+00	1.52E+02	1.64E-03	6.10E-03	1.47E-02	1.67E+00	1.68E-05	5.64E-04	0.00E+00	1.48E-04
Crawler Tractors	D	1000	Construction and Minin	2.18E+00	4.86E+00	1.46E+02	1.68E-03	6.56E-03	1.79E-02	1.60E+00	1.61E-05	5.74E-04	0.00E+00	1.51E-04
Skid Steer Loaders	D	25	Construction and Minin	2.14E+02	5.62E+02	3.54E+02	5.66E-03	1.74E-02	3.28E-02	3.88E+00	4.92E-05	1.77E-03	0.00E+00	5.11E-04
Skid Steer Loaders	D	50	Construction and Minin	1.94E+03	5.19E+03	6.09E+03	1.34E-01	5.87E-01	5.91E-01	6.61E+01	8.55E-04	4.08E-02	0.00E+00	1.21E-02
Skid Steer Loaders	D	120	Construction and Minin	1.02E+03	2.72E+03	5.30E+03	5.84E-02	3.73E-01	4.44E-01	5.81E+01	6.81E-04	3.33E-02	0.00E+00	5.27E-03
Off-Highway Tractors	D	120	Construction and Minin	1.12E-01	3.92E-01	1.69E+00	4.15E-05	1.41E-04	2.42E-04	1.84E-02	2.15E-07	2.12E-05	0.00E+00	3.74E-06
Off-Highway Tractors	D	175	Construction and Minin	1.36E+02	4.80E+02	2.86E+03	4.91E-02	2.00E-01	3.68E-01	3.12E+01	3.52E-04	2.09E-02	0.00E+00	4.43E-03
Off-Highway Tractors	D	250	Construction and Minin	1.29E+02	4.53E+02	2.69E+03	3.71E-02	1.06E-01	3.27E-01	2.95E+01	3.32E-04	1.36E-02	0.00E+00	3.35E-03
Off-Highway Tractors	D	750	Construction and Minin	1.37E+01	4.81E+01	1.24E+03	1.57E-02	6.93E-02	1.40E-01	1.36E+01	1.37E-04	5.65E-03	0.00E+00	1.42E-03
Off-Highway Tractors	D	1000	Construction and Minin	1.44E+00	3.44E+00	1.28E+02	1.69E-03	7.73E-03	1.73E-02	1.40E+00	1.41E-05	5.90E-04	0.00E+00	1.52E-04
Dumpers/Tenders	D	25	Construction and Minin	2.68E+00	5.58E+00	1.94E+00	2.69E-05	8.92E-05	1.67E-04	2.13E-02	2.70E-07	8.07E-06	0.00E+00	2.43E-06
Other Construction Equipment	D	15	Construction and Minin	3.69E+01	8.02E+01	3.70E+01	4.71E-04	2.47E-03	2.95E-03	4.05E-01	6.30E-06	1.15E-04	0.00E+00	4.25E-05
Other Construction Equipment	D	25	Construction and Minin	6.25E+00	1.36E+01	8.16E+00	1.08E-04	3.69E-04	6.87E-04	8.96E-02	1.14E-06	2.75E-05	0.00E+00	9.78E-06
Other Construction Equipment	D	50	Construction and Minin	9.59E+00	2.12E+01	2.74E+01	8.00E-04	2.81E-03	2.74E-03	2.96E-01	3.83E-06	2.18E-04	0.00E+00	7.22E-05
Other Construction Equipment	D	120	Construction and Minin	1.58E+01	3.50E+01	1.29E+02	1.76E-03	9.23E-03	1.23E-02	1.41E+00	1.66E-05	9.95E-04	0.00E+00	1.59E-04

Other Construction Equipment	D	175	Construction and Minin	2.19E+01	4.83E+01	2.34E+02	2.26E-03	1.42E-02	1.94E-02	2.57E+00	2.89E-05	1.02E-03	0.00E+00	2.04E-04
Other Construction Equipment	D	500	Construction and Minin	5.08E+01	1.12E+02	1.29E+03	8.14E-03	2.93E-02	8.52E-02	1.42E+01	1.40E-04	2.75E-03	0.00E+00	7.35E-04
Aerial Lifts	D	15	Industrial Equipment	3.05E+01	3.83E+01	1.51E+01	1.94E-04	1.01E-03	1.22E-03	1.66E-01	2.58E-06	5.15E-05	0.00E+00	1.75E-05
Aerial Lifts	D	25	Industrial Equipment	4.98E+01	6.26E+01	3.13E+01	5.12E-04	1.56E-03	2.92E-03	3.42E-01	4.35E-06	1.59E-04	0.00E+00	4.62E-05
Aerial Lifts	D	50	Industrial Equipment	1.82E+02	2.20E+02	1.99E+02	6.29E-03	1.90E-02	2.01E-02	2.15E+00	2.79E-05	1.68E-03	0.00E+00	5.67E-04
Aerial Lifts	D	120	Industrial Equipment	1.61E+02	1.95E+02	3.39E+02	5.30E-03	2.35E-02	3.61E-02	3.71E+00	4.35E-05	2.85E-03	0.00E+00	4.78E-04
Aerial Lifts	D	500	Industrial Equipment	2.07E+01	2.50E+01	2.41E+02	1.45E-03	5.73E-03	1.87E-02	2.66E+00	2.61E-05	5.49E-04	0.00E+00	1.31E-04
Aerial Lifts	D	750	Industrial Equipment	1.66E+00	2.01E+00	3.50E+01	2.18E-04	8.33E-04	2.81E-03	3.86E-01	3.88E-06	8.14E-05	0.00E+00	1.96E-05
Forklifts	D	50	Industrial Equipment	5.52E+01	3.13E+02	2.12E+02	6.87E-03	2.53E-02	2.23E-02	2.29E+00	2.96E-05	1.88E-03	0.00E+00	6.20E-04
Forklifts	D	120	Industrial Equipment	8.65E+01	4.90E+02	7.00E+02	1.07E-02	5.33E-02	6.80E-02	7.65E+00	8.97E-05	5.87E-03	0.00E+00	9.62E-04
Forklifts	D	175	Industrial Equipment	8.70E+01	4.93E+02	1.26E+03	1.40E-02	8.14E-02	1.04E-01	1.38E+01	1.55E-04	6.01E-03	0.00E+00	1.26E-03
Forklifts	D	250	Industrial Equipment	8.63E+01	4.89E+02	1.71E+03	1.39E-02	3.93E-02	1.28E-01	1.88E+01	2.12E-04	4.08E-03	0.00E+00	1.25E-03
Forklifts	D	500	Industrial Equipment	3.69E+01	2.09E+02	1.05E+03	8.15E-03	2.30E-02	6.85E-02	1.16E+01	1.14E-04	2.38E-03	0.00E+00	7.35E-04
Sweepers/Scrubbers	D	15	Industrial Equipment	4.05E+00	8.28E+00	4.51E+00	5.12E-05	3.02E-04	3.60E-04	4.94E-02	7.69E-07	1.41E-05	0.00E+00	4.62E-06
Sweepers/Scrubbers	D	25	Industrial Equipment	4.05E+00	8.28E+00	7.39E+00	9.79E-05	3.34E-04	6.19E-04	8.11E-02	1.03E-06	2.41E-05	0.00E+00	8.84E-06
Sweepers/Scrubbers	D	50	Industrial Equipment	7.89E+01	3.03E+02	4.43E+02	1.57E-02	5.16E-02	4.62E-02	4.77E+00	6.17E-05	4.08E-03	0.00E+00	1.41E-03
Sweepers/Scrubbers	D	120	Industrial Equipment	1.30E+02	5.01E+02	1.72E+03	2.75E-02	1.29E-01	1.74E-01	1.88E+01	2.20E-04	1.55E-02	0.00E+00	2.48E-03
Sweepers/Scrubbers	D	175	Industrial Equipment	6.01E+01	2.31E+02	1.46E+03	1.65E-02	9.22E-02	1.28E-01	1.60E+01	1.80E-04	7.29E-03	0.00E+00	1.48E-03
Sweepers/Scrubbers	D	250	Industrial Equipment	9.61E+00	3.69E+01	2.71E+02	2.11E-03	6.21E-03	2.16E-02	2.99E+00	3.36E-05	6.65E-04	0.00E+00	1.90E-04
Other General Industrial Equipmen	D	15	Industrial Equipment	1.06E+01	4.77E+01	1.39E+01	1.58E-04	9.30E-04	1.11E-03	1.52E-01	2.37E-06	4.33E-05	0.00E+00	1.42E-05
Other General Industrial Equipmen	D	25	Industrial Equipment	1.42E+01	6.39E+01	4.46E+01	5.91E-04	2.02E-03	3.73E-03	4.90E-01	6.21E-06	1.40E-04	0.00E+00	5.33E-05
Other General Industrial Equipmen	D	50	Industrial Equipment	1.76E+01	7.91E+01	8.03E+01	3.77E-03	1.07E-02	8.83E-03	8.59E-01	1.11E-05	9.05E-04	0.00E+00	3.40E-04
Other General Industrial Equipmen	D	120	Industrial Equipment	7.05E+01	3.16E+02	9.00E+02	1.83E-02	7.07E-02	1.06E-01	9.81E+00	1.15E-04	1.00E-02	0.00E+00	1.65E-03
Other General Industrial Equipmen	D	175	Industrial Equipment	7.08E+01	3.17E+02	1.39E+03	1.96E-02	9.08E-02	1.46E-01	1.52E+01	1.71E-04	8.56E-03	0.00E+00	1.77E-03
Other General Industrial Equipmen	D	250	Industrial Equipment	7.05E+01	3.16E+02	1.94E+03	1.83E-02	4.96E-02	1.87E-01	2.14E+01	2.41E-04	5.91E-03	0.00E+00	1.65E-03
Other General Industrial Equipmen	D	500	Industrial Equipment	7.03E+01	3.15E+02	3.79E+03	3.33E-02	9.90E-02	3.19E-01	4.18E+01	4.11E-04	1.08E-02	0.00E+00	3.00E-03
Other General Industrial Equipmen	D	750	Industrial Equipment	1.76E+01	7.88E+01	1.56E+03	1.38E-02	4.07E-02	1.36E-01	1.72E+01	1.73E-04	4.52E-03	0.00E+00	1.25E-03
Other General Industrial Equipmen	D	1000	Industrial Equipment	1.07E+01	3.25E+01	8.25E+02	8.37E-03	2.65E-02	9.65E-02	9.08E+00	9.13E-05	2.88E-03	0.00E+00	7.55E-04
Other Material Handling Equipment	D	50	Industrial Equipment	5.06E-01	2.10E+00	2.97E+00	1.39E-04	3.93E-04	3.26E-04	3.18E-02	4.11E-07	3.33E-05	0.00E+00	1.25E-05
Other Material Handling Equipment	D	120	Industrial Equipment	3.04E+00	1.26E+01	3.50E+01	7.06E-04	2.74E-03	4.12E-03	3.82E-01	4.48E-06	3.89E-04	0.00E+00	6.37E-05
Other Material Handling Equipment	D	175	Industrial Equipment	3.25E+00	1.35E+01	7.52E+01	1.05E-03	4.89E-03	7.87E-03	8.23E-01	9.26E-06	4.61E-04	0.00E+00	9.50E-05
Other Material Handling Equipment	D	250	Industrial Equipment	7.73E+00	3.21E+01	2.11E+02	1.96E-03	5.36E-03	2.03E-02	2.32E+00	2.62E-05	6.38E-04	0.00E+00	1.77E-04
Other Material Handling Equipment	D	500	Industrial Equipment	1.45E+00	6.00E+00	5.21E+01	4.50E-04	1.35E-03	4.38E-03	5.74E-01	5.64E-06	1.47E-04	0.00E+00	4.06E-05
Other Material Handling Equipment	D	9999	Industrial Equipment	4.34E-01	1.80E+00	6.05E+01	6.20E-04	1.94E-03	7.07E-03	6.66E-01	6.54E-06	2.11E-04	0.00E+00	5.60E-05
Leaf Blowers/Vacuums	D	15	Lawn and Garden Equip	9.47E-01	3.07E-01	4.21E-02	4.83E-07	2.82E-06	3.39E-06	4.61E-04	7.18E-09	1.43E-07	0.00E+00	4.35E-08
Leaf Blowers/Vacuums	D	120	Lawn and Garden Equip	8.29E-01	2.69E-01	5.96E-01	7.25E-06	3.84E-05	5.73E-05	6.53E-03	7.66E-08	3.86E-06	0.00E+00	6.54E-07
Leaf Blowers/Vacuums	D	250	Lawn and Garden Equip	2.37E-01	7.67E-02	3.48E-01	1.84E-06	7.42E-06	2.71E-05	3.85E-03	4.33E-08	7.02E-07	0.00E+00	1.66E-07
Lawn & Garden Tractors	D	15	Lawn and Garden Equip	2.29E+03	3.36E+03	1.42E+03	1.65E-02	9.52E-02	1.16E-01	1.56E+01	2.43E-04	5.28E-03	0.00E+00	1.49E-03
Lawn & Garden Tractors	D	25	Lawn and Garden Equip	1.79E+03	2.63E+03	1.71E+03	2.28E-02	7.73E-02	1.45E-01	1.88E+01	2.38E-04	6.24E-03	0.00E+00	2.05E-03
Chippers/Stump Grinders	D	25	Lawn and Garden Equip	1.07E+00	1.34E+00	1.23E+00	1.62E-05	5.54E-05	1.03E-04	1.35E-02	1.71E-07	3.99E-06	0.00E+00	1.47E-06
Chippers/Stump Grinders	D	120	Lawn and Garden Equip	2.94E+01	3.69E+01	1.28E+02	1.92E-03	8.93E-03	1.33E-02	1.40E+00	1.64E-05	1.06E-03	0.00E+00	1.74E-04
Chippers/Stump Grinders	D	175	Lawn and Garden Equip	2.01E+00	2.53E+00	1.52E+01	1.55E-04	8.84E-04	1.40E-03	1.66E-01	1.87E-06	6.96E-05	0.00E+00	1.40E-05
Chippers/Stump Grinders	D	250	Lawn and Garden Equip	4.74E-01	5.95E-01	5.99E+00	4.10E-05	1.40E-04	5.06E-04	6.61E-02	7.44E-07	1.50E-05	0.00E+00	3.70E-06
Chippers/Stump Grinders	D	500	Lawn and Garden Equip	4.38E+00	5.50E+00	6.15E+01	3.81E-04	1.48E-03	4.64E-03	6.79E-01	6.67E-06	1.44E-04	0.00E+00	3.44E-05
Chippers/Stump Grinders	D	750	Lawn and Garden Equip	4.97E+00	6.24E+00	1.68E+02	1.07E-03	4.05E-03	1.31E-02	1.86E+00	1.87E-05	3.99E-04	0.00E+00	9.66E-05
Chippers/Stump Grinders	D	1000	Lawn and Garden Equip	9.47E+00	9.38E+00	3.60E+02	2.91E-03	1.04E-02	3.83E-02	3.97E+00	3.99E-05	1.06E-03	0.00E+00	2.63E-04
Commercial Turf Equipment	D	15	Lawn and Garden Equip	5.76E+01	1.66E+02	7.31E+01	8.30E-04	4.89E-03	5.84E-03	8.00E-01	1.25E-05	2.29E-04	0.00E+00	7.49E-05
Commercial Turf Equipment	D	25	Lawn and Garden Equip	1.08E+03	3.12E+03	2.06E+03	2.72E-02	9.29E-02	1.72E-01	2.26E+01	2.86E-04	6.45E-03	0.00E+00	2.46E-03
Other Lawn & Garden Equipment	D	15	Lawn and Garden Equip	8.29E-01	9.69E-01	5.40E-01	6.15E-06	3.61E-05	4.32E-05	5.92E-03	9.21E-08	1.76E-06	0.00E+00	5.55E-07
Other Lawn & Garden Equipment	D	25	Lawn and Garden Equip	1.18E-01	1.38E-01	1.03E-01	1.36E-06	4.64E-06	8.60E-06	1.13E-03	1.43E-08	3.34E-07	0.00E+00	1.23E-07
Agricultural Tractors	D	15	Agricultural Equipment	4.14E+02	6.94E+02	3.34E+02	4.25E-03	2.23E-02	2.66E-02	3.65E+00	5.68E-05	1.03E-03	0.00E+00	3.84E-04
Agricultural Tractors	D	25	Agricultural Equipment	5.11E+02	8.56E+02	7.86E+02	1.04E-02	3.55E-02	6.63E-02	8.63E+00	1.10E-04	2.68E-03	0.00E+00	9.43E-04
Agricultural Tractors	D	50	Agricultural Equipment	1.19E+03	1.78E+03	2.83E+03	1.07E-01	3.02E-01	2.94E-01	3.05E+01	3.94E-04	2.65E-02	0.00E+00	9.62E-03
Agricultural Tractors	D	120	Agricultural Equipment	1.38E+03	2.06E+03	6.87E+03	1.19E-01	4.92E-01	7.78E-01	7.50E+01	8.80E-04	6.33E-02	0.00E+00	1.07E-02
Agricultural Tractors	D	175	Agricultural Equipment	7.76E+02	1.16E+03	6.59E+03	7.72E-02	3.91E-01	6.65E-01	7.22E+01	8.13E-04	3.38E-02	0.00E+00	6.97E-03
Agricultural Tractors	D	250	Agricultural Equipment	5.01E+02	7.49E+02	6.05E+03	4.68E-02	1.50E-01	5.58E-01	6.67E+01	7.51E-04	1.69E-02	0.00E+00	4.22E-03
Agricultural Tractors	D	500	Agricultural Equipment	9.95E+01	1.49E+02	1.96E+03	1.38E-02	5.21E-02	1.63E-01	2.17E+01	2.13E-04	5.11E-03	0.00E+00	1.24E-03

Combines	D	120	Agricultural Equipment	2.91E+01	1.37E+01	5.94E+01	8.41E-04	3.92E-03	6.21E-03	6.50E-01	7.63E-06	4.31E-04	0.00E+00	7.58E-05
Combines	D	175	Agricultural Equipment	4.31E+01	2.04E+01	1.16E+02	1.09E-03	6.33E-03	1.07E-02	1.27E+00	1.43E-05	4.65E-04	0.00E+00	9.86E-05
Combines	D	250	Agricultural Equipment	4.61E+01	2.18E+01	1.73E+02	1.06E-03	3.90E-03	1.47E-02	1.91E+00	2.15E-05	3.88E-04	0.00E+00	9.53E-05
Combines	D	500	Agricultural Equipment	1.84E+00	8.71E-01	9.50E+00	5.26E-05	2.20E-04	7.42E-04	1.05E-01	1.03E-06	2.03E-05	0.00E+00	4.74E-06
Balers	D	50	Agricultural Equipment	5.50E-02	1.65E-02	2.75E-02	6.38E-07	2.11E-06	2.69E-06	2.99E-04	3.87E-09	1.92E-07	0.00E+00	5.76E-08
Balers	D	120	Agricultural Equipment	3.87E+01	1.16E+01	2.88E+01	3.92E-04	1.88E-03	2.97E-03	3.16E-01	3.70E-06	1.99E-04	0.00E+00	3.54E-05
Agricultural Mowers	D	120	Agricultural Equipment	1.82E+00	2.08E+00	3.33E+00	5.39E-05	2.32E-04	3.67E-04	3.63E-02	4.26E-07	2.84E-05	0.00E+00	4.86E-06
Sprayers	D	25	Agricultural Equipment	8.53E+00	2.95E+00	1.61E+00	3.42E-05	9.40E-05	1.60E-04	1.76E-02	2.23E-07	1.02E-05	0.00E+00	3.09E-06
Sprayers	D	50	Agricultural Equipment	1.93E+00	5.46E-01	5.65E-01	1.30E-05	4.31E-05	5.53E-05	6.15E-03	7.95E-08	3.92E-06	0.00E+00	1.17E-06
Sprayers	D	120	Agricultural Equipment	1.84E+01	5.22E+00	1.36E+01	1.84E-04	8.83E-04	1.40E-03	1.49E-01	1.75E-06	9.35E-05	0.00E+00	1.66E-05
Sprayers	D	175	Agricultural Equipment	7.76E+00	2.20E+00	9.47E+00	8.55E-05	5.10E-04	8.66E-04	1.04E-01	1.17E-06	3.61E-05	0.00E+00	7.71E-06
Sprayers	D	250	Agricultural Equipment	4.84E+00	1.37E+00	9.65E+00	5.59E-05	2.14E-04	8.05E-04	1.07E-01	1.20E-06	2.06E-05	0.00E+00	5.05E-06
Sprayers	D	500	Agricultural Equipment	8.25E-01	2.34E-01	1.80E+00	9.44E-06	4.04E-05	1.39E-04	1.99E-02	1.95E-07	3.68E-06	0.00E+00	8.52E-07
Tillers	D	15	Agricultural Equipment	1.93E-01	1.59E-01	4.98E-02	5.72E-07	3.33E-06	4.02E-06	5.45E-04	8.49E-09	1.71E-07	0.00E+00	5.16E-08
Tillers	D	250	Agricultural Equipment	2.75E-02	1.49E-02	1.62E-01	1.00E-06	3.67E-06	1.38E-05	1.78E-03	2.01E-08	3.68E-07	0.00E+00	9.06E-08
Tillers	D	500	Agricultural Equipment	8.25E-02	4.47E-02	8.64E-01	4.87E-06	2.03E-05	6.78E-05	9.54E-03	9.37E-08	1.87E-06	0.00E+00	4.39E-07
Swathers	D	120	Agricultural Equipment	2.09E+02	7.25E+01	1.78E+02	2.45E-03	1.16E-02	1.84E-02	1.95E+00	2.29E-05	1.25E-03	0.00E+00	2.21E-04
Swathers	D	175	Agricultural Equipment	1.87E+00	6.48E-01	3.05E+00	2.80E-05	1.65E-04	2.80E-04	3.35E-02	3.77E-07	1.18E-05	0.00E+00	2.52E-06
Hydro Power Units	D	15	Agricultural Equipment	1.60E+00	4.09E+00	1.12E+00	1.43E-05	7.51E-05	8.96E-05	1.23E-02	1.91E-07	3.48E-06	0.00E+00	1.29E-06
Hydro Power Units	D	25	Agricultural Equipment	4.81E+00	1.23E+01	6.42E+00	8.53E-05	2.90E-04	5.41E-04	7.05E-02	8.94E-07	2.19E-05	0.00E+00	7.70E-06
Hydro Power Units	D	50	Agricultural Equipment	5.39E+00	1.34E+01	1.32E+01	6.06E-04	1.64E-03	1.42E-03	1.41E-01	1.82E-06	1.42E-04	0.00E+00	5.47E-05
Hydro Power Units	D	120	Agricultural Equipment	4.95E-01	1.23E+00	2.38E+00	4.63E-05	1.80E-04	2.83E-04	2.59E-02	3.04E-07	2.52E-05	0.00E+00	4.18E-06
Other Agricultural Equipment	D	15	Agricultural Equipment	5.83E+00	8.19E+00	2.87E+00	3.66E-05	1.92E-04	2.29E-04	3.14E-02	4.89E-07	9.39E-06	0.00E+00	3.30E-06
Other Agricultural Equipment	D	25	Agricultural Equipment	1.62E+01	2.28E+01	1.46E+01	2.29E-04	7.14E-04	1.33E-03	1.60E-01	2.03E-06	7.10E-05	0.00E+00	2.07E-05
Other Agricultural Equipment	D	50	Agricultural Equipment	1.42E+01	1.70E+01	2.01E+01	6.90E-04	2.01E-03	2.07E-03	2.18E-01	2.81E-06	1.77E-04	0.00E+00	6.23E-05
Other Agricultural Equipment	D	120	Agricultural Equipment	4.79E+01	5.75E+01	1.34E+02	2.20E-03	9.42E-03	1.49E-02	1.47E+00	1.72E-05	1.16E-03	0.00E+00	1.99E-04
Other Agricultural Equipment	D	175	Agricultural Equipment	3.99E+00	4.79E+00	2.02E+01	2.24E-04	1.17E-03	1.99E-03	2.22E-01	2.49E-06	9.73E-05	0.00E+00	2.02E-05
Other Agricultural Equipment	D	250	Agricultural Equipment	3.99E+00	4.79E+00	2.91E+01	2.12E-04	7.04E-04	2.63E-03	3.21E-01	3.61E-06	7.70E-05	0.00E+00	1.91E-05
Other Agricultural Equipment	D	500	Agricultural Equipment	9.63E-01	1.16E+00	1.01E+01	6.66E-05	2.61E-04	8.26E-04	1.11E-01	1.09E-06	2.50E-05	0.00E+00	6.01E-06
Generator Sets	D	15	Light Commercial Equip	4.67E+02	3.36E+02	1.57E+02	2.47E-03	1.14E-02	1.69E-02	1.71E+00	2.67E-05	9.58E-04	0.00E+00	2.23E-04
Generator Sets	D	25	Light Commercial Equip	3.42E+02	2.46E+02	1.98E+02	3.23E-03	1.10E-02	1.95E-02	2.17E+00	2.75E-05	1.10E-03	0.00E+00	2.91E-04
Generator Sets	D	50	Light Commercial Equip	4.17E+02	3.00E+02	4.24E+02	1.27E-02	3.91E-02	4.25E-02	4.59E+00	5.94E-05	3.46E-03	0.00E+00	1.15E-03
Generator Sets	D	120	Light Commercial Equip	6.34E+02	4.56E+02	1.63E+03	2.47E-02	1.11E-01	1.71E-01	1.78E+01	2.08E-04	1.32E-02	0.00E+00	2.23E-03
Generator Sets	D	175	Light Commercial Equip	3.75E+01	2.70E+01	1.74E+02	1.77E-03	9.94E-03	1.64E-02	1.91E+00	2.15E-05	7.84E-04	0.00E+00	1.60E-04
Generator Sets	D	250	Light Commercial Equip	2.10E+01	1.51E+01	1.45E+02	9.42E-04	3.25E-03	1.25E-02	1.60E+00	1.80E-05	3.44E-04	0.00E+00	8.50E-05
Generator Sets	D	500	Light Commercial Equip	4.66E+01	3.35E+01	5.11E+02	2.97E-03	1.19E-02	3.95E-02	5.64E+00	5.54E-05	1.14E-03	0.00E+00	2.68E-04
Generator Sets	D	750	Light Commercial Equip	2.89E+01	2.08E+01	5.12E+02	3.09E-03	1.20E-02	4.09E-02	5.66E+00	5.69E-05	1.16E-03	0.00E+00	2.79E-04
Generator Sets	D	9999	Light Commercial Equip	7.54E+00	5.42E+00	2.58E+02	2.11E-03	7.41E-03	2.75E-02	2.84E+00	2.85E-05	7.56E-04	0.00E+00	1.90E-04
Pumps	D	15	Light Commercial Equip	3.51E+02	3.01E+02	1.02E+02	1.85E-03	7.44E-03	1.12E-02	1.12E+00	1.74E-05	7.29E-04	0.00E+00	1.67E-04
Pumps	D	25	Light Commercial Equip	1.05E+02	8.99E+01	8.01E+01	1.58E-03	4.45E-03	7.87E-03	8.75E-01	1.11E-05	4.81E-04	0.00E+00	1.42E-04
Pumps	D	50	Light Commercial Equip	1.83E+02	1.57E+02	2.49E+02	8.01E-03	2.41E-02	2.52E-02	2.69E+00	3.48E-05	2.12E-03	0.00E+00	7.22E-04
Pumps	D	120	Light Commercial Equip	3.58E+02	3.07E+02	1.10E+03	1.73E-02	7.63E-02	1.17E-01	1.20E+01	1.40E-04	9.32E-03	0.00E+00	1.56E-03
Pumps	D	175	Light Commercial Equip	3.88E+01	3.33E+01	2.12E+02	2.25E-03	1.23E-02	2.02E-02	2.33E+00	2.62E-05	9.98E-04	0.00E+00	2.03E-04
Pumps	D	250	Light Commercial Equip	2.79E+01	2.40E+01	2.18E+02	1.48E-03	4.98E-03	1.91E-02	2.41E+00	2.71E-05	5.39E-04	0.00E+00	1.34E-04
Pumps	D	500	Light Commercial Equip	5.51E-01	4.73E-01	7.39E+00	4.51E-05	1.77E-04	5.77E-04	8.15E-02	8.00E-07	1.70E-05	0.00E+00	4.07E-06
Pumps	D	750	Light Commercial Equip	9.19E-02	7.88E-02	2.04E+00	1.28E-05	4.87E-05	1.64E-04	2.25E-02	2.26E-07	4.79E-06	0.00E+00	1.16E-06
Pumps	D	9999	Light Commercial Equip	2.02E+00	1.73E+00	1.06E+02	8.94E-04	3.13E-03	1.15E-02	1.17E+00	1.18E-05	3.18E-04	0.00E+00	8.06E-05
Air Compressors	D	15	Light Commercial Equip	4.78E+00	8.29E+00	2.74E+00	4.95E-05	1.99E-04	2.99E-04	2.99E-02	4.65E-07	1.95E-05	0.00E+00	4.46E-06
Air Compressors	D	25	Light Commercial Equip	9.47E+00	1.64E+01	1.08E+01	2.13E-04	6.02E-04	1.06E-03	1.18E-01	1.50E-06	6.51E-05	0.00E+00	1.92E-05
Air Compressors	D	50	Light Commercial Equip	8.60E+01	1.49E+02	1.55E+02	6.68E-03	1.87E-02	1.65E-02	1.66E+00	2.15E-05	1.61E-03	0.00E+00	6.02E-04
Air Compressors	D	120	Light Commercial Equip	5.73E+02	9.94E+02	2.14E+03	4.01E-02	1.61E-01	2.45E-01	2.33E+01	2.73E-04	2.22E-02	0.00E+00	3.62E-03
Air Compressors	D	175	Light Commercial Equip	2.17E+01	3.76E+01	1.52E+02	1.95E-03	9.48E-03	1.55E-02	1.66E+00	1.87E-05	8.72E-04	0.00E+00	1.76E-04
Air Compressors	D	250	Light Commercial Equip	3.05E+01	5.29E+01	3.14E+02	2.62E-03	7.72E-03	2.95E-02	3.47E+00	3.90E-05	9.02E-04	0.00E+00	2.36E-04
Air Compressors	D	500	Light Commercial Equip	3.98E+01	6.90E+01	7.24E+02	5.52E-03	1.83E-02	5.98E-02	7.99E+00	7.84E-05	1.93E-03	0.00E+00	4.98E-04
Air Compressors	D	750	Light Commercial Equip	1.49E+01	2.58E+01	4.19E+02	3.23E-03	1.06E-02	3.57E-02	4.62E+00	4.65E-05	1.14E-03	0.00E+00	2.92E-04
Air Compressors	D	1000	Light Commercial Equip	3.68E-01	6.38E-01	1.41E+01	1.31E-04	4.41E-04	1.60E-03	1.55E-01	1.56E-06	4.62E-05	0.00E+00	1.18E-05
Welders	D	15	Light Commercial Equip	1.59E+02	2.17E+02	6.17E+01	1.11E-03	4.48E-03	6.74E-03	6.73E-01	1.05E-05	4.40E-04	0.00E+00	1.01E-04

Welders	D	25	Light Commercial Equip	1.40E+02	1.91E+02	9.85E+01	1.94E-03	5.47E-03	9.69E-03	1.08E+00	1.37E-05	5.93E-04	0.00E+00	1.75E-04
Welders	D	50	Light Commercial Equip	4.30E+02	5.88E+02	7.09E+02	2.80E-02	7.98E-02	7.41E-02	7.63E+00	9.86E-05	6.92E-03	0.00E+00	2.52E-03
Welders	D	120	Light Commercial Equip	3.34E+02	4.57E+02	8.26E+02	1.46E-02	6.04E-02	9.24E-02	9.02E+00	1.06E-04	8.04E-03	0.00E+00	1.32E-03
Welders	D	175	Light Commercial Equip	1.65E+00	2.26E+00	1.01E+01	1.22E-04	6.15E-04	1.01E-03	1.11E-01	1.25E-06	5.45E-05	0.00E+00	1.10E-05
Welders	D	250	Light Commercial Equip	3.68E-01	5.03E-01	2.71E+00	2.11E-05	6.50E-05	2.48E-04	2.99E-02	3.37E-07	7.43E-06	0.00E+00	1.90E-06
Welders	D	500	Light Commercial Equip	9.19E-01	1.26E+00	9.54E+00	6.73E-05	2.37E-04	7.74E-04	1.05E-01	1.03E-06	2.43E-05	0.00E+00	6.07E-06
Pressure Washers	D	15	Light Commercial Equip	2.17E+01	6.69E+00	1.50E+00	2.36E-05	1.09E-04	1.61E-04	1.64E-02	2.54E-07	9.14E-06	0.00E+00	2.13E-06
Pressure Washers	D	25	Light Commercial Equip	5.05E+00	1.56E+00	5.09E-01	8.30E-06	2.83E-05	5.01E-05	5.57E-03	7.07E-08	2.83E-06	0.00E+00	7.49E-07
Pressure Washers	D	50	Light Commercial Equip	1.00E+01	3.09E+00	2.03E+00	4.74E-05	1.59E-04	1.97E-04	2.21E-02	2.85E-07	1.42E-05	0.00E+00	4.28E-06
Pressure Washers	D	120	Light Commercial Equip	4.14E+00	1.28E+00	1.40E+00	1.89E-05	9.18E-05	1.41E-04	1.53E-02	1.80E-07	9.89E-06	0.00E+00	1.70E-06
Cargo Tractor	D	120	Airport Ground Support	4.75E+00	1.71E+01	4.66E+01	9.00E-04	3.62E-03	5.39E-03	5.08E-01	5.72E-06	4.93E-04	0.00E+00	8.12E-05
A/C Tug Narrow Body	D	250	Airport Ground Support	2.57E+01	4.41E+01	3.58E+02	4.94E-03	1.46E-02	4.64E-02	3.94E+00	4.43E-05	1.92E-03	0.00E+00	4.46E-04
A/C Tug Wide Body	D	500	Airport Ground Support	6.37E+00	1.33E+01	2.02E+02	2.56E-03	1.21E-02	2.39E-02	2.21E+00	2.17E-05	9.71E-04	0.00E+00	2.31E-04
Air Conditioner	D	175	Airport Ground Support	4.11E+00	9.11E+00	6.02E+01	3.69E-04	3.50E-03	3.74E-03	6.61E-01	7.44E-06	1.75E-04	0.00E+00	3.33E-05
Air Conditioner	D	250	Airport Ground Support	3.24E-01	7.19E-01	6.75E+00	3.25E-05	1.35E-04	3.70E-04	7.46E-02	8.39E-07	1.07E-05	0.00E+00	2.93E-06
Air Conditioner	D	500	Airport Ground Support	2.16E-01	4.79E-01	8.99E+00	4.16E-05	1.75E-04	4.38E-04	9.94E-02	1.12E-06	1.39E-05	0.00E+00	3.76E-06
Air Start Unit	D	175	Airport Ground Support	1.08E-01	9.88E-02	6.82E-01	6.28E-06	3.85E-05	5.99E-05	7.48E-03	7.34E-08	2.82E-06	0.00E+00	5.67E-07
Air Start Unit	D	250	Airport Ground Support	3.24E-01	2.96E-01	2.90E+00	1.77E-05	6.45E-05	2.34E-04	3.21E-02	3.15E-07	6.56E-06	0.00E+00	1.60E-06
Air Start Unit	D	500	Airport Ground Support	1.27E+01	1.17E+01	2.28E+02	1.25E-03	5.17E-03	1.65E-02	2.52E+00	2.48E-05	4.85E-04	0.00E+00	1.13E-04
Air Start Unit	D	750	Airport Ground Support	1.84E+00	1.68E+00	4.93E+01	2.80E-04	1.12E-03	3.68E-03	5.45E-01	5.35E-06	1.07E-04	0.00E+00	2.53E-05
Baggage Tug	D	120	Airport Ground Support	5.18E+01	1.98E+02	4.44E+02	1.10E-02	3.67E-02	6.34E-02	4.83E+00	5.67E-05	5.75E-03	0.00E+00	9.94E-04
Belt Loader	D	120	Airport Ground Support	2.50E+01	6.67E+01	1.04E+02	2.36E-03	8.28E-03	1.39E-02	1.13E+00	1.33E-05	1.26E-03	0.00E+00	2.13E-04
Bobtail	D	120	Airport Ground Support	1.84E+00	3.44E+00	1.23E+01	2.62E-04	9.47E-04	1.60E-03	1.34E-01	1.57E-06	1.39E-04	0.00E+00	2.37E-05
Cargo Loader	D	120	Airport Ground Support	3.05E+01	7.58E+01	2.19E+02	4.23E-03	1.67E-02	2.58E-02	2.39E+00	2.80E-05	2.32E-03	0.00E+00	3.82E-04
Forklift	D	175	Airport Ground Support	4.21E+00	8.59E+00	2.29E+01	2.62E-04	1.40E-03	2.17E-03	2.51E-01	2.83E-06	1.18E-04	0.00E+00	2.36E-05
Fuel Truck	D	250	Airport Ground Support	2.27E+00	3.89E+00	1.04E+01	7.61E-05	2.46E-04	8.90E-04	1.15E-01	1.29E-06	2.71E-05	0.00E+00	6.86E-06
Ground Power Unit	D	175	Airport Ground Support	3.38E+01	8.99E+01	6.29E+02	7.28E-03	3.92E-02	5.83E-02	6.89E+00	7.75E-05	3.26E-03	0.00E+00	6.57E-04
Lav Truck	D	175	Airport Ground Support	5.40E-01	1.94E+00	4.64E+00	5.98E-05	2.98E-04	4.54E-04	5.08E-02	5.72E-07	2.62E-05	0.00E+00	5.40E-06
Lift	D	120	Airport Ground Support	5.62E+00	1.22E+01	4.03E+01	6.78E-04	2.96E-03	4.34E-03	4.40E-01	5.16E-06	3.79E-04	0.00E+00	6.12E-05
Other GSE	D	175	Airport Ground Support	1.00E+01	2.54E+01	1.02E+02	1.57E-03	6.68E-03	1.22E-02	1.12E+00	1.45E-05	6.86E-04	0.00E+00	1.42E-04
Passenger Stand	D	120	Airport Ground Support	8.64E-01	1.66E-01	5.62E-01	6.47E-06	3.57E-05	5.27E-05	6.16E-03	7.22E-08	3.45E-06	0.00E+00	5.84E-07
Sweeper	D	120	Airport Ground Support	2.49E+00	1.97E+00	2.95E+00	2.85E-05	1.90E-04	2.51E-04	3.23E-02	3.64E-07	1.66E-05	0.00E+00	2.57E-06
Generator	D	120	Airport Ground Support	1.62E+00	7.25E+00	2.73E+01	5.11E-04	2.13E-03	3.04E-03	2.98E-01	3.35E-06	2.80E-04	0.00E+00	4.61E-05
Generator	D	175	Airport Ground Support	8.86E+00	3.96E+01	2.80E+02	3.72E-03	1.83E-02	2.75E-02	3.07E+00	3.45E-05	1.61E-03	0.00E+00	3.36E-04
Generator	D	250	Airport Ground Support	9.18E+00	4.11E+01	4.17E+02	3.87E-03	1.06E-02	3.76E-02	4.60E+00	5.17E-05	1.23E-03	0.00E+00	3.49E-04
Generator	D	500	Airport Ground Support	9.72E-01	4.35E+00	7.00E+01	6.08E-04	1.77E-03	5.53E-03	7.72E-01	8.68E-06	1.92E-04	0.00E+00	5.49E-05
Generator	D	750	Airport Ground Support	1.30E+00	5.80E+00	1.51E+02	1.32E-03	3.82E-03	1.23E-02	1.66E+00	1.87E-05	4.21E-04	0.00E+00	1.19E-04
Service Truck	D	175	Airport Ground Support	3.57E+00	4.94E+00	9.80E+00	1.00E-04	5.74E-04	8.94E-04	1.07E-01	1.21E-06	4.52E-05	0.00E+00	9.05E-06
Catering Truck	D	250	Airport Ground Support	8.64E-01	8.78E-01	6.21E+00	2.92E-05	1.24E-04	4.13E-04	6.86E-02	7.72E-07	1.10E-05	0.00E+00	2.64E-06
Hydrant Truck	D	175	Airport Ground Support	1.73E+00	2.96E+00	2.07E+01	2.39E-04	1.25E-03	2.02E-03	2.27E-01	2.55E-06	1.07E-04	0.00E+00	2.16E-05
Compressor (GSE)	D	120	Airport Ground Support	5.40E-01	9.38E-01	2.45E+00	4.16E-05	1.81E-04	2.65E-04	2.68E-02	3.14E-07	2.33E-05	0.00E+00	3.76E-06
Compressor (GSE)	D	250	Airport Ground Support	1.08E-01	1.88E-01	9.92E-01	7.83E-06	2.41E-05	8.70E-05	1.09E-02	1.23E-07	2.71E-06	0.00E+00	7.07E-07
Compressor (GSE)	D	500	Airport Ground Support	4.32E-01	7.50E-01	8.18E+00	5.94E-05	2.00E-04	6.31E-04	9.03E-02	8.86E-07	2.08E-05	0.00E+00	5.36E-06
Compressor (GSE)	D	750	Airport Ground Support	1.40E+00	2.44E+00	3.93E+01	2.89E-04	9.60E-04	3.13E-03	4.33E-01	4.36E-06	1.02E-04	0.00E+00	2.61E-05
Transport Refrigeration Units	D	15	Transport Refrigeration	5.78E+02	1.65E+03	6.03E+02	7.06E-03	4.04E-02	4.96E-02	6.61E+00	8.38E-05	2.33E-03	0.00E+00	6.37E-04
Transport Refrigeration Units	D	25	Transport Refrigeration	2.01E+02	5.72E+02	3.55E+02	4.76E-03	1.61E-02	3.04E-02	3.90E+00	4.95E-05	1.35E-03	0.00E+00	4.29E-04
Transport Refrigeration Units	D	50	Transport Refrigeration	4.32E+03	1.74E+04	2.06E+04	2.82E-01	1.86E+00	1.94E+00	2.25E+02	2.91E-03	1.05E-01	0.00E+00	2.54E-02
A/C unit	D	120	Military Tactical Suppor	6.82E+01	5.61E+01	1.95E+02	2.86E-03	1.32E-02	2.03E-02	2.13E+00	2.50E-05	1.53E-03	0.00E+00	2.58E-04
A/C unit	D	250	Military Tactical Suppor	2.85E+01	2.34E+01	1.66E+02	1.09E-03	3.87E-03	1.42E-02	1.83E+00	2.06E-05	4.06E-04	0.00E+00	9.87E-05
A/C unit	D	500	Military Tactical Suppor	1.13E+01	9.26E+00	9.93E+01	5.89E-04	2.42E-03	7.68E-03	1.10E+00	1.08E-05	2.28E-04	0.00E+00	5.32E-05
Aircraft Support	D	120	Military Tactical Suppor	1.85E+01	1.53E+01	3.57E+01	5.23E-04	2.42E-03	3.72E-03	3.90E-01	4.57E-06	2.80E-04	0.00E+00	4.72E-05
Aircraft Support	D	175	Military Tactical Suppor	2.65E+01	2.18E+01	1.05E+02	1.03E-03	5.92E-03	9.69E-03	1.15E+00	1.29E-05	4.55E-04	0.00E+00	9.29E-05
Cart	D	120	Military Tactical Suppor	7.94E+00	6.54E+00	1.82E+01	2.67E-04	1.24E-03	1.90E-03	1.99E-01	2.34E-06	1.43E-04	0.00E+00	2.41E-05
Cart	D	175	Military Tactical Suppor	1.99E+00	1.63E+00	8.57E+00	8.44E-05	4.85E-04	7.95E-04	9.40E-02	1.06E-06	3.73E-05	0.00E+00	7.62E-06
Cart	D	250	Military Tactical Suppor	6.62E+00	5.45E+00	3.65E+01	2.41E-04	8.53E-04	3.12E-03	4.04E-01	4.54E-06	8.95E-05	0.00E+00	2.17E-05
Communications	D	50	Military Tactical Suppor	2.65E+00	2.18E+00	3.02E+00	8.66E-05	2.71E-04	3.02E-04	3.28E-02	4.24E-07	2.39E-05	0.00E+00	7.81E-06
Communications	D	120	Military Tactical Suppor	3.97E+00	3.27E+00	8.99E+00	1.32E-04	6.11E-04	9.39E-04	9.83E-02	1.15E-06	7.05E-05	0.00E+00	1.19E-05

Compressor (Military)	D	50	Military Tactical Suppor	2.65E+00	2.18E+00	3.70E+00	1.06E-04	3.33E-04	3.70E-04	4.01E-02	5.19E-07	2.92E-05	0.00E+00	9.57E-06
Compressor (Military)	D	120	Military Tactical Suppor	9.99E+01	8.23E+01	2.01E+02	2.94E-03	1.37E-02	2.10E-02	2.20E+00	2.58E-05	1.57E-03	0.00E+00	2.66E-04
Compressor (Military)	D	175	Military Tactical Suppor	2.65E+00	2.18E+00	1.25E+01	1.23E-04	7.06E-04	1.16E-03	1.37E-01	1.54E-06	5.43E-05	0.00E+00	1.11E-05
Compressor (Military)	D	250	Military Tactical Suppor	5.29E+00	4.36E+00	3.31E+01	2.18E-04	7.72E-04	2.83E-03	3.65E-01	4.11E-06	8.10E-05	0.00E+00	1.97E-05
Compressor (Military)	D	500	Military Tactical Suppor	1.85E+01	1.53E+01	1.94E+02	1.15E-03	4.72E-03	1.50E-02	2.14E+00	2.10E-05	4.45E-04	0.00E+00	1.04E-04
Crane	D	120	Military Tactical Suppor	1.06E+01	8.72E+00	3.13E+01	1.99E-04	1.97E-03	2.28E-03	3.44E-01	4.04E-06	1.30E-04	0.00E+00	1.80E-05
Crane	D	175	Military Tactical Suppor	1.99E+00	1.63E+00	7.88E+00	3.68E-05	4.30E-04	4.76E-04	8.66E-02	9.75E-07	1.94E-05	0.00E+00	3.32E-06
Crane	D	250	Military Tactical Suppor	1.32E+00	1.09E+00	7.93E+00	2.77E-05	1.48E-04	4.25E-04	8.77E-02	9.86E-07	1.11E-05	0.00E+00	2.50E-06
Deicer	D	120	Military Tactical Suppor	2.65E+00	2.18E+00	8.24E+00	1.21E-04	5.60E-04	8.60E-04	9.01E-02	1.06E-06	6.46E-05	0.00E+00	1.09E-05
Generator (Military)	D	50	Military Tactical Suppor	1.79E+01	1.47E+01	1.94E+01	5.55E-04	1.74E-03	1.94E-03	2.10E-01	2.72E-06	1.53E-04	0.00E+00	5.01E-05
Generator (Military)	D	120	Military Tactical Suppor	4.45E+02	3.66E+02	1.04E+03	1.53E-02	7.10E-02	1.09E-01	1.14E+01	1.34E-04	8.19E-03	0.00E+00	1.38E-03
Generator (Military)	D	175	Military Tactical Suppor	3.58E+02	2.95E+02	1.48E+03	1.46E-02	8.40E-02	1.38E-01	1.63E+01	1.83E-04	6.47E-03	0.00E+00	1.32E-03
Generator (Military)	D	250	Military Tactical Suppor	9.46E+01	7.79E+01	5.92E+02	3.90E-03	1.38E-02	5.06E-02	6.53E+00	7.35E-05	1.45E-03	0.00E+00	3.52E-04
Generator (Military)	D	500	Military Tactical Suppor	3.84E+01	3.16E+01	3.74E+02	2.22E-03	9.13E-03	2.89E-02	4.13E+00	4.06E-05	8.60E-04	0.00E+00	2.00E-04
Generator (Military)	D	750	Military Tactical Suppor	1.32E+00	8.46E-01	1.54E+01	9.45E-05	3.76E-04	1.23E-03	1.70E-01	1.71E-06	3.60E-05	0.00E+00	8.53E-06
Hydraulic unit	D	120	Military Tactical Suppor	4.43E+01	3.65E+01	1.19E+02	1.75E-03	8.10E-03	1.24E-02	1.30E+00	1.53E-05	9.34E-04	0.00E+00	1.58E-04
Lift (Military)	D	120	Military Tactical Suppor	1.32E+00	1.09E+00	3.56E+00	5.22E-05	2.42E-04	3.72E-04	3.89E-02	4.57E-07	2.79E-05	0.00E+00	4.71E-06
Light	D	50	Military Tactical Suppor	3.31E+00	2.72E+00	4.72E+00	1.35E-04	4.24E-04	4.72E-04	5.12E-02	6.62E-07	3.73E-05	0.00E+00	1.22E-05
Pressure Washers	D	175	Military Tactical Suppor	1.99E+00	1.63E+00	8.51E+00	8.39E-05	4.82E-04	7.89E-04	9.34E-02	1.05E-06	3.71E-05	0.00E+00	7.57E-06
Pump (Military)	D	50	Military Tactical Suppor	3.84E+01	3.16E+01	4.27E+01	1.22E-03	3.84E-03	4.27E-03	4.63E-01	5.99E-06	3.37E-04	0.00E+00	1.10E-04
Pump (Military)	D	120	Military Tactical Suppor	2.98E+01	2.45E+01	8.43E+01	1.24E-03	5.73E-03	8.80E-03	9.22E-01	1.08E-05	6.61E-04	0.00E+00	1.11E-04
Start Cart	D	120	Military Tactical Suppor	6.62E-01	5.45E-01	1.87E+00	2.75E-05	1.27E-04	1.96E-04	2.05E-02	2.40E-07	1.47E-05	0.00E+00	2.48E-06
Start Cart	D	500	Military Tactical Suppor	6.62E-01	5.45E-01	5.25E+00	3.11E-05	1.28E-04	4.06E-04	5.80E-02	5.69E-07	1.21E-05	0.00E+00	2.81E-06
Test Stand	D	120	Military Tactical Suppor	2.18E+01	1.80E+01	5.69E+01	8.34E-04	3.87E-03	5.94E-03	6.22E-01	7.29E-06	4.46E-04	0.00E+00	7.52E-05
Test Stand	D	175	Military Tactical Suppor	1.32E+00	1.09E+00	5.30E+00	5.22E-05	3.00E-04	4.92E-04	5.82E-02	6.55E-07	2.31E-05	0.00E+00	4.71E-06
Test Stand	D	250	Military Tactical Suppor	2.05E+01	1.69E+01	1.13E+02	7.47E-04	2.64E-03	9.68E-03	1.25E+00	1.41E-05	2.77E-04	0.00E+00	6.74E-05
Test Stand	D	500	Military Tactical Suppor	7.94E+00	6.54E+00	7.64E+01	4.53E-04	1.86E-03	5.90E-03	8.43E-01	8.28E-06	1.75E-04	0.00E+00	4.09E-05
Welder	D	50	Military Tactical Suppor	1.39E+01	1.14E+01	1.39E+01	3.98E-04	1.25E-03	1.39E-03	1.51E-01	1.95E-06	1.10E-04	0.00E+00	3.59E-05
Welder	D	120	Military Tactical Suppor	3.84E+01	3.16E+01	6.73E+01	9.87E-04	4.58E-03	7.03E-03	7.37E-01	8.64E-06	5.28E-04	0.00E+00	8.91E-05
Other tactical support equipment	D	50	Military Tactical Suppor	6.62E-01	5.45E-01	9.44E-01	2.71E-05	8.48E-05	9.45E-05	1.02E-02	1.32E-07	7.45E-06	0.00E+00	2.44E-06
Other tactical support equipment	D	120	Military Tactical Suppor	1.06E+01	8.72E+00	2.37E+01	3.47E-04	1.61E-03	2.47E-03	2.59E-01	3.04E-06	1.86E-04	0.00E+00	3.13E-05
Other tactical support equipment	D	175	Military Tactical Suppor	1.06E+01	8.72E+00	4.42E+01	4.35E-04	2.50E-03	4.10E-03	4.85E-01	5.46E-06	1.93E-04	0.00E+00	3.93E-05
Other tactical support equipment	D	250	Military Tactical Suppor	3.97E+00	3.27E+00	2.43E+01	1.60E-04	5.66E-04	2.07E-03	2.68E-01	3.01E-06	5.94E-05	0.00E+00	1.44E-05
Other tactical support equipment	D	500	Military Tactical Suppor	1.32E+00	1.09E+00	1.00E+01	5.94E-05	2.44E-04	7.74E-04	1.11E-01	1.09E-06	2.30E-05	0.00E+00	5.36E-06
Other tactical support equipment	D	750	Military Tactical Suppor	6.62E-01	5.45E-01	1.16E+01	7.12E-05	2.83E-04	9.24E-04	1.28E-01	1.29E-06	2.71E-05	0.00E+00	6.43E-06
Compressor (Dredging)	D	50	Dredging	1.83E+00	4.70E+00	6.58E+00	2.81E-04	7.95E-04	7.02E-04	7.06E-02	9.13E-07	6.80E-05	0.00E+00	2.54E-05
Compressor (Dredging)	D	120	Dredging	1.37E+01	3.52E+01	9.22E+01	1.70E-03	6.93E-03	1.06E-02	1.01E+00	1.18E-05	9.43E-04	0.00E+00	1.54E-04
Compressor (Dredging)	D	175	Dredging	2.75E+00	4.77E+00	2.11E+01	2.68E-04	1.32E-03	2.14E-03	2.31E-01	2.60E-06	1.20E-04	0.00E+00	2.42E-05
Compressor (Dredging)	D	250	Dredging	2.75E+00	4.77E+00	2.67E+01	2.30E-04	6.87E-04	2.50E-03	2.94E-01	3.31E-06	8.06E-05	0.00E+00	2.07E-05
Compressor (Dredging)	D	500	Dredging	2.75E+00	4.77E+00	4.24E+01	3.35E-04	1.14E-03	3.52E-03	4.67E-01	4.59E-06	1.19E-04	0.00E+00	3.02E-05
Compressor (Dredging)	D	1000	Dredging	5.49E+00	9.54E+00	2.10E+02	1.97E-03	6.77E-03	2.39E-02	2.32E+00	2.33E-05	6.91E-04	0.00E+00	1.77E-04
Crane (Dredging)	D	750	Dredging	1.83E+00	4.65E+00	7.56E+01	3.64E-04	1.48E-03	3.90E-03	8.36E-01	8.20E-06	1.23E-04	0.00E+00	3.29E-05
Deck/door engine	D	250	Dredging	3.66E+00	1.64E+00	1.05E+01	6.13E-05	2.35E-04	8.65E-04	1.16E-01	1.31E-06	2.31E-05	0.00E+00	5.53E-06
Dredger	D	175	Dredging	7.32E+00	2.02E+01	8.27E+01	1.07E-03	5.20E-03	8.46E-03	9.05E-01	1.02E-05	4.77E-04	0.00E+00	9.64E-05
Dredger	D	250	Dredging	1.37E+01	3.80E+01	2.16E+02	1.89E-03	5.59E-03	2.04E-02	2.38E+00	2.67E-05	6.58E-04	0.00E+00	1.71E-04
Dredger	D	750	Dredging	5.49E+00	1.52E+01	2.41E+02	1.97E-03	6.49E-03	2.07E-02	2.66E+00	2.61E-05	6.94E-04	0.00E+00	1.77E-04
Dredger	D	9999	Dredging	5.49E+00	1.52E+01	5.27E+02	5.08E-03	1.70E-02	6.02E-02	5.81E+00	5.70E-05	1.75E-03	0.00E+00	4.59E-04
Hoist/swing/winch	D	50	Dredging	9.15E-01	2.53E+00	2.41E+00	1.05E-04	2.96E-04	2.59E-04	2.59E-02	3.34E-07	2.53E-05	0.00E+00	9.48E-06
Hoist/swing/winch	D	120	Dredging	8.24E+00	2.28E+01	6.94E+01	1.30E-03	5.25E-03	7.98E-03	7.57E-01	8.88E-06	7.20E-04	0.00E+00	1.17E-04
Hoist/swing/winch	D	175	Dredging	1.19E+01	3.29E+01	1.28E+02	1.65E-03	8.02E-03	1.31E-02	1.40E+00	1.57E-05	7.36E-04	0.00E+00	1.49E-04
Hoist/swing/winch	D	250	Dredging	2.29E+01	6.33E+01	3.90E+02	3.43E-03	1.01E-02	3.69E-02	4.30E+00	4.84E-05	1.19E-03	0.00E+00	3.09E-04
Hoist/swing/winch	D	500	Dredging	2.38E+01	6.58E+01	6.44E+02	5.20E-03	1.74E-02	5.37E-02	7.10E+00	6.97E-05	1.82E-03	0.00E+00	4.69E-04
Hoist/swing/winch	D	750	Dredging	1.01E+01	2.78E+01	5.43E+02	4.43E-03	1.46E-02	4.67E-02	5.99E+00	5.88E-05	1.57E-03	0.00E+00	4.00E-04
Hoist/swing/winch	D	9999	Dredging	4.58E+00	1.27E+01	4.65E+02	4.49E-03	1.50E-02	5.32E-02	5.12E+00	5.03E-05	1.55E-03	0.00E+00	4.05E-04
Pump (Dredging)	D	120	Dredging	3.66E+00	3.14E+00	1.35E+01	2.10E-04	9.38E-04	1.44E-03	1.47E-01	1.73E-06	1.13E-04	0.00E+00	1.89E-05
Pump (Dredging)	D	175	Dredging	9.15E-01	1.16E+00	7.36E+00	7.75E-05	4.27E-04	7.00E-04	8.08E-02	9.09E-07	3.45E-05	0.00E+00	7.00E-06
Pump (Dredging)	D	250	Dredging	8.24E+00	1.05E+01	1.10E+02	7.79E-04	2.64E-03	9.62E-03	1.21E+00	1.36E-05	2.87E-04	0.00E+00	7.03E-05

Pump (Dredging)	D	500	Dredging	1.37E+01	1.74E+01	2.82E+02	1.81E-03	7.17E-03	2.22E-02	3.12E+00	3.06E-05	6.88E-04	0.00E+00	1.63E-04
Pump (Dredging)	D	750	Dredging	7.32E+00	6.29E+00	1.49E+02	9.82E-04	3.79E-03	1.21E-02	1.65E+00	1.62E-05	3.70E-04	0.00E+00	8.86E-05
Pump (Dredging)	D	9999	Dredging	1.46E+01	1.86E+01	2.12E+03	1.79E-02	6.43E-02	2.29E-01	2.34E+01	2.29E-04	6.37E-03	0.00E+00	1.61E-03
Generator (Dredging)	D	50	Dredging	1.83E+00	5.83E+00	8.32E+00	3.73E-04	1.05E-03	9.00E-04	8.91E-02	1.15E-06	8.94E-05	0.00E+00	3.36E-05
Generator (Dredging)	D	120	Dredging	1.46E+01	4.66E+01	1.88E+02	3.62E-03	1.44E-02	2.18E-02	2.05E+00	2.41E-05	2.00E-03	0.00E+00	3.26E-04
Generator (Dredging)	D	175	Dredging	9.15E-01	2.91E+00	1.59E+01	2.11E-04	1.01E-03	1.64E-03	1.74E-01	1.96E-06	9.38E-05	0.00E+00	1.91E-05
Generator (Dredging)	D	250	Dredging	1.46E+01	4.66E+01	4.63E+02	4.20E-03	1.21E-02	4.40E-02	5.10E+00	5.74E-05	1.44E-03	0.00E+00	3.79E-04
Generator (Dredging)	D	500	Dredging	2.56E+01	8.16E+01	1.38E+03	1.15E-02	3.73E-02	1.15E-01	1.52E+01	1.49E-04	3.96E-03	0.00E+00	1.04E-03
Generator (Dredging)	D	750	Dredging	9.15E+00	2.91E+01	8.17E+02	6.92E-03	2.22E-02	7.06E-02	9.01E+00	8.84E-05	2.39E-03	0.00E+00	6.24E-04
Generator (Dredging)	D	9999	Dredging	1.46E+01	4.66E+01	2.86E+03	2.83E-02	9.31E-02	3.30E-01	3.15E+01	3.09E-04	9.69E-03	0.00E+00	2.55E-03
Other (Dredging)	D	120	Dredging	2.75E+00	7.59E+00	2.25E+01	4.21E-04	1.70E-03	2.58E-03	2.45E-01	2.87E-06	2.33E-04	0.00E+00	3.80E-05
Other (Dredging)	D	175	Dredging	9.15E-01	2.53E+00	1.29E+01	1.67E-04	8.12E-04	1.32E-03	1.41E-01	1.59E-06	7.45E-05	0.00E+00	1.51E-05
Other (Dredging)	D	250	Dredging	1.83E+00	5.06E+00	3.20E+01	2.81E-04	8.29E-04	3.02E-03	3.52E-01	3.97E-06	9.77E-05	0.00E+00	2.53E-05
Other (Dredging)	D	500	Dredging	3.66E+00	1.01E+01	1.13E+02	9.13E-04	3.05E-03	9.43E-03	1.25E+00	1.22E-05	3.20E-04	0.00E+00	8.24E-05
Misc Portable Equipment	D	120	Other Portable Equipme	1.78E+00	1.84E+00	5.78E+00	9.42E-05	4.10E-04	6.29E-04	6.32E-02	7.41E-07	5.12E-05	0.00E+00	8.50E-06
Misc Portable Equipment	D	175	Other Portable Equipme	4.38E-01	4.51E-01	1.95E+00	2.15E-05	1.15E-04	1.89E-04	2.14E-02	2.41E-07	9.60E-06	0.00E+00	1.94E-06
Misc Portable Equipment	D	250	Other Portable Equipme	9.39E-02	9.67E-02	6.95E-01	5.19E-06	1.70E-05	6.20E-05	7.67E-03	8.63E-08	1.90E-06	0.00E+00	4.68E-07
Misc Portable Equipment	D	500	Other Portable Equipme	3.44E-01	3.55E-01	4.76E+00	3.21E-05	1.23E-04	3.80E-04	5.25E-02	5.15E-07	1.21E-05	0.00E+00	2.90E-06
Misc Portable Equipment	D	750	Other Portable Equipme	1.57E-01	1.61E-01	3.07E+00	2.13E-05	7.96E-05	2.53E-04	3.39E-02	3.41E-07	7.93E-06	0.00E+00	1.92E-06
Misc Portable Equipment	D	1000	Other Portable Equipme	6.26E-02	6.45E-02	1.64E+00	1.40E-05	5.07E-05	1.79E-04	1.81E-02	1.82E-07	5.03E-06	0.00E+00	1.26E-06
Generator (Entertainment)	D	50	Entertainment Equipme	3.17E-01	2.28E-01	4.59E-01	1.38E-05	4.25E-05	4.62E-05	4.97E-03	6.43E-08	3.72E-06	0.00E+00	1.24E-06
Generator (Entertainment)	D	120	Entertainment Equipme	7.77E+00	5.59E+00	2.28E+01	3.41E-04	1.56E-03	2.40E-03	2.49E-01	2.92E-06	1.83E-04	0.00E+00	3.08E-05
Generator (Entertainment)	D	175	Entertainment Equipme	6.42E+00	4.62E+00	3.14E+01	3.18E-04	1.80E-03	2.94E-03	3.45E-01	3.88E-06	1.41E-04	0.00E+00	2.87E-05
Generator (Entertainment)	D	250	Entertainment Equipme	9.91E+00	7.13E+00	6.38E+01	4.32E-04	1.50E-03	5.50E-03	7.04E-01	7.92E-06	1.60E-04	0.00E+00	3.90E-05
Generator (Entertainment)	D	500	Entertainment Equipme	1.54E+01	1.11E+01	1.38E+02	8.46E-04	3.43E-03	1.08E-02	1.53E+00	1.50E-05	3.25E-04	0.00E+00	7.63E-05
Generator (Entertainment)	D	750	Entertainment Equipme	2.70E+00	1.94E+00	4.76E+01	3.00E-04	1.18E-03	3.82E-03	5.26E-01	5.29E-06	1.14E-04	0.00E+00	2.71E-05
Generator (Entertainment)	D	9999	Entertainment Equipme	3.96E-01	2.85E-01	1.25E+01	1.03E-04	3.69E-04	1.33E-03	1.38E-01	1.38E-06	3.68E-05	0.00E+00	9.25E-06
Compressor (Entertainment)	D	120	Entertainment Equipme	7.93E-02	1.38E-01	2.20E-01	4.06E-06	1.65E-05	2.52E-05	2.40E-03	2.81E-08	2.25E-06	0.00E+00	3.67E-07
Compressor (Railyard)	D	120	Railyard Operations	1.59E-01	2.75E-01	4.09E-01	7.57E-06	3.08E-05	4.69E-05	4.47E-03	5.24E-08	4.18E-06	0.00E+00	6.83E-07
Crane (Rail-CHE)	D	120	Railyard Operations	7.93E-02	1.38E-01	3.40E-01	6.28E-06	2.55E-05	3.89E-05	3.71E-03	4.35E-08	3.47E-06	0.00E+00	5.66E-07
Crane (Rail-CHE)	D	175	Railyard Operations	2.38E-01	1.71E-01	5.34E-01	5.39E-06	3.05E-05	4.99E-05	5.85E-03	6.59E-08	2.39E-06	0.00E+00	4.86E-07
Materials Handling (Rail-CHE)	D	120	Railyard Operations	7.93E-02	1.38E-01	3.73E-01	6.89E-06	2.80E-05	4.27E-05	4.07E-03	4.58E-08	3.81E-06	0.00E+00	6.22E-07
Generator (Railyard)	D	175	Railyard Operations	7.93E-02	5.70E-02	3.61E-01	3.65E-06	2.07E-05	3.38E-05	3.97E-03	4.46E-08	1.62E-06	0.00E+00	3.30E-07
Generator (Railyard)	D	9999	Railyard Operations	7.93E-02	5.70E-02	2.27E+00	1.87E-05	6.72E-05	2.42E-04	2.50E-02	2.52E-07	6.69E-06	0.00E+00	1.68E-06
Vessels w/Outboard Engines	G2	2	Pleasure Craft	3.36E+02	3.54E+01	2.47E+00	2.25E-03	2.86E-03	9.78E-06	1.07E-02	3.06E-07	1.77E-04	7.90E-06	1.40E-04
Vessels w/Outboard Engines	G2	15	Pleasure Craft	1.86E+04	1.96E+03	3.89E+02	3.18E-01	4.86E-01	1.04E-02	1.78E+00	5.08E-05	2.95E-02	2.17E-03	1.98E-02
Vessels w/Outboard Engines	G2	25	Pleasure Craft	5.06E+03	5.33E+02	3.05E+02	1.91E-01	3.86E-01	1.22E-02	1.61E+00	4.60E-05	2.67E-02	1.28E-03	1.18E-02
Vessels w/Outboard Engines	G2	50	Pleasure Craft	4.94E+03	5.20E+02	7.50E+02	2.98E-01	5.00E-01	3.34E-02	5.32E+00	8.31E-05	4.82E-02	2.14E-03	1.85E-02
Vessels w/Outboard Engines	G2	120	Pleasure Craft	4.34E+03	4.57E+02	1.38E+03	5.14E-01	9.66E-01	6.19E-02	9.87E+00	1.56E-04	9.05E-02	2.82E-03	3.19E-02
Vessels w/Outboard Engines	G2	175	Pleasure Craft	2.01E+03	2.11E+02	1.16E+03	4.26E-01	9.25E-01	4.89E-02	8.14E+00	1.32E-04	7.67E-02	1.70E-03	2.65E-02
Vessels w/Outboard Engines	G2	250	Pleasure Craft	5.76E+02	6.06E+01	4.28E+02	1.56E-01	2.98E-01	2.70E-02	3.07E+00	5.13E-05	2.98E-02	6.88E-04	9.72E-03
Vessels w/Outboard Engines	G2	500	Pleasure Craft	1.16E+02	1.22E+01	1.25E+02	5.09E-02	9.29E-02	8.60E-04	8.66E-01	1.45E-05	8.40E-03	5.29E-05	3.16E-03
Sailboat Auxiliary Outboard Engin	G2	15	Pleasure Craft	2.10E+02	4.61E+00	9.45E-01	7.30E-04	1.12E-03	2.82E-05	4.58E-03	1.31E-07	7.57E-05	5.50E-06	4.54E-05
Sailboat Auxiliary Outboard Engin	G2	25	Pleasure Craft	1.13E+02	2.48E+00	1.11E+00	6.51E-04	1.33E-03	4.60E-05	6.15E-03	1.75E-07	1.02E-04	5.33E-06	4.05E-05
Sailboat Auxiliary Outboard Engin	G2	50	Pleasure Craft	1.05E+02	2.30E+00	2.85E+00	1.04E-03	1.75E-03	1.36E-04	2.08E-02	3.25E-07	1.89E-04	9.08E-06	6.44E-05
Personal Water Craft	G2	9999	Pleasure Craft	2.93E+04	1.60E+03	6.13E+03	1.32E+00	2.32E+00	2.79E-01	5.05E+01	8.21E-04	4.63E-01	1.13E-02	8.21E-02
Vessels w/Inboard Engines	G4	250	Pleasure Craft	1.66E+04	3.39E+03	1.87E+04	7.10E-01	2.20E+01	9.05E-01	1.43E+02	1.65E-03	1.37E-02	2.95E-02	4.04E-02
Vessels w/Outboard Engines	G4	50	Pleasure Craft	3.02E+03	3.19E+02	4.26E+02	2.54E-02	6.71E-01	1.98E-02	2.96E+00	3.41E-05	2.83E-04	1.31E-03	1.44E-03
Vessels w/Sterndrive Engines	G4	250	Pleasure Craft	4.09E+04	6.55E+03	2.68E+04	1.01E+00	3.14E+01	1.27E+00	2.05E+02	2.37E-03	1.96E-02	4.81E-02	5.72E-02
Sailboat Auxiliary Inboard Engine	G4	15	Pleasure Craft	5.60E+02	1.23E+01	5.04E+00	3.02E-04	8.12E-03	2.35E-04	3.47E-02	5.80E-07	3.32E-06	2.70E-05	1.71E-05
Vessels w/Inboard Jet Engines	G4	500	Pleasure Craft	4.73E+03	7.57E+02	4.98E+03	1.90E-01	5.85E+00	2.42E-01	3.81E+01	4.39E-04	3.64E-03	7.28E-03	1.08E-02
Vessels w/Inboard Engines	D	250	Pleasure Craft	1.78E+03	3.63E+02	1.81E+03	1.07E-01	1.60E-01	3.65E-01	1.94E+01	2.18E-04	9.32E-03	0.00E+00	9.63E-03
Sailboat Auxiliary Inboard Engine	D	50	Pleasure Craft	1.14E+03	2.50E+01	1.38E+01	8.15E-04	1.22E-03	2.78E-03	1.48E-01	1.91E-06	7.00E-05	0.00E+00	7.35E-05

Table F.5-10 Offroad 2007-Emissions Factor Calculations (16 Pages)

Equipment Type	Fuel	HP vs. Equip Class	Equip Class hp-hrs/day	ROG Exhaust lbs/Hp-Hr	CO Exhaust lbs/Hp-Hr	NOX Exhaust lbs/Hp-Hr	CO2 Exhaust lbs/Hp-Hr	SO2 Exhaust lbs/Hp-Hr	PM Exhaust lbs/Hp-Hr	N2O Exhaust lbs/Hp-Hr	CH4 Exhaust lbs/Hp-Hr	Equip Class Fuel Use gal/hr
Off-Road Motorcycles Inactive	G2	15	4.44E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G2	25	6.36E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G2	50	1.04E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G2	120	1.19E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowmobiles Inactive	G2	25	1.48E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowmobiles Inactive	G2	50	1.40E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowmobiles Inactive	G2	120	6.11E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G2	15	5.86E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G2	25	6.36E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G2	50	1.67E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G4	15	8.65E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G4	25	2.33E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G4	50	4.85E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G4	15	4.78E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G4	25	1.11E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G4	50	1.00E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Active	G2	15	1.11E+05	5.09E-03	7.95E-03	1.51E-06	1.69E-02	1.37E-05	6.17E-05	5.71E-06	3.16E-04	3.79E-02
Off-Road Motorcycles Active	G2	25	1.59E+05	3.05E-03	4.77E-03	9.06E-07	1.01E-02	1.53E-05	3.70E-05	3.42E-06	1.90E-04	3.79E-02
Off-Road Motorcycles Active	G2	50	2.59E+06	1.53E-03	2.39E-03	4.53E-07	5.07E-03	1.21E-05	1.85E-05	1.71E-06	9.49E-05	3.79E-02
Off-Road Motorcycles Active	G2	120	2.97E+06	6.36E-04	9.94E-04	1.89E-07	2.11E-03	7.45E-06	7.72E-06	7.13E-07	3.95E-05	3.79E-02
Snowmobiles Active	G2	25	4.27E+01	5.82E-02	1.70E-01	1.89E-03	2.58E-01	4.49E-06	1.78E-03	2.00E-04	3.62E-03	9.67E-01
Snowmobiles Active	G2	50	4.02E+02	5.53E-02	1.61E-01	1.80E-03	2.45E-01	4.26E-06	1.69E-03	1.41E-04	3.44E-03	1.84E+00
Snowmobiles Active	G2	120	1.76E+03	3.53E-02	1.06E-01	1.38E-03	1.74E-01	3.04E-06	1.16E-03	8.18E-05	2.19E-03	2.95E+00
All Terrain Vehicles (ATVs) Active	G2	15	1.93E+05	5.09E-03	7.95E-03	1.51E-06	1.69E-02	1.68E-05	6.17E-05	5.71E-06	3.16E-04	3.79E-02
All Terrain Vehicles (ATVs) Active	G2	25	2.09E+05	3.05E-03	4.77E-03	9.06E-07	1.01E-02	1.38E-05	3.70E-05	3.42E-06	1.90E-04	3.79E-02
All Terrain Vehicles (ATVs) Active	G2	50	5.51E+05	1.53E-03	2.39E-03	4.53E-07	5.07E-03	9.07E-06	1.85E-05	1.71E-06	9.49E-05	3.79E-02
Golf Carts	G2	15	0.00E+00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Specialty Vehicles Carts	G2	15	1.90E+04	1.77E-03	1.34E-01	1.31E-03	2.56E-01	1.06E-05	9.63E-05	2.11E-04	1.10E-04	3.68E-01
Tampers/Rammers	G2	15	2.82E+03	1.69E-03	7.26E-02	1.27E-03	1.39E-01	5.72E-06	1.16E-03	2.07E-04	1.05E-04	2.02E-01
Plate Compactors	G2	15	2.74E+02	1.69E-03	7.26E-02	1.27E-03	1.39E-01	5.72E-06	1.16E-03	2.07E-04	1.05E-04	2.02E-01
Other General Industrial Equipmen	G2	15	1.14E+02	2.36E-03	1.43E-01	1.73E-03	2.73E-01	1.12E-05	1.27E-04	2.44E-04	1.47E-04	3.93E-01
Lawn Mowers	G2	15	6.20E+04	1.71E-03	3.06E-02	4.42E-04	9.09E-02	3.74E-06	2.87E-04	1.18E-04	1.06E-04	1.13E-01
Lawn Mowers	G2	15	2.37E+04	4.01E-03	4.74E-02	4.92E-04	9.09E-02	3.74E-06	3.09E-04	1.19E-04	2.49E-04	1.40E-01
Chainsaws	G2	2	1.87E+04	4.99E-02	9.02E-02	7.63E-04	2.44E-01	1.00E-05	1.42E-04	4.04E-04	3.10E-03	5.96E-02
Chainsaws	G2	2	2.68E+03	2.80E-02	1.14E-01	8.06E-04	2.44E-01	1.00E-05	4.92E-04	4.13E-04	1.74E-03	5.49E-02
Chainsaws	G2	15	9.89E+04	1.61E-02	2.91E-02	2.46E-04	7.86E-02	3.24E-06	4.57E-05	8.63E-05	9.99E-04	1.44E-01
Chainsaws	G2	15	1.42E+04	8.21E-03	3.45E-02	2.56E-04	7.86E-02	3.24E-06	1.75E-04	8.72E-05	5.10E-04	1.28E-01
Chainsaws Preempt	G2	15	1.23E+05	1.61E-02	2.91E-02	2.46E-04	7.86E-02	3.24E-06	4.57E-05	8.63E-05	9.99E-04	1.44E-01
Chainsaws Preempt	G2	15	1.76E+04	1.10E-02	4.12E-02	2.12E-04	7.86E-02	3.24E-06	9.84E-05	7.92E-05	6.85E-04	1.44E-01
Trimmers/Edgers/Brush Cutters	G2	2	2.56E+04	2.39E-02	7.88E-02	6.67E-04	2.13E-01	8.77E-06	1.24E-04	3.76E-04	1.49E-03	4.44E-02
Trimmers/Edgers/Brush Cutters	G2	2	3.80E+04	1.91E-02	7.88E-02	6.82E-04	2.13E-01	8.77E-06	1.24E-04	3.80E-04	1.19E-03	4.25E-02
Leaf Blowers/Vacuums	G2	2	6.19E+04	3.68E-02	8.76E-02	7.41E-04	2.37E-01	9.75E-06	1.38E-04	3.98E-04	2.29E-03	5.33E-02
Leaf Blowers/Vacuums	G2	2	2.93E+03	2.71E-02	1.11E-01	7.82E-04	2.37E-01	9.75E-06	4.78E-04	4.06E-04	1.69E-03	5.33E-02
Shredders	G2	15	1.62E+03	3.29E-03	1.58E-01	2.48E-03	3.03E-01	1.25E-05	2.54E-03	2.96E-04	2.04E-04	4.39E-01
Shredders	G2	15	2.88E+02	1.38E-02	1.77E-01	1.93E-03	3.03E-01	1.25E-05	2.54E-03	2.54E-04	8.59E-04	4.93E-01

Commercial Turf Equipment	G2	15	5.07E+03	2.48E-03	1.49E-01	1.82E-03	2.84E-01	1.17E-05	1.32E-04	2.51E-04	1.54E-04	4.10E-01
Commercial Turf Equipment	G2	25	4.17E+03	3.13E-03	2.00E-01	2.33E-03	3.60E-01	1.48E-05	1.68E-04	2.25E-04	1.95E-04	8.88E-01
Other Lawn & Garden Equipment	G2	2	2.45E+01	2.74E-02	1.02E-01	8.59E-04	2.75E-01	1.13E-05	1.60E-04	4.31E-04	1.70E-03	5.58E-02
Other Lawn & Garden Equipment	G2	2	3.53E+01	3.10E-02	1.28E-01	9.07E-04	2.75E-01	1.13E-05	5.54E-04	4.40E-04	1.93E-03	6.16E-02
Other Lawn & Garden Equipment	G2	15	7.99E+01	1.83E-02	6.77E-02	5.73E-04	1.83E-01	7.54E-06	1.07E-04	1.35E-04	1.14E-03	2.79E-01
Other Lawn & Garden Equipment	G2	15	1.15E+02	1.88E-02	8.04E-02	5.95E-04	1.83E-01	7.54E-06	4.07E-04	1.37E-04	1.17E-03	2.96E-01
Generator Sets	G2	2	1.11E+02	1.42E-02	1.31E-01	2.37E-03	3.22E-01	1.33E-05	1.24E-03	7.27E-04	8.81E-04	6.02E-02
Generator Sets	G2	2	5.84E+01	1.85E-02	1.50E-01	2.35E-03	3.22E-01	1.33E-05	1.32E-03	7.20E-04	1.15E-03	6.52E-02
Generator Sets	G2	15	8.36E+00	4.37E-03	2.07E-01	2.85E-03	3.86E-01	1.59E-05	1.81E-04	3.17E-04	2.72E-04	5.65E-01
Generator Sets	G2	15	4.28E+00	1.14E-02	2.22E-01	2.75E-03	3.86E-01	1.59E-05	4.37E-04	3.08E-04	7.06E-04	6.05E-01
Pumps	G2	2	8.44E+02	7.68E-03	9.86E-02	2.28E-03	3.27E-01	1.35E-05	1.15E-03	7.16E-04	4.77E-04	5.29E-02
Pumps	G2	2	4.46E+02	1.23E-02	1.22E-01	2.41E-03	3.27E-01	1.35E-05	1.22E-03	7.35E-04	7.63E-04	5.86E-02
Pumps	G2	15	1.71E+03	4.41E-03	1.83E-01	3.25E-03	3.48E-01	1.43E-05	2.92E-03	3.42E-04	2.74E-04	5.08E-01
Pumps	G2	15	9.01E+02	5.84E-03	1.88E-01	3.15E-03	3.48E-01	1.43E-05	2.92E-03	3.35E-04	3.63E-04	5.18E-01
Pumps	G2	25	3.44E+01	5.83E-03	2.47E-01	3.84E-03	4.44E-01	1.83E-05	3.72E-03	2.94E-04	3.62E-04	1.11E+00
Pumps	G2	25	1.80E+01	5.93E-03	2.49E-01	3.76E-03	4.44E-01	1.83E-05	3.72E-03	2.91E-04	3.69E-04	1.11E+00
Off-Road Motorcycles Active	G4	15	2.16E+05	1.79E-04	4.09E-03	7.80E-05	1.69E-02	1.37E-05	8.82E-06	4.54E-05	1.01E-05	1.87E-02
Off-Road Motorcycles Active	G4	25	5.81E+05	1.07E-04	2.45E-03	4.68E-05	1.01E-02	1.53E-05	5.29E-06	2.73E-05	6.03E-06	1.87E-02
Off-Road Motorcycles Active	G4	50	1.21E+06	5.37E-05	1.23E-03	2.34E-05	5.07E-03	1.21E-05	2.65E-06	1.36E-05	3.02E-06	1.87E-02
All Terrain Vehicles (ATVs) Active	G4	15	1.57E+05	1.88E-04	4.19E-03	1.02E-04	1.69E-02	1.68E-05	8.82E-06	5.24E-05	1.06E-05	1.88E-02
All Terrain Vehicles (ATVs) Active	G4	25	3.65E+06	1.13E-04	2.52E-03	6.11E-05	1.01E-02	1.38E-05	5.29E-06	3.14E-05	6.33E-06	1.88E-02
All Terrain Vehicles (ATVs) Active	G4	50	3.30E+05	5.63E-05	1.26E-03	3.06E-05	5.07E-03	9.07E-06	2.65E-06	1.57E-05	3.17E-06	1.88E-02
Minibikes	G4	5	2.93E+03	5.82E-02	3.74E-01	1.42E-03	5.07E-02	1.62E-05	1.56E-03	3.58E-04	3.31E-03	2.23E-01
Golf Carts	G4	15	0.00E+00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Specialty Vehicles Carts	G4	5	1.96E+02	7.93E-03	2.80E-01	1.91E-03	5.49E-01	1.90E-05	1.30E-03	4.18E-04	4.51E-04	2.64E-01
Specialty Vehicles Carts	G4	15	7.97E+03	1.93E-03	1.51E-01	1.37E-03	2.56E-01	7.31E-06	9.63E-05	2.11E-04	1.10E-04	3.89E-01
Specialty Vehicles Carts	G4	25	7.30E+03	3.23E-03	2.60E-01	2.15E-03	4.17E-01	1.06E-05	1.57E-04	2.10E-04	1.83E-04	1.09E+00
Asphalt Pavers	G4	15	1.34E+02	5.82E-03	2.21E-01	4.19E-03	3.75E-01	1.07E-05	3.14E-03	3.82E-04	3.30E-04	5.78E-01
Asphalt Pavers	G4	25	3.81E+02	9.01E-03	3.44E-01	5.69E-03	5.50E-01	1.39E-05	4.61E-03	3.54E-04	5.11E-04	1.46E+00
Asphalt Pavers	G4	50	3.88E+02	3.14E-03	9.83E-02	4.44E-03	7.29E-01	8.87E-06	5.59E-05	2.09E-04	1.78E-04	2.32E+00
Asphalt Pavers	G4	120	5.12E+02	1.59E-03	3.00E-02	4.57E-03	5.73E-01	5.53E-06	4.44E-05	1.32E-04	9.02E-05	3.89E+00
Tampers/Rammers	G4	15	1.30E+02	4.90E-03	1.85E-01	3.43E-03	3.12E-01	8.91E-06	2.62E-03	3.43E-04	2.79E-04	4.83E-01
Plate Compactors	G4	5	1.57E+03	1.02E-02	1.55E-01	4.46E-03	4.17E-01	1.44E-05	1.36E-04	6.58E-04	5.79E-04	1.81E-01
Plate Compactors	G4	15	5.73E+03	4.28E-03	1.63E-01	3.07E-03	2.78E-01	7.92E-06	2.33E-03	3.23E-04	2.43E-04	4.28E-01
Rollers	G4	5	8.09E+01	1.29E-02	2.58E-01	5.65E-03	5.87E-01	2.03E-05	1.91E-04	7.46E-04	7.34E-04	2.70E-01
Rollers	G4	15	1.47E+03	5.41E-03	2.07E-01	3.90E-03	3.52E-01	1.00E-05	2.95E-03	3.67E-04	3.07E-04	5.43E-01
Rollers	G4	25	1.65E+03	7.23E-03	2.78E-01	4.56E-03	4.46E-01	1.13E-05	3.74E-03	3.15E-04	4.11E-04	1.18E+00
Rollers	G4	50	4.33E+02	4.80E-03	1.41E-01	5.79E-03	7.92E-01	9.63E-06	6.07E-05	2.45E-04	2.72E-04	2.67E+00
Rollers	G4	120	1.95E+03	2.64E-03	4.72E-02	6.33E-03	6.62E-01	6.39E-06	5.13E-05	1.63E-04	1.50E-04	4.64E+00
Paving Equipment	G4	5	2.08E+03	1.09E-02	1.69E-01	4.75E-03	4.47E-01	1.54E-05	1.46E-04	6.81E-04	6.17E-04	1.95E-01
Paving Equipment	G4	15	1.24E+04	5.72E-03	2.19E-01	4.11E-03	3.72E-01	1.06E-05	3.12E-03	3.77E-04	3.25E-04	5.74E-01
Paving Equipment	G4	25	4.60E+02	7.97E-03	3.07E-01	5.01E-03	4.92E-01	1.25E-05	4.12E-03	3.30E-04	4.53E-04	1.30E+00
Paving Equipment	G4	50	4.73E+02	1.71E-03	6.90E-02	2.82E-03	7.54E-01	9.17E-06	5.78E-05	1.61E-04	9.70E-05	2.25E+00
Paving Equipment	G4	120	2.93E+02	7.15E-04	1.67E-02	2.43E-03	5.54E-01	5.35E-06	4.29E-05	8.89E-05	4.06E-05	3.63E+00
Surfacing Equipment	G4	5	4.49E+02	1.15E-02	1.68E-01	5.04E-03	4.64E-01	1.60E-05	1.51E-04	7.03E-04	6.55E-04	2.00E-01
Surfacing Equipment	G4	15	1.01E+04	3.99E-03	1.46E-01	2.88E-03	2.47E-01	7.05E-06	2.07E-03	3.12E-04	2.26E-04	3.82E-01
Surfacing Equipment	G4	25	2.30E+02	6.01E-03	2.21E-01	3.79E-03	3.53E-01	8.94E-06	2.96E-03	2.85E-04	3.41E-04	9.36E-01
Signal Boards	G4	5	3.61E+00	1.65E-02	2.97E-01	7.23E-03	7.20E-01	2.48E-05	2.35E-04	8.51E-04	9.40E-04	3.24E-01

Signal Boards	G4	15	1.68E+02	5.85E-03	2.26E-01	4.22E-03	3.84E-01	1.09E-05	3.22E-03	3.83E-04	3.33E-04	5.91E-01
Trenchers	G4	15	2.38E+03	6.56E-03	2.45E-01	4.73E-03	4.17E-01	1.19E-05	3.49E-03	4.07E-04	3.72E-04	6.43E-01
Trenchers	G4	25	3.07E+03	8.73E-03	3.28E-01	5.51E-03	5.25E-01	1.33E-05	4.40E-03	3.48E-04	4.95E-04	1.39E+00
Trenchers	G4	50	2.55E+03	3.41E-03	1.00E-01	4.71E-03	6.84E-01	8.31E-06	5.24E-05	2.18E-04	1.94E-04	2.21E+00
Trenchers	G4	120	2.03E+03	2.03E-03	3.66E-02	5.73E-03	6.20E-01	5.99E-06	4.80E-05	1.53E-04	1.15E-04	4.26E+00
Bore/Drill Rigs	G4	15	1.94E+01	7.58E-03	2.95E-01	5.29E-03	4.99E-01	1.42E-05	4.18E-03	4.31E-04	4.30E-04	7.70E-01
Bore/Drill Rigs	G4	25	1.61E+02	8.57E-03	3.37E-01	5.28E-03	5.39E-01	1.36E-05	4.51E-03	3.39E-04	4.87E-04	1.43E+00
Bore/Drill Rigs	G4	50	3.28E+01	3.11E-03	9.10E-02	5.53E-03	8.73E-01	1.06E-05	6.69E-05	2.34E-04	1.77E-04	2.66E+00
Bore/Drill Rigs	G4	120	3.62E+02	2.30E-03	4.21E-02	8.71E-03	9.89E-01	9.56E-06	7.66E-05	1.88E-04	1.31E-04	6.62E+00
Bore/Drill Rigs	G4	175	1.31E+02	1.27E-03	3.02E-02	9.42E-03	9.45E-01	9.38E-06	7.52E-05	1.65E-04	7.20E-05	9.04E+00
Concrete/Industrial Saws	G4	5	1.25E+02	1.36E-02	2.44E-01	5.94E-03	5.91E-01	2.04E-05	1.93E-04	7.66E-04	7.72E-04	2.66E-01
Concrete/Industrial Saws	G4	15	4.01E+03	6.80E-03	2.60E-01	4.90E-03	4.43E-01	1.26E-05	3.71E-03	4.15E-04	3.86E-04	6.83E-01
Concrete/Industrial Saws	G4	25	2.09E+03	8.14E-03	3.13E-01	5.14E-03	5.02E-01	1.27E-05	4.21E-03	3.35E-04	4.63E-04	1.33E+00
Concrete/Industrial Saws	G4	50	6.98E+02	1.16E-03	7.80E-02	1.65E-03	9.43E-01	1.15E-05	7.22E-05	1.32E-04	6.55E-05	2.77E+00
Concrete/Industrial Saws	G4	120	9.60E+02	3.46E-04	1.55E-02	7.69E-04	7.33E-01	7.08E-06	5.67E-05	5.84E-05	1.96E-05	4.71E+00
Cement and Mortar Mixers	G4	5	1.60E+03	1.26E-02	2.37E-01	5.52E-03	5.59E-01	1.93E-05	1.82E-04	7.36E-04	7.17E-04	2.54E-01
Cement and Mortar Mixers	G4	15	8.13E+03	6.21E-03	1.94E-01	2.89E-03	2.98E-01	8.49E-06	2.45E-03	3.12E-04	3.53E-04	4.87E-01
Cement and Mortar Mixers	G4	25	5.71E+01	1.12E-02	3.73E-01	4.91E-03	5.59E-01	1.42E-05	4.59E-03	3.25E-04	6.35E-04	1.54E+00
Cranes	G4	50	1.45E+02	3.03E-03	8.90E-02	4.15E-03	6.01E-01	7.30E-06	4.60E-05	2.04E-04	1.72E-04	1.95E+00
Cranes	G4	120	6.94E+02	1.65E-03	2.96E-02	4.58E-03	4.95E-01	4.78E-06	3.83E-05	1.36E-04	9.33E-05	3.40E+00
Cranes	G4	175	4.05E+01	9.01E-04	1.99E-02	5.97E-03	5.57E-01	5.54E-06	4.44E-05	1.31E-04	5.11E-05	5.37E+00
Crushing/Proc. Equipment	G4	15	4.10E+01	7.37E-03	2.84E-01	5.32E-03	4.83E-01	1.38E-05	4.05E-03	4.33E-04	4.19E-04	7.44E-01
Crushing/Proc. Equipment	G4	25	4.48E+01	8.31E-03	3.21E-01	5.24E-03	5.15E-01	1.31E-05	4.32E-03	3.39E-04	4.72E-04	1.36E+00
Crushing/Proc. Equipment	G4	120	2.34E+02	3.20E-03	5.80E-02	1.05E-02	1.16E+00	1.12E-05	8.99E-05	2.09E-04	1.82E-04	7.86E+00
Rough Terrain Forklifts	G4	50	5.76E+01	5.16E-03	1.51E-01	7.07E-03	1.02E+00	1.24E-05	7.83E-05	2.71E-04	2.93E-04	3.32E+00
Rough Terrain Forklifts	G4	120	1.96E+03	2.53E-03	4.54E-02	7.05E-03	7.62E-01	7.36E-06	5.90E-05	1.71E-04	1.43E-04	5.24E+00
Rough Terrain Forklifts	G4	175	1.01E+02	1.37E-03	3.03E-02	9.08E-03	8.49E-01	8.43E-06	6.76E-05	1.64E-04	7.77E-05	8.18E+00
Rubber Tired Loaders	G4	50	1.78E+02	3.88E-03	1.17E-01	5.05E-03	7.46E-01	9.07E-06	5.71E-05	2.26E-04	2.20E-04	2.45E+00
Rubber Tired Loaders	G4	120	2.84E+03	1.88E-03	3.44E-02	4.91E-03	5.53E-01	5.34E-06	4.29E-05	1.40E-04	1.07E-04	3.82E+00
Tractors/Loaders/Backhoes	G4	120	2.56E+03	8.03E-04	2.49E-02	1.85E-03	4.30E-01	4.16E-06	3.33E-05	8.20E-05	4.53E-05	2.94E+00
Skid Steer Loaders	G4	15	8.90E+01	7.98E-03	3.01E-01	5.75E-03	5.13E-01	1.46E-05	4.30E-03	4.52E-04	4.53E-04	7.90E-01
Skid Steer Loaders	G4	25	9.92E+03	6.86E-03	2.60E-01	4.33E-03	4.17E-01	1.06E-05	3.50E-03	3.06E-04	3.90E-04	1.10E+00
Skid Steer Loaders	G4	50	2.95E+03	9.58E-04	5.96E-02	1.44E-03	6.41E-01	7.79E-06	4.91E-05	1.19E-04	5.44E-05	1.91E+00
Skid Steer Loaders	G4	120	4.23E+03	4.35E-04	1.67E-02	1.18E-03	6.60E-01	6.38E-06	5.11E-05	6.64E-05	2.47E-05	4.28E+00
Dumpers/Tenders	G4	5	1.32E+02	7.69E-03	1.13E-01	3.36E-03	3.11E-01	1.07E-05	1.01E-04	5.66E-04	4.37E-04	1.34E-01
Dumpers/Tenders	G4	15	8.46E+02	4.65E-03	1.49E-01	2.39E-03	2.33E-01	6.64E-06	1.93E-03	2.81E-04	2.64E-04	3.76E-01
Dumpers/Tenders	G4	25	2.61E+02	5.76E-03	1.94E-01	2.75E-03	2.95E-01	7.48E-06	2.44E-03	2.39E-04	3.27E-04	8.06E-01
Dumpers/Tenders	G4	120	7.65E+01	9.21E-04	1.68E-02	3.40E-03	3.85E-01	3.72E-06	2.98E-05	1.14E-04	5.23E-05	2.58E+00
Other Construction Equipment	G4	175	1.27E+03	2.56E-04	1.89E-02	8.99E-04	5.74E-01	5.70E-06	4.57E-05	5.07E-05	1.45E-05	5.48E+00
Aerial Lifts	G4	15	2.20E+01	5.81E-03	2.22E-01	4.19E-03	3.77E-01	1.08E-05	3.16E-03	3.81E-04	3.30E-04	5.82E-01
Aerial Lifts	G4	25	1.56E+03	5.50E-03	2.07E-01	3.47E-03	3.31E-01	8.39E-06	2.77E-03	2.72E-04	3.12E-04	8.77E-01
Aerial Lifts	G4	50	3.67E+03	9.23E-04	5.45E-02	1.40E-03	5.24E-01	6.37E-06	4.02E-05	1.15E-04	5.24E-05	1.59E+00
Aerial Lifts	G4	120	8.82E+03	3.69E-04	1.30E-02	1.05E-03	4.39E-01	4.24E-06	3.40E-05	6.06E-05	2.09E-05	2.86E+00
Forklifts	G4	25	8.79E+01	2.93E-03	1.65E-01	2.19E-03	2.61E-01	6.62E-06	1.46E-04	2.12E-04	1.65E-04	6.88E-01
Forklifts	G4	50	6.11E+04	1.26E-03	1.21E-01	2.52E-03	4.25E-01	5.16E-06	3.25E-05	1.60E-04	7.02E-05	1.61E+00
Forklifts	G4	120	5.15E+05	3.70E-04	2.45E-02	1.39E-03	2.99E-01	2.89E-06	2.31E-05	7.76E-05	2.05E-05	2.11E+00
Forklifts	G4	175	2.74E+04	3.53E-04	1.75E-02	1.74E-03	4.16E-01	4.13E-06	3.31E-05	7.34E-05	1.96E-05	4.03E+00
Sweepers/Scrubbers	G4	15	4.59E+02	3.72E-03	2.11E-01	2.59E-03	3.59E-01	1.02E-05	1.82E-04	2.95E-04	2.11E-04	5.47E-01

Sweepers/Scrubbers	G4	25	7.46E+02	5.08E-03	3.02E-01	3.74E-03	4.84E-01	1.23E-05	2.54E-04	2.83E-04	2.88E-04	1.27E+00
Sweepers/Scrubbers	G4	50	4.88E+03	1.24E-03	9.52E-02	2.43E-03	8.58E-01	1.04E-05	6.57E-05	1.61E-04	7.03E-05	2.62E+00
Sweepers/Scrubbers	G4	120	9.79E+03	3.76E-04	2.05E-02	2.04E-03	6.87E-01	6.64E-06	5.32E-05	9.80E-05	2.13E-05	4.48E+00
Sweepers/Scrubbers	G4	175	8.30E+01	3.57E-04	3.17E-02	2.91E-03	9.43E-01	9.37E-06	7.51E-05	9.93E-05	2.02E-05	9.02E+00
Other General Industrial Equipmen	G4	15	1.26E+03	2.97E-03	1.60E-01	2.06E-03	2.73E-01	7.77E-06	1.45E-04	2.62E-04	1.69E-04	4.17E-01
Other General Industrial Equipmen	G4	25	7.90E+02	4.03E-03	2.30E-01	3.00E-03	3.68E-01	9.33E-06	2.02E-04	2.52E-04	2.29E-04	9.65E-01
Other General Industrial Equipmen	G4	50	2.32E+03	1.01E-03	8.10E-02	1.98E-03	5.60E-01	6.80E-06	4.29E-05	1.43E-04	5.71E-05	1.79E+00
Other General Industrial Equipmen	G4	120	1.83E+03	4.48E-04	2.44E-02	2.09E-03	6.07E-01	5.86E-06	4.70E-05	9.80E-05	2.53E-05	4.02E+00
Other General Industrial Equipmen	G4	175	2.58E+02	4.43E-04	3.13E-02	3.08E-03	8.92E-01	8.86E-06	7.10E-05	1.01E-04	2.50E-05	8.55E+00
Other Material Handling Equipment	G4	50	1.77E+01	2.98E-03	1.11E-01	4.56E-03	7.51E-01	9.12E-06	5.75E-05	2.16E-04	1.69E-04	2.42E+00
Other Material Handling Equipment	G4	120	1.88E+03	1.02E-03	2.17E-02	3.19E-03	4.07E-01	3.93E-06	3.15E-05	1.16E-04	5.77E-05	2.77E+00
Lawn Mowers	G4	5	1.22E+05	5.59E-03	1.03E-01	1.39E-03	2.73E-01	9.42E-06	8.60E-04	3.53E-04	3.18E-04	1.18E-01
Lawn Mowers	G4	5	9.87E+04	5.40E-03	1.49E-01	1.50E-03	2.73E-01	9.42E-06	6.52E-04	3.54E-04	3.08E-04	1.37E-01
Tillers	G4	5	3.10E+03	5.01E-03	1.41E-01	1.23E-03	3.03E-01	1.05E-05	7.99E-04	3.29E-04	2.85E-04	1.41E-01
Tillers	G4	5	2.92E+03	6.52E-03	1.65E-01	1.71E-03	3.03E-01	1.05E-05	7.55E-04	3.81E-04	3.71E-04	1.52E-01
Trimmers/Edgers/Brush Cutters	G4	5	1.33E+04	1.58E-03	2.77E-02	6.93E-04	6.82E-02	2.35E-06	2.22E-05	2.44E-04	9.00E-05	3.05E-02
Trimmers/Edgers/Brush Cutters	G4	5	7.35E+03	2.01E-03	3.81E-02	5.89E-04	6.82E-02	2.35E-06	9.69E-05	2.23E-04	1.14E-04	3.51E-02
Leaf Blowers/Vacuums	G4	5	1.55E+03	1.94E-03	7.00E-02	4.68E-04	1.36E-01	4.71E-06	3.20E-04	1.97E-04	1.10E-04	6.57E-02
Leaf Blowers/Vacuums	G4	5	7.71E+01	2.79E-03	9.12E-02	6.54E-04	1.36E-01	4.71E-06	2.71E-04	2.30E-04	1.59E-04	7.52E-02
Rear Engine Riding Mowers	G4	15	2.39E+05	2.04E-03	1.27E-01	1.43E-03	2.16E-01	6.15E-06	1.00E-04	2.15E-04	1.16E-04	3.29E-01
Rear Engine Riding Mowers	G4	15	1.63E+04	2.22E-03	1.29E-01	1.45E-03	2.16E-01	6.15E-06	8.60E-05	2.14E-04	1.26E-04	3.32E-01
Rear Engine Riding Mowers	G4	25	1.82E+03	2.29E-03	1.53E-01	1.64E-03	2.45E-01	6.20E-06	1.14E-04	1.82E-04	1.30E-04	6.39E-01
Rear Engine Riding Mowers	G4	25	1.22E+02	2.56E-03	1.54E-01	1.53E-03	2.45E-01	6.20E-06	9.75E-05	1.74E-04	1.45E-04	6.43E-01
Front Mowers	G4	15	1.09E+04	3.25E-03	2.03E-01	2.28E-03	3.45E-01	9.83E-06	1.60E-04	2.76E-04	1.85E-04	5.25E-01
Front Mowers	G4	15	2.76E+04	3.54E-03	2.06E-01	2.31E-03	3.45E-01	9.83E-06	1.37E-04	2.75E-04	2.01E-04	5.29E-01
Front Mowers	G4	25	1.43E+04	2.54E-03	1.69E-01	1.81E-03	2.70E-01	6.85E-06	1.25E-04	1.92E-04	1.44E-04	7.06E-01
Front Mowers	G4	25	3.60E+04	2.83E-03	1.70E-01	1.69E-03	2.70E-01	6.85E-06	1.08E-04	1.84E-04	1.61E-04	7.11E-01
Shredders	G4	5	1.43E+03	1.41E-02	2.46E-01	6.16E-03	6.06E-01	2.09E-05	1.98E-04	7.81E-04	8.00E-04	2.71E-01
Shredders	G4	5	2.65E+02	1.26E-02	4.20E-01	3.94E-03	6.06E-01	2.09E-05	1.22E-03	6.16E-04	7.14E-04	3.41E-01
Lawn & Garden Tractors	G4	15	2.07E+04	3.29E-03	2.45E-01	2.33E-03	4.17E-01	1.19E-05	1.63E-04	2.79E-04	1.87E-04	6.33E-01
Lawn & Garden Tractors	G4	15	1.15E+04	3.79E-03	2.48E-01	2.57E-03	4.17E-01	1.19E-05	1.51E-04	2.92E-04	2.15E-04	6.38E-01
Lawn & Garden Tractors	G4	25	1.36E+04	3.11E-03	2.41E-01	2.10E-03	3.86E-01	9.79E-06	1.52E-04	2.08E-04	1.77E-04	1.01E+00
Lawn & Garden Tractors	G4	25	7.54E+03	3.62E-03	2.43E-01	2.21E-03	3.86E-01	9.79E-06	1.40E-04	2.12E-04	2.06E-04	1.01E+00
Lawn & Garden Tractors	G4	50	2.24E+02	1.18E-03	4.71E-02	2.26E-03	5.18E-01	6.30E-06	3.97E-05	1.46E-04	6.71E-05	1.55E+00
Wood Splitters	G4	5	2.32E+03	1.23E-02	2.71E-01	3.03E-03	6.53E-01	2.26E-05	1.92E-03	5.34E-04	6.99E-04	2.92E-01
Wood Splitters	G4	5	3.72E+02	1.11E-02	4.46E-01	2.91E-03	6.53E-01	2.26E-05	1.17E-03	5.09E-04	6.30E-04	3.62E-01
Chippers/Stump Grinders	G4	15	9.63E+02	8.88E-03	3.26E-01	6.36E-03	5.42E-01	1.54E-05	4.54E-03	4.74E-04	4.95E-04	8.45E-01
Chippers/Stump Grinders	G4	15	1.69E+01	8.69E-03	3.55E-01	4.29E-03	5.42E-01	1.54E-05	4.17E-03	3.86E-04	4.94E-04	8.80E-01
Chippers/Stump Grinders	G4	25	9.11E+03	9.20E-03	3.40E-01	5.77E-03	5.32E-01	1.35E-05	4.46E-03	3.54E-04	5.14E-04	1.43E+00
Chippers/Stump Grinders	G4	25	1.59E+02	8.26E-03	3.60E-01	3.82E-03	5.32E-01	1.35E-05	4.09E-03	2.86E-04	4.69E-04	1.46E+00
Commercial Turf Equipment	G4	15	4.56E+04	4.05E-03	2.06E-01	2.81E-03	3.47E-01	9.90E-06	1.94E-04	3.07E-04	2.28E-04	5.34E-01
Commercial Turf Equipment	G4	25	3.75E+04	4.09E-03	2.27E-01	3.04E-03	3.60E-01	9.12E-06	2.01E-04	2.52E-04	2.30E-04	9.48E-01
Commercial Turf Equipment	G4	50	1.95E+04	1.85E-03	9.56E-02	2.82E-03	4.84E-01	5.88E-06	3.70E-05	1.69E-04	1.05E-04	1.66E+00
Commercial Turf Equipment	G4	120	3.09E+02	1.82E-04	9.86E-03	1.06E-03	3.77E-01	3.64E-06	2.92E-05	6.93E-05	1.03E-05	2.44E+00
Other Lawn & Garden Equipment	G4	5	1.15E+03	7.23E-03	2.05E-01	1.76E-03	4.39E-01	1.52E-05	1.15E-03	3.99E-04	4.11E-04	2.04E-01
Other Lawn & Garden Equipment	G4	5	1.65E+03	8.78E-03	2.95E-01	2.09E-03	4.39E-01	1.52E-05	8.61E-04	4.26E-04	4.99E-04	2.42E-01
Other Lawn & Garden Equipment	G4	15	1.53E+03	2.34E-03	1.72E-01	1.66E-03	2.93E-01	8.35E-06	1.16E-04	2.33E-04	1.33E-04	4.45E-01
Other Lawn & Garden Equipment	G4	15	2.20E+03	3.10E-03	1.85E-01	1.88E-03	2.93E-01	8.35E-06	1.01E-04	2.47E-04	1.76E-04	4.62E-01

Other Lawn & Garden Equipment	G4	25	5.37E+01	3.03E-03	2.33E-01	2.06E-03	3.73E-01	9.46E-06	1.48E-04	2.06E-04	1.72E-04	9.73E-01
Other Lawn & Garden Equipment	G4	25	7.80E+01	3.97E-03	2.46E-01	2.16E-03	3.73E-01	9.46E-06	1.29E-04	2.10E-04	2.25E-04	1.00E+00
Other Lawn & Garden Equipment	G4	50	4.88E+00	1.78E-03	6.32E-02	3.49E-03	7.21E-01	8.77E-06	5.52E-05	1.83E-04	1.01E-04	2.14E+00
Other Lawn & Garden Equipment	G4	120	2.81E+01	1.27E-03	2.78E-02	5.66E-03	8.42E-01	8.13E-06	6.52E-05	1.56E-04	7.20E-05	5.54E+00
2-Wheel Tractors	G4	5	9.93E+01	1.13E-02	1.80E-01	4.95E-03	4.70E-01	1.62E-05	1.53E-04	6.96E-04	6.43E-04	2.06E-01
2-Wheel Tractors	G4	15	7.19E+02	4.83E-03	1.84E-01	3.48E-03	3.13E-01	8.93E-06	2.62E-03	3.46E-04	2.75E-04	4.82E-01
2-Wheel Tractors	G4	25	3.22E+01	6.13E-03	2.34E-01	3.87E-03	3.76E-01	9.52E-06	3.15E-03	2.88E-04	3.48E-04	9.94E-01
Agricultural Tractors	G4	120	3.20E+03	2.72E-03	4.87E-02	6.84E-03	7.23E-01	6.99E-06	5.60E-05	1.69E-04	1.54E-04	5.04E+00
Agricultural Tractors	G4	175	6.39E+02	1.28E-03	2.76E-02	8.11E-03	7.35E-01	7.31E-06	5.86E-05	1.55E-04	7.23E-05	7.10E+00
Combines	G4	120	1.82E+02	8.74E-04	2.46E-02	2.95E-03	1.08E+00	1.05E-05	8.40E-05	1.00E-04	4.97E-05	7.00E+00
Combines	G4	175	1.48E+02	5.97E-04	3.67E-02	3.54E-03	1.15E+00	1.14E-05	9.17E-05	9.26E-05	3.39E-05	1.10E+01
Combines	G4	250	3.89E+01	4.21E-04	3.04E-02	3.72E-03	9.27E-01	9.47E-06	7.60E-05	9.17E-05	2.39E-05	1.26E+01
Balers	G4	50	6.02E+02	2.24E-03	6.56E-02	4.16E-03	6.65E-01	8.08E-06	5.09E-05	2.00E-04	1.27E-04	2.01E+00
Balers	G4	120	7.38E+02	1.10E-03	2.02E-02	4.38E-03	5.01E-01	4.84E-06	3.88E-05	1.30E-04	6.26E-05	3.34E+00
Agricultural Mowers	G4	15	3.48E+02	3.94E-03	1.45E-01	2.65E-03	2.42E-01	6.91E-06	2.03E-03	2.98E-04	2.24E-04	3.77E-01
Agricultural Mowers	G4	25	4.74E+02	5.52E-03	2.06E-01	3.30E-03	3.27E-01	8.29E-06	2.74E-03	2.64E-04	3.14E-04	8.71E-01
Sprayers	G4	5	2.40E+02	9.01E-03	1.48E-01	3.94E-03	3.79E-01	1.31E-05	1.23E-04	6.15E-04	5.12E-04	1.67E-01
Sprayers	G4	15	2.24E+02	5.07E-03	1.49E-01	2.12E-03	2.21E-01	6.30E-06	1.78E-03	2.64E-04	2.88E-04	3.68E-01
Sprayers	G4	25	9.65E+02	6.96E-03	2.20E-01	2.78E-03	3.22E-01	8.16E-06	2.60E-03	2.40E-04	3.95E-04	8.99E-01
Sprayers	G4	50	1.33E+02	1.96E-03	5.72E-02	3.58E-03	5.70E-01	6.93E-06	4.37E-05	1.85E-04	1.11E-04	1.73E+00
Sprayers	G4	120	5.39E+02	1.08E-03	1.98E-02	4.24E-03	4.84E-01	4.67E-06	3.75E-05	1.28E-04	6.16E-05	3.23E+00
Sprayers	G4	175	1.77E+02	8.76E-04	2.10E-02	6.59E-03	6.64E-01	6.60E-06	5.29E-05	1.36E-04	4.98E-05	6.35E+00
Tillers	G4	15	1.77E+04	5.73E-03	2.02E-01	2.68E-03	3.14E-01	8.94E-06	1.60E-04	2.97E-04	3.26E-04	5.07E-01
Swathers	G4	120	2.07E+03	1.49E-03	2.72E-02	5.73E-03	6.51E-01	6.29E-06	5.04E-05	1.50E-04	8.46E-05	4.35E+00
Swathers	G4	175	2.31E+03	8.48E-04	2.02E-02	6.33E-03	6.37E-01	6.32E-06	5.07E-05	1.33E-04	4.82E-05	6.09E+00
Hydro Power Units	G4	5	2.58E+01	1.29E-02	1.99E-01	5.65E-03	5.30E-01	1.83E-05	1.73E-04	7.47E-04	7.34E-04	2.31E-01
Hydro Power Units	G4	15	4.09E+02	4.50E-03	1.67E-01	3.24E-03	2.83E-01	8.06E-06	2.37E-03	3.33E-04	2.55E-04	4.37E-01
Hydro Power Units	G4	25	2.60E+02	6.06E-03	2.26E-01	3.82E-03	3.61E-01	9.14E-06	3.02E-03	2.86E-04	3.44E-04	9.56E-01
Hydro Power Units	G4	50	3.74E+01	9.83E-04	7.09E-02	1.40E-03	7.35E-01	8.94E-06	5.63E-05	1.21E-04	5.58E-05	2.20E+00
Hydro Power Units	G4	120	1.12E+01	2.47E-04	1.10E-02	5.50E-04	5.26E-01	5.08E-06	4.07E-05	4.89E-05	1.40E-05	3.38E+00
Other Agricultural Equipment	G4	5	1.49E+01	9.87E-03	1.64E-01	4.32E-03	4.17E-01	1.44E-05	1.36E-04	6.46E-04	5.61E-04	1.84E-01
Other Agricultural Equipment	G4	15	3.91E+01	5.81E-03	2.10E-01	3.72E-03	3.47E-01	9.90E-06	2.91E-03	3.57E-04	3.30E-04	5.43E-01
Other Agricultural Equipment	G4	25	1.66E+01	8.94E-03	3.30E-01	5.13E-03	5.21E-01	1.32E-05	4.36E-03	3.34E-04	5.08E-04	1.39E+00
Other Agricultural Equipment	G4	50	3.41E+01	1.63E-03	5.28E-02	2.84E-03	5.51E-01	6.70E-06	4.22E-05	1.61E-04	9.27E-05	1.66E+00
Other Agricultural Equipment	G4	120	4.74E+02	9.73E-04	1.90E-02	3.57E-03	5.24E-01	5.07E-06	4.06E-05	1.12E-04	5.53E-05	3.47E+00
Other Agricultural Equipment	G4	175	7.88E+01	7.68E-04	2.27E-02	5.47E-03	7.10E-01	7.05E-06	5.65E-05	1.17E-04	4.36E-05	6.79E+00
Other Agricultural Equipment	G4	250	4.18E+01	7.80E-04	2.88E-02	6.03E-03	8.73E-01	8.93E-06	7.16E-05	1.15E-04	4.43E-05	1.19E+01
Generator Sets	G4	5	3.63E+03	1.75E-02	2.30E-01	4.01E-03	5.15E-01	1.78E-05	1.78E-03	6.14E-04	9.95E-04	2.45E-01
Generator Sets	G4	5	1.92E+03	1.97E-02	2.62E-01	4.00E-03	5.15E-01	1.78E-05	1.75E-03	6.12E-04	1.12E-03	2.59E-01
Generator Sets	G4	15	2.99E+04	5.55E-03	2.33E-01	3.40E-03	3.86E-01	1.10E-05	2.04E-04	3.39E-04	3.15E-04	6.02E-01
Generator Sets	G4	15	1.58E+04	7.49E-03	2.52E-01	3.30E-03	3.86E-01	1.10E-05	2.02E-04	3.33E-04	4.25E-04	6.30E-01
Generator Sets	G4	25	2.68E+04	6.95E-03	3.11E-01	4.16E-03	4.89E-01	1.24E-05	2.59E-04	2.98E-04	3.95E-04	1.30E+00
Generator Sets	G4	25	1.41E+04	8.92E-03	3.26E-01	3.90E-03	4.89E-01	1.24E-05	2.56E-04	2.86E-04	5.07E-04	1.34E+00
Generator Sets	G4	50	1.52E+04	2.15E-03	7.53E-02	4.01E-03	7.52E-01	9.14E-06	5.76E-05	1.99E-04	1.22E-04	2.27E+00
Generator Sets	G4	120	7.07E+03	1.43E-03	3.07E-02	5.90E-03	8.03E-01	7.76E-06	6.22E-05	1.60E-04	8.14E-05	5.33E+00
Generator Sets	G4	175	9.74E+02	9.81E-04	2.98E-02	7.66E-03	9.42E-01	9.36E-06	7.50E-05	1.54E-04	5.57E-05	9.00E+00
Pumps	G4	5	2.47E+03	1.10E-02	1.33E-01	4.47E-03	3.92E-01	1.35E-05	2.61E-04	6.59E-04	6.25E-04	1.67E-01
Pumps	G4	5	1.31E+03	1.38E-02	1.70E-01	4.21E-03	3.92E-01	1.35E-05	6.15E-04	6.36E-04	7.83E-04	1.84E-01

Pumps	G4	15	8.03E+03	5.59E-03	2.06E-01	3.92E-03	3.48E-01	9.93E-06	2.92E-03	3.68E-04	3.18E-04	5.39E-01
Pumps	G4	15	4.24E+03	6.11E-03	2.13E-01	3.77E-03	3.48E-01	9.93E-06	2.90E-03	3.60E-04	3.47E-04	5.48E-01
Pumps	G4	25	3.43E+03	7.28E-03	2.77E-01	4.60E-03	4.44E-01	1.13E-05	3.72E-03	3.16E-04	4.14E-04	1.18E+00
Pumps	G4	25	1.81E+03	7.48E-03	2.80E-01	4.47E-03	4.44E-01	1.13E-05	3.72E-03	3.11E-04	4.25E-04	1.18E+00
Pumps	G4	50	2.34E+03	2.17E-03	7.69E-02	3.47E-03	7.39E-01	8.98E-06	5.66E-05	1.80E-04	1.23E-04	2.25E+00
Pumps	G4	120	7.12E+03	1.63E-03	3.41E-02	5.40E-03	9.13E-01	8.82E-06	7.07E-05	1.39E-04	9.29E-05	6.05E+00
Pumps	G4	175	3.13E+02	9.55E-04	3.08E-02	6.35E-03	9.43E-01	9.37E-06	7.51E-05	1.27E-04	5.42E-05	9.02E+00
Air Compressors	G4	5	1.96E+03	1.41E-02	1.67E-01	6.17E-03	5.30E-01	1.83E-05	1.73E-04	7.83E-04	8.02E-04	2.19E-01
Air Compressors	G4	5	1.03E+03	1.41E-02	1.67E-01	6.17E-03	5.30E-01	1.83E-05	1.73E-04	7.83E-04	8.02E-04	2.19E-01
Air Compressors	G4	15	2.97E+03	3.99E-03	1.46E-01	2.87E-03	2.47E-01	7.05E-06	2.07E-03	3.12E-04	2.26E-04	3.82E-01
Air Compressors	G4	15	1.57E+03	3.90E-03	1.45E-01	2.81E-03	2.47E-01	7.05E-06	2.07E-03	3.08E-04	2.21E-04	3.81E-01
Air Compressors	G4	25	6.67E+02	6.14E-03	2.25E-01	3.87E-03	3.61E-01	9.14E-06	3.02E-03	2.88E-04	3.48E-04	9.56E-01
Air Compressors	G4	25	3.53E+02	6.02E-03	2.25E-01	3.80E-03	3.61E-01	9.14E-06	3.02E-03	2.85E-04	3.42E-04	9.55E-01
Air Compressors	G4	50	1.95E+03	3.26E-03	9.99E-02	4.24E-03	6.77E-01	8.23E-06	5.19E-05	2.04E-04	1.85E-04	2.19E+00
Air Compressors	G4	120	1.52E+04	1.74E-03	3.21E-02	4.55E-03	5.58E-01	5.39E-06	4.32E-05	1.33E-04	9.89E-05	3.82E+00
Air Compressors	G4	175	1.49E+03	1.06E-03	2.54E-02	6.74E-03	7.12E-01	7.07E-06	5.67E-05	1.37E-04	6.03E-05	6.86E+00
Welders	G4	15	4.22E+03	6.52E-03	2.19E-01	3.83E-03	3.54E-01	1.01E-05	2.92E-03	3.63E-04	3.70E-04	5.62E-01
Welders	G4	25	2.54E+04	5.72E-03	2.08E-01	3.32E-03	3.28E-01	8.32E-06	2.75E-03	2.65E-04	3.25E-04	8.77E-01
Welders	G4	50	4.38E+03	2.88E-03	8.79E-02	4.61E-03	7.93E-01	9.64E-06	6.07E-05	2.11E-04	1.64E-04	2.44E+00
Welders	G4	120	1.07E+04	1.19E-03	2.21E-02	3.96E-03	5.08E-01	4.91E-06	3.94E-05	1.21E-04	6.75E-05	3.40E+00
Welders	G4	175	1.08E+03	7.98E-04	2.05E-02	5.59E-03	6.29E-01	6.25E-06	5.01E-05	1.22E-04	4.53E-05	6.02E+00
Pressure Washers	G4	5	9.74E+02	2.11E-02	2.94E-01	5.96E-03	8.05E-01	2.78E-05	2.76E-03	7.56E-04	1.20E-03	3.49E-01
Pressure Washers	G4	5	5.15E+02	2.89E-02	3.90E-01	6.21E-03	8.05E-01	2.78E-05	2.73E-03	7.73E-04	1.64E-03	3.96E-01
Pressure Washers	G4	15	2.61E+03	5.39E-03	2.27E-01	3.31E-03	3.76E-01	1.07E-05	1.98E-04	3.34E-04	3.06E-04	5.85E-01
Pressure Washers	G4	15	1.38E+03	7.28E-03	2.45E-01	3.21E-03	3.76E-01	1.07E-05	1.96E-04	3.28E-04	4.14E-04	6.12E-01
Pressure Washers	G4	25	8.16E+02	7.76E-03	3.66E-01	4.88E-03	5.79E-01	1.47E-05	3.03E-04	3.24E-04	4.41E-04	1.53E+00
Pressure Washers	G4	25	4.31E+02	9.99E-03	3.82E-01	4.64E-03	5.79E-01	1.47E-05	3.01E-04	3.15E-04	5.68E-04	1.58E+00
Pressure Washers	G4	50	1.36E+02	2.21E-03	7.69E-02	3.86E-03	8.51E-01	1.04E-05	6.52E-05	1.89E-04	1.26E-04	2.54E+00
Cargo Tractor	G4	120	2.65E+04	1.66E-03	6.25E-02	4.52E-03	7.30E-01	6.03E-06	5.65E-05	1.42E-04	9.34E-05	5.19E+00
A/C Tug Narrow Body	G4	175	1.99E+03	1.31E-03	3.76E-02	8.29E-03	9.87E-01	9.80E-06	7.86E-05	1.61E-04	7.41E-05	9.53E+00
A/C Tug Wide Body	G4	500	1.32E+03	5.65E-04	4.50E-02	4.38E-03	1.29E+00	1.32E-05	1.06E-04	7.50E-05	3.21E-05	3.53E+01
Air Conditioner	G4	175	1.90E+00	7.85E-04	2.84E-02	6.46E-03	9.25E-01	9.19E-06	7.37E-05	1.40E-04	4.46E-05	8.82E+00
Air Start Unit	G4	175	1.50E+02	9.81E-04	3.47E-02	7.85E-03	1.11E+00	1.10E-05	8.84E-05	1.56E-04	5.57E-05	1.06E+01
Baggage Tug	G4	120	2.21E+04	5.13E-04	3.21E-02	2.56E-03	7.83E-01	7.56E-06	6.06E-05	1.10E-04	2.90E-05	5.19E+00
Belt Loader	G4	120	9.66E+03	3.25E-04	1.84E-02	1.50E-03	4.27E-01	4.12E-06	3.31E-05	8.20E-05	1.84E-05	2.84E+00
Bobtail	G4	120	3.55E+03	5.13E-04	3.21E-02	2.56E-03	7.83E-01	7.56E-06	6.06E-05	1.10E-04	2.90E-05	5.19E+00
Cargo Loader	G4	120	2.29E+03	4.48E-04	2.16E-02	1.89E-03	4.98E-01	4.81E-06	3.86E-05	9.17E-05	2.54E-05	3.32E+00
Cart	G4	15	2.03E+01	4.01E-03	2.23E-01	2.81E-03	3.79E-01	1.08E-05	1.91E-04	3.07E-04	2.28E-04	5.78E-01
Deicer	G4	120	3.39E+01	1.70E-03	3.81E-02	8.07E-03	1.26E+00	1.21E-05	9.74E-05	1.88E-04	9.66E-05	8.23E+00
Forklift	G4	50	9.09E+02	8.31E-04	6.85E-02	1.65E-03	5.18E-01	6.30E-06	3.97E-05	1.31E-04	4.71E-05	1.63E+00
Fuel Truck	G4	175	5.96E+01	2.70E-04	9.44E-03	2.23E-03	3.08E-01	3.06E-06	2.46E-05	7.93E-05	1.53E-05	2.94E+00
Ground Power Unit	G4	175	2.74E+03	4.21E-04	3.68E-02	3.27E-03	1.07E+00	1.06E-05	8.50E-05	1.06E-04	2.38E-05	1.02E+01
Lav Cart	G4	15	1.76E+00	4.01E-03	2.23E-01	2.81E-03	3.79E-01	1.08E-05	1.91E-04	3.07E-04	2.28E-04	5.78E-01
Lav Truck	G4	175	5.11E+03	2.79E-04	1.22E-02	1.49E-03	3.08E-01	3.06E-06	2.46E-05	6.66E-05	1.57E-05	2.98E+00
Lift	G4	120	1.98E+03	1.56E-03	3.51E-02	5.07E-03	7.11E-01	6.87E-06	5.51E-05	1.48E-04	8.86E-05	4.80E+00
Maint. Truck	G4	175	2.42E+03	5.57E-04	2.15E-02	3.80E-03	6.17E-01	6.13E-06	4.91E-05	1.07E-04	3.16E-05	5.92E+00
Other GSE	G4	50	4.17E+02	2.47E-03	9.30E-02	4.38E-03	8.63E-01	1.05E-05	6.61E-05	2.09E-04	1.41E-04	2.64E+00
Passenger Stand	G4	175	6.90E+02	6.84E-04	2.27E-02	5.23E-03	7.00E-01	6.20E-06	5.58E-05	1.25E-04	3.89E-05	6.70E+00

Sweeper	G4	120	8.79E+01	8.33E-04	1.88E-02	2.74E-03	3.87E-01	3.19E-06	3.00E-05	1.07E-04	4.73E-05	2.61E+00
Generator	G4	120	1.37E+02	4.06E-03	9.28E-02	9.59E-03	1.19E+00	9.80E-06	9.20E-05	2.10E-04	2.29E-04	8.39E+00
Service Truck	G4	250	1.87E+04	3.35E-04	9.41E-03	2.05E-03	2.32E-01	2.38E-06	1.90E-05	6.48E-05	1.89E-05	3.22E+00
Catering Truck	G4	250	4.55E+03	1.07E-03	2.91E-02	6.24E-03	6.84E-01	5.98E-06	5.61E-05	1.17E-04	6.02E-05	9.51E+00
Water Truck	G4	175	4.24E+02	3.00E-04	9.57E-03	2.18E-03	2.85E-01	2.83E-06	2.27E-05	7.88E-05	1.71E-05	2.73E+00
Hydrant truck	G4	175	4.01E+03	1.50E-03	3.80E-02	7.87E-03	8.07E-01	6.85E-06	6.43E-05	1.57E-04	8.40E-05	7.91E+00
Transport Refrigeration Units	G4	15	1.29E+04	4.36E-03	2.24E-01	3.02E-03	3.79E-01	1.08E-05	2.12E-04	3.20E-04	2.47E-04	5.80E-01
Aerial Lifts	C4	15	2.46E+01	2.48E-04	9.58E-02	2.62E-03	5.93E-01	0.00E+00	2.72E-04	0.00E+00	2.08E-03	8.01E-01
Aerial Lifts	C4	25	1.76E+03	3.35E-04	8.85E-02	2.44E-03	5.20E-01	0.00E+00	2.68E-04	0.00E+00	2.81E-03	1.19E+00
Forklifts	C4	25	5.74E+01	4.98E-04	7.88E-02	2.20E-03	4.11E-01	0.00E+00	2.70E-04	0.00E+00	4.18E-03	9.81E-01
Forklifts	C4	50	1.12E+05	4.22E-05	5.89E-03	1.81E-03	3.66E-01	0.00E+00	3.25E-05	0.00E+00	3.54E-04	1.34E+00
Forklifts	C4	120	9.44E+05	3.01E-05	1.18E-02	1.35E-03	2.60E-01	0.00E+00	2.31E-05	0.00E+00	2.52E-04	2.38E+00
Forklifts	C4	175	5.04E+04	2.76E-05	1.29E-02	1.35E-03	3.72E-01	0.00E+00	3.31E-05	0.00E+00	2.32E-04	4.89E+00
Generator Sets	C4	120	5.26E+02	7.66E-05	2.20E-02	5.06E-03	7.00E-01	0.00E+00	6.22E-05	0.00E+00	6.42E-04	6.27E+00
Generator Sets	C4	175	6.36E+02	7.27E-05	2.18E-02	6.03E-03	8.44E-01	0.00E+00	7.50E-05	0.00E+00	6.10E-04	1.09E+01
Gas Compressors	C4	50	3.24E+03	7.79E-05	1.38E-02	2.83E-03	9.39E-01	0.00E+00	7.20E-05	0.00E+00	6.53E-04	3.42E+00
Gas Compressors	C4	120	1.61E+04	8.56E-05	4.45E-02	3.37E-03	1.06E+00	0.00E+00	8.25E-05	0.00E+00	7.17E-04	9.68E+00
Gas Compressors	C4	175	3.78E+03	1.01E-04	3.85E-02	3.84E-03	1.18E+00	0.00E+00	9.38E-05	0.00E+00	8.51E-04	1.54E+01
Gas Compressors	C4	250	4.32E+03	6.83E-05	3.87E-02	3.25E-03	1.06E+00	0.00E+00	9.44E-05	0.00E+00	5.73E-04	2.00E+01
Gas Compressors	C4	500	7.56E+03	5.50E-05	3.12E-02	2.61E-03	8.55E-01	0.00E+00	7.60E-05	0.00E+00	4.61E-04	3.21E+01
Cargo Tractor	C4	175	4.83E+02	5.71E-05	1.87E-02	4.69E-03	7.14E-01	0.00E+00	6.35E-05	0.00E+00	4.78E-04	9.26E+00
Air Conditioner	C4	175	1.14E+01	5.99E-05	2.04E-02	5.27E-03	8.29E-01	0.00E+00	7.37E-05	0.00E+00	5.02E-04	1.07E+01
Baggage Tug	C4	120	4.17E+03	1.48E-04	3.00E-02	5.57E-03	6.82E-01	0.00E+00	6.06E-05	0.00E+00	1.24E-03	6.25E+00
Belt Loader	C4	120	7.37E+02	6.36E-05	1.45E-02	2.81E-03	3.72E-01	0.00E+00	3.31E-05	0.00E+00	5.33E-04	3.38E+00
Bobtail	C4	120	1.01E+02	3.88E-05	2.45E-02	2.35E-03	6.82E-01	0.00E+00	6.06E-05	0.00E+00	3.25E-04	6.14E+00
Cargo Loader	C4	120	5.57E+02	1.09E-04	2.06E-02	3.74E-03	4.34E-01	0.00E+00	3.86E-05	0.00E+00	9.13E-04	4.00E+00
Forklift	C4	50	2.13E+03	2.20E-05	5.52E-03	1.57E-03	4.46E-01	0.00E+00	3.97E-05	0.00E+00	1.85E-04	1.62E+00
Fuel Truck	C4	175	1.94E+02	3.07E-05	9.18E-03	2.14E-03	2.97E-01	0.00E+00	2.65E-05	0.00E+00	2.57E-04	3.89E+00
Lav Truck	C4	175	1.19E+02	2.57E-05	7.96E-03	1.91E-03	2.76E-01	0.00E+00	2.46E-05	0.00E+00	2.15E-04	3.60E+00
Lift	C4	120	6.74E+01	8.43E-05	2.19E-02	4.39E-03	6.20E-01	0.00E+00	5.51E-05	0.00E+00	7.06E-04	5.59E+00
Other	C4	50	4.38E+02	1.71E-04	1.25E-02	7.23E-03	7.44E-01	0.00E+00	6.61E-05	0.00E+00	1.43E-03	2.73E+00
Passenger Stand	C4	175	1.60E+00	5.93E-05	2.03E-02	5.25E-03	8.27E-01	0.00E+00	7.36E-05	0.00E+00	4.97E-04	1.07E+01
Sweeper	C4	50	1.06E+01	6.60E-05	8.18E-03	4.86E-03	6.83E-01	0.00E+00	6.07E-05	0.00E+00	5.54E-04	2.48E+00
Service Truck	C4	250	2.83E+03	2.22E-05	7.55E-03	1.15E-03	2.14E-01	0.00E+00	1.90E-05	0.00E+00	1.86E-04	4.02E+00
Catering Truck	C4	250	3.76E+02	6.14E-05	1.88E-02	4.45E-03	6.34E-01	0.00E+00	5.64E-05	0.00E+00	5.14E-04	1.18E+01
Pavers	D	25	1.08E+02	9.85E-04	3.19E-03	6.00E-03	7.46E-01	9.46E-06	3.00E-04	0.00E+00	8.89E-05	8.50E-01
Pavers	D	50	1.28E+04	2.73E-03	7.18E-03	5.89E-03	5.59E-01	7.23E-06	6.17E-04	0.00E+00	2.47E-04	1.31E+00
Pavers	D	120	3.61E+04	1.16E-03	4.21E-03	6.96E-03	5.76E-01	6.76E-06	6.08E-04	0.00E+00	1.04E-04	3.17E+00
Pavers	D	175	3.27E+04	1.02E-03	4.44E-03	7.87E-03	7.32E-01	8.24E-06	4.40E-04	0.00E+00	9.17E-05	5.86E+00
Pavers	D	250	5.63E+03	8.28E-04	2.43E-03	7.79E-03	7.77E-01	8.74E-06	3.02E-04	0.00E+00	7.47E-05	8.83E+00
Pavers	D	500	1.16E+04	4.54E-04	1.85E-03	4.21E-03	4.66E-01	4.57E-06	1.63E-04	0.00E+00	4.10E-05	1.06E+01
Plate Compactors	D	15	1.02E+03	3.34E-04	1.75E-03	2.09E-03	2.87E-01	4.47E-06	8.20E-05	0.00E+00	3.02E-05	1.97E-01
Rollers	D	15	2.22E+03	4.90E-04	2.57E-03	3.07E-03	4.21E-01	6.55E-06	1.19E-04	0.00E+00	4.42E-05	2.88E-01
Rollers	D	25	1.54E+03	6.45E-04	2.20E-03	4.09E-03	5.33E-01	6.77E-06	1.64E-04	0.00E+00	5.82E-05	6.07E-01
Rollers	D	50	9.70E+03	2.05E-03	5.82E-03	5.16E-03	5.19E-01	6.71E-06	4.90E-04	0.00E+00	1.85E-04	1.21E+00
Rollers	D	120	1.25E+05	8.23E-04	3.38E-03	5.21E-03	4.91E-01	5.76E-06	4.45E-04	0.00E+00	7.42E-05	2.70E+00
Rollers	D	175	7.33E+04	7.14E-04	3.54E-03	5.78E-03	6.17E-01	6.95E-06	3.15E-04	0.00E+00	6.44E-05	4.93E+00
Rollers	D	250	1.48E+04	5.05E-04	1.55E-03	5.25E-03	6.12E-01	6.88E-06	1.80E-04	0.00E+00	4.55E-05	6.94E+00

Rollers	D	500	2.08E+04	3.30E-04	1.26E-03	3.36E-03	4.38E-01	4.30E-06	1.18E-04	0.00E+00	2.98E-05	9.93E+00
Scrapers	D	120	1.83E+03	1.57E-03	5.78E-03	9.28E-03	7.82E-01	9.17E-06	8.20E-04	0.00E+00	1.41E-04	4.31E+00
Scrapers	D	175	2.44E+04	1.18E-03	5.20E-03	8.90E-03	8.45E-01	9.51E-06	5.06E-04	0.00E+00	1.07E-04	6.76E+00
Scrapers	D	250	3.40E+04	9.00E-04	2.56E-03	8.19E-03	8.37E-01	9.42E-06	3.16E-04	0.00E+00	8.12E-05	9.51E+00
Scrapers	D	500	1.87E+05	6.36E-04	2.42E-03	5.65E-03	6.42E-01	6.30E-06	2.19E-04	0.00E+00	5.74E-05	1.46E+01
Scrapers	D	750	1.12E+04	7.36E-04	2.78E-03	6.65E-03	7.40E-01	7.44E-06	2.55E-04	0.00E+00	6.64E-05	2.52E+01
Paving Equipment	D	25	1.89E+02	6.10E-04	2.08E-03	3.87E-03	5.05E-01	6.40E-06	1.55E-04	0.00E+00	5.51E-05	5.75E-01
Paving Equipment	D	50	3.23E+02	2.33E-03	6.10E-03	5.02E-03	4.78E-01	6.18E-06	5.26E-04	0.00E+00	2.11E-04	1.12E+00
Paving Equipment	D	120	1.12E+04	9.07E-04	3.30E-03	5.47E-03	4.54E-01	5.32E-06	4.79E-04	0.00E+00	8.18E-05	2.50E+00
Paving Equipment	D	175	7.66E+03	7.94E-04	3.47E-03	6.18E-03	5.77E-01	6.49E-06	3.44E-04	0.00E+00	7.16E-05	4.61E+00
Paving Equipment	D	250	3.08E+03	5.10E-04	1.50E-03	4.88E-03	4.89E-01	5.50E-06	1.87E-04	0.00E+00	4.61E-05	5.55E+00
Surfacing Equipment	D	50	1.59E+02	9.54E-04	2.81E-03	2.72E-03	2.82E-01	3.64E-06	2.37E-04	0.00E+00	8.61E-05	6.54E-01
Surfacing Equipment	D	120	7.63E+01	8.09E-04	3.51E-03	5.44E-03	5.31E-01	6.23E-06	4.31E-04	0.00E+00	7.30E-05	2.92E+00
Surfacing Equipment	D	175	8.35E+01	5.12E-04	2.70E-03	4.43E-03	4.90E-01	5.51E-06	2.24E-04	0.00E+00	4.62E-05	3.91E+00
Surfacing Equipment	D	250	2.38E+02	4.10E-04	1.35E-03	4.47E-03	5.39E-01	6.06E-06	1.50E-04	0.00E+00	3.70E-05	6.11E+00
Surfacing Equipment	D	500	3.97E+03	3.06E-04	1.28E-03	3.32E-03	4.42E-01	4.34E-06	1.13E-04	0.00E+00	2.76E-05	1.00E+01
Surfacing Equipment	D	750	8.73E+02	3.25E-04	1.34E-03	3.55E-03	4.62E-01	4.65E-06	1.20E-04	0.00E+00	2.94E-05	1.57E+01
Signal Boards	D	15	1.11E+04	4.78E-04	2.51E-03	3.00E-03	4.11E-01	6.39E-06	1.17E-04	0.00E+00	4.32E-05	2.82E-01
Signal Boards	D	50	1.32E+02	2.31E-03	6.91E-03	6.83E-03	7.23E-01	9.35E-06	5.93E-04	0.00E+00	2.08E-04	1.67E+00
Signal Boards	D	120	5.16E+03	9.81E-04	4.34E-03	6.51E-03	6.68E-01	7.83E-06	5.38E-04	0.00E+00	8.85E-05	3.67E+00
Signal Boards	D	175	4.67E+03	8.79E-04	4.76E-03	7.62E-03	8.82E-01	9.93E-06	3.92E-04	0.00E+00	7.93E-05	7.04E+00
Signal Boards	D	250	1.41E+03	6.53E-04	2.14E-03	7.99E-03	1.02E+00	1.15E-05	2.32E-04	0.00E+00	5.89E-05	1.16E+01
Trenchers	D	15	2.44E+02	6.56E-04	3.44E-03	4.11E-03	5.64E-01	8.77E-06	1.60E-04	0.00E+00	5.92E-05	3.86E-01
Trenchers	D	25	4.29E+02	1.59E-03	5.42E-03	1.00E-02	1.32E+00	1.67E-05	3.89E-04	0.00E+00	1.43E-04	1.50E+00
Trenchers	D	50	3.33E+04	3.13E-03	8.16E-03	6.86E-03	6.58E-01	8.50E-06	7.07E-04	0.00E+00	2.83E-04	1.54E+00
Trenchers	D	120	1.08E+05	1.07E-03	3.90E-03	6.55E-03	5.40E-01	6.34E-06	5.58E-04	0.00E+00	9.64E-05	2.98E+00
Trenchers	D	175	1.73E+04	1.12E-03	4.93E-03	8.87E-03	8.22E-01	9.24E-06	4.86E-04	0.00E+00	1.01E-04	6.57E+00
Trenchers	D	250	2.22E+03	9.40E-04	2.83E-03	8.99E-03	8.91E-01	1.00E-05	3.51E-04	0.00E+00	8.48E-05	1.01E+01
Trenchers	D	500	5.65E+03	5.96E-04	2.59E-03	5.69E-03	6.22E-01	6.11E-06	2.20E-04	0.00E+00	5.38E-05	1.42E+01
Trenchers	D	750	2.44E+02	7.55E-04	3.26E-03	7.28E-03	7.82E-01	7.86E-06	2.80E-04	0.00E+00	6.81E-05	2.67E+01
Bore/Drill Rigs	D	15	4.27E+01	8.02E-04	4.21E-03	5.02E-03	6.89E-01	1.07E-05	1.95E-04	0.00E+00	7.24E-05	4.72E-01
Bore/Drill Rigs	D	25	2.14E+02	7.73E-04	2.63E-03	4.90E-03	6.39E-01	8.11E-06	1.96E-04	0.00E+00	6.97E-05	7.28E-01
Bore/Drill Rigs	D	50	1.94E+03	5.77E-04	4.56E-03	5.13E-03	6.20E-01	8.02E-06	2.39E-04	0.00E+00	5.21E-05	1.42E+00
Bore/Drill Rigs	D	120	1.43E+04	3.72E-04	3.91E-03	3.81E-03	6.42E-01	7.53E-06	2.14E-04	0.00E+00	3.35E-05	3.51E+00
Bore/Drill Rigs	D	175	4.82E+03	4.02E-04	4.30E-03	3.96E-03	8.05E-01	9.06E-06	1.72E-04	0.00E+00	3.62E-05	6.41E+00
Bore/Drill Rigs	D	250	5.92E+03	3.17E-04	1.37E-03	3.05E-03	7.52E-01	8.46E-06	8.81E-05	0.00E+00	2.86E-05	8.50E+00
Bore/Drill Rigs	D	500	2.63E+04	2.59E-04	1.10E-03	2.34E-03	6.22E-01	6.11E-06	7.20E-05	0.00E+00	2.33E-05	1.41E+01
Bore/Drill Rigs	D	750	5.04E+03	3.42E-04	1.45E-03	3.12E-03	8.19E-01	8.24E-06	9.53E-05	0.00E+00	3.08E-05	2.78E+01
Bore/Drill Rigs	D	1000	7.63E+03	4.16E-04	1.67E-03	5.95E-03	9.27E-01	9.33E-06	1.54E-04	0.00E+00	3.75E-05	4.20E+01
Excavators	D	25	4.53E+02	7.93E-04	2.71E-03	5.01E-03	6.57E-01	8.34E-06	1.88E-04	0.00E+00	7.15E-05	7.48E-01
Excavators	D	50	3.48E+04	1.64E-03	5.68E-03	4.91E-03	5.00E-01	6.46E-06	4.25E-04	0.00E+00	1.48E-04	1.16E+00
Excavators	D	120	2.27E+05	9.07E-04	4.31E-03	5.66E-03	6.13E-01	7.19E-06	4.90E-04	0.00E+00	8.18E-05	3.37E+00
Excavators	D	175	6.38E+05	6.91E-04	3.81E-03	5.11E-03	6.41E-01	7.21E-06	2.93E-04	0.00E+00	6.24E-05	5.12E+00
Excavators	D	250	3.71E+05	4.97E-04	1.42E-03	4.55E-03	6.34E-01	7.14E-06	1.49E-04	0.00E+00	4.48E-05	7.19E+00
Excavators	D	500	5.35E+05	3.47E-04	1.05E-03	2.95E-03	4.67E-01	4.58E-06	1.03E-04	0.00E+00	3.13E-05	1.06E+01
Excavators	D	750	4.30E+03	3.86E-04	1.16E-03	3.36E-03	5.16E-01	5.19E-06	1.16E-04	0.00E+00	3.48E-05	1.75E+01
Concrete/Industrial Saws	D	25	2.08E+01	7.95E-04	2.71E-03	5.02E-03	6.59E-01	8.36E-06	1.95E-04	0.00E+00	7.17E-05	7.50E-01
Concrete/Industrial Saws	D	50	3.56E+02	1.91E-03	5.84E-03	5.71E-03	6.04E-01	7.80E-06	4.94E-04	0.00E+00	1.73E-04	1.40E+00

Concrete/Industrial Saws	D	120	1.49E+03	8.89E-04	4.03E-03	5.96E-03	6.17E-01	7.24E-06	4.92E-04	0.00E+00	8.02E-05	3.39E+00
Concrete/Industrial Saws	D	175	7.13E+01	8.98E-04	4.97E-03	7.78E-03	9.15E-01	1.03E-05	4.04E-04	0.00E+00	8.10E-05	7.30E+00
Cement and Mortar Mixers	D	15	8.08E+02	4.96E-04	2.57E-03	3.13E-03	4.21E-01	6.55E-06	1.42E-04	0.00E+00	4.47E-05	2.88E-01
Cement and Mortar Mixers	D	25	1.21E+02	1.08E-03	3.25E-03	6.04E-03	7.02E-01	8.90E-06	3.32E-04	0.00E+00	9.75E-05	8.01E-01
Cranes	D	50	7.65E+02	2.03E-03	5.78E-03	4.79E-03	4.63E-01	5.99E-06	4.79E-04	0.00E+00	1.83E-04	1.08E+00
Cranes	D	120	2.01E+04	7.67E-04	3.01E-03	4.59E-03	4.18E-01	4.90E-06	4.11E-04	0.00E+00	6.92E-05	2.30E+00
Cranes	D	175	2.94E+04	5.90E-04	2.75E-03	4.44E-03	4.59E-01	5.16E-06	2.55E-04	0.00E+00	5.32E-05	3.67E+00
Cranes	D	250	8.13E+04	4.16E-04	1.18E-03	3.98E-03	4.48E-01	5.04E-06	1.40E-04	0.00E+00	3.75E-05	5.09E+00
Cranes	D	500	5.96E+04	3.10E-04	1.06E-03	2.84E-03	3.60E-01	3.53E-06	1.04E-04	0.00E+00	2.80E-05	8.17E+00
Cranes	D	750	1.61E+04	3.50E-04	1.18E-03	3.28E-03	4.04E-01	4.06E-06	1.18E-04	0.00E+00	3.15E-05	1.37E+01
Cranes	D	9999	1.82E+05	9.49E-05	3.33E-04	1.04E-03	9.70E-02	9.75E-07	3.19E-05	0.00E+00	8.56E-06	4.41E+01
Graders	D	50	2.34E+02	2.16E-03	6.53E-03	5.54E-03	5.50E-01	7.11E-06	5.25E-04	0.00E+00	1.95E-04	1.28E+00
Graders	D	120	3.74E+04	1.05E-03	4.42E-03	6.44E-03	6.24E-01	7.32E-06	5.64E-04	0.00E+00	9.44E-05	3.43E+00
Graders	D	175	1.86E+05	8.40E-04	4.19E-03	6.40E-03	7.07E-01	7.96E-06	3.62E-04	0.00E+00	7.58E-05	5.65E+00
Graders	D	250	1.65E+05	5.97E-04	1.73E-03	5.68E-03	6.88E-01	7.74E-06	1.97E-04	0.00E+00	5.38E-05	7.80E+00
Graders	D	500	9.35E+03	3.71E-04	1.26E-03	3.37E-03	4.59E-01	4.50E-06	1.21E-04	0.00E+00	3.35E-05	1.04E+01
Graders	D	750	1.83E+02	5.26E-04	1.77E-03	4.88E-03	6.47E-01	6.51E-06	1.74E-04	0.00E+00	4.75E-05	2.20E+01
Off-Highway Trucks	D	175	7.94E+03	8.25E-04	4.33E-03	5.89E-03	7.14E-01	8.04E-06	3.45E-04	0.00E+00	7.44E-05	5.71E+00
Off-Highway Trucks	D	250	8.38E+04	5.60E-04	1.53E-03	4.95E-03	6.66E-01	7.49E-06	1.65E-04	0.00E+00	5.05E-05	7.55E+00
Off-Highway Trucks	D	500	2.36E+05	4.34E-04	1.27E-03	3.57E-03	5.44E-01	5.34E-06	1.27E-04	0.00E+00	3.91E-05	1.23E+01
Off-Highway Trucks	D	750	8.04E+04	4.72E-04	1.37E-03	3.98E-03	5.88E-01	5.92E-06	1.39E-04	0.00E+00	4.26E-05	2.00E+01
Off-Highway Trucks	D	1000	3.40E+04	5.48E-04	1.67E-03	5.97E-03	6.24E-01	6.28E-06	1.79E-04	0.00E+00	4.94E-05	2.83E+01
Crushing/Proc. Equipment	D	50	2.68E+03	3.49E-03	1.00E-02	8.71E-03	8.80E-01	1.14E-05	8.46E-04	0.00E+00	3.15E-04	2.05E+00
Crushing/Proc. Equipment	D	120	1.82E+04	1.17E-03	4.80E-03	7.13E-03	6.92E-01	8.12E-06	6.51E-04	0.00E+00	1.06E-04	3.81E+00
Crushing/Proc. Equipment	D	175	1.12E+04	1.11E-03	5.49E-03	8.71E-03	9.55E-01	1.07E-05	4.95E-04	0.00E+00	1.00E-04	7.63E+00
Crushing/Proc. Equipment	D	250	1.59E+03	7.39E-04	2.17E-03	8.09E-03	9.77E-01	1.10E-05	2.48E-04	0.00E+00	6.67E-05	1.11E+01
Crushing/Proc. Equipment	D	500	1.79E+04	5.22E-04	1.69E-03	5.42E-03	7.47E-01	7.33E-06	1.77E-04	0.00E+00	4.71E-05	1.69E+01
Crushing/Proc. Equipment	D	750	3.07E+02	5.52E-04	1.76E-03	5.92E-03	7.84E-01	7.89E-06	1.89E-04	0.00E+00	4.98E-05	2.67E+01
Crushing/Proc. Equipment	D	9999	4.09E+03	1.13E-04	3.67E-04	1.33E-03	1.31E-01	1.31E-06	3.88E-05	0.00E+00	1.02E-05	5.93E+01
Rough Terrain Forklifts	D	50	2.21E+03	2.37E-03	7.56E-03	6.63E-03	6.77E-01	8.75E-06	6.01E-04	0.00E+00	2.14E-04	1.57E+00
Rough Terrain Forklifts	D	120	2.54E+05	7.97E-04	3.60E-03	5.00E-03	5.20E-01	6.10E-06	4.42E-04	0.00E+00	7.20E-05	2.86E+00
Rough Terrain Forklifts	D	175	4.74E+04	7.74E-04	4.14E-03	5.98E-03	7.13E-01	8.02E-06	3.39E-04	0.00E+00	6.98E-05	5.70E+00
Rough Terrain Forklifts	D	250	3.78E+03	5.18E-04	1.52E-03	5.19E-03	6.83E-01	7.68E-06	1.66E-04	0.00E+00	4.67E-05	7.73E+00
Rough Terrain Forklifts	D	500	4.97E+03	3.65E-04	1.14E-03	3.42E-03	5.13E-01	5.03E-06	1.17E-04	0.00E+00	3.29E-05	1.16E+01
Rubber Tired Loaders	D	25	1.18E+02	8.16E-04	2.79E-03	5.16E-03	6.77E-01	8.58E-06	2.00E-04	0.00E+00	7.37E-05	7.70E-01
Rubber Tired Loaders	D	50	4.66E+03	2.40E-03	7.28E-03	6.23E-03	6.22E-01	8.05E-06	5.85E-04	0.00E+00	2.17E-04	1.45E+00
Rubber Tired Loaders	D	120	3.04E+05	8.10E-04	3.46E-03	5.01E-03	4.91E-01	5.75E-06	4.38E-04	0.00E+00	7.31E-05	2.70E+00
Rubber Tired Loaders	D	175	2.50E+05	7.08E-04	3.58E-03	5.43E-03	6.07E-01	6.83E-06	3.06E-04	0.00E+00	6.39E-05	4.85E+00
Rubber Tired Loaders	D	250	3.55E+05	5.03E-04	1.47E-03	4.85E-03	5.95E-01	6.70E-06	1.67E-04	0.00E+00	4.54E-05	6.75E+00
Rubber Tired Loaders	D	500	2.95E+05	3.73E-04	1.28E-03	3.43E-03	4.74E-01	4.65E-06	1.23E-04	0.00E+00	3.37E-05	1.07E+01
Rubber Tired Loaders	D	750	7.59E+03	5.13E-04	1.74E-03	4.81E-03	6.47E-01	6.50E-06	1.70E-04	0.00E+00	4.63E-05	2.20E+01
Rubber Tired Loaders	D	1000	7.36E+02	5.18E-04	1.84E-03	5.96E-03	5.93E-01	5.97E-06	1.79E-04	0.00E+00	4.68E-05	2.69E+01
Rubber Tired Dozers	D	175	1.00E+03	1.21E-03	4.83E-03	8.89E-03	7.39E-01	8.32E-06	5.10E-04	0.00E+00	1.09E-04	5.92E+00
Rubber Tired Dozers	D	250	3.50E+04	9.72E-04	2.73E-03	8.32E-03	7.33E-01	8.25E-06	3.51E-04	0.00E+00	8.77E-05	8.35E+00
Rubber Tired Dozers	D	500	1.08E+05	6.41E-04	2.84E-03	5.45E-03	5.29E-01	5.19E-06	2.26E-04	0.00E+00	5.78E-05	1.21E+01
Rubber Tired Dozers	D	750	1.39E+04	6.46E-04	2.85E-03	5.57E-03	5.31E-01	5.34E-06	2.29E-04	0.00E+00	5.82E-05	1.82E+01
Rubber Tired Dozers	D	1000	8.51E+02	7.49E-04	3.44E-03	7.44E-03	5.91E-01	5.95E-06	2.59E-04	0.00E+00	6.76E-05	2.70E+01
Tractors/Loaders/Backhoes	D	25	2.33E+03	7.80E-04	2.62E-03	4.94E-03	6.34E-01	8.04E-06	2.26E-04	0.00E+00	7.04E-05	7.22E-01

Tractors/Loaders/Backhoes	D	50	2.86E+04	1.79E-03	6.40E-03	5.78E-03	6.06E-01	7.84E-06	4.77E-04	0.00E+00	1.62E-04	1.40E+00
Tractors/Loaders/Backhoes	D	120	9.18E+05	5.80E-04	2.94E-03	3.81E-03	4.31E-01	5.05E-06	3.20E-04	0.00E+00	5.23E-05	2.36E+00
Tractors/Loaders/Backhoes	D	175	9.99E+04	5.66E-04	3.35E-03	4.40E-03	5.79E-01	6.51E-06	2.45E-04	0.00E+00	5.10E-05	4.62E+00
Tractors/Loaders/Backhoes	D	250	4.62E+04	4.82E-04	1.46E-03	4.67E-03	6.86E-01	7.72E-06	1.48E-04	0.00E+00	4.35E-05	7.77E+00
Tractors/Loaders/Backhoes	D	500	1.49E+05	4.58E-04	1.49E-03	4.13E-03	6.89E-01	7.75E-06	1.40E-04	0.00E+00	4.13E-05	1.56E+01
Tractors/Loaders/Backhoes	D	750	3.76E+04	4.61E-04	1.49E-03	4.26E-03	6.89E-01	7.75E-06	1.43E-04	0.00E+00	4.16E-05	2.34E+01
Crawler Tractors	D	50	2.57E+02	2.35E-03	6.49E-03	5.25E-03	4.97E-01	6.43E-06	5.41E-04	0.00E+00	2.12E-04	1.16E+00
Crawler Tractors	D	120	3.51E+05	1.08E-03	4.05E-03	6.40E-03	5.48E-01	6.43E-06	5.65E-04	0.00E+00	9.74E-05	3.02E+00
Crawler Tractors	D	175	1.73E+05	9.58E-04	4.25E-03	7.16E-03	6.92E-01	7.78E-06	4.08E-04	0.00E+00	8.64E-05	5.54E+00
Crawler Tractors	D	250	2.12E+05	7.05E-04	2.00E-03	6.38E-03	6.64E-01	7.47E-06	2.45E-04	0.00E+00	6.36E-05	7.54E+00
Crawler Tractors	D	500	2.91E+05	5.08E-04	1.90E-03	4.47E-03	5.18E-01	5.08E-06	1.73E-04	0.00E+00	4.58E-05	1.18E+01
Crawler Tractors	D	750	5.39E+03	6.09E-04	2.27E-03	5.46E-03	6.19E-01	6.22E-06	2.10E-04	0.00E+00	5.50E-05	2.11E+01
Crawler Tractors	D	1000	4.86E+03	6.90E-04	2.70E-03	7.37E-03	6.58E-01	6.61E-06	2.36E-04	0.00E+00	6.22E-05	2.99E+01
Skid Steer Loaders	D	25	1.41E+04	8.06E-04	2.48E-03	4.66E-03	5.51E-01	6.99E-06	2.51E-04	0.00E+00	7.27E-05	6.29E-01
Skid Steer Loaders	D	50	2.59E+05	1.04E-03	4.53E-03	4.55E-03	5.10E-01	6.59E-06	3.14E-04	0.00E+00	9.35E-05	1.17E+00
Skid Steer Loaders	D	120	3.26E+05	3.58E-04	2.29E-03	2.72E-03	3.56E-01	4.18E-06	2.04E-04	0.00E+00	3.23E-05	1.95E+00
Off-Highway Tractors	D	120	4.71E+01	1.76E-03	5.99E-03	1.03E-02	7.80E-01	9.16E-06	8.99E-04	0.00E+00	1.59E-04	4.31E+00
Off-Highway Tractors	D	175	8.39E+04	1.17E-03	4.76E-03	8.76E-03	7.45E-01	8.38E-06	4.98E-04	0.00E+00	1.06E-04	5.96E+00
Off-Highway Tractors	D	250	1.13E+05	6.55E-04	1.87E-03	5.78E-03	5.21E-01	5.86E-06	2.40E-04	0.00E+00	5.91E-05	5.93E+00
Off-Highway Tractors	D	750	3.61E+04	8.71E-04	3.84E-03	7.74E-03	7.57E-01	7.61E-06	3.14E-04	0.00E+00	7.86E-05	2.59E+01
Off-Highway Tractors	D	1000	3.44E+03	9.82E-04	4.50E-03	1.00E-02	8.14E-01	8.18E-06	3.43E-04	0.00E+00	8.86E-05	3.71E+01
Dumpers/Tenders	D	25	1.39E+02	3.86E-04	1.28E-03	2.40E-03	3.05E-01	3.87E-06	1.16E-04	0.00E+00	3.48E-05	3.47E-01
Other Construction Equipment	D	15	1.20E+03	7.84E-04	4.11E-03	4.91E-03	6.73E-01	1.05E-05	1.90E-04	0.00E+00	7.07E-05	4.61E-01
Other Construction Equipment	D	25	3.39E+02	6.39E-04	2.17E-03	4.05E-03	5.28E-01	6.70E-06	1.62E-04	0.00E+00	5.76E-05	6.01E-01
Other Construction Equipment	D	50	1.06E+03	1.51E-03	5.31E-03	5.17E-03	5.59E-01	7.23E-06	4.10E-04	0.00E+00	1.36E-04	1.29E+00
Other Construction Equipment	D	120	4.20E+03	8.40E-04	4.40E-03	5.86E-03	6.73E-01	7.90E-06	4.74E-04	0.00E+00	7.58E-05	3.69E+00
Other Construction Equipment	D	175	8.46E+03	5.36E-04	3.35E-03	4.58E-03	6.08E-01	6.84E-06	2.40E-04	0.00E+00	4.83E-05	4.85E+00
Other Construction Equipment	D	500	5.61E+04	2.90E-04	1.05E-03	3.04E-03	5.08E-01	4.99E-06	9.82E-05	0.00E+00	2.62E-05	1.15E+01
Aerial Lifts	D	15	5.75E+02	6.75E-04	3.52E-03	4.24E-03	5.76E-01	8.97E-06	1.79E-04	0.00E+00	6.09E-05	3.95E-01
Aerial Lifts	D	25	1.56E+03	6.55E-04	1.99E-03	3.73E-03	4.38E-01	5.56E-06	2.03E-04	0.00E+00	5.91E-05	5.00E-01
Aerial Lifts	D	50	1.10E+04	1.14E-03	3.46E-03	3.66E-03	3.92E-01	5.07E-06	3.05E-04	0.00E+00	1.03E-04	9.05E-01
Aerial Lifts	D	120	2.34E+04	4.53E-04	2.01E-03	3.09E-03	3.17E-01	3.72E-06	2.44E-04	0.00E+00	4.09E-05	1.74E+00
Aerial Lifts	D	500	1.25E+04	2.32E-04	9.17E-04	3.00E-03	4.25E-01	4.17E-06	8.79E-05	0.00E+00	2.09E-05	9.63E+00
Aerial Lifts	D	750	1.51E+03	2.89E-04	1.11E-03	3.73E-03	5.13E-01	5.15E-06	1.08E-04	0.00E+00	2.61E-05	1.74E+01
Forklifts	D	50	1.56E+04	8.80E-04	3.23E-03	2.86E-03	2.93E-01	3.79E-06	2.41E-04	0.00E+00	7.94E-05	6.80E-01
Forklifts	D	120	5.88E+04	3.62E-04	1.81E-03	2.31E-03	2.60E-01	3.05E-06	2.00E-04	0.00E+00	3.27E-05	1.43E+00
Forklifts	D	175	8.62E+04	3.25E-04	1.89E-03	2.42E-03	3.20E-01	3.60E-06	1.39E-04	0.00E+00	2.93E-05	2.56E+00
Forklifts	D	250	1.22E+05	2.27E-04	6.43E-04	2.10E-03	3.08E-01	3.47E-06	6.67E-05	0.00E+00	2.05E-05	3.49E+00
Forklifts	D	500	1.05E+05	1.56E-04	4.40E-04	1.31E-03	2.22E-01	2.18E-06	4.54E-05	0.00E+00	1.41E-05	5.02E+00
Sweepers/Scrubbers	D	15	1.24E+02	8.25E-04	4.86E-03	5.80E-03	7.95E-01	1.24E-05	2.26E-04	0.00E+00	7.44E-05	5.45E-01
Sweepers/Scrubbers	D	25	2.07E+02	9.46E-04	3.23E-03	5.98E-03	7.84E-01	9.95E-06	2.32E-04	0.00E+00	8.54E-05	8.92E-01
Sweepers/Scrubbers	D	50	1.51E+04	2.07E-03	6.82E-03	6.10E-03	6.30E-01	8.15E-06	5.39E-04	0.00E+00	1.87E-04	1.46E+00
Sweepers/Scrubbers	D	120	6.01E+04	9.15E-04	4.28E-03	5.80E-03	6.25E-01	7.33E-06	5.15E-04	0.00E+00	8.26E-05	3.43E+00
Sweepers/Scrubbers	D	175	4.04E+04	8.15E-04	4.57E-03	6.36E-03	7.94E-01	8.93E-06	3.61E-04	0.00E+00	7.36E-05	6.34E+00
Sweepers/Scrubbers	D	250	9.23E+03	4.56E-04	1.35E-03	4.69E-03	6.47E-01	7.29E-06	1.44E-04	0.00E+00	4.12E-05	7.33E+00
Other General Industrial Equipmen	D	15	7.15E+02	4.42E-04	2.60E-03	3.11E-03	4.26E-01	6.63E-06	1.21E-04	0.00E+00	3.99E-05	2.92E-01
Other General Industrial Equipmen	D	25	1.60E+03	7.40E-04	2.53E-03	4.68E-03	6.13E-01	7.78E-06	1.75E-04	0.00E+00	6.68E-05	6.98E-01
Other General Industrial Equipmen	D	50	3.96E+03	1.91E-03	5.42E-03	4.46E-03	4.35E-01	5.62E-06	4.57E-04	0.00E+00	1.72E-04	1.02E+00

Other General Industrial Equipmen	D	120	3.80E+04	9.62E-04	3.73E-03	5.58E-03	5.17E-01	6.06E-06	5.28E-04	0.00E+00	8.68E-05	2.84E+00
Other General Industrial Equipmen	D	175	5.56E+04	7.07E-04	3.27E-03	5.24E-03	5.48E-01	6.16E-06	3.08E-04	0.00E+00	6.38E-05	4.38E+00
Other General Industrial Equipmen	D	250	7.90E+04	4.63E-04	1.26E-03	4.73E-03	5.42E-01	6.10E-06	1.50E-04	0.00E+00	4.18E-05	6.14E+00
Other General Industrial Equipmen	D	500	1.58E+05	4.22E-04	1.26E-03	4.05E-03	5.30E-01	5.21E-06	1.36E-04	0.00E+00	3.81E-05	1.20E+01
Other General Industrial Equipmen	D	750	5.91E+04	4.67E-04	1.38E-03	4.60E-03	5.83E-01	5.86E-06	1.53E-04	0.00E+00	4.21E-05	1.98E+01
Other General Industrial Equipmen	D	1000	3.25E+04	5.15E-04	1.63E-03	5.95E-03	5.59E-01	5.62E-06	1.78E-04	0.00E+00	4.65E-05	2.54E+01
Other Material Handling Equipment	D	50	1.05E+02	2.65E-03	7.49E-03	6.20E-03	6.06E-01	7.84E-06	6.35E-04	0.00E+00	2.39E-04	1.42E+00
Other Material Handling Equipment	D	120	1.51E+03	9.35E-04	3.63E-03	5.45E-03	5.05E-01	5.93E-06	5.14E-04	0.00E+00	8.43E-05	2.78E+00
Other Material Handling Equipment	D	175	2.36E+03	8.91E-04	4.14E-03	6.66E-03	6.97E-01	7.84E-06	3.90E-04	0.00E+00	8.04E-05	5.57E+00
Other Material Handling Equipment	D	250	8.02E+03	4.89E-04	1.34E-03	5.05E-03	5.80E-01	6.52E-06	1.59E-04	0.00E+00	4.41E-05	6.57E+00
Other Material Handling Equipment	D	500	3.00E+03	3.00E-04	9.03E-04	2.92E-03	3.83E-01	3.76E-06	9.79E-05	0.00E+00	2.71E-05	8.68E+00
Other Material Handling Equipment	D	9999	1.80E+04	6.90E-05	2.15E-04	7.86E-04	7.41E-02	7.27E-07	2.34E-05	0.00E+00	6.22E-06	3.36E+01
Leaf Blowers/Vacuums	D	15	4.60E+00	2.10E-04	1.22E-03	1.47E-03	2.00E-01	3.12E-06	6.22E-05	0.00E+00	1.89E-05	1.37E-01
Leaf Blowers/Vacuums	D	120	3.22E+01	4.50E-04	2.39E-03	3.56E-03	4.05E-01	4.75E-06	2.40E-04	0.00E+00	4.06E-05	2.22E+00
Leaf Blowers/Vacuums	D	250	1.92E+01	1.92E-04	7.73E-04	2.83E-03	4.01E-01	4.51E-06	7.32E-05	0.00E+00	1.73E-05	4.54E+00
Lawn & Garden Tractors	D	15	5.04E+04	6.54E-04	3.78E-03	4.60E-03	6.19E-01	9.63E-06	2.10E-04	0.00E+00	5.90E-05	4.24E-01
Lawn & Garden Tractors	D	25	6.57E+04	6.93E-04	2.35E-03	4.41E-03	5.71E-01	7.25E-06	1.90E-04	0.00E+00	6.26E-05	6.51E-01
Chippers/Stump Grinders	D	25	3.35E+01	9.71E-04	3.31E-03	6.14E-03	8.05E-01	1.02E-05	2.38E-04	0.00E+00	8.76E-05	9.16E-01
Chippers/Stump Grinders	D	120	4.42E+03	8.70E-04	4.04E-03	6.01E-03	6.33E-01	7.42E-06	4.77E-04	0.00E+00	7.85E-05	3.47E+00
Chippers/Stump Grinders	D	175	4.42E+02	7.01E-04	4.00E-03	6.31E-03	7.53E-01	8.47E-06	3.15E-04	0.00E+00	6.32E-05	6.00E+00
Chippers/Stump Grinders	D	250	1.49E+02	5.52E-04	1.88E-03	6.80E-03	8.89E-01	1.00E-05	2.01E-04	0.00E+00	4.98E-05	1.01E+01
Chippers/Stump Grinders	D	500	2.75E+03	2.77E-04	1.08E-03	3.37E-03	4.94E-01	4.85E-06	1.04E-04	0.00E+00	2.50E-05	1.12E+01
Chippers/Stump Grinders	D	750	4.68E+03	4.57E-04	1.73E-03	5.58E-03	7.93E-01	7.97E-06	1.71E-04	0.00E+00	4.12E-05	2.69E+01
Chippers/Stump Grinders	D	1000	9.38E+03	6.21E-04	2.22E-03	8.16E-03	8.46E-01	8.51E-06	2.25E-04	0.00E+00	5.61E-05	3.84E+01
Commercial Turf Equipment	D	15	2.49E+03	6.67E-04	3.93E-03	4.69E-03	6.43E-01	1.00E-05	1.84E-04	0.00E+00	6.02E-05	4.40E-01
Commercial Turf Equipment	D	25	7.80E+04	6.98E-04	2.38E-03	4.41E-03	5.79E-01	7.34E-06	1.65E-04	0.00E+00	6.30E-05	6.59E-01
Other Lawn & Garden Equipment	D	15	1.45E+01	8.46E-04	4.97E-03	5.94E-03	8.14E-01	1.27E-05	2.41E-04	0.00E+00	7.63E-05	5.58E-01
Other Lawn & Garden Equipment	D	25	3.46E+00	7.86E-04	2.68E-03	4.97E-03	6.52E-01	8.27E-06	1.93E-04	0.00E+00	7.09E-05	7.42E-01
Agricultural Tractors	D	15	1.04E+04	8.17E-04	4.28E-03	5.11E-03	7.02E-01	1.09E-05	1.98E-04	0.00E+00	7.37E-05	4.81E-01
Agricultural Tractors	D	25	2.14E+04	9.77E-04	3.32E-03	6.20E-03	8.07E-01	1.02E-05	2.50E-04	0.00E+00	8.81E-05	9.19E-01
Agricultural Tractors	D	50	8.91E+04	2.40E-03	6.78E-03	6.60E-03	6.84E-01	8.84E-06	5.95E-04	0.00E+00	2.16E-04	1.59E+00
Agricultural Tractors	D	120	2.47E+05	9.59E-04	3.98E-03	6.29E-03	6.07E-01	7.12E-06	5.12E-04	0.00E+00	8.65E-05	3.33E+00
Agricultural Tractors	D	175	2.03E+05	7.61E-04	3.85E-03	6.55E-03	7.12E-01	8.01E-06	3.33E-04	0.00E+00	6.86E-05	5.68E+00
Agricultural Tractors	D	250	1.87E+05	4.99E-04	1.60E-03	5.96E-03	7.12E-01	8.01E-06	1.81E-04	0.00E+00	4.50E-05	8.07E+00
Agricultural Tractors	D	500	7.44E+04	3.70E-04	1.40E-03	4.39E-03	5.82E-01	5.72E-06	1.37E-04	0.00E+00	3.34E-05	1.32E+01
Combines	D	120	1.65E+03	1.02E-03	4.76E-03	7.54E-03	7.89E-01	9.26E-06	5.23E-04	0.00E+00	9.20E-05	4.33E+00
Combines	D	175	3.57E+03	6.12E-04	3.55E-03	6.03E-03	7.12E-01	8.01E-06	2.61E-04	0.00E+00	5.53E-05	5.67E+00
Combines	D	250	5.45E+03	3.88E-04	1.43E-03	5.39E-03	7.02E-01	7.89E-06	1.42E-04	0.00E+00	3.50E-05	7.94E+00
Combines	D	500	4.35E+02	2.42E-04	1.01E-03	3.41E-03	4.82E-01	4.73E-06	9.34E-05	0.00E+00	2.18E-05	1.09E+01
Balers	D	50	8.23E-01	1.55E-03	5.12E-03	6.54E-03	7.27E-01	9.39E-06	4.65E-04	0.00E+00	1.40E-04	1.67E+00
Balers	D	120	1.39E+03	5.65E-04	2.70E-03	4.27E-03	4.54E-01	5.33E-06	2.87E-04	0.00E+00	5.09E-05	2.49E+00
Agricultural Mowers	D	120	2.49E+02	4.33E-04	1.86E-03	2.95E-03	2.92E-01	3.42E-06	2.28E-04	0.00E+00	3.91E-05	1.60E+00
Sprayers	D	25	7.38E+01	9.27E-04	2.54E-03	4.35E-03	4.76E-01	6.04E-06	2.76E-04	0.00E+00	8.37E-05	5.45E-01
Sprayers	D	50	2.73E+01	9.54E-04	3.16E-03	4.06E-03	4.51E-01	5.83E-06	2.88E-04	0.00E+00	8.61E-05	1.04E+00
Sprayers	D	120	6.27E+02	5.88E-04	2.82E-03	4.46E-03	4.75E-01	5.57E-06	2.98E-04	0.00E+00	5.31E-05	2.60E+00
Sprayers	D	175	3.85E+02	4.44E-04	2.65E-03	4.50E-03	5.41E-01	6.08E-06	1.88E-04	0.00E+00	4.01E-05	4.31E+00
Sprayers	D	250	3.43E+02	3.26E-04	1.25E-03	4.69E-03	6.21E-01	6.99E-06	1.20E-04	0.00E+00	2.94E-05	7.03E+00
Sprayers	D	500	1.17E+02	1.61E-04	6.92E-04	2.37E-03	3.40E-01	3.33E-06	6.30E-05	0.00E+00	1.46E-05	7.68E+00

Tillers	D	15	2.39E+00	4.78E-04	2.78E-03	3.36E-03	4.56E-01	7.10E-06	1.43E-04	0.00E+00	4.31E-05	3.12E-01
Tillers	D	250	3.72E+00	5.39E-04	1.97E-03	7.40E-03	9.58E-01	1.08E-05	1.98E-04	0.00E+00	4.86E-05	1.08E+01
Tillers	D	500	2.23E+01	4.35E-04	1.81E-03	6.07E-03	8.54E-01	8.38E-06	1.68E-04	0.00E+00	3.93E-05	1.93E+01
Swathers	D	120	8.70E+03	5.63E-04	2.67E-03	4.23E-03	4.48E-01	5.25E-06	2.86E-04	0.00E+00	5.08E-05	2.46E+00
Swathers	D	175	1.13E+02	4.93E-04	2.92E-03	4.95E-03	5.91E-01	6.65E-06	2.09E-04	0.00E+00	4.45E-05	4.71E+00
Hydro Power Units	D	15	6.13E+01	4.67E-04	2.45E-03	2.92E-03	4.01E-01	6.24E-06	1.13E-04	0.00E+00	4.21E-05	2.75E-01
Hydro Power Units	D	25	3.08E+02	5.53E-04	1.88E-03	3.51E-03	4.57E-01	5.80E-06	1.42E-04	0.00E+00	4.99E-05	5.20E-01
Hydro Power Units	D	50	6.71E+02	1.81E-03	4.90E-03	4.24E-03	4.21E-01	5.44E-06	4.25E-04	0.00E+00	1.63E-04	9.82E-01
Hydro Power Units	D	120	1.48E+02	6.27E-04	2.44E-03	3.83E-03	3.51E-01	4.12E-06	3.42E-04	0.00E+00	5.66E-05	1.93E+00
Other Agricultural Equipment	D	15	1.23E+02	5.96E-04	3.12E-03	3.73E-03	5.11E-01	7.95E-06	1.53E-04	0.00E+00	5.37E-05	3.50E-01
Other Agricultural Equipment	D	25	5.70E+02	8.05E-04	2.51E-03	4.68E-03	5.62E-01	7.13E-06	2.49E-04	0.00E+00	7.26E-05	6.41E-01
Other Agricultural Equipment	D	50	8.51E+02	1.62E-03	4.71E-03	4.85E-03	5.11E-01	6.61E-06	4.17E-04	0.00E+00	1.46E-04	1.18E+00
Other Agricultural Equipment	D	120	6.90E+03	6.39E-04	2.73E-03	4.32E-03	4.26E-01	5.00E-06	3.38E-04	0.00E+00	5.76E-05	2.34E+00
Other Agricultural Equipment	D	175	8.37E+02	5.35E-04	2.80E-03	4.76E-03	5.29E-01	5.96E-06	2.32E-04	0.00E+00	4.83E-05	4.22E+00
Other Agricultural Equipment	D	250	1.20E+03	3.54E-04	1.18E-03	4.39E-03	5.37E-01	6.04E-06	1.29E-04	0.00E+00	3.19E-05	6.08E+00
Other Agricultural Equipment	D	500	5.78E+02	2.30E-04	9.03E-04	2.86E-03	3.86E-01	3.79E-06	8.65E-05	0.00E+00	2.08E-05	8.74E+00
Generator Sets	D	15	5.04E+03	9.80E-04	4.53E-03	6.69E-03	6.80E-01	1.06E-05	3.80E-04	0.00E+00	8.84E-05	4.67E-01
Generator Sets	D	25	6.15E+03	1.05E-03	3.58E-03	6.33E-03	7.05E-01	8.94E-06	3.58E-04	0.00E+00	9.48E-05	8.04E-01
Generator Sets	D	50	1.50E+04	1.69E-03	5.21E-03	5.66E-03	6.12E-01	7.91E-06	4.60E-04	0.00E+00	1.53E-04	1.41E+00
Generator Sets	D	120	5.48E+04	9.02E-04	4.07E-03	6.25E-03	6.49E-01	7.61E-06	4.83E-04	0.00E+00	8.14E-05	3.56E+00
Generator Sets	D	175	4.72E+03	7.52E-04	4.21E-03	6.93E-03	8.11E-01	9.12E-06	3.32E-04	0.00E+00	6.78E-05	6.46E+00
Generator Sets	D	250	3.77E+03	5.00E-04	1.73E-03	6.61E-03	8.49E-01	9.56E-06	1.82E-04	0.00E+00	4.51E-05	9.61E+00
Generator Sets	D	500	1.68E+04	3.55E-04	1.42E-03	4.71E-03	6.73E-01	6.61E-06	1.36E-04	0.00E+00	3.20E-05	1.52E+01
Generator Sets	D	750	1.56E+04	3.96E-04	1.53E-03	5.23E-03	7.24E-01	7.28E-06	1.49E-04	0.00E+00	3.57E-05	2.46E+01
Generator Sets	D	9999	5.42E+04	7.78E-05	2.74E-04	1.01E-03	1.05E-01	1.05E-06	2.79E-05	0.00E+00	7.02E-06	4.75E+01
Pumps	D	15	4.52E+03	8.18E-04	3.29E-03	4.95E-03	4.94E-01	7.69E-06	3.23E-04	0.00E+00	7.38E-05	3.40E-01
Pumps	D	25	2.25E+03	1.40E-03	3.96E-03	7.00E-03	7.79E-01	9.88E-06	4.28E-04	0.00E+00	1.27E-04	8.90E-01
Pumps	D	50	7.84E+03	2.04E-03	6.15E-03	6.42E-03	6.86E-01	8.87E-06	5.41E-04	0.00E+00	1.84E-04	1.59E+00
Pumps	D	120	3.69E+04	9.37E-04	4.14E-03	6.34E-03	6.49E-01	7.61E-06	5.05E-04	0.00E+00	8.45E-05	3.56E+00
Pumps	D	175	5.82E+03	7.73E-04	4.22E-03	6.95E-03	8.00E-01	9.00E-06	3.43E-04	0.00E+00	6.98E-05	6.38E+00
Pumps	D	250	5.99E+03	4.96E-04	1.66E-03	6.37E-03	8.05E-01	9.05E-06	1.80E-04	0.00E+00	4.47E-05	9.11E+00
Pumps	D	500	2.36E+02	3.82E-04	1.49E-03	4.88E-03	6.90E-01	6.77E-06	1.44E-04	0.00E+00	3.44E-05	1.56E+01
Pumps	D	750	5.91E+01	4.34E-04	1.65E-03	5.56E-03	7.60E-01	7.64E-06	1.62E-04	0.00E+00	3.92E-05	2.58E+01
Pumps	D	9999	1.73E+04	1.03E-04	3.62E-04	1.33E-03	1.35E-01	1.36E-06	3.67E-05	0.00E+00	9.30E-06	6.14E+01
Air Compressors	D	15	1.24E+02	7.96E-04	3.20E-03	4.81E-03	4.81E-01	7.49E-06	3.14E-04	0.00E+00	7.18E-05	3.31E-01
Air Compressors	D	25	4.10E+02	1.04E-03	2.93E-03	5.19E-03	5.77E-01	7.33E-06	3.17E-04	0.00E+00	9.38E-05	6.60E-01
Air Compressors	D	50	7.46E+03	1.79E-03	5.02E-03	4.42E-03	4.45E-01	5.75E-06	4.33E-04	0.00E+00	1.62E-04	1.04E+00
Air Compressors	D	120	1.19E+05	6.73E-04	2.70E-03	4.11E-03	3.91E-01	4.59E-06	3.73E-04	0.00E+00	6.07E-05	2.15E+00
Air Compressors	D	175	6.58E+03	5.92E-04	2.88E-03	4.72E-03	5.05E-01	5.68E-06	2.65E-04	0.00E+00	5.35E-05	4.04E+00
Air Compressors	D	250	1.32E+04	3.96E-04	1.17E-03	4.46E-03	5.24E-01	5.90E-06	1.36E-04	0.00E+00	3.57E-05	5.94E+00
Air Compressors	D	500	3.45E+04	3.20E-04	1.06E-03	3.46E-03	4.63E-01	4.55E-06	1.12E-04	0.00E+00	2.89E-05	1.05E+01
Air Compressors	D	750	1.94E+04	3.34E-04	1.09E-03	3.69E-03	4.77E-01	4.80E-06	1.18E-04	0.00E+00	3.01E-05	1.62E+01
Air Compressors	D	1000	6.38E+02	4.11E-04	1.38E-03	5.03E-03	4.86E-01	4.89E-06	1.45E-04	0.00E+00	3.71E-05	2.21E+01
Welders	D	15	3.26E+03	6.84E-04	2.75E-03	4.14E-03	4.13E-01	6.43E-06	2.70E-04	0.00E+00	6.17E-05	2.84E-01
Welders	D	25	4.78E+03	8.12E-04	2.29E-03	4.05E-03	4.51E-01	5.72E-06	2.48E-04	0.00E+00	7.33E-05	5.16E-01
Welders	D	50	2.94E+04	1.90E-03	5.43E-03	5.04E-03	5.19E-01	6.71E-06	4.71E-04	0.00E+00	1.72E-04	1.20E+00
Welders	D	120	5.48E+04	5.33E-04	2.21E-03	3.37E-03	3.29E-01	3.86E-06	2.93E-04	0.00E+00	4.81E-05	1.81E+00
Welders	D	175	3.96E+02	6.15E-04	3.11E-03	5.11E-03	5.61E-01	6.31E-06	2.75E-04	0.00E+00	5.55E-05	4.48E+00

Welders	D	250	1.26E+02	3.35E-04	1.03E-03	3.95E-03	4.76E-01	5.35E-06	1.18E-04	0.00E+00	3.03E-05	5.39E+00
Welders	D	500	6.29E+02	2.14E-04	7.55E-04	2.46E-03	3.35E-01	3.29E-06	7.74E-05	0.00E+00	1.93E-05	7.59E+00
Pressure Washers	D	15	1.00E+02	4.69E-04	2.17E-03	3.20E-03	3.26E-01	5.07E-06	1.82E-04	0.00E+00	4.23E-05	2.24E-01
Pressure Washers	D	25	3.90E+01	4.26E-04	1.45E-03	2.57E-03	2.86E-01	3.62E-06	1.45E-04	0.00E+00	3.84E-05	3.26E-01
Pressure Washers	D	50	1.55E+02	6.13E-04	2.05E-03	2.55E-03	2.86E-01	3.69E-06	1.84E-04	0.00E+00	5.53E-05	6.56E-01
Pressure Washers	D	120	1.53E+02	2.47E-04	1.20E-03	1.84E-03	2.00E-01	2.35E-06	1.29E-04	0.00E+00	2.23E-05	1.10E+00
Cargo Tractor	D	120	2.05E+03	8.78E-04	3.53E-03	5.26E-03	4.96E-01	5.58E-06	4.81E-04	0.00E+00	7.93E-05	2.73E+00
A/C Tug Narrow Body	D	250	1.10E+04	8.96E-04	2.65E-03	8.41E-03	7.14E-01	8.03E-06	3.48E-04	0.00E+00	8.09E-05	8.13E+00
A/C Tug Wide Body	D	500	6.64E+03	7.71E-04	3.65E-03	7.20E-03	6.65E-01	6.53E-06	2.93E-04	0.00E+00	6.95E-05	1.52E+01
Air Conditioner	D	175	1.59E+03	4.63E-04	4.40E-03	4.69E-03	8.30E-01	9.33E-06	2.19E-04	0.00E+00	4.18E-05	6.61E+00
Air Conditioner	D	250	1.80E+02	3.61E-04	1.50E-03	4.12E-03	8.30E-01	9.33E-06	1.19E-04	0.00E+00	3.26E-05	9.38E+00
Air Conditioner	D	500	2.40E+02	3.47E-04	1.46E-03	3.66E-03	8.30E-01	9.33E-06	1.16E-04	0.00E+00	3.14E-05	1.88E+01
Air Start Unit	D	175	1.73E+01	7.27E-04	4.46E-03	6.94E-03	8.66E-01	8.50E-06	3.26E-04	0.00E+00	6.56E-05	6.90E+00
Air Start Unit	D	250	7.41E+01	4.79E-04	1.74E-03	6.32E-03	8.66E-01	8.50E-06	1.77E-04	0.00E+00	4.32E-05	9.80E+00
Air Start Unit	D	500	5.83E+03	4.30E-04	1.78E-03	5.67E-03	8.66E-01	8.50E-06	1.66E-04	0.00E+00	3.88E-05	1.96E+01
Air Start Unit	D	750	1.26E+03	4.45E-04	1.78E-03	5.85E-03	8.66E-01	8.50E-06	1.70E-04	0.00E+00	4.01E-05	2.94E+01
Baggage Tug	D	120	2.37E+04	9.29E-04	3.09E-03	5.34E-03	4.07E-01	4.78E-06	4.84E-04	0.00E+00	8.38E-05	2.25E+00
Belt Loader	D	120	8.01E+03	5.89E-04	2.07E-03	3.47E-03	2.83E-01	3.33E-06	3.14E-04	0.00E+00	5.31E-05	1.56E+00
Bobtail	D	120	4.13E+02	1.27E-03	4.58E-03	7.75E-03	6.47E-01	7.59E-06	6.72E-04	0.00E+00	1.15E-04	3.56E+00
Cargo Loader	D	120	9.09E+03	9.31E-04	3.68E-03	5.69E-03	5.26E-01	6.17E-06	5.10E-04	0.00E+00	8.40E-05	2.89E+00
Forklift	D	175	1.50E+03	3.48E-04	1.86E-03	2.89E-03	3.34E-01	3.76E-06	1.57E-04	0.00E+00	3.14E-05	2.67E+00
Fuel Truck	D	250	9.73E+02	1.56E-04	5.06E-04	1.83E-03	2.36E-01	2.66E-06	5.57E-05	0.00E+00	1.41E-05	2.68E+00
Ground Power Unit	D	175	1.57E+04	9.25E-04	4.98E-03	7.42E-03	8.76E-01	9.85E-06	4.15E-04	0.00E+00	8.35E-05	6.99E+00
Lav Truck	D	175	3.39E+02	3.53E-04	1.76E-03	2.68E-03	3.00E-01	3.37E-06	1.55E-04	0.00E+00	3.19E-05	2.40E+00
Lift	D	120	1.46E+03	9.27E-04	4.05E-03	5.93E-03	6.01E-01	7.05E-06	5.18E-04	0.00E+00	8.36E-05	3.30E+00
Other GSE	D	175	4.45E+03	7.08E-04	3.00E-03	5.48E-03	5.03E-01	6.50E-06	3.08E-04	0.00E+00	6.39E-05	4.02E+00
Passenger Stand	D	120	1.99E+01	6.49E-04	3.59E-03	5.29E-03	6.18E-01	7.25E-06	3.46E-04	0.00E+00	5.86E-05	3.38E+00
Sweeper	D	120	2.37E+02	2.41E-04	1.61E-03	2.12E-03	2.73E-01	3.07E-06	1.40E-04	0.00E+00	2.17E-05	1.49E+00
Generator	D	120	8.70E+02	1.17E-03	4.89E-03	6.99E-03	6.84E-01	7.70E-06	6.43E-04	0.00E+00	1.06E-04	3.76E+00
Generator	D	175	6.94E+03	1.07E-03	5.27E-03	7.93E-03	8.84E-01	9.95E-06	4.64E-04	0.00E+00	9.68E-05	7.07E+00
Generator	D	250	1.03E+04	7.54E-04	2.07E-03	7.32E-03	8.95E-01	1.01E-05	2.39E-04	0.00E+00	6.80E-05	1.01E+01
Generator	D	500	2.17E+03	5.60E-04	1.63E-03	5.08E-03	7.09E-01	7.98E-06	1.76E-04	0.00E+00	5.05E-05	1.61E+01
Generator	D	750	4.35E+03	6.07E-04	1.76E-03	5.65E-03	7.64E-01	8.59E-06	1.94E-04	0.00E+00	5.47E-05	2.60E+01
Service Truck	D	175	8.65E+02	2.32E-04	1.33E-03	2.07E-03	2.49E-01	2.80E-06	1.04E-04	0.00E+00	2.09E-05	1.98E+00
Catering Truck	D	250	2.19E+02	2.66E-04	1.13E-03	3.76E-03	6.25E-01	7.04E-06	1.00E-04	0.00E+00	2.40E-05	7.07E+00
Hydrant Truck	D	175	5.17E+02	9.25E-04	4.84E-03	7.81E-03	8.77E-01	9.87E-06	4.14E-04	0.00E+00	8.35E-05	7.00E+00
Compressor (GSE)	D	120	1.13E+02	7.40E-04	3.22E-03	4.71E-03	4.76E-01	5.58E-06	4.13E-04	0.00E+00	6.67E-05	2.62E+00
Compressor (GSE)	D	250	4.69E+01	3.34E-04	1.03E-03	3.71E-03	4.67E-01	5.25E-06	1.15E-04	0.00E+00	3.01E-05	5.29E+00
Compressor (GSE)	D	500	3.75E+02	3.16E-04	1.07E-03	3.36E-03	4.81E-01	4.72E-06	1.11E-04	0.00E+00	2.85E-05	1.09E+01
Compressor (GSE)	D	750	1.83E+03	3.16E-04	1.05E-03	3.42E-03	4.74E-01	4.76E-06	1.11E-04	0.00E+00	2.85E-05	1.61E+01
Transport Refrigeration Units	D	15	2.47E+04	5.71E-04	3.26E-03	4.02E-03	5.35E-01	6.78E-06	1.89E-04	0.00E+00	5.15E-05	3.66E-01
Transport Refrigeration Units	D	25	1.43E+04	6.65E-04	2.25E-03	4.25E-03	5.45E-01	6.92E-06	1.89E-04	0.00E+00	6.00E-05	6.21E-01
Transport Refrigeration Units	D	50	8.68E+05	6.49E-04	4.29E-03	4.48E-03	5.18E-01	6.70E-06	2.42E-04	0.00E+00	5.86E-05	1.19E+00
A/C unit	D	120	6.74E+03	8.48E-04	3.93E-03	6.04E-03	6.33E-01	7.42E-06	4.53E-04	0.00E+00	7.65E-05	3.47E+00
A/C unit	D	250	5.86E+03	3.73E-04	1.32E-03	4.84E-03	6.25E-01	7.04E-06	1.39E-04	0.00E+00	3.37E-05	7.08E+00
A/C unit	D	500	4.63E+03	2.54E-04	1.05E-03	3.31E-03	4.74E-01	4.65E-06	9.86E-05	0.00E+00	2.30E-05	1.07E+01
Aircraft Support	D	120	1.83E+03	5.71E-04	2.65E-03	4.07E-03	4.26E-01	5.00E-06	3.05E-04	0.00E+00	5.15E-05	2.34E+00
Aircraft Support	D	175	3.81E+03	5.40E-04	3.10E-03	5.08E-03	6.01E-01	6.77E-06	2.39E-04	0.00E+00	4.87E-05	4.79E+00

Cart	D	120	7.85E+02	6.80E-04	3.15E-03	4.84E-03	5.07E-01	5.95E-06	3.64E-04	0.00E+00	6.14E-05	2.78E+00
Cart	D	175	2.86E+02	5.90E-04	3.39E-03	5.55E-03	6.57E-01	7.39E-06	2.61E-04	0.00E+00	5.32E-05	5.24E+00
Cart	D	250	1.36E+03	3.54E-04	1.25E-03	4.58E-03	5.92E-01	6.67E-06	1.31E-04	0.00E+00	3.19E-05	6.71E+00
Communications	D	50	1.09E+02	1.59E-03	4.98E-03	5.55E-03	6.01E-01	7.77E-06	4.38E-04	0.00E+00	1.43E-04	1.39E+00
Communications	D	120	3.92E+02	6.72E-04	3.12E-03	4.78E-03	5.01E-01	5.88E-06	3.59E-04	0.00E+00	6.06E-05	2.75E+00
Compressor (Military)	D	50	1.09E+02	1.95E-03	6.10E-03	6.80E-03	7.37E-01	9.52E-06	5.36E-04	0.00E+00	1.76E-04	1.70E+00
Compressor (Military)	D	120	9.87E+03	5.96E-04	2.76E-03	4.25E-03	4.45E-01	5.22E-06	3.19E-04	0.00E+00	5.38E-05	2.44E+00
Compressor (Military)	D	175	3.81E+02	6.44E-04	3.70E-03	6.06E-03	7.17E-01	8.07E-06	2.85E-04	0.00E+00	5.81E-05	5.72E+00
Compressor (Military)	D	250	1.09E+03	4.00E-04	1.42E-03	5.19E-03	6.71E-01	7.54E-06	1.49E-04	0.00E+00	3.61E-05	7.59E+00
Compressor (Military)	D	500	7.63E+03	3.01E-04	1.24E-03	3.92E-03	5.61E-01	5.50E-06	1.17E-04	0.00E+00	2.72E-05	1.27E+01
Crane	D	120	1.05E+03	3.81E-04	3.77E-03	4.36E-03	6.58E-01	7.72E-06	2.49E-04	0.00E+00	3.44E-05	3.59E+00
Crane	D	175	2.86E+02	2.58E-04	3.01E-03	3.33E-03	6.06E-01	6.81E-06	1.35E-04	0.00E+00	2.32E-05	4.82E+00
Crane	D	250	2.72E+02	2.03E-04	1.09E-03	3.12E-03	6.43E-01	7.24E-06	8.17E-05	0.00E+00	1.84E-05	7.27E+00
Deicer	D	120	2.62E+02	9.24E-04	4.28E-03	6.58E-03	6.89E-01	8.08E-06	4.94E-04	0.00E+00	8.33E-05	3.78E+00
Generator (Military)	D	50	7.36E+02	1.51E-03	4.73E-03	5.27E-03	5.71E-01	7.39E-06	4.16E-04	0.00E+00	1.36E-04	1.32E+00
Generator (Military)	D	120	4.39E+04	6.97E-04	3.23E-03	4.96E-03	5.20E-01	6.10E-06	3.73E-04	0.00E+00	6.29E-05	2.85E+00
Generator (Military)	D	175	5.16E+04	5.67E-04	3.26E-03	5.34E-03	6.31E-01	7.10E-06	2.51E-04	0.00E+00	5.12E-05	5.03E+00
Generator (Military)	D	250	1.95E+04	4.00E-04	1.42E-03	5.19E-03	6.71E-01	7.54E-06	1.49E-04	0.00E+00	3.61E-05	7.59E+00
Generator (Military)	D	500	1.58E+04	2.81E-04	1.15E-03	3.66E-03	5.23E-01	5.14E-06	1.09E-04	0.00E+00	2.54E-05	1.18E+01
Generator (Military)	D	750	6.35E+02	2.98E-04	1.18E-03	3.86E-03	5.36E-01	5.39E-06	1.13E-04	0.00E+00	2.69E-05	1.82E+01
Hydraulic unit	D	120	4.38E+03	7.98E-04	3.70E-03	5.68E-03	5.95E-01	6.98E-06	4.27E-04	0.00E+00	7.20E-05	3.26E+00
Lift (Military)	D	120	1.31E+02	7.98E-04	3.70E-03	5.68E-03	5.95E-01	6.98E-06	4.27E-04	0.00E+00	7.20E-05	3.26E+00
Light	D	50	1.36E+02	1.99E-03	6.23E-03	6.93E-03	7.52E-01	9.72E-06	5.47E-04	0.00E+00	1.79E-04	1.73E+00
Pressure Washers	D	175	2.86E+02	5.86E-04	3.37E-03	5.52E-03	6.53E-01	7.35E-06	2.59E-04	0.00E+00	5.29E-05	5.21E+00
Pump (Military)	D	50	1.58E+03	1.55E-03	4.86E-03	5.41E-03	5.86E-01	7.58E-06	4.27E-04	0.00E+00	1.40E-04	1.35E+00
Pump (Military)	D	120	2.94E+03	8.40E-04	3.89E-03	5.98E-03	6.26E-01	7.35E-06	4.49E-04	0.00E+00	7.58E-05	3.44E+00
Start Cart	D	120	6.54E+01	8.40E-04	3.89E-03	5.98E-03	6.26E-01	7.35E-06	4.49E-04	0.00E+00	7.58E-05	3.44E+00
Start Cart	D	500	2.72E+02	2.29E-04	9.39E-04	2.98E-03	4.25E-01	4.18E-06	8.85E-05	0.00E+00	2.06E-05	9.63E+00
Test Stand	D	120	2.16E+03	7.73E-04	3.58E-03	5.50E-03	5.76E-01	6.76E-06	4.13E-04	0.00E+00	6.97E-05	3.16E+00
Test Stand	D	175	1.91E+02	5.48E-04	3.15E-03	5.16E-03	6.10E-01	6.86E-06	2.42E-04	0.00E+00	4.94E-05	4.86E+00
Test Stand	D	250	4.22E+03	3.54E-04	1.25E-03	4.58E-03	5.92E-01	6.67E-06	1.31E-04	0.00E+00	3.19E-05	6.71E+00
Test Stand	D	500	3.27E+03	2.77E-04	1.14E-03	3.61E-03	5.16E-01	5.06E-06	1.07E-04	0.00E+00	2.50E-05	1.17E+01
Welder	D	50	5.72E+02	1.39E-03	4.36E-03	4.85E-03	5.26E-01	6.80E-06	3.83E-04	0.00E+00	1.25E-04	1.21E+00
Welder	D	120	3.79E+03	5.21E-04	2.41E-03	3.71E-03	3.88E-01	4.56E-06	2.78E-04	0.00E+00	4.70E-05	2.13E+00
Other tactical support equipment	D	50	2.72E+01	1.99E-03	6.23E-03	6.93E-03	7.52E-01	9.72E-06	5.47E-04	0.00E+00	1.79E-04	1.73E+00
Other tactical support equipment	D	120	1.05E+03	6.63E-04	3.08E-03	4.72E-03	4.95E-01	5.81E-06	3.55E-04	0.00E+00	5.99E-05	2.71E+00
Other tactical support equipment	D	175	1.53E+03	5.71E-04	3.28E-03	5.37E-03	6.36E-01	7.15E-06	2.52E-04	0.00E+00	5.15E-05	5.07E+00
Other tactical support equipment	D	250	8.17E+02	3.91E-04	1.39E-03	5.07E-03	6.56E-01	7.38E-06	1.45E-04	0.00E+00	3.53E-05	7.42E+00
Other tactical support equipment	D	500	5.45E+02	2.18E-04	8.96E-04	2.84E-03	4.06E-01	3.98E-06	8.45E-05	0.00E+00	1.97E-05	9.19E+00
Other tactical support equipment	D	750	4.09E+02	3.49E-04	1.39E-03	4.52E-03	6.27E-01	6.31E-06	1.33E-04	0.00E+00	3.15E-05	2.13E+01
Compressor (Dredging)	D	50	2.35E+02	2.39E-03	6.77E-03	5.98E-03	6.01E-01	7.77E-06	5.79E-04	0.00E+00	2.16E-04	1.40E+00
Compressor (Dredging)	D	120	4.23E+03	8.07E-04	3.28E-03	4.99E-03	4.76E-01	5.58E-06	4.46E-04	0.00E+00	7.28E-05	2.62E+00
Compressor (Dredging)	D	175	8.35E+02	6.42E-04	3.15E-03	5.14E-03	5.53E-01	6.23E-06	2.87E-04	0.00E+00	5.79E-05	4.42E+00
Compressor (Dredging)	D	250	1.19E+03	3.85E-04	1.15E-03	4.20E-03	4.93E-01	5.55E-06	1.35E-04	0.00E+00	3.48E-05	5.59E+00
Compressor (Dredging)	D	500	2.38E+03	2.81E-04	9.54E-04	2.95E-03	3.92E-01	3.85E-06	9.95E-05	0.00E+00	2.53E-05	8.89E+00
Compressor (Dredging)	D	1000	9.54E+03	4.12E-04	1.42E-03	5.02E-03	4.86E-01	4.89E-06	1.45E-04	0.00E+00	3.72E-05	2.21E+01
Crane (Dredging)	D	750	3.48E+03	2.09E-04	8.47E-04	2.24E-03	4.80E-01	4.71E-06	7.05E-05	0.00E+00	1.89E-05	1.63E+01
Deck/door engine	D	250	4.09E+02	2.99E-04	1.15E-03	4.23E-03	5.69E-01	6.41E-06	1.13E-04	0.00E+00	2.70E-05	6.44E+00

Dredger	D	175	3.54E+03	6.03E-04	2.93E-03	4.78E-03	5.11E-01	5.75E-06	2.69E-04	0.00E+00	5.44E-05	4.08E+00
Dredger	D	250	9.49E+03	3.99E-04	1.18E-03	4.29E-03	5.01E-01	5.64E-06	1.39E-04	0.00E+00	3.60E-05	5.68E+00
Dredger	D	750	1.14E+04	3.45E-04	1.14E-03	3.64E-03	4.67E-01	4.58E-06	1.22E-04	0.00E+00	3.12E-05	1.59E+01
Dredger	D	9999	1.52E+05	6.70E-05	2.24E-04	7.94E-04	7.65E-02	7.51E-07	2.31E-05	0.00E+00	6.04E-06	3.47E+01
Hoist/swing/winch	D	50	1.27E+02	1.66E-03	4.69E-03	4.09E-03	4.09E-01	5.29E-06	4.00E-04	0.00E+00	1.50E-04	9.53E-01
Hoist/swing/winch	D	120	2.73E+03	9.52E-04	3.84E-03	5.84E-03	5.54E-01	6.50E-06	5.27E-04	0.00E+00	8.59E-05	3.05E+00
Hoist/swing/winch	D	175	5.76E+03	5.73E-04	2.79E-03	4.54E-03	4.86E-01	5.46E-06	2.56E-04	0.00E+00	5.17E-05	3.88E+00
Hoist/swing/winch	D	250	1.58E+04	4.34E-04	1.28E-03	4.66E-03	5.44E-01	6.13E-06	1.51E-04	0.00E+00	3.91E-05	6.17E+00
Hoist/swing/winch	D	500	3.29E+04	3.16E-04	1.06E-03	3.26E-03	4.32E-01	4.24E-06	1.11E-04	0.00E+00	2.85E-05	9.79E+00
Hoist/swing/winch	D	750	2.09E+04	4.25E-04	1.40E-03	4.48E-03	5.74E-01	5.64E-06	1.50E-04	0.00E+00	3.83E-05	1.95E+01
Hoist/swing/winch	D	9999	1.26E+05	7.09E-05	2.38E-04	8.41E-04	8.10E-02	7.95E-07	2.44E-05	0.00E+00	6.40E-06	3.68E+01
Pump (Dredging)	D	120	3.77E+02	1.11E-03	4.97E-03	7.64E-03	7.80E-01	9.15E-06	6.01E-04	0.00E+00	1.00E-04	4.28E+00
Pump (Dredging)	D	175	2.03E+02	7.63E-04	4.20E-03	6.89E-03	7.95E-01	8.94E-06	3.39E-04	0.00E+00	6.89E-05	6.34E+00
Pump (Dredging)	D	250	2.61E+03	5.96E-04	2.02E-03	7.36E-03	9.27E-01	1.04E-05	2.20E-04	0.00E+00	5.38E-05	1.05E+01
Pump (Dredging)	D	500	8.71E+03	4.15E-04	1.65E-03	5.11E-03	7.16E-01	7.03E-06	1.58E-04	0.00E+00	3.74E-05	1.62E+01
Pump (Dredging)	D	750	4.72E+03	4.16E-04	1.61E-03	5.13E-03	6.98E-01	6.86E-06	1.57E-04	0.00E+00	3.76E-05	2.37E+01
Pump (Dredging)	D	9999	1.86E+05	1.92E-04	6.92E-04	2.46E-03	2.52E-01	2.47E-06	6.85E-05	0.00E+00	1.74E-05	1.14E+02
Generator (Dredging)	D	50	2.91E+02	2.56E-03	7.23E-03	6.18E-03	6.12E-01	7.91E-06	6.14E-04	0.00E+00	2.31E-04	1.43E+00
Generator (Dredging)	D	120	5.59E+03	1.29E-03	5.16E-03	7.81E-03	7.34E-01	8.61E-06	7.15E-04	0.00E+00	1.17E-04	4.04E+00
Generator (Dredging)	D	175	5.10E+02	8.29E-04	3.98E-03	6.44E-03	6.83E-01	7.69E-06	3.68E-04	0.00E+00	7.48E-05	5.46E+00
Generator (Dredging)	D	250	1.17E+04	7.21E-04	2.08E-03	7.56E-03	8.75E-01	9.85E-06	2.47E-04	0.00E+00	6.51E-05	9.92E+00
Generator (Dredging)	D	500	4.08E+04	5.66E-04	1.83E-03	5.65E-03	7.44E-01	7.30E-06	1.94E-04	0.00E+00	5.11E-05	1.69E+01
Generator (Dredging)	D	750	2.18E+04	6.33E-04	2.03E-03	6.47E-03	8.25E-01	8.09E-06	2.19E-04	0.00E+00	5.71E-05	2.80E+01
Generator (Dredging)	D	9999	4.66E+05	1.21E-04	3.99E-04	1.41E-03	1.35E-01	1.33E-06	4.16E-05	0.00E+00	1.09E-05	6.14E+01
Other (Dredging)	D	120	9.11E+02	9.25E-04	3.73E-03	5.67E-03	5.38E-01	6.31E-06	5.12E-04	0.00E+00	8.35E-05	2.96E+00
Other (Dredging)	D	175	4.43E+02	7.54E-04	3.67E-03	5.97E-03	6.39E-01	7.19E-06	3.36E-04	0.00E+00	6.80E-05	5.10E+00
Other (Dredging)	D	250	1.27E+03	4.44E-04	1.31E-03	4.77E-03	5.57E-01	6.27E-06	1.54E-04	0.00E+00	4.00E-05	6.32E+00
Other (Dredging)	D	500	5.06E+03	3.61E-04	1.21E-03	3.73E-03	4.93E-01	4.84E-06	1.27E-04	0.00E+00	3.26E-05	1.12E+01
Misc Portable Equipment	D	120	2.21E+02	8.54E-04	3.72E-03	5.71E-03	5.73E-01	6.72E-06	4.64E-04	0.00E+00	7.71E-05	3.15E+00
Misc Portable Equipment	D	175	7.90E+01	5.45E-04	2.91E-03	4.78E-03	5.41E-01	6.09E-06	2.43E-04	0.00E+00	4.92E-05	4.32E+00
Misc Portable Equipment	D	250	2.42E+01	4.29E-04	1.41E-03	5.13E-03	6.34E-01	7.14E-06	1.57E-04	0.00E+00	3.87E-05	7.18E+00
Misc Portable Equipment	D	500	1.77E+02	3.62E-04	1.39E-03	4.29E-03	5.92E-01	5.81E-06	1.36E-04	0.00E+00	3.27E-05	1.34E+01
Misc Portable Equipment	D	750	1.21E+02	3.52E-04	1.32E-03	4.18E-03	5.61E-01	5.64E-06	1.31E-04	0.00E+00	3.17E-05	1.91E+01
Misc Portable Equipment	D	1000	6.45E+01	4.34E-04	1.57E-03	5.56E-03	5.61E-01	5.64E-06	1.56E-04	0.00E+00	3.92E-05	2.55E+01
Generator (Entertainment)	D	50	1.14E+01	2.41E-03	7.45E-03	8.09E-03	8.72E-01	1.13E-05	6.53E-04	0.00E+00	2.18E-04	2.01E+00
Generator (Entertainment)	D	120	6.71E+02	1.02E-03	4.65E-03	7.15E-03	7.42E-01	8.70E-06	5.46E-04	0.00E+00	9.18E-05	4.07E+00
Generator (Entertainment)	D	175	8.09E+02	7.85E-04	4.44E-03	7.28E-03	8.53E-01	9.60E-06	3.48E-04	0.00E+00	7.09E-05	6.80E+00
Generator (Entertainment)	D	250	1.78E+03	4.85E-04	1.69E-03	6.17E-03	7.90E-01	8.89E-06	1.80E-04	0.00E+00	4.38E-05	8.94E+00
Generator (Entertainment)	D	500	5.53E+03	3.06E-04	1.24E-03	3.90E-03	5.53E-01	5.42E-06	1.18E-04	0.00E+00	2.76E-05	1.25E+01
Generator (Entertainment)	D	750	1.45E+03	4.13E-04	1.62E-03	5.25E-03	7.23E-01	7.27E-06	1.56E-04	0.00E+00	3.72E-05	2.46E+01
Generator (Entertainment)	D	9999	2.85E+03	7.19E-05	2.59E-04	9.32E-04	9.64E-02	9.70E-07	2.58E-05	0.00E+00	6.49E-06	4.37E+01
Compressor (Entertainment)	D	120	1.65E+01	4.92E-04	2.00E-03	3.05E-03	2.91E-01	3.41E-06	2.72E-04	0.00E+00	4.44E-05	1.60E+00
Compressor (Railyard)	D	120	3.30E+01	4.59E-04	1.86E-03	2.84E-03	2.71E-01	3.17E-06	2.54E-04	0.00E+00	4.14E-05	1.49E+00
Crane (Rail-CHE)	D	120	1.65E+01	7.61E-04	3.09E-03	4.71E-03	4.49E-01	5.27E-06	4.21E-04	0.00E+00	6.86E-05	2.47E+00
Crane (Rail-CHE)	D	175	2.99E+01	3.60E-04	2.04E-03	3.34E-03	3.91E-01	4.40E-06	1.59E-04	0.00E+00	3.25E-05	3.12E+00
Materials Handling (Rail-CHE)	D	120	1.65E+01	8.35E-04	3.39E-03	5.17E-03	4.93E-01	5.54E-06	4.62E-04	0.00E+00	7.53E-05	2.71E+00
Generator (Railyard)	D	175	9.98E+00	7.32E-04	4.14E-03	6.78E-03	7.95E-01	8.94E-06	3.24E-04	0.00E+00	6.60E-05	6.34E+00
Generator (Railyard)	D	9999	5.70E+02	6.55E-05	2.35E-04	8.48E-04	8.78E-02	8.83E-07	2.35E-05	0.00E+00	5.91E-06	3.98E+01

Vessels w/Outboard Engines	G2	2	7.09E+01	6.36E-02	8.07E-02	2.76E-04	3.03E-01	8.64E-06	5.01E-03	2.23E-04	3.95E-03	6.96E-02
Vessels w/Outboard Engines	G2	15	2.94E+04	2.16E-02	3.30E-02	7.10E-04	1.21E-01	3.46E-06	2.00E-03	1.48E-04	1.34E-03	1.99E-01
Vessels w/Outboard Engines	G2	25	1.33E+04	2.86E-02	5.79E-02	1.83E-03	2.42E-01	6.91E-06	4.01E-03	1.92E-04	1.78E-03	5.73E-01
Vessels w/Outboard Engines	G2	50	2.60E+04	2.29E-02	3.84E-02	2.56E-03	4.09E-01	6.39E-06	3.71E-03	1.64E-04	1.42E-03	1.44E+00
Vessels w/Outboard Engines	G2	120	5.49E+04	1.87E-02	3.52E-02	2.25E-03	3.60E-01	5.69E-06	3.30E-03	1.03E-04	1.16E-03	3.02E+00
Vessels w/Outboard Engines	G2	175	3.70E+04	2.30E-02	5.01E-02	2.65E-03	4.40E-01	7.16E-06	4.15E-03	9.21E-05	1.43E-03	5.50E+00
Vessels w/Outboard Engines	G2	250	1.52E+04	2.06E-02	3.93E-02	3.57E-03	4.05E-01	6.77E-06	3.93E-03	9.07E-05	1.28E-03	7.06E+00
Vessels w/Outboard Engines	G2	500	6.12E+03	1.66E-02	3.04E-02	2.81E-04	2.83E-01	4.73E-06	2.74E-03	1.73E-05	1.03E-03	1.02E+01
Sailboat Auxiliary Outboard Engin	G2	15	6.91E+01	2.11E-02	3.25E-02	8.17E-04	1.33E-01	3.78E-06	2.19E-03	1.59E-04	1.31E-03	2.05E-01
Sailboat Auxiliary Outboard Engin	G2	25	6.19E+01	2.10E-02	4.29E-02	1.49E-03	1.99E-01	5.67E-06	3.29E-03	1.72E-04	1.31E-03	4.49E-01
Sailboat Auxiliary Outboard Engin	G2	50	1.15E+02	1.80E-02	3.05E-02	2.37E-03	3.63E-01	5.67E-06	3.29E-03	1.58E-04	1.12E-03	1.24E+00
Personal Water Craft	G2	9999	1.60E+07	1.65E-04	2.90E-04	3.49E-05	6.31E-03	1.03E-07	5.78E-05	1.42E-06	1.03E-05	3.83E+00
Vessels w/Inboard Engines	G4	250	8.46E+05	1.68E-03	5.19E-02	2.14E-03	3.39E-01	3.91E-06	3.24E-05	6.98E-05	9.54E-05	5.53E+00
Vessels w/Outboard Engines	G4	50	1.59E+04	3.19E-03	8.42E-02	2.49E-03	3.72E-01	4.28E-06	3.56E-05	1.65E-04	1.81E-04	1.34E+00
Vessels w/Sterndrive Engines	G4	250	1.64E+06	1.23E-03	3.84E-02	1.55E-03	2.51E-01	2.89E-06	2.40E-05	5.87E-05	6.99E-05	4.09E+00
Sailboat Auxiliary Inboard Engine	G4	15	1.84E+02	3.27E-03	8.81E-02	2.55E-03	3.77E-01	6.30E-06	3.60E-05	2.93E-04	1.86E-04	4.10E-01
Vessels w/Inboard Jet Engines	G4	500	3.78E+05	1.00E-03	3.09E-02	1.28E-03	2.01E-01	2.32E-06	1.93E-05	3.85E-05	5.71E-05	6.57E+00
Vessels w/Inboard Engines	D	250	9.07E+04	2.36E-03	3.54E-03	8.06E-03	4.28E-01	4.82E-06	2.06E-04	0.00E+00	2.12E-04	4.99E+00
Sailboat Auxiliary Inboard Engine	D	50	1.25E+03	1.30E-03	1.96E-03	4.45E-03	2.37E-01	3.06E-06	1.12E-04	0.00E+00	1.18E-04	5.52E-01

Table F.5-11 Construction Impact Summary

Modeling Inputs/Results for QBPP Construction Impacts (Combustion Sources as Point Sources) - FASTALL/20m+50m+Prop.Bdy Recs

Short Term Impacts (24 hrs and less)						Long Term Impacts (annual)					
	NOx	CO	SOx	PM10	PM2.5		NOx	CO	SOx	PM10	PM2.5
Combustion (lbs/day)	174.4	127.9	0.201	9.43	9.34	Combustion (tons/year)	23.59	19.95	0.030	1.64	1.62
						Combustion (days/year)**	312	312	312	312	312
Combustion (hrs/day)	10	10	10	10	10	Combustion (hrs/day)	10	10	10	10	10
Combustion (lbs/hr)	17.44	12.79	0.02	0.94	0.93	Combustion (lbs/hr)**	12.93	10.93	0.02	0.90	0.89
Combustion (g/sec)	2.20E+00	1.61E+00	2.53E-03	1.19E-01	1.18E-01	Combustion (g/sec)	1.63E+00	1.38E+00	2.07E-03	1.13E-01	1.12E-01
Construction Dust (lbs/day)	Worst-case Short-term Conditions:			12.55	1.90	Construction Dust (tons/year)	Worst-case 12-month Conditions:			0.767	0.139
	NOx/SO2/PM10/2.5=Grading Phase					Construction Dust (days/year)	NOx/CO/SO2: 12 months Building Ph			312	312
Construction Dust (hrs/day)	CO=Building Phase			10	10	Construction Dust (hrs/day)	PM10/2.5: 2m Grading + 10m Building			10	10
Construction Dust (lbs/hr)				1.26	0.19	Construction Dust (lbs/hr)**		(Based on lbs/month)		0.420	0.076
Construction Dust (g/sec)	3.00 acres			1.58E-01	2.39E-02	Construction Dust (g/sec)	16.01 acres			5.30E-02	9.60E-03
AERMOD Inputs	**12,150 m^2**		**32 Pt.Srcs**				**64,803 m^2**		**43 Pt.Srcs**		
Combustion (g/s/src)	6.867E-02	5.036E-02	7.914E-05	3.713E-03	3.678E-03	Combustion (g/s/src)	3.788E-02	3.203E-02	4.817E-05	2.633E-03	2.601E-03
Construction Dust (g/s/m^2)				1.301E-05	1.970E-06	Construction Dust (g/s/m^2)				8.172E-07	1.481E-07
AERMOD Results (ug/m^3)											
Combustion Only						Combustion Only					
1-hour Max	615.728*	451.557	0.710	33.29309							
3-hour Max			0.286	13.40857							
8-hour Max		77.071		5.68237							
24-hour Max			0.060	2.83608	2.80901	Annual	8.708		0.011	0.60542	0.59804
All Particulate Sources						All Particulate Sources					
24-hour Max				65.89531	10.05596	Annual				2.38999	0.76422
3-yr Avg 8th High Daily 1-hr NO2 Max	212.256*	w/ Seasonal/Hourly NO2 Background for NAAQS				Annual NO2 w/ ARM	6.531	based on ARM Ratio of:		75%	
Max 1-hr NO2 Max	282.671*	w/ Concurrent Hourly NO2 Background for CAAQS									
Background (ug/m^3)						Background (ug/m^3)					
1-hour Max	N/A	5290	49.8								
3-hour Max			36.4								
8-hour Max		3600									
24-hour Max			18.4	50	23.7	Annual	26.4		7.9	25	12
Total + Background (ug/m^3)						Total + Background (ug/m^3)					
1-hour Max	N/A	5742	50.5								
3-hour Max			36.69								
8-hour Max		3677									
24-hour Max			18.46	115.9	33.8	Annual	32.9		7.9	27.4	12.8

*Based on AERMOD Ozone Limiting Method (OLM) keyword with all sources combined in one source group, including background in AERMOD analyses.

**Even for construction projects taking less than 12-months or 7 days/wk, the hourly emissions for modeling are still based on total tons (projects<12 months) or tons/year (projects>12months) divided by 365 days since all days in the met dataset (i.e., all 12 months and all 365 days - i.e., 7 days/week) are modeled.

Table F.5-12

Construction Personnel Craft by Month Estimates (months after Notice to Proceed)

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
Carpenter	0	0	8	8	15	15	22	22	18	18	8	8	0	0	0	0	0	0	142
Cement Mason	0	6	12	20	20	24	26	26	26	12	12	12	6	6	2	0	0	0	210
Electricians	0	0	0	0	0	0	0	0	16	42	58	56	42	40	12	3	2	2	273
Iron Worker	0	0	0	8	14	20	22	14	14	14	14	12	12	8	2	0	0	0	154
labor	9	15	10	24	46	56	50	44	44	34	46	46	36	18	9	0	0	0	487
Millwright	0	0	0	0	0	6	16	32	36	36	36	36	26	4	4	2	2	2	238
Operator	18	20	15	15	15	15	15	15	6	6	12	12	12	6	2	2	0	0	186
Pipe fitter	0	0	0	0	0	6	6	12	38	42	52	52	38	8	6	2	2	2	266
Teamster	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0	0	0	30
Insulation Worker	0	0	0	0	0	0	0	0	6	6	12	12	12	12	8	2	0	0	70
Painter	0	0	0	0	0	0	0	0	0	0	0	6	6	8	8	2	2	2	34
Sheet Metal	0	0	0	0	0	0	0	0	6	10	16	10	10	0	0	2	0	0	54
Total Craft	**29**	**43**	**47**	**77**	**112**	**144**	**159**	**167**	**212**	**222**	**268**	**264**	**202**	**112**	**55**	**15**	**8**	**8**	**2144**

Above chart based on the construction of Plains End Facility with adjustments for Quail Brush site specifics :
134 average workforce over 16 months
252 peak workforce at month 11

APPENDIX F.6

Evaluation of Best Available Control Technology

Objectives of the QBPP Project

QBPP will be a nominal 100-megawatt (MW) facility using 11 natural gas-fired reciprocating engines (hereinafter referred to as the "Power Cycle Engines".) QBPP is contracted under a 20-year power purchase agreement (PPA) with the investor-owned utility San Diego Gas & Electric (SDG&E) in response to the utility's 2009 Request for Offers (RFO). The RFO sought several types of energy products to support reliability within SDG&E's service territory, supply energy to bundled customers, meet Resource Adequacy requirements and provide other portfolio needs. The requested energy products in the RFO included peaking facilities (such as QBPP), demand-side management, and renewable resource generation. In particular, the RFO sought projects that would be online no later than October 1, 2014, have an annual capacity of at least 30% and an availability of at least 98%. The RFO also specified that SDG&E was seeking flexible resources that would be capable of providing regulation during the morning and evening ramps and/or units that can be started and shutdown as needed. It also emphasized the importance of quick start operations and black start capability.

QBPP is designed to specifically satisfy these needs and will provide SDG&E and the San Diego area for more peaking and load-shaping generation for both the short and long term. By necessity, peaking plants must be able to start quickly and adjust load levels easily. In particular, SDG&E needs peaking facilities to support renewable energy generation, including generation from wind, hydroelectric, and solar facilities, that have variable outputs. When the output of the renewable resources decreases, QBPP can be dispatched quickly. Conversely, when the output of renewable resources increases, QBPP can be ramped down quickly and still operate efficiently with the lower load. The design of the project as consisting of multiple Power Cycle Engines, as opposed to one or two combustion turbines, provides unique flexibility, while still achieving higher efficiencies across the entire load range. QBPP can thus support further integration of renewable resources into SDG&E's generation portfolio, and assist statewide goals calling for increased reliance on renewable energy.

Additionally, the design of QBPP will allow it provide several ancillary services necessary for reliability of the grid operated by the California Independent System Operator (CAISO) within SDG&E's service territory. These services include: (1) regulation service (regulation up and regulation down) to allow the CAISO balancing authority area to meet reliability standards set by the North American Electric Reliability Corporation (NERC) and the Western Electricity Coordinating Council (WECC); (2) spinning and non-spinning reserves to help maintain contingency capacity and energy on the grid; and (3) voltage support to help maintain required voltage levels and reactive margins on the grid within NERC and WECC reliability standards. Provision of such services requires QBPP to be under the direct control of CAISO's Automatic Generation Control system. The ability of QBPP to start quickly, operate efficiently across the entire load range, and provide such ancillary services will help improve system-wide reliability within SDG&E's service territory. These features are all key elements to the Project's overall business objectives.

When considering the project design and building into the RFO, the Applicant gave consideration to multiple other types of generation. However, all were ultimately rejected because they did not meet the RFO objectives of providing peaking and load-shaping generation to SDG&E and ancillary services to the grid within SDG&E's service territory and therefore would not meet the Project's goals. A discussion of the rationale for eliminating these alternative generation technologies is provided at Section 3.0 of the Application for Certification (AFC).

Meaning of Best Available Control Technology (BACT)

BACT Definition Per the San Diego APCD Rules and Regulations (Rule 20.1)

"Best Available Control Technology (BACT)" means and is applied as follows:

(i) The lowest emitting of any of the following:

(A) the most stringent emission limitation, or the most effective emission control device or control technique, which has been proven in field application and which is cost-effective for such class or category of emission unit, unless the applicant demonstrates to the satisfaction of the Air Pollution Control Officer that such limitation, device or control technique is not technologically feasible, or

(B) any emission control device, emission limitation or control technique which has been demonstrated but not necessarily proven in field application and which is cost-effective for such class or category of emission unit, as determined by the Air Pollution Control Officer, unless the applicant demonstrates to the satisfaction of the Air Pollution Control Officer that such limitation, device or control technique is not technologically feasible, or

(C) any control equipment, process modifications, changes in raw material including alternate fuels, and substitution of equipment or processes with any equipment or processes, or any combination of these, determined by the Air Pollution Control Officer on a case-by-case basis to be technologically feasible and cost-effective, including transfers of technology from another category of source, or

(D) the most stringent emission limitation, or the most effective emission control device or control technique, contained in any State Implementation Plan (SIP) approved by the federal EPA for such emission unit category, unless the applicant demonstrates to the satisfaction of the Air Pollution Control Officer that such limitation or technique has not been proven in field application, that it is not technologically feasible or that it is not cost-effective for such class or category of emission unit.

BACT is applied to new sources per Rule 20.2(d)(1)(i), as follows: Any new or modified emission unit which has any increase in its potential to emit particulate matter (PM10), oxides of nitrogen (NOx), volatile organic compounds (VOC) or oxides of sulfur (SOx) and which unit has a post-project potential to emit of 10 pounds per day or more of PM10, NOx, VOC, or SOx shall be equipped with Best Available Control Technology (BACT) for each such air contaminant.

BACT Definition per the PSD Regulations (40 CFR 52.21)

Best available control technology means an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Clean Air Act (CAA or Act) which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results.

BACT Analysis for Criteria Pollutants

BACT for Power Cycle Engines - Normal Operations

To evaluate BACT for the proposed Wartsila natural gas-fired lean burn, spark-ignited reciprocating internal combustion engines (RICEs), the applicant applied the U.S. Environmental Protection Agency's (EPA) "top-down" method, which requires, as "Step 1", identification, for the proposed source and each pollutant subject to analysis, all available control technologies. This may include inherently lower-emitting processes, practices or designs; add-on controls; and combinations of inherently lower-emitting processes with add-on controls. "Step 2" of the top-down method involves elimination of technically infeasible options. A control option will generally be considered technically feasible for the proposed source if it either has been demonstrated and operated successfully on the same type of source or is both available and applicable to the source under review. "Step 3" involves ranking of all technically feasible control technologies that were not eliminated at Step 2. At "Step 4", the applicant considers the relative economic, energy and environmental impacts of the available control technologies, either to affirm selection of the top control technology identified at Step 3 or to justify selection of a lower-ranked control technology. Finally, at "Step 5" of the analysis, the most effective control option not eliminated at Step 4 is selected as BACT for each particular pollutant and unit under consideration. This selection of BACT must then be translated into an enforceable emissions limitation by the permitting agency.

As a starting point for consideration of BACT for criteria pollutants emitted by the proposed QBPP, the applicant reviewed several general references to identify guidelines for appropriate emissions limitations for this source category. The SDAPCD's "Best Available Control Technology (BACT) Guidelines" were then evaluated. For the purposes of comparison to the District's guideline, select other permitting agencies' summaries of BACT determinations were reviewed.

Step 1 - Identify BACT Technologies

The primary reference was the SDAPCD's BACT guidelines, while other references included other California Districts' guidelines for this source category. Table F.6-1 presents a summary of this initial review.

Table F.6-1 BACT Guidelines for Specified California Air Districts

District	Units	NOx	CO	VOC	SOx	PM10
SDAPCD[2]	g/hp-hr	.07-.15	none	.6-1.0	LSF	.1 PCV
BAAQMD[1]	g/hp-hr	.07-.15	.1-.6	.15	LSF	LSF
SCAQMD[3]	g/hp-hr	.15	.6	.15	LSF	LSF
SJVUAPCD[3]	g/hp-hr	.15	.6	.15	LSF	LSF
Proposed 20V34SG-C2 Engines*	**g/hp-hr**	**.046**	**.055**	**.056**	**.009**	**.049**

*based on engine at full load rating (12874 HP) and Wartsila data per Table F.1-2 (Appendix F.1), firing nat gas.

[1] BACT is specific for natural gas-fired, spark-ignited, lean burn internal combustion engines.

[2] BACT is specific for natural gas-fired, spark-ignited, lean burn internal combustion engines greater than 2,000 hp.

[3] BACT is general for natural gas-fired, spark-ignited internal combustion engines, i.e., it is applicable to both lean-burn and rich burn engines.

LSF = low sulfur fuel (natural gas, propane, LNG, low sulfur fuel oil, etc.)

The agencies referenced in Table F.6-1, which have BACT determinations specific for lean-burn engines, have identified the following methods for reducing the criteria pollutant emissions include the following:

Table F.6-2 Identified BACT Technologies

Pollutant	Technology
NOx	Lean burn, lean burn w/3-way catalyst, lean burn with SCR
CO	Lean burn, lean burn w/3-way catalyst, lean burn with oxidation catalyst
VOC	Lean burn, lean burn w/3-way catalyst, lean burn with oxidation catalyst
SOx	Clean fuel (natural gas, propane, LS fuel oil, etc)
PM10/PM2.5	Lean burn, Clean fuel (natural gas, propane, LNG, LS fuel oil, etc), PCV filter

As a preliminary matter, the Applicant also considered inherently lower polluting processes that might be available for the general source category of electric power generation. This consisted of evaluation of several alternative generating technologies, none of which could meet the project objectives. See Section 3.0 of the AFC for a more detailed discussion of this consideration of alternative technologies. The Applicant considered both renewable energy technologies (hydroelectric processes, geothermal power processes, ocean wave energy processes, energy from biomass, solar energy, wind energy), and other fossil-fuel energy technologies (conventional boiler and steam turbine, conventional simple-cycle combustion turbine, conventional combined-cycle power plant, Kalina combined-cycle power plant, and advanced combustion turbine designs). In each case, however, these alternative generating technologies failed to meet fundamental project objectives and/or were not technically feasible and were therefore eliminated from consideration for the reasons described below. Indeed, EPA guidance provides that BACT will not ordinarily be applied to require an applicant to redefine its proposed source.

Alternative Fuels

Other fuels such as propane, LNG, and LS fuel oils were eliminated from consideration because SDG&E's RFO specifically called for projects that would operate pursuant to a tolling agreement, i.e., projects that would utilize PUC-quality natural gas provided by SDG&E to generate electricity. Accordingly, use of any other fuel would defeat a project objective. Moreover, PUC-grade natural gas is the best (cleanest) fuel choice with respect to all criteria pollutants under consideration. Thus, even if alternative fuel sources were available, they would be ranked lower than the proposed use of PUC-grade natural gas. In addition, these other fuel sources would all be eliminated due to technical infeasibility for the Project. On-site propane storage would be impractical from the standpoint of tank number or tank sizes, safety and the constant need for deliveries, etc. LNG is not commercially available in the project region at this time. LS fuel oil does not match the design of the proposed engines; nor would use of LS fuel oil constitute a clean fuel choice.

Alternative Generating Technologies - Renewable Energy

The Applicant considered renewable generating sources as an alternative to the proposed Project. The Applicant notes that both the California Energy Commission and SDG&E have aggressive goals and targets for increasing renewable generating capacity within San Diego County and the SDG&E service area. The Applicant believes that, due to their intermittent availability, there are no renewable energy projects that would meet the need for new peaking capacity and ancillary services in the San Diego region in the near term. Indeed, a fundamental objective of QBPP is to provide dispatchable peaking and load-shaping power that will help facilitate integration of intermittent renewable generating sources, in particular, wind and solar resources, to the grid. The proposed QBPP, which will have a 10-minute start-time from cold start, will be under the direct control of the CAISO's Automatic Generator Control system and can be flexibly dispatched to increase or decrease load, as load from intermittent renewable sources varies throughout the day. Thus, QBPP will provide critical grid support within SDG&E's service territory and assure system reliability as significant additional renewable generating sources are connected to the grid. The following summarizes select renewable generating technologies that were eliminated as alternatives for the Project.

Hydroelectric Processes

A new hydroelectric project would require a flowing river or a series of reservoirs that could store water for a pumped storage project, requiring a large quantity of water. No rivers are located in the vicinity of the Project, and the use of pumped storage would require a much larger site area and result in a significantly larger environmental footprint than the Project. It is highly unlikely that this technology could be implemented within 3 to 5 years from the date of the RFO and online by 2014. Therefore, the hydroelectric option is not feasible and was eliminated from consideration.

Geothermal Power Processes

Geothermal power plants use steam turbine facilities, for which the heat is generated by the high temperature and pressure geothermal fluids that are pumped from deep underground. Geothermal development is not viable at the Project location because suitable thermal vents and strata are not present. Therefore, geothermal power processes are not feasible. Moreover, geothermal power plants typically provide baseload power and do not have the fast-ramping flexibly that could provide peaking and load-shaping power to the grid, to help integrate intermittent renewables. Thus, geothermal generation would not meet the Project's objectives and was eliminated.

Ocean Wave Energy Processes

Wave energy is generated by the influence of wind on the ocean surface. At the present time very few of these devices have been tested at full-scale and even fewer devices are ready for early adoption in commercial development projects. Therefore, this technology is not commercially available and cannot be considered technically feasible at this time. Additionally, the Project site is not located near enough the ocean to make ocean wave energy processes feasible.

Energy from Biomass

Energy production from a biomass power plant may come from the direct combustion of the biomass materials or from the conversion of the biomass into another fuel (such as alcohol or methane) and subsequent combustion of that fuel. The combustion process is used to heat steam boilers to generate steam for a steam turbine. Large quantities of the biomass "fuel" are not generated in the vicinity of the Project site and would need to be trucked to the site. The storage and handling of the biomass would require additional space, and the power plant footprint would be larger than that for the proposed Project. Additionally, although classified as renewable, the emissions of criteria pollutants from a biomass power plant are, in many cases, significantly greater than the emissions from the proposed Power Cycle Engines burning PUC-grade natural gas. Moreover, as previously noted, the Project objectives include utilization of natural gas provided to the Project by SDG&E pursuant to a tolling agreement. Thus, construction of a biomass power plant instead of the proposed gas-fired reciprocating engines would defeat a Project objective. For all these reasons, although this technology is considered to be commercially available, it is not a feasible technology for the proposed Project and was eliminated from consideration.

Solar Energy

Most of these technologies collect solar radiation, heat water to create steam, and use the steam to power a steam turbine/generator. Photovoltaic technologies convert the sunlight directly into electricity. In both cases, power is only available while the sun shines so the units do not supply power that can be cycled up or down to follow demand as a peaking power plant is designed to operate. Thus, solar energy fails to meet project needs for peaking, load-shaping generation, which, by definition, is intended to balance integration of intermittent renewable sources such as solar to the grid. Additionally, the acreage required per MW generated is high, and not enough land is available at the Project site to deliver sufficient energy to meet project needs. Because a solar project would be inconsistent with the fundamental objective of providing firming and shaping power intended to balance variable renewable generating sources (such as solar), solar generation technology is not an alternative to the Project and was eliminated from consideration.

Wind Energy

Based on current technology, the production of 100 MW of electrical power would potentially require between 25 and 30 wind turbines, spaced out along available ridge lines. The project site is not suitable for wind energy development and therefore such technology is not feasible. Additionally, wind power does not meet the peaking power plant operational needs and is fundamentally inconsistent with the project objective of providing peaking, load-shaping generation that can be flexibly and efficiently dispatched to assure reliability and grid stability as intermittent renewable sources such as wind are increasingly integrated to the grid. Thus, a wind project fails to meet a fundamental project objective and cannot be considered a feasible alternative for the project.

Nuclear Power Technology

Nuclear power alternatives are not considered as a feasible alternative for the QBPP project and are not discussed further in this evaluation. The Applicant is unaware of any application of nuclear generating technology to meet peak and load-shaping demand. Additionally, given the permitting and regulatory constraints and barriers that would likely be faced by construction of a new nuclear generating facility in California (or elsewhere, for that matter), it is entirely unreasonable to anticipate that a new nuclear power plant could be constructed to meet demand within SDG&E's service area by October 2014. Thus, the technology would fail to meet fundamental project objectives and was rejected from consideration.

Alternative Fossil-Fuel Generating Technologies

The Applicant also evaluated several alternative fossil-fueled generating technologies that have been used to produce both peaking and base-load power in and out of California, i.e., boilers, simple cycle combustion turbines, and combined-cycle turbines. These alternative generating technologies were rejected for failing to achieve fundamental project objectives. In general, these technologies are commercially available. However, because of their relatively low efficiency at low load, low turn-down ratios and difficulty achieving fast-start times, these traditional systems would fail to meet critical Project objectives.

Conventional Boiler and Steam Turbine

Conventional boiler and steam turbine technology generates high pressure steam by burning natural gas in the furnace of a conventional boiler. This technology is well established and has been used in countless power plants worldwide. Typical thermal efficiencies of up to approximately 36 percent can be achieved by Boiler/Steam Turbine plants when utilizing natural gas. However, this technology is best suited for continuously operating power plants, due to the need to maintain the steam pressure in the boiler.

The conventional boiler and steam turbine technology does not meet project needs because of its inability to quickly ramp up to meet demand as needed to meet SDG&E's dispatch pattern, and its resulting lower overall efficiency due to the need to maintain high readiness for peaker operation (i.e., with frequent start-stop cycles). QBPP is designed to have a 10-minute cold-start to full capacity and as many as four start-up events per day. Thus, a conventional boiler/steam turbine design would be poorly suited to the Project. Additionally, this technology, although proven reliable and commercially available, would involve considerably greater water consumption and waste generation and would also require significantly greater space. For these reasons, use of a conventional boiler and steam turbine is inappropriate and was rejected from consideration for the Project.

Simple-Cycle Combustion Turbine

Simple-cycle combustion turbines are able to achieve thermal efficiencies up to approximately 38 percent. These systems are capable of rapidly reaching their operating peak, which makes them suitable for use in peaking power production. However, gas turbines are designed and built in fixed sizes (capacities) and are most efficient when they are operated at or near their design load capacity, i.e., the efficiency of the system decreases as a turbine is operated at reduced load. For a 100-MW project, either one (LMS100) or two (LM6000) turbines would be needed. Because simple-cycle gas turbines typically have a limited turn-down ratio, use of only one or two gas turbines would not provide the same flexibility that will be afforded by use of multiple reciprocating engines, as proposed for QBPP. Nor would use of simple-cycle turbine afford the same degree of efficiency in generation across the entire load range, as will the proposed QBPP. In addition, simple-cycle turbines generally operate at a higher heat rate than the proposed reciprocating engines and could therefore result in increased emissions of both GHGs and criteria pollutants per MWh-generated. A simple cycle turbine-generator could also result in increased water usage for water injection for emissions control and increased land requirements. For these reasons, simple-cycle combustion turbine technology was rejected as an alternative to the proposed QBPP.

Combined-Cycle Power Plant

A combined-cycle power plant integrates combustion turbines (equivalent to the simple-cycle combustion turbine-generator) and steam turbines to improve the overall power plant efficiency, relative to a simple-cycle plant, by capturing and utilizing waste heat from the combustion turbines to generate additional power in the steam turbine. The combustion turbine's hot exhaust is passed through a heat recovery steam generator (HRSG) to create high pressure steam which is then used to drive a steam turbine-generator. This technology is able to achieve high thermal efficiencies, typically in the 50 to 60 percent under a steady-state operation. The high efficiency resulting from the additional heat recovery and power generation systems is achieved when these systems are at their normal operating temperatures and pressures. Thus, a combined-cycle power plant is more appropriate for intermediate to baseload power plants and is not an appropriate choice for a peaking plant. EPA guidance and case law confirms that the intended function of an electric generating unit as a baseload or peaking plant may be considered as part of the fundamental business purpose of a proposed source, i.e., permitting agencies should not require an applicant to build a combined-cycle power plant when they have proposed a simple-cycle facility instead.

While turbine vendors have developed fast-start technology, such technology is currently only available for larger "frame" turbines, which are much larger than the proposed QBPP. Operation of a larger capacity turbine at only a fraction of its capacity to meet the demand of a 100-MW plant would likely reduce the overall efficiency of the combined-cycle plant, such that it would be inferior to, or no better than, that of the proposed reciprocating engines. Further, although once-through steam generators (OTSG) could be used in place of conventional HSRG technology, affording faster start-up times than a conventional combined-cycle plant, the steam cycle would still need to be warmed to generate any efficiency gain, relative to a simple-cycle operation. For a plant such as QBPP that is intended for peaking/firming and shaping power with multiple daily startups, use of an OTSG would therefore likely provide little to no efficiency gain. Further, to assure that the facility's capacity was available to quickly be brought online, the facility would need to maintain the steam cycle in some standby- or partial load-mode when not dispatched, which would be neither practical nor economical for a project intended to operate no more than 4,000 hours per year. Additionally, combined-cycle power plants require the use of very high quality water and involve much greater water consumption if cooling towers are used for cooling; if air cooled, the project would require considerably greater space for an air cooled condenser, which would also consume significant auxiliary load, reducing the plant's overall efficiency and therefore erasing some of the gains attributable to the steam cycle. For these reasons, a combined-cycle power plant is not an appropriate choice for a project intended to provide peaking and load-shaping power to the grid. Accordingly, combined-cycle technology was eliminated as a feasible alternative for the Project.

Step 2 - Eliminate Technologically Infeasible Options

Alternative Control Technologies

SCONOX, a new catalytic reduction technology, was not listed by any agency as a viable control technology for LB-RICEs, and was eliminated as BACT technology for the proposed power cycle engines simply based on the fact that no applications of the technology could be found or confirmed for any internal combustion engine, regardless of size or duty category.

The Applicant could not identify a manufacturer of Standard 3-Way Catalysts (NSCR) which could provide NSCR for engines with the exhaust flow of the Wartsila engines. Thus, this technology, while commercially available, is not applicable to the Project and was eliminated from consideration. Additionally, the Applicant concluded that, even if NSCR were both an available and applicable technology, it would be less effective than the proposed BACT technologies of SCR for NOx and an oxidation catalyst for CO. This was based upon a technical analysis that indicated that NSCR is not an effective or recommended control for the facility "lean-burn" power cycle engines. Attachment F.6-1 presents a summary discussion of this analysis, supporting the conclusion that 3-way catalysts (NSCR) are not an effective control technology for large lean-burn engines firing natural gas, due in part to thermal, chemical and/or mechanical deactivation of the catalysts.

Step 3 - Rank Remaining BACT Technologies

Table F.6-3 ranks the remaining BACT technologies in order of control efficiency.

Table F.6-3 BACT Technology Ranking in Order of Control Efficiency

Pollutant	Technology
NOx	(1) Lean burn with SCR (2) Lean burn
CO	(1) Lean burn with oxidation catalyst (2) Lean burn
VOC	(1) Lean burn with oxidation catalyst (2) Lean burn
SOx	(1) Clean Fuel - natural gas
PM10/PM2.5	(1) Clean Fuel – natural gas
All Pollutants	(1) Good combustion practices (GCP)

Step 4 – Evaluate the Most Effective Controls

For each pollutant, QBPP has selected the highest rank control technology listed in Table F.6-3 as the appropriate controls for the proposed Wartsila 20V34SG engines. The Applicant is not aware of any other identified control technologies that could be applied to the proposed engines. Nor is the Applicant aware of any energy, environmental, or economic impacts associated with use of the selected technologies that would warrant their elimination from the BACT analysis. In light of this and because the Applicant has selected the most stringent control technology available for each pollutant, a more detailed assessment of the economic, energy and environmental impacts is not included here. Screening level control cost-effectiveness estimates for NOx and CO are presented in Attachment F.6-2.

Step 5 - Select BACT for Power Cycle Engines

As suggested above, BACT is determined to be the most effective control technology that is not eliminated from consideration due to infeasibility (at Step 2) or unacceptable energy, environmental, or cost impacts (at Step 4).

Table F.6-4 presents the Applicant's proposed BACT technologies and numeric emissions limits based upon the chosen BACT technologies for the power cycle engines.

Table F.6-4 Proposed BACT Numeric Emissions Limits (Steady-state Operations, 100% Load, per Engine)

Pollutant	BACT Technology	BACT Emissions Limit
NOx	Lean burn with SCR and GCP	1.317 lbs/hour
CO	Lean burn with oxidation catalyst and GCP	1.564 lbs/hour

VOC	Lean burn with oxidation catalyst and GCP	1.584 lbs/hour
SOx	Clean Fuel - natural gas and GCP	0.256 lbs/hour (Fuel S <= 0.25 gr S/100scf)
PM10/PM2.5	Clean Fuel - natural gas, PCV filter and GCP	1.379 lbs/hour (Fuel S <= 0.25 gr S/100scf)
Opacity	All of the above.	<=10% / 0.5 Ringelmann
Ammonia Slip*	Use of Urea*	1.08 lbs/hr (10 ppmvd @ 15%O2)*

BACT limits in units of lbs/hour apply over all engine operational load ranges.

GCP = good combustion practices

SOx BACT limit in lbs/hr includes the contribution from lube oil consumption.

*Ammonia is not a BACT pollutant under either federal PSD or SDAPCD regulations, but is included here to assure no unacceptable environmental impacts associated with selection of SCR as BACT for NOx.

The Applicant is proposing the following BACT technologies for the power cycle engines as follows:

- NOx – Lean burn engine technology with SCR
- CO - Lean burn engine technology with Oxidation Catalyst
- VOC - Lean burn engine technology with Oxidation Catalyst
- SOx – Clean fuel, use of natural gas with sulfur content less than or equal to 0.25 gr S/100scf.
- PM10/PM2.5 - Lean burn engine technology with use of natural gas with sulfur content less than or equal to 0.25 gr S/100scf.
- Opacity – less than or equal to 10% or 0.5 Ringelmann
- Good combustion practices (GCP)

Based on the Applicant's BACT review of available technologies and data, the combination of the above technologies also represents T-BACT for the Wartsila engines.

Summary of Other BACT Data

Tables F.6-5 and F.6-7 present a summary of a recent review of other BACT-related decisions. Table F.6-5 presents information from the South Coast Air Quality Management District (SCAQMD) and includes the broader category of gas-fired, spark-ignited engines, i.e., both rich-burn and lean-burn.

Table F.6-5 SCAQMD Recent BACT Decisions (Achieved in Practice) for Spark-Ignited Gas Fired IC

Engine HP/Controls	NOx	CO	VOC	PM10/SOx
750 w/3 way catalyst + AFRC	0.15 g/bhp-hr	0.6 g/bhp-hr	0.15 g/bhp-hr	Natural gas
1334 w/3 way catalyst +AFRC	1.5 g/bhp-hr	2.0 g/bhp-hr	1.5 g/bhp-hr	Natural gas
93 w/3 way catalyst +AFRC	0.15 g/bhp-hr	0.6 g/bhp-hr	0.15 g/bhp-hr	Natural gas

Table F.6-5 SCAQMD Recent BACT Decisions (Achieved in Practice) for Spark-Ignited Gas Fired IC

171 w/3 way catalyst +AFRC	0.15 g/bhp-hr	0.6 g/bhp-hr	0.15 g/bhp-hr	Natural gas
1408 lean burn + AFRC2	0.6 g/bhp-hr	2.5g/bhp-hr	0.8 g/bhp-hr	No BACT limits
1850 no control3	0.6 g/bhp-hr	2.5 g/bhp-hr	0.8 g/bhp-hr	No BACT limits
4321 no controls4	0.53 g-bhp-hr	-	0.216 g/bhp-hr	Natural gas
3870 lean burn SCR5	9 ppmv	56 ppmv	25 ppmv	PM10: 0.02 g/bhp-hr

1 This compilation presents both rich and lean burn BACT determinations. AFRC is defined as air-to-fuel ratio controller. SCR is defined as selective catalytic reduction.

[2] Source is fired with digester gas and natural gas as an alternative fuel.

[3] Source is fired with landfill gas fuel, turbocharged with AFRC.

[4] Source is a facility located in Santa Barbara. PM10 BACT at 0.66 g/bhp-hr

[5] Source is a facility (NEO Landfill) located in Red Bluff, CA, Tehama County APCD.

The US EPA RACT-BACT-LAER Clearinghouse (RBLC) was also consulted to review recent US EPA BACT decisions for large gas fired IC engines with size ratings at least 1,000 bhp (or approximately 745 kW) or greater. These recent BACT decisions are summarized in Table F.6-6. Emission levels are presented in g/bhp-hr units, unless otherwise noted. See Table F.6-13 for a comprehensive listing of search results. In all cases, the proposed BACT limits for QBPP (see Table F.6-1) are more stringent, confirming the appropriateness of these BACT limits for the Project.

Table F.6-6 Large Gas Fired IC Engines RBLC BACT Determinations (Natural Gas) 2001 -2011

RBLC ID	Unit Size BHP	Control Type	NOx, g/bhp-hr	CO, g/bhp -hr	VOC, g/bhp-hr
AL 0189	4000	Lean Burn	2.2	2.68	1.52
AZ 0047	6MW (7895 BHP)	Not specified	1.5	2.3	-
CA1068	3870	Lean Burn	9 ppmv	56 ppmv	25 ppmv
CO 0058[1]	1775	Lean Burn	0.8	0.21	0.3
GA 0104	4730	Lean Burn	0.7	0.18	0.3
IA 0077	4735	Catalytic Oxidizer	1.0	0.18	0.68
IL 0083	4000	Clean Burn	2	2.2	0.43
LA 0141	1478	Not specified	-	3.0	0.50
MS 0056	4730	Lean Burn	0.7	-	-
OK 0109	2200	Lean Burn	2	-	-
PA 0201	800	Clean Burn	3	-	-
PA 0209[1]	1088	Lean Burn	1.5	-	-
PA 0230	1665	Not specified	0.7	-	0.9

Table F.6-6 Large Gas Fired IC Engines RBLC BACT Determinations (Natural Gas) 2001 -2011

TX 0364	2400	Not specified	-	1.2	1.2[2]
TX0364	3105	Not specified	3.2/2/0[3]	4.8[2]	1.6[2]
TX 0408	800	Not specified	2.0	3.0	1.2
WA 0289	1448	Not specified	10	-	-
WV 0019 +0020	4640	Lean Burn	2	2.1	0.7[2]
WY 0060	1252	NSCR and AFRC	1.1	1.6	-

[1] Draft status as presented in the RBLC.

[2] Other permit limit; limit is not specified as BACT as presented in the RBLC.

[3] Hourly/annual limit as presented for this source in the RBLC.

Enforceability of BACT

Pursuant to the NSR/PSD Workbook (10/90, Chapter B, Section V) the following guidance is provided regarding the establishment and enforceability of BACT emissions limits.

> "The emissions limits must be included in the proposed permit submitted for public comment, as well as the final permit. BACT emission limits or conditions must be met on a continual basis at all levels of operation (e.g., limits written in pounds/MMBtu or percent reduction achieved), demonstrate protection of short term ambient standards (limits written in pounds/hour) and be enforceable as a practical manner (contain appropriate averaging times, compliance verification procedures and record keeping requirements). Consequently, the permit must:
>
> - "Be able to show compliance or noncompliance (i.e., through monitoring times of operation, fuel input, or other indices of operating conditions and practices), and,
> - "Specify a reasonable compliance averaging time consistent with established reference methods, contain reference methods for compliance, and provide for adequate reporting and record keeping so that the permitting agency can determine the compliance status of the source."

Furthermore, in Sections B.IV.C and B.IV.C.1 which discuss the ranking of technical feasibility to establish a control hierarchy and the choice of units of emissions performance to compare levels amongst control options, the use of appropriate units such as lbs/gallon, lbs/hr, lbs/ton, lbs/MMBtu, lbs/kWh, etc., are presented as examples of BACT units for such analyses.

The Applicant has chosen to set the appropriate BACT limits in terms of lbs/hour, which will assure compliance with BACT across the entire range of operational loads for the proposed Wartsila engines. The applicant also notes that these limits are readily enforceable through the use of periodic source testing, and CEMs/PEMs to monitor, calculate, report, and record the necessary data to show compliance with the established BACT limits. In addition, the applicant notes that BACT emissions rate "units" vary widely as presented in the EPA RBLC

Clearinghouse listings, as well as in numerous California air district BACT guidance and listing documents. (See Table F.6-13, RBLC Search Results.)

Compliance monitoring and reporting is proposed as follows (for each stack):

- For NOx, the use of a certified CEM system per 40 CFR 60 coupled with a DAHS capable of analyzing and presenting the data in terms of lbs/hr. NOx CEMS will also be required at the inlet to the SCR to satisfy the ammonia slip compliance verification as noted below.
- For CO, the use of a certified CEM system per 40 CFR 60 coupled with a DAHS capable of analyzing and presenting the data in terms of lbs/hr.
- For O2, the use of a certified CEM system per 40 CFR 60 capable of analyzing stack gas O2 data and transfer of the data to the CEMs DAHS for compliance reporting.
- For SOx, periodic analysis of natural gas samples, monitoring of fuel use via certified fuel meters, and a DAHS capable of calculating and reporting SOx emissions in units of lbs/hr.
- For PM10 and PM2.5, periodic (annual) source testing of the engine stacks. This testing may be accomplished on all the engines or a subset of the engines at the discretion of SDAPCD.
- For ammonia, periodic (annual) source testing of the engine stacks. This testing may be accomplished on all the engines or a subset of the engines at the discretion of SDAPCD. Monitoring of urea injection rates, coupled with parametric monitoring of specific process variables will be used to establish an enforceable relationship to track and report ammonia "slip" emissions.. Ammonia is not subject to BACT under either federal PSD or SDAPCD regulations. Nevertheless, an appropriate limit on ammonia slip is included here to assure no unacceptable environmental impacts associated with selection of SCR as the BACT selection for NOx.

BACT for Power Cycle Engines - Startup and Shutdown Periods

The emissions controls for the project – SCR and an oxidation catalyst – cannot be operated or only provide limited control during periods of start-up and shutdown. In the case of SCR, the Applicant will not be able to commence urea injection until the catalyst has reached adequate temperature. This top-down BACT analysis will consider the following technologies for startup and shutdown.

Best Operating Practices

The Applicant is proposing best operating practices to minimize the duration of startup and shutdown events and thereby reduce the resulting emissions. These best operating practices include the following:

- During a startup, bring the engines to the minimum load needed to achieve compliance with the applicable NOx and CO limits as quickly as possible, consistent with the equipment manufacturers' recommendations and safe operating practices;
- During a startup, initiate urea injection to the SCR as soon as the SCR catalyst temperature has reached its minimum operating temperature;

- During shutdown, once the engines reach a load that is lower than the minimum load necessary to maintain compliance with the NOx and CO emissions limits, reduce the engine load to zero as quickly as possible, consistent with the equipment manufacturers' recommendations and safe operating practices; and
- During shutdown, maintain urea injection to the SCR as long as the SCR catalyst temperature remains above its minimum operating temperature.

Quick-Start Design of Power Cycle Engines

As discussed previously, a critical Project objective is assuring fast start-up times. The proposed Power Cycle Engines were specifically chosen because they will provide the fastest start-capability available. QBPP is designed for fast start-up and shutdown; the engines are guaranteed to ramp from cold start to maximum capacity in only 10 minutes. They are also guaranteed to ramp-down from maximum capacity to shutdown within 10 minutes.

The Applicant is unaware of any additional technologies that could be used to further shorten the duration of startup or shutdown. Thus, for purposes of the BACT analysis, the two technologies identified as both available and applicable to the Project are best operating practices and the proposed Power Cycle Engines.

Both of these technologies – best operating practices and the 10-minute start-up guaranteed for the Power Cycle Engines – are being proposed for the Project. Because the Applicant is selecting all available control technologies identified, no further analysis of the technologies' relative energy, environmental or economic impacts is provided here. Moreover, the Applicant is unaware of any such impacts. Accordingly, both technologies are retained at Step 4 of the BACT analysis and will be selected as BACT at Step 5.

The Applicant is proposing the numerical mass emissions limits and event time limits as stated in AFC Section 4.7, Table 4.7-8 as appropriate BACT limits, to assure the enforceability of this BACT determination. These mass emissions limits and time limits were provided by the equipment vendor and will be achieved through use of best operational practices.

BACT for Emergency Diesel Compression Ignition Engine

The proposed diesel engine (fire pump) will comply with the EPA Tier III standards (at a minimum) as applicable based upon engine size and year of manufacture. This engine will be fired on California certified low sulfur diesel fuel. Due to the low use rates of this device no other controls were considered for application as BACT on these engines. Pursuant to SDAPCD Rule 20.2 (d)(1)(i), the fire pump is exempt from the district BACT determination process due to emissions (potential and actual) of the affected BACT pollutants being below 10 lbs/day. The fire pump engine will nevertheless be subject to BACT pursuant to the federal PSD permit, which does not afford any *de minimis* exemption for major stationary sources. Use of Tier III fire pump engine will meet BACT for all criteria pollutants.

BACT for Cooling Towers

There are no proposals for cooling towers at the QBPP site. The cooling system employed will be a closed loop fan-cooled "radiator" type system, with no emissions.

BACT for Fuel Gas and Warm Start Heaters

The proposed fuel gas and warm start heaters (rated at 4 MMBtu/hr each) will be equipped with low NOx burners, will fire only PUC grade natural gas, and will utilize good combustion practices. This is considered BACT for these small heaters. Pursuant to SDAPCD Rule 20.2

(d)(1)(i), the fuel gas and warm start heaters are exempt from the district BACT determination process due to emissions (potential and actual) of the affected BACT pollutants being below 10 lbs/day. Although these units are also exempt from the APCD permitting requirements, they will be subject to BACT pursuant to the federal PSD permitting program, which does not provide for any *de minimis* exemption. As noted, utilization of good combustion practices and PUC-grade natural gas will meet BACT for all PSD pollutants for the fuel gas and warm start heaters.

BACT Analysis for Greenhouse Gases

This section presents the BACT analysis for GHGs for the Wartsila power cycle engines, the emergency fire pump engine, fuel gas and warm start heaters, and electrical breakers.

Introduction

In November of 2010, EPA issued guidance to assist permit writers and permit applicants in addressing the prevention of significant deterioration (PSD) and Title V permitting requirements for greenhouse gases (GHGs) that began to apply on January 2, 2011. The guidance document: (1) describes, in general terms and through examples, the requirements of the PSD and Title V permit regulations; (2) reiterates and emphasizes relevant past EPA guidance on the PSD and Title V review processes for other regulated air pollutants; and (3) provides additional recommendations and suggested methods for meeting the permitting requirements for GHGs, which are illustrated in many cases by examples. EPA believed this guidance was necessary to respond to inquiries from permitting authorities and other stakeholders regarding how these permitting programs will apply to GHG emissions. The guidance was finalized in March of 2011.[1]

New major stationary sources and major modifications at existing major stationary sources are required by the Clean Air Act (CAA or Act) to, among other things, obtain an air pollution permit before commencing construction. This permitting process for major stationary sources is called new source review (NSR) and is required whether the major source or major modification is planned for an area where the national ambient air quality standards (NAAQS) are exceeded (nonattainment areas) or an area where the NAAQS have not been exceeded (attainment and unclassifiable areas). In general, permits for sources in attainment or unclassifiable areas are referred to as prevention of significant deterioration (PSD) permits, while permits for major sources emitting nonattainment pollutants in major amounts and located in nonattainment areas are referred to as nonattainment NSR (NNSR) permits. The entire preconstruction permitting program, including both the PSD and NNSR permitting programs, is referred to as the NSR program. Because EPA has not established a NAAQS for GHGs, the nonattainment component of the NSR program does not apply. Thus, the NSR portions of the EPA guidance focus on the PSD requirements that apply once GHGs become a regulated NSR pollutant.

Over the past several years, EPA has taken several actions regarding GHGs under the CAA. The result of these EPA actions, explained in more detail below, is that certain PSD permits and certain Title V permits issued on or after January 2, 2011, must address emissions of GHGs. These actions included new rules that established a common sense approach to phase in

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[1] *See* PSD and Title V Permitting Guidance for Greenhouse Gases, U.S. EPA, Office of Air Quality Planning and Standards, March 2011.

permitting requirements for greenhouse gas (GHG) emissions from stationary sources, beginning with large industrial sources that are already subject to PSD and Title V permitting requirements. On December 15, 2009, EPA found that elevated atmospheric concentrations of six well mixed GHGs, taken in combination, endanger both public health and welfare, i.e., "the endangerment finding".

For stationary sources, on March 29, 2010, EPA made a final decision to continue applying (with one refinement) the Agency's existing interpretation regarding when a pollutant becomes "subject to regulation" under the Act, and thus covered under the PSD and Title V permitting programs applicable to such sources. EPA published notice of this decision on April 2, 2010. Under EPA's final interpretation, a pollutant becomes "subject to regulation" on the date that a requirement in the CAA or a rule adopted by EPA under the Act to actually control emissions of that pollutant "takes effect" or becomes applicable to the regulated activity (rather than upon promulgation or the legal effective date of the rule containing such a requirement). Thus, under EPA's interpretation of the Act and applicable rules, construction permits issued under the PSD program on or after January 2, 2011, must contain conditions addressing GHG emissions.

On June 3, 2010, EPA issued a final rule that "tailors" the applicability provisions of the PSD and Title V programs to enable EPA and states to phase in permitting requirements for GHGs in a common sense manner ("Tailoring Rule"). The Tailoring Rule focuses on first applying the CAA permitting requirements for GHG emissions to the largest sources with the most CAA permitting experience. Under the Tailoring Rule, facilities responsible for nearly 70 percent of the national GHG emissions from stationary sources are subject to permitting requirements beginning in 2011, including the nation's largest GHG emitters. i.e., power plants, refineries, and cement production facilities. Emissions from small farms, churches, restaurants, and small commercial facilities are examples of source types that are not likely to be covered by these programs under the Tailoring Rule. The rule then expands to cover the largest sources of GHGs that may not have been previously covered by the CAA for other pollutants.

As discussed below, under the Tailoring Rule, application of PSD to GHGs will be implemented in multiple steps, which we refer to in this document as "Tailoring Rule Steps" to avoid confusion with the five steps for implementing the "top down" best available control technology (BACT) analysis and the two steps of the applicability procedures for modifications.

The first Tailoring Rule step begins on January 2, 2011, and ends on June 30, 2011, and this step covers what EPA has called "anyway sources" and "anyway modifications" that would be subject to PSD "anyway" based on emissions of pollutants other than GHGs. The second step begins on July 1, 2011, and continues thereafter to cover both anyway sources and certain other large emitters of GHGs. EPA has committed to completing another rulemaking no later than July 1, 2012, to solicit comments on whether to take a third step of the implementation process to apply the PSD permitting programs to additional sources. EPA has also committed to undertaking another rulemaking after 2012. Sources subject to the permitting programs under the first two steps will remain subject to these programs through any future steps. Future steps are not discussed in the March 2011 guidance document, given that the outcomes of those rulemaking efforts are not yet known. Under the Tailoring Rule, in no event are sources with a potential to emit (PTE) less than 50,000 TPY of CO2 equivalent (CO2e) subject to PSD or Title V permitting for GHG emissions before 2016.

EPA Regional Offices have been advised that they should apply the policies and practices reflected in the guidance document when issuing permits under the federal PSD and Title V permitting programs, unless the facts and the record in an individual case demonstrate grounds to approach the subjects discussed in a different manner. State, local and tribal permitting authorities that issue permits under a delegation of federal authority from EPA Regional Offices are also advised to follow the guidance document. EPA has also recommended that permitting authorities with approved PSD or Title V permit programs apply the guidance reflected in the document, but these permitting authorities have the discretion to apply alternative approaches that comply with state and/or local laws and the requirements of the CAA and approved state, local or tribal programs. As is always the case, permitting authorities have the discretion to establish requirements in their permits that are more stringent than those suggested in the guidance or prescribed by EPA regulations.[1]

The QBPP is being proposed in response to a power delivery solicitation from San Diego Gas and Electric Company (SDG&E). The solicitation for power development proposals, is in response to the predicted power needs of the San Diego region in the both the short and long term (see Appendix F.10). As discussed previously, the QBPP is designed to provide peaking, load-shaping power to the SDG&E service area, along with certain ancillary services to support grid stability and reliability as intermittent renewable generating sources are integrated to the grid in coming years. In addition, QBPP will have a relatively low heat rate and will be capable of sustaining high-efficiency operations across its entire load range. As a consequence, dispatch of QBPP is expected to displace power generation by less efficient and more polluting technologies, in both the short and long term. The Applicant believes that QBPP will meet BACT for GHGs through use of high-efficiency natural gas-fired generating equipment, as well as by incorporating high-efficiency auxiliary load-consuming equipment into the overall plant design.

Summary of Proposed GHG BACT

The QBPP facility is proposing the following as GHG BACT:

1. Power Cycle Engines:
    a. Use of lean-burn, 4 stroke, internal combustion engine generating technology to generate the greatest amount of peaking and load-shaping power from each unit of fuel combusted
    b. Use of natural gas as the only fuel in the engine power systems
    c. Maintain the efficiency of the internal combustion engine power systems by employing proper maintenance practices and procedures, and using good combustion practices
2. Fuel Gas and Warm Start Heaters
    a. Use of natural gas as the only fuel in the heaters
    b. Record operational hours and total fuel use (annual basis)
    c. Maintain heaters according to manufacturers specifications
    d. Tune heaters every two (2) years according to manufacturers specifications

3. Auxiliary Load-Consuming Equipment
    a. Specification of high-efficiency load-consuming equipment (fans and pumps) as part of the overall plant design
4. Diesel Fire Pump Engine
    a. Use California certified low sulfur diesel fuel
    b. Use of the appropriate Tier rated engine based upon date of manufacture, size, duty, etc.
    c. Record operational hours and total fuel use (annual basis)
    d. Maintain engine tuning and maintenance according to the manufacturers specifications
5. SF_6 Equipment (electrical breakers)
    a. Purchase breakers which have manufacturers specified leak rates at less than or equal to 1%
    b. Maintain breakers to insure an annual leak rate of less than or equal to 1%
    c. Maintain purchase, disposal, and use records for all SF_6 transactions and report emissions per CARB requirements

GHG BACT for Power Cycle Engines/Generating Equipment

Step 1 - Identify All Possible Control Technologies, and Step 2 - Eliminate Technologically Infeasible Options

Steps 1 and 2 of the EPA top-down method are presented together in this analysis. The table summarizes the potentially available control technologies for GHGs and those that have been eliminated and/or included for consideration as BACT for the project.

TABLE F.6-7 GHG Technologies Identified

GHG Technology	Evaluation Status
Inherently lower-emitting GHG processes, practices, or designs	Considered/Eliminated
Add-on GHG controls	Considered/Eliminated
Combinations of Inherently lower-emitting GHG processes, practices, or designs, and add-on GHG controls	Considered/Eliminated
Renewable energy technology (solar or wind)	Considered/Eliminated
Alternative generating technologies	Considered/Eliminated
Alternative fuels	Considered/Eliminated
Energy efficiency	Considered/Applied
Carbon capture and storage	Considered/Eliminated

EPA defines BACT as an emissions limitation based on the maximum degree of reduction for each pollutant subject to regulation under the Clean Air Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant.

EPA also states, in the NSR Workshop Manual, that, (1) a control technology that is demonstrated for a given type or class of sources is assumed to be technically feasible unless source-specific factors exist and are demonstrated to justify technical infeasibility, (2) technical feasibility of technology transfer control options is generally assessed based on an evaluation of the pollutant-bearing gas stream characteristics for the proposed source and other source types to which the control has been previously applied, (3) innovative controls that have not been demonstrated on any source type similar to the proposed source need not be considered in the BACT analysis, and (4) the applicant is responsible for providing the basis for assessing technical feasibility or infeasibility and the reviewing authority is responsible for the decision on what is and is not technically feasible.

EPA notes in its March 2011 GHG Guidance document, that the requirement to consider inherently lower-emitting processes, practices, or designs does not require a fundamental redesign of the device, process, or source. As such, lower-emitting process/practices/designs that do not achieve the objectives, goals, or overall purposes of the project may be considered technologically infeasible as BACT for a specific project system or process.

Unlike other regulated air pollutants, which are often emitted as by-products of imperfect combustion and can be reduced by controlling the combustion process or through addition of add-on controls, at this time, there is no corresponding way to reduce the amount of CO2 generated during combustion, as CO2 is an essential product of the chemical reaction between the fuel and oxygen in which it burns. As such, the only way to reduce the amount of CO2 generated by a fuel-burning power plant is to generate as much electric power as possible from combustion through the use of efficient generating technologies. The Applicant notes that natural gas produces about half as much CO2 as coal and substantially less emissions of both criteria and toxic air pollutants as well. Based on the analysis presented herein, the Applicant believes that the proposed reciprocating engine technology (firing natural gas) constitutes the most efficient electrical generating technology available for the Project.

Renewable Energy Technologies

As explained above, the Applicant considered several alternative generation technologies, including renewable energy technologies. The Applicant again notes that, in conducting BACT analyses for power plants, permitting authorities have not typically considered whether renewable alternatives would achieve lower emissions and should therefore be required as BACT. Moreover, because of the intermittent availability of renewable energy generation technologies, they would fail to achieve a basic objective of the proposed project: to provide peaking and load-shaping power to meet the growing demand of reliable peaking power in the San Diego region. For a discussion of the specific renewable generating sources the Applicant considered and the reasons why each was eliminated from consideration, see Section 3.0 of the AFC and pages ___ above in this BACT evaluation.

Alternative Fossil-Fuel Generating Technologies

As explained above, the Applicant identified several alternative generating technologies that have been used to produce both peaking and base-load power in and out of California, i.e., boilers, and simple cycle combustion turbines, and combined-cycle turbines. These alternative generating technologies either fail to meet fundamental project objectives and/or would operate at lower efficiency and thereby increased emissions of GHG per MWh generated. For these reasons, they were eliminated from consideration as part of this BACT analysis.

Conventional Boiler and Steam Turbine

As explained above, conventional boiler and steam turbine technology does not meet Project needs because of its inability to quickly ramp up to meet demand as needed to meet SDG&E's dispatch pattern, and its resulting lower overall efficiency due to the need to maintain high readiness for peaker operation (i.e., with frequent start-stop cycles).

QBPP is designed to have a 10-minutes cold start to full capacity and as many as four start-up events per day. Thus, a conventional boiler/steam turbine design would be poorly suited to the project. Additionally, this technology, although proven reliable and commercially available, would involve considerably greater water consumption and waste generation and would also require significantly greater space. For these reasons, use of a conventional boiler and steam turbine is inappropriate and was rejected from consideration for the project.

Simple-Cycle Combustion Turbine

As explained above, simple-cycle combustion turbines, which can achieve thermal efficiencies of up to approximately 38 percent, are capable of rapidly reaching their operating peak, making them suitable for use in peaking power production. However, gas turbines are designed and built in fixed sizes (capacities) and are most efficient when they are operated at or near their design load capacity, i.e., the efficiency of the system decreases as a turbine is operated at reduced load. Moreover, simple-cycle gas turbines typically have a limited turn-down ratio and operate at a higher heat rate than the proposed QBPP. This combination of reduced capacity range and decrease in efficiency, at both full and partial load, would therefore fail to meet the project objectives of providing fast-ramping peaking power and ancillary services, while operating efficiently across the entire load range.

In addition, even if simple-cycle turbine technology was not eliminated from consideration because requiring use of a turbine would redefine the proposed source, it would be ranked lower than the proposed reciprocating engines at Step 3 because simple-cycle turbines generally operate at a higher heat rate, i.e., are less efficient, and would therefore generate more emissions per MWh-generated. This confirms that, even if a simple-cycle turbine were not eliminated as a feasible alternative for the Project, it would not constitute BACT for GHGs.

Combined-Cycle Power Plant

As explained above, conventional combined-cycle plants are able to achieve high thermal efficiencies, when these systems are at their normal operating temperatures and pressures. The peaking dispatch requirement to rapidly bring the power plant online would necessitate that these systems be maintained in some standby or partial load mode when not dispatched, which is not economical or practical. Rather, combined-cycle technology is appropriate for intermediate to baseload duty cycles and would not be an appropriate technology for a power plant intended to have as many as four start-up events per day and to be operated less than 4,000 hours per year. For this reason, combined-cycle technology was rejected as inconsistent with the Project objectives of providing peaking and firming power to the grid.

While turbine vendors have developed fast-start technology, such technology is currently only available for larger "frame" turbines, which are significantly larger than the proposed QBPP. Operation of a larger capacity turbine at only a fraction of its capacity to provide only a 100-MW to the grid would likely reduce the overall efficiency of the combined-cycle plant, such that it would be inferior to, or no better than, that of the proposed reciprocating engines. Further, although once-through steam generators (OTSG) could be used in place of conventional HSRG technology, the steam cycle would still need to be warmed to generate any efficiency gain, relative to a simple-cycle operation. For a plant such as QBPP that is intended for peaking/firming with multiple daily startups, use of an OTSG would therefore likely provide no efficiency gain. As EPA's March 2011 guidance notes, "the permitting authority can consider the intended function of an electric generating facility as a baseload or peaking unit in assessing the fundamental business purpose of a permit applicant." March 2011 Guidance, 27. Because combined-cycle technology is inconsistent with the Project's intended purpose of providing peaking power, it was not considered as part of this BACT analysis.

Alternative Fuels

Emissions of carbon dioxide (CO_2) during fossil fueled combustion are strongly correlated to the amount of carbon in the fuel stream. As noted previously, a fundamental objective of the Project is to utilize PUC-quality natural gas provided by SDG&E pursuant to a tolling agreement. Thus, specification of any other fuel would frustrate a fundamental project objective. Nevertheless, because the definition of BACT includes, among other things, "fuel cleaning, clean fuels, or treatment or innovative fuel combustion techniques for control of each … pollutant", the Applicant would note that, in comparison to all other potential fuels, natural gas will achieve the lowest emissions of CO_2 and other greenhouse gases. A comparison of emissions rate factors for the various fuels as presented in Table F.6-8 shows that natural gas, when used as a fuel in stationary sources, typically produces less CO_2 than other fuels.

Table F.6-8 CO2 Emissions Factors for Various Fuels

Fuel	Stationary Source Factors	
	CCAR, lb/gal	CCAR, lb/MMBtu
Nat Gas	15.12	116.98
LNG	9.63	-
LPG	13.11	139.24
Diesel #2	22.38	161.27
Gasoline	19.55	-
Residual Oil	25.99	173.72
Propane	12.57	139.04
Biodiesel	20.99	-

Table F.6-8 CO2 Emissions Factors for Various Fuels		
Fuel	Stationary Source Factors	
	CCAR, lb/gal	CCAR, lb/MMBtu
Wood-Biomass	-	200.49
Kerosene	21.54	159.41
Coal	-	206.04
California Climate Action Registry (CCAR), General Protocol, V3.1, 1/2009, and Power Sector Protocol, V1.1, May 2009.		

Another fuel choice might include combustion of biomass, such as wood ships or agricultural waste. Biomass is considered a renewable fuel choice and EPA has recently agreed to a three-year deferral from PSD permitting requirements for biomass fuel combustion. However, the Applicant has not been able to identify a biomass fuel source in large enough quantities in the vicinity to make such a plant viable. The Energy Commission has noted that biomass plants are typically sized to generate less than 10 MW, which is substantially less than the capacity of the QBPP project (~102.3 Mw). In addition, biomass fired power plants are usually designed and operated as base-loaded facilities, not peakers. For this reason, combustion of biomass does not appear at this time to provide a feasible alternative to the proposed Project. Moreover, as previously noted, use of any other fuel than natural gas would frustrate the project objective of using only PUC-quality natural gas provided by SDG&E pursuant to a tolling agreement.

Carbon Capture and Storage (CCS)

Background on CCS. Carbon capture (or compression), transport, and storage (CCS) is the term used to describe a set of technologies aimed at capturing carbon dioxide emitted from industrial and energy-related sources before it enters the atmosphere, compressing it, and injecting it deep underground in secure geological formations, and ensuring it remains stored there indefinitely. EPA states, in the guidance noted above, that CCS is not in widespread use at this time, but that EPA generally considers CCS to be an "available" add-on pollution control for large CO2-emitting facilities with high-purity CO2 streams. EPA further states while CCS is a promising technology, EPA does not believe that at this time CCS will be a technically feasible BACT option in certain cases. In particular, EPA notes that there are significant logistical hurdles that may preclude its application to a particular project or site, warranting its elimination from the BACT analysis at Step 2. The applicant agrees with EPA and concludes, for the reasons explained below, CCS is technologically infeasible for the proposed Project and, even if it were available at this time, would likely be cost prohibitive.

The key driving force behind undertaking CCS is the need to find cost-effective solutions to tackle the global issue of climate change by reducing CO_2 emissions in a world where there is a continued and rising demand for energy. CCS has an important role to play as a bridge to a low-carbon energy future. However, CCS faces a number of challenges; the biggest of which is how to best demonstrate that CCS is safe, effective and can be done now at industrial scale at a competitive cost. Large scale pilot and demonstration projects will play an important role in showing that the integrated process can work, from capture through to storage. These demonstrations and accompanying research and technology development require substantial investment but will ultimately drive down costs while helping identify the most appropriate technologies, equipment and skills needed to use them. Additionally, a regulatory framework is needed for CCS to clarify, both at national and international levels, the long-term rights, liabilities and technical requirements as to how CCS will be undertaken.

Over 90% of the CO_2 produced by fossil fuels at large fixed installations can be captured and prevented from reaching the atmosphere. Three main technology types; pre-combustion, post-combustion and oxy-firing, are available, allowing CO_2 to be captured from industrial processes such as power generation, oil refining and cement manufacture.

Pre-combustion capture involves partial combustion of CO_2 to produce hydrogen and CO_2. Hydrogen combustion produces no CO_2 emissions, with water vapor being the main by-product. The component parts of pre-combustion technology exist today at commercial scale; the challenge now is to integrate these in a power application.

In post-combustion capture, the CO_2 is removed after combustion of the fossil fuel. CO_2 is captured from exhaust gases and other large point sources. Post-combustion can be installed on both new and existing power plants, which is important given that the average power plant operates for 40 years. The challenge around post-combustion is scale-up of the technology to commercial scale in a power application, as well as integration.

Today, CO_2 is transported by truck, ship or pipeline. However, to transport the large amounts of CO_2 from power plant emissions, pipelines are the only practical solution. The pipeline transportation process is well understood as CO_2 pipelines have been used since the 1970s, transporting large volumes of CO_2 to oil fields for enhanced oil recovery (EOR). For example, US pipeline infrastructure has the capacity to safely and reliably carry 50 million tons of CO_2 a year.

The oil and gas industry has years of experience injecting CO_2 underground into geological formations for EOR. Oil and gas have remained underground for millions of years. The same natural conditions allow injected CO_2 to be stored securely. Once CO_2 is injected deep underground (typically more than 800 meters) it is absorbed and then trapped in minute pores or spaces in the rock structure. Impermeable cap-rock acts as a final seal to ensure safe storage for millions of years.

Structural trapping - at the storage site the CO_2 is injected under pressure deep down into the ground until it reaches the geological storage formation. The rocks of the storage formation are like a rigid sponge; they are both porous and permeable. Fluid CO_2 tends to rise towards the top of the formation until it reaches an impermeable layer of rock overlying the storage site. This layer, known as the cap-rock, securely traps the CO_2 in the storage formation. Structural trapping is the same mechanism that has kept oil and gas securely stored under the ground for millions of years.

Residual trapping - another natural process further traps the CO_2. As the injected CO_2 moves up through the geological storage site towards the cap-rock some is left behind, trapped in the microscopic pore spaces of the rock. This process is similar to air becoming trapped in a sponge.

Dissolution and mineral trapping – two additional mechanisms also trap CO_2. Over time the CO_2 stored in a geological formation will begin to dissolve in the surrounding salty water. The salty water combined with the CO_2 becomes heavier and sinks towards the bottom of the formation over time. This is known as dissolution storage. Mineral storage occurs when the CO_2 held within the storage site binds chemically and permanently with the surrounding rock. Depleted hydrocarbon reservoirs, such as oil and gas fields, are highly suited to such geological storage of CO_2. Other potential storage sites are saline formations (permeable rock formations, which contain salty waters in their pore spaces), and unminable coal beds. According to the Intergovernmental Panel on Climate Change (IPCC), such geological formations could provide storage space for at least 2,000Gt (billion metric tonnes) of CO_2.

Feasibility of CCS for the Proposed Project. The Applicant is unaware of instances where CCS has successfully been applied to a similarly sized peaking or gas-fired power plant. CCS therefore cannot be considered to constitute a demonstrated technology for the proposed source at this time. While EPA's March 2011 Guidance indicates that EPA would generally consider CCS to be an available technology, according to this guidance, the determination of whether CCS is technically feasible for any individual project involves consideration of all three main components of the process: CO_2 capture and/or compression, transport and storage. If these three components cannot be integrated into the base facility, then CCS may be eliminated from consideration as infeasible. The Applicant is unaware of the availability of adequate sequestration basins within the vicinity of the Project site. The time required to study the availability of such sequestration basins and confirm their adequacy for long-term capture would likely preclude development of the project in time to meet one the Project's objective of providing power to SDG&E's service area no later than October 2014. Further, there currently exists no adequate infrastructure for the transport of any captured carbon to sequestration basins elsewhere. Thus, for logistical reasons, implementation of CCS at the Project site would be infeasible, even if the technology for CO_2 capture from natural-gas fired emissions streams were commercially available at this time. Moreover, all available information surveyed by the Applicant indicates that most CCS technologies are not yet commercial and are not expected to become commercially available for 10 to 20+ years. Additionally, the regulatory regime governing CO_2 injection and future liability is nascent, posing additional regulatory hurdles to the feasibility of CO_2 for the Project site.

In addition to these logistical hurdles, which render CCS an infeasible option for the Project at this time, another major impediment to implementation CCS would be the significant cost associated with capturing the flue gas, which can amount to up to 75% of the total cost of CCS. Recent studies conducted by MIT researchers *(The Cost of Carbon Capture, J. David and H. Herzog, MIT, Cambridge, MA)*, indicated that the range of CCS costs ($/metric ton) for technologies such as IGCC, PC, and NGCC plants was approximately $18 to $41. Assuming a $40/metric ton cost and based on an estimated CO2 emissions rate from the plant combustion related processes of approximately 191,590 metric tons/year, the cost for implementation of CCS could be approximately $7.66 million per year in equipment and operational costs.

As acknowledged by EPA in its March 2011 Guidance, "EPA recognizes that at present CCS is an expensive technology, largely because of the costs associated with CO2 capture and compression, and these costs will generally make the price of electricity from power plants with CCS uncompetitive compared to electricity from plants with other GHG controls." March 2011 Guidance, 42. Thus, EPA anticipates that CCS will often be eliminated as too costly at Step 4 of the analysis, even in cases where feasible. *See id.*, 42-43. The Applicant is unaware of any circumstances that would make CCS a less costly or more viable option for the project, *e.g.*, proximity to enhanced oil recovery fields, developed sequestration basins or existing pipeline infrastructure. Accordingly, the Applicant believes that, even if CCS were feasible for the Project at this time, it would likely be eliminated from consideration due to excessive cost.

Step 3 - Rank Remaining Control Technologies

As suggested previously, the amount of CO_2 and other GHGs emitted during combustion of fossil fuels is directly correlative to the amount of fuel consumed. Thus, the only available means of reducing emissions of CO_2 from the generation of power is to reduce the amount of fuel consumed per unit of energy generated. Accordingly, a comparison of various generating technologies' relative efficiency – or "heat rate" – provides an appropriate basis for comparing and ranking the control efficiency of such technologies. For QBPP, the only fuel to be used in the power generation cycle will be natural gas. QBPP is therefore proposing to minimize GHG emissions in its generation of peaking power by using highly efficient reciprocating engine technology with a low heat rate and high efficiency across the entire load range.

Table F.6-9 presents a generalized ranking of the identified generation technologies based on their known ranges of heat rates[7], as considered in the BACT analysis for this project.

TABLE F.6-9 Ranking of Potential Generating Technologies by Heat Rate[7]

Technology	Heat Rate Range (HHV basis)	Technologically Feasible for This Project?
Renewable energy sources	n/a	No
Nuclear power	n/a	No
Biomass and other biofuels	n/a	No
CCS	n/a	No
Combined cycle turbines	~7000-8000 btu/Kw-hr	No
Reciprocating IC engines	~7500-8600 btu/Kw-hr	Yes
Simple cycle turbines	~8500-10000 btu/Kw-hr	No
Boilers	>10000 btu/Kw-hr	No

Notably, simple-cycle combustion turbine technology generally has a higher heat rate than reciprocating engine technology. Table F.6-10 presents a comparison of various power plant facility heat rates and GHG performance as prepared by CEC staff dated March 2011. This data is primarily for combined cycle turbines and boilers. The applicant has added data for QBPP and for the Eastshore Energy Project (which proposed to use similar engines to QBPP), as well as data on simple-cycle turbine applications.

Table F.6-10 Power Plant Heat Rates and GHG Performance

Facility	Heat Rate, Btu/kWh	Est. Energy Output, GWh	GHG Performance, MTCO2/MWh
QBPP (Rice)	8600	~412.5	~0.464
Eastshore (Rice)	8898	~462	~0.463
Mariposa Energy (SC)	9450	800	0.541
EME Walnut (SC)	8595	2000	0.481

Table F.6-10 Power Plant Heat Rates and GHG Performance			
Facility	**Heat Rate, Btu/kWh**	**Est. Energy Output, GWh**	**GHG Performance, MTCO2/MWh**
Gateway GS (CC)	7123	2490.2	0.378
Los Medanos EC (CC)	7184	3394.7	0.381
Delta EC (CC)	7308	5013.5	0.387
CCPP #6 (Blr)	13499	21.1	0.716
CCPP #7 (Blr)	11182	176.9	0.593
PPP #5 (Blr)	11461	103.3	0.608
PPP #6 (Blr)	11918	84.4	0.632
PPP #7 (Blr)	14629	29.3	0.776
RICE-reciprocating internal combustion engine(s)			
*Dependent upon PPA and actual facility dispatch.			

At the present time, combined cycle plants utilizing efficient turbines, HRSGs, and clean fuels certainly represent the highest efficiencies with respect to fuel burned versus power produced. But, a combined cycle plant does not always "fit the bill" when peaking power is what is needed. As previously discussed, fast-start capabilities are currently only available for much larger turbines than would be needed to meet the Project's proposed capacity of 100 MW (the 300 MW Siemens SCC6-500F and GE 7FA Response System). Operation of a larger turbine at only a fraction of its capacity would result in significant losses in efficiency, such that the efficiency of the combined-cycle plant would likely be even less than a smaller simple-cycle plant. Further, although once-through steam generators (OTSG) might be used in lieu of conventional HSRG technology, the addition of a steam cycle to a plant only intended for peaking generation likely would provide only marginal to no efficiency gains, in comparison to a simple-cycle operation. Thus, for peaking and load-shaping plants that will undergo multiple daily startups, the steam cycle would likely provide no to marginal benefit.

For peaking power production, simple cycle turbines and reciprocating internal combustion engines typically represent the systems of choice due to the flexibility in overall operations, i.e., fast startup times, fast power ramp-up times, ability of air pollution control systems to reach optimum performance levels within short periods of time, and ability to vary loads versus demand. This last attribute - the ability to change load swiftly in response to demand - is more characteristic of reciprocating engines than simple-cycle turbines. Thus, one clear advantage to the proposed QBPP design in using several reciprocating engines, as opposed to one or two combustion turbines, is the wide range of dispatch scenarios that QBPP can achieve. Table F.6-12 shows the flexibility of the system for a set of typical operational loads.

Table F.6-11 Power Supply Scenarios					
	Load vs MW				**# of Engines Operating**
Engine #	50%	75%	90%	100%	
Engine 1	4.65	6.98	8.37	9.3	
MWs	*4.65*	*6.98*	*8.37*	*9.3*	*1*
Engine 2	4.65	6.98	8.37	9.3	

Table F.6-11 Power Supply Scenarios

Engine #	Load vs MW				# of Engines Operating
	50%	75%	90%	100%	
MWs	*13.95*	*16.28*	*17.67*	*18.6*	*2*
Engine 3	4.65	6.98	8.37	9.3	
MWs	*23.25*	*25.58*	*26.97*	*27.9*	*3*
Engine 4	4.65	6.98	8.37	9.3	
MWs	*32.55*	*34.88*	*36.27*	*37.2*	*4*
Engine 5	4.65	6.98	8.37	9.3	
MWs	*41.85*	*44.18*	*45.57*	*46.5*	*5*
Engine 6	4.65	6.98	8.37	9.3	
MWs	*51.15*	*53.48*	*54.87*	*55.8*	*6*
Engine 7	4.65	6.98	8.37	9.3	
MWs	*60.45*	*62.78*	*64.17*	*65.1*	*7*
Engine 8	4.65	6.98	8.37	9.3	
MWs	*69.75*	*72.08*	*73.47*	*74.4*	*8*
Engine 9	4.65	6.98	8.37	9.3	
MWs	*79.05*	*81.38*	*82.77*	*83.7*	*9*
Engine 10	4.65	6.98	8.37	9.3	
MWs	*88.35*	*90.68*	*92.07*	*93*	*10*
Engine 11	4.65	6.98	8.37	9.3	
MWs	*97.65*	*99.98*	*101.37*	*102.3*	*11*

The flexibility of the proposed engines to produce a wide range of power output is evident from the above basic load vs. MW table. The lowest typical load is 50% for any single engine. Each engine can be run at numerous load levels above 50%. The engines will be dispatched per the PPA which may differ in load scenarios from the above noted values in the table.

In comparison, use of simple-cycle gas turbines to meet the proposed Project's demand, such as a single 100-MW LMS-100 or two 50-MW LM-6000s would not afford the same degree of flexibility as the multiple dispatch scenarios noted above for the reciprocating engines by Table F.6-11. Moreover, as indicated above by Tables F.6-9 and F.6-10, reciprocating engines generally have a lower heat rate that simple-cycle combustion turbines. While the LMS-100 represents a significant advancement in the heat rate for smaller combustion turbines, due to its size, its overall efficiency would be substantially reduced if operated at only a fraction of its capacity to meet the varying load levels expected for a plant intended to provide firming and shaping power to support renewables integration. Thus, even if combustion turbines were deemed a feasible alternative for the proposed Project, they would be ranked lower than the proposed reciprocating engines in terms of efficiency. To illustrate this, a single LMS-100 simple cycle turbine (~100 MW) operating for 4000 hrs/yr would produce approximately 192,547 mtons of CO2e per year, while two (2) LM-6000 PG simple cycle turbines (~50 MW each) operating 4000 hrs/yr each would produce approximately 220,060 mtons of CO2e per year. This assumes that the combustion turbines were operating at their optimal efficiency, which is typically constrained to a fairly narrow capacity range near maximum capacity. In contrast, the proposed 11 reciprocating IC engines, based on 4032 hrs/yr of operation each (including startups and shutdowns) would produce approximately 189,600 mtons of CO2e per year.

As suggested by the foregoing discussion, a critical component of GHG BACT for the Project includes the use of clean fuels. The QBPP proposes to use PUC -grade natural gas as the only fuel in the power generation cycle, and as such the use of clean fuels, i.e., fuels which inherently have lower CO2e emissions, becomes an integral part of the overall GHG BACT applied to the project.

Beyond consideration of the power cycle, another critical component of the GHG BACT analysis is the efficiency of load-consuming elements of the overall plant design. The more efficiently the plant consumes energy, the more energy that can be provided to the grid, resulting in lower emissions of GHGs per MWh of energy provided to the grid. As a consequence, the Applicant will also consider the efficiency of other major components of plant design, including fans and pumps used for the engine cooling system, to assure that these are designed to achieve maximum efficiency. However, the Applicant has not yet completed the design of the Project, and does not yet know what equipment will make up the remainder of the auxiliary load. When information on the overall plant design is available, the Applicant will provide a supplement to this GHG BACT analysis to demonstrate that the design of the load-consuming elements of the plant will meet BACT for GHGs.

Table F.6-12 presents the ranking of the GHG technologies deemed feasible for the proposed project. While these three technologies are "ranked" in order of their presentation, they are more appropriately considered as a suite of measures that will be implemented to assure that the proposed Project generates and consume power in the most efficient manner and thereby achieves BACT for GHGs.

TABLE F.6-12 GHG Technology Ranking for QBPP per the Executed Agreement and PPA

Technology	Ranking	Applied to Project
Reciprocating Engines	1	Yes
Clean Fuels	2	Yes
Energy Efficiency	3	Yes

Based on the foregoing, the Applicant believes that reciprocating engine power generation systems utilizing efficient engine designs and firing natural gas, represent the most efficient system in terms of GHG emissions for the proposed Project.

Step 4 – Evaluate the Most Effective Control Technologies Considering Environmental, Energy, and Cost Impacts

Because the Applicant is proposing to utilize all three of the feasible technologies for reducing GHGs from the generation of power, no detailed analysis is provided to compare the available control technologies' relative environmental, energy and economic impacts.

Step 5 – Select BACT

As indicated above, the Applicant is proposing the use of reciprocating engines, clean fuels and efficient design of load-consuming equipment as BACT for the proposed Project. The Applicant will also maintain the efficiency of the internal combustion engine power systems by employing proper maintenance practices and procedures, and using good combustion practices.

The technology selected as BACT at Step 5 must be translated into an enforceable emissions limitation by the permitting agency. In its March 2011 Guidance, EPA encouraged permitting authorities to consider establishing output-based limits or a combination of both output- and input-based limits. March 2011 Guidance, 46. EPA noted that, because the environmental concern related to GHG emissions is their cumulative impacts, the focus in establishing limits should be on longer-term averages, e.g., 30- or 365-day rolling average, rather than short-term averages. *Id.* The Applicant will work with agency personnel to establish appropriate BACT limits for the Power Cycle Equipment and auxiliary load-consuming elements that affect efficiency.

GHG BACT for Diesel Engine (Fire Pump System)

The Project includes an emergency diesel engine (fire pump) for use in the case of an emergency to provide water to fight fires. Such a diesel-fired engine is required by fire safety standards, which require redundant sources of power for the fire suppression system. The Project will be equipped with one electric fire pump and another diesel fire pump to meet this redundancy requirement. The Air Resources Board's Airborne Toxic Control Measure (ATCM) for Stationary Compression-Ignition Engines limits operations of diesel-fired fire pump engines to emergencies and no more than 50 hours per year for inspection, maintenance and testing, which is typically done to meet the requirements of National Fire Protection Association (NFPA) standards. The design of these diesel engines is dictated by the manufacturer, not by the end-user. As such, the Applicant is limited to commercially available options, which include those engines meeting EPA Tier 3 requirements.

Consistent with its rationale for the BACT determination for greenhouse gas emissions from the RICE power plant, the Applicant believes that BACT for this source involves selection of the most efficient stationary fire pump engine that can meet the facility's needs. The Applicant has provided information on the emissions from the specified diesel engine in the AFC and District permitting documents. The Applicant has estimated total greenhouse gas emissions from the diesel engine at 5.11 metric tons CO_2E per year.

The Applicant is unaware of any more fuel efficient alternative to a Tier 3-certified engine for these purposes. Further, because emissions of greenhouse gases are directly correlative to operation of the unit, the Applicant believes that BACT requires that the engine shall only be operated for readiness testing and during emergencies and other periods authorized by the ATCM, or permitting authority permit.

Because operation of this source will be limited by permit conditions for reliability-related activities and the Applicant will be required to keep records of the operation of this source and its fuel usage, the Applicant believes no additional conditions are required to enforce this BACT determination.

GHG BACT for Fuel Gas Heater and Warm Start Heaters

The fuel gas heater and the engine warm start heaters as proposed, would be fired exclusively on natural gas, and are used to pre-heat fuel and engine water to facilitate rapid starts. The units are rated at approximately 4.0 MMBtu/hr each, and are expected to be fired for a total of

4232 and 4928 hours per year (each respectively). GHG emissions from these units are estimated to be on the order of 1953.4 metric tons CO2e/yr. The basic GHG BACT reasoning presented for the reciprocating engines essentially applies to these heaters as well. The Applicant proposes that GHG BACT for these units will be the following:

- Use of clean fuels (exclusive use of natural gas)
- Requiring the Applicant to maintain the units according to the manufacturer's specifications, and to operate the units in the most efficient manner possible, i.e. good combustion practices.
- Tune the units every two (2) years according to the manufacturer's specifications.
- Record the annual hours of operation and annual fuel use, and report the GHG emissions annually. The GHG emissions from this unit will be included in the facility-wide annual GHG limit.

It should be noted that there will be three (3) units, one fuel gas heater, and two warm start heaters. But, one of the warm start heater units will be used strictly as a backup unit, therefore emissions are only calculated for the fuel heater and a single warm start heater at full operational mode.

Emissions of Sulfur Hexafluoride (SF_6) from Circuit Breakers

In addition to emissions of greenhouse gases from the IC engine based power plant, fuel and water heaters, and the emergency diesel engine, QBPP will also utilize high-voltage circuit breakers which use sulfur hexafluoride (SF_6) as a gaseous dielectric. The Applicant's facility will include a switchyard with a single circuit breaker, containing SF_6 in a sealed-pressure system. Total system capacity of SF6 is expected to be less than 290 lbs.

SF_6 is the most highly potent greenhouse gas, with a "global warming potential" over a 100-year period 23,900 times greater than carbon dioxide (CO_2) and an estimated persistence in the atmosphere for several thousand years. Because of SF_6's high global warming potential, the California Air Resources Board (CARB) has promulgated a regulation limiting emissions of SF6 from gas insulated switchgear. *See* Cal. Code Reg., tit. 17 §§ 95350 *et seq*. This regulation requires owners of gas insulated switchgear to reduce emissions from such equipment to no more than 1% per year (by weight) by 2020. *See id.* § 95352. This limitation is enforced through recordkeeping and reporting requirements based upon the amount of SF6 replacement gas that is added to the switchgear.

To evaluate the "best available control technology" for emissions of SF_6 from the facility, the Applicant followed U.S. EPA's "top-down" methodology.

Step 1 - Identify Control Technologies for SF_6

1. *Use of Other Gases/Substances for Insulation and Arc Quenching*

The best way to control emissions of SF_6 would be to eliminate its use in the circuit breakers and substitute in its place a non-hazardous substance that does not have comparable emissions of greenhouse gases. However, due to the superior performance and arc-quenching capability afforded by SF_6 breakers, use of a dielectric oil or an compressed air ("air blast") circuit breaker does not represent a feasible option for the Project. Research and development efforts have focused on finding substitutes for SF_6 that have comparable insulating and arc quenching properties in high-voltage applications. While some progress has reportedly been made using mixtures of SF_6 and other inert gases (e.g., nitrogen or helium) in medium- or low-voltage applications, most studies have concluded that there is no replacement gas immediately available to use as an SF_6 substitute for high-voltage applications.

2. *Modern Closed-Pressure SF_6 Breakers with Leak Detection*

In comparison to older SF_6 circuit breakers, modern breakers use substantially less SF_6 and are designed as a totally enclosed-pressure system. According to information provided by the Applicant, the facility will consist of a single state-of-the-art circuit breaker, containing a total of approximately 290 pounds of SF_6 at a pressure rating determined by the manufacturer. New circuit breakers are typically guaranteed by the equipment vendor with leakage of no more than 1% per year (by weight). Leakage is only expected to occur as a result of circuit interruption and at extremely low temperatures which are not anticipated in the San Diego region.

Step 2 - Eliminate Technically Infeasible Options

As indicated above, SF_6 has become the predominant insulator and arc quenching substance in circuit breakers because of its superior capabilities, in comparison to other alternatives. Thus, alternatives to SF_6 breakers were eliminated from consideration for the proposed Project. As noted above, modern breakers with a guaranteed leakage rate of less than 1% per year (by weight) represent an available and applicable control technology for the Project.

Step 3 - Rank Control Technologies

In the absence of feasible alternatives to use of SF_6, the next best control would be use of a new circuit breaker that has guaranteed leak rate of 1% or less per year. Assuming a total inventory of 290 lbs for the proposed QBPP and leakage rate of 1%, this would amount to potential emissions of SF_6 of 2.9 lbs/year, which due to SF_6's high global warming potential would equal approximately 31.5 metric tons CO_2E per year.

Step 4 - Evaluate Most Effective Controls and Economic Impacts and Document Results

Because the Applicant is selecting the highest ranked control technology as BACT, no consideration is given to ancillary energy, environmental or economic impacts. However, the Applicant would not that, if oil-filled breakers were not eliminated as infeasible for the Project, they would have potential environmental and safety impacts in the case of leakage that would possibly warrant their elimination from consideration at Step 4 of the BACT analysis.

Step 5 - Select BACT

The Applicant has concluded that using totally enclosed circuit breakers of the number and size proposed by the Applicant, coupled with a leak rate of less than or equal to 1%, constitutes BACT for this source. In addition, the proposed Project's product purchase and use records will provide a relatively accurate process for inventorying emissions of SF_6. Based upon the Applicant's review, purchase record reconciliation is the standard method for measuring and reporting SF_6 emissions from circuit breakers, as required by CARB's regulation and Mandatory Reporting Rule. Thus, the Applicant believes that an appropriate emissions limit would be based upon the anticipated leakage rate of less than or equal to 1%.

References

1. PSD and Title V Permitting Guidance for GHGs, EPA-OAQPS, November 2010.
2. Avenal Energy Project, Final Staff Assessment, California Energy Commission, June 2009.
3. Change in Carbon Emissions from the Base Case When Avenal Energy Power Plant is Added, Black and Veatch, 164901, May 2009
4. Additional Statement of Basis, Draft Federal PSD Permit, Russell City Energy Center, BAAQMD, Application #15487, August 2009.
5. Bay Area Air Quality Management District Revised GHG BACT Analysis for the Russell City Energy Center (RCEC), BAAQMD, 2010.
6. USEPA, OAQPS, New Source Review Manual, PSD and Nonattainment Area Permitting, October 1990.
7. Sierra Research, Pio-Pico GHG BACT Assessment, Appendix G, 2/2011.
8. CEC, Final Staff Assessment, CEC-700-2011-001-FSA, 09-AFC-4, Air Quality Section 4.1, March 2011.

Attachment F.6-1
3-Way Catalyst (NSCR) Data Summary

Non-Selective Catalytic Reduction (NSCR or 3-Way Catalyst) BACT Discussion

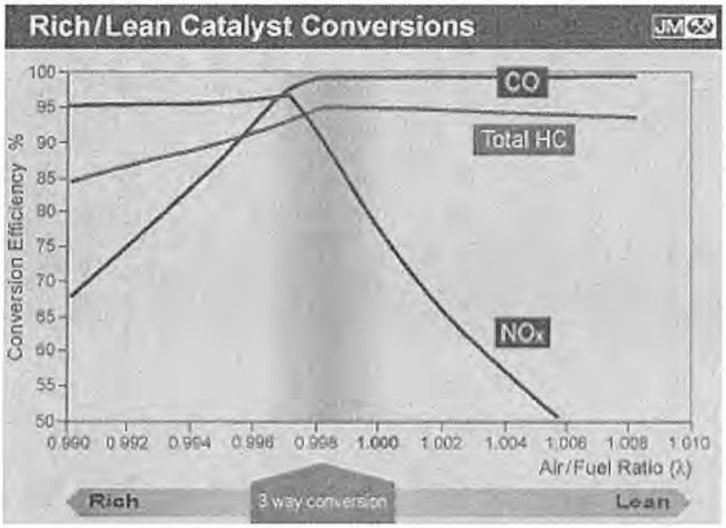
Application of 3-way catalyst systems (NSCR) on lean burn engines operating in excess of 4% O2 are not as ideal as similar applications to rich burn engines firing natural gas. 3-way catalysts can reduce carbon monoxide (CO), hydrocarbons (HC), and oxides of nitrogen (NOx). The following data is presented to support the Applicant's rationale for eliminating NSCR from consideration for use on the large Wartsila lean-burn power cycle engines.

Applicability of the Technology

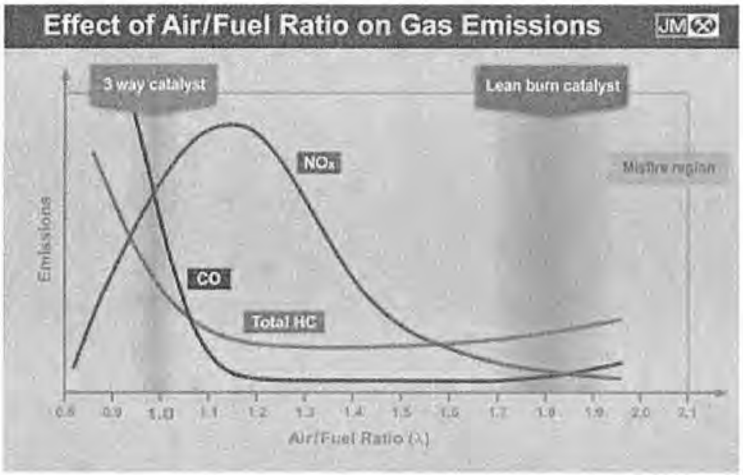
Review of the references listed below indicates the following:

1. For lean burn engines (both 2 and 4 stroke), the control technology recommended is SCR coupled with a CO catalyst.
2. The NESHAPs summary prepared by ILTA, indicates that EPA does not recommend NSCR (TWCs) for lean burn engines in either the major source or area source categories.
3. The CDPHE reasonable progress review for NOx emissions from RICEs clearly indicates that NSCR is not the preferred control technology for lean burn engines, and they state that NSCR is only applicable to rich burn engines. Their technology #5 option, for large lean burn engines, is to control NOx via the use of SCR.
4. The control technology and cost analysis prepared for OAQPS by ECR, Inc., indicates that for 2SLB and 4SLB engines for CO control, an oxidation catalyst is the preferred option. They state that NSCR is applicable to rich burn engines (no cost or technology application data is presented for NSCR applied to lean burn engines).
5. Draft cost effectiveness data from OAQPS (3-21-06) only addresses NSCR for rich burn engines.
6. Data compiled by MECA (1997) indicates that the preferred NOx control for large lean burn engines is SCR, and for CO is the use of an oxidation catalyst.
7. In the STAPPA-ALAPCO RICE summary, they indicate that NSCR is not applicable to lean burn engines, and that SCR is the recommended technology for such engines.
8. The Applicant concludes that NSCR is not applicable to, or available for use on the large Wartsila lean burn engines, and as such, no cost data is presented for this technology.
9. Several of the primary TWC manufacturers (such as Miratech) do not recommend TWC systems for large lean burn 4-stroke engines, but rather they recommend SCR in conjunction with a CO Catalyst. For example, Miratech makes TWCs for rich burn engines up to 10,000 bhp. The Wartsila engines are rated at 12,874 bhp, and are lean burn design.
10. The Applicant could not find a manufacturer that builds a TWC that could handle the exhaust flows from the Wartisla engines, i.e., in excess of 61,000 acfm at fuel rated load.
11. Data provided by JM Catalysts shows the following for lean burn engine TWC applications:

Graph 1:



Graph 2:



12. Data from these two graphs, which is typical of those presented in most of the TWC (NSCR) manufacturers websites and technical brochures indicates that a TWC system is most likely not the best control system for the proposed Wartsila lean-burn engines. Data presented in the Wartsila brochure in Appendix F.1 indicates that the engines operate in the air-fuel ratio range of slightly above 2.0 but less than 2.3. In addition, Caterpillar clearly indicates on its website for TWCs that they cannot operate efficiently on lean-burn engines.
13. In addition, the following technical data is presented as further evidence that NSCR is not BACT for the proposed Wartsila lean burn engines.

Three-Way Catalysts: Aging, Causes of Failure and Deactivation

Three-Way Catalytic Converters ("Three-Way Catalysts", "TWC") are generally effective at achieving significant reductions of Carbon Monoxide, Hydrocarbons and Nitrogen Oxides. Unfortunately, the operating conditions to which Three-Way Converters are subjected often cause their catalysts to become thermally, chemically and/or mechanically deactivated. These causes of deactivation may occur separately or in combination, but their net effect is always the removal of active sites from the converter's catalytic surface. Catalytic deactivation is broadly defined as a phenomenon in which the structure and state of the catalyst changes, leading to the loss of active sites on the catalyst's surface, thereby causing a decrease in the catalyst's performance. High temperatures and high temperature gradients, the presence of poisons and other impurities, as well as the fluctuation of gas phase composition and flow rates all increase the possibility of catalytic de-activation .

Thermal Deactivation by Thermal Degradation and Sintering

Thermal degradation of a Three-Way Catalyst begins at temperatures between 800° - 900° C, or in some cases, at lower temperatures depending upon the catalytic material. Thermal degradation is a physical process which leads to catalytic deactivation at high temperatures. Deactivation of this type is caused by a loss of catalytic surface area due to crystalline growth of the catalytic phase, the loss of washcoat area due to the collapse of the pore structure, and/or chemical transformations of catalytic phases to non-catalytic phases. The first two processes are typically referred to as sintering and the third process as Solid-solid Phase Transition at high temperatures.

Sintering: There are two models used to explain how sintering occurs: 1) the atomic migration model, and 2) the crystallite migration model.

1. The Atomic Migration Model: during atomic migration, .sintering occurs due to metal atoms migrating from one crystallite to another via the catalyst surface or gas phase by diminishing the size of small crystallites and increasing the size of larger ones.

2. The Crystallite Migration Model: during crystallite migration, sintering occurs when crystallites migrate along the catalyst's surface. During crystallite migration, crystallites collide and coalesce to form larger crystallites.

In any case, the formulation and growth of crystals on the catalyst's surface reduce the amount active sites which affect the oxidation of pollutant emissions. It should be mentioned that the rate of sintering increases exponentially with temperature and becomes increasingly pronounced above temperatures of 600°C. Temperatures in the range of 800° - 900° C are not expected to occur in the Wartsila engine exhaust stream.

Solid-solid Phase Transitions: are extreme forms of sintering that occur at very high temperatures and lead to the transformation of one crystalline phase into another. Phase transformations typically occur in the bulk washcoat and they dramatically decrease the surface area of the catalyst.

Active precious metals are commonly used as catalysts for the purification of exhaust gasses. Of all of the precious metals employed in TWCs—platinum, palladium and rhodium—rhodium has the greatest propensity to sinter at high temperatures. This leads to poor activity in the reduction of NOx, as rhodium is the most commonly used precious metal in a TWC's reduction catalysts.

Re-dispersion: re-dispersion is a process that is the opposite of sintering. During re-dispersion, complex phenomena occur. Among them, particle sizes decrease and the surface area increases. In particular, the interaction between oxygen and precious metals may lead to the formation of species that are mobile on the catalyst's surface and reverse the process of agglomeration.

Chemical Deactivation, Poisoning and Inhibition

Accumulation of fuels and lubricants on catalytic surfaces reduces a catalyst's effectiveness. Poisoning is defined as a loss of catalytic activity due to the chemisorptions of impurities on the catalyst's the active sites. Normally, a distinction is made between poisons and inhibitors. Poisons are substances that interact very strongly and irreversibly with the catalyst's active sites, whereas the adsorption of inhibitors on the catalytic surface is weak and most-often reversible.

Catalytic converters are poisoned and/or inhibited by impurities contained in fuel and lubrication oils, or by metal shavings from the exhaust pipe. Even low levels of impurities are enough to completely cover a catalyst's active sites. Of all poisons and inhibitors, lead, sulfur, phosphorus, zinc, calcium and magnesium are the most common.

Fuel-based Poisons and Inhibitors:

Lead (Pb): Pb is arguably the most damaging catalytic poison. Catalytic converters are known to completely lose their catalytic capacity with persistent use of fuel containing lead, and the effects of lead on the catalyst are irreversible. This will not be the case for the proposed engines firing natural gas.

Sulfur (S): The presence of sulfur as oxide or sulfide invariably and often immediately decreases catalytic performance. Sulfur competes with other exhaust pollutants for space on the catalytic surface. During the combustion process, fuel sulfur oxidizes to SO2 and SO3. These compounds absorb onto the catalytic surface at low temperatures and react with alumina to form aluminum sulfates. These sulfates reduce the active surface of the wash coat and deactivate the catalyst. Deactivation of this type has the duel effect of reducing the converter's overall performance as well as its oxygen storage capacity. The impact of sulfur on aged catalysts is typically irreversible under temperatures of 650°C. It should also be noted that even though catalytic purification efficiency is partially recoverable at higher temperatures, oxygen storage capacity is not. Fuel based poisons and/or inhibitors are not expected to be present in the natural gas proposed for use at the facility (but see the discussion below for SOx and LOC).

Lube Oil Poisons and Inhibitors

Lube oils can enter into the exhaust system by leaking through worn out piston rings, faulty valve seals, failed gaskets and/or warped engine components. Fouling occurs when lube oil emissions coat the catalyst with carbon soot. Carbon deposits prevent the catalytic converter from reducing harmful emissions, and they also reduce air flow. Reduced air flow increases engine backpressure and can force heat and exhaust gasses back into the engine compartment. In some cases, the engine may actually draw back exhaust gasses into the combustion chamber. Re-entrance of exhaust gases into the combustion chamber reduces subsequent combustion cycle efficiency. Reduced cycle efficiencies result in a loss of power, increased emissions, and overheating of engine components.

The process of a catalyst being coated with carbon soot is technically referred to as "coke formation". In technical terms, coke formation is a phenomenon during which carbonaceous residues cover the catalyst's active sites and decrease the catalyst's active surface area. A primary cause of "pore blockage" is caused when coke formations are so large that carbon blocks the internal pores of the catalyst, thereby prohibiting airflow.

Phosphorus, zinc, calcium and magnesium are the most common impurities found in lubrication oils. Like sulfur, these substances accumulate on the catalyst's surface and compete with other exhaust pollutants for surface area (26). These substances are generally regarded as catalyst inhibitors, rather than catalyst poisons. All of them however, decrease catalytic efficiency and can potentially cause harm to the engine.

Lube oil consumption, and combustion (LOC), has been addressed by the facility in its calculation of potential SOx emissions. Wartsila has provided information which indicates that up to 0.2 lbs/hr of SO2 can emitted from each engine due to LOC. Therefore, lube oil constituent poisoning is a potential problem for the use of TWCs at the proposed facility.

Mechanical Deactivation

Mechanical deactivation is caused by mechanical malfunction, improper operation of key components or physical damage being inflicted upon the TWC converter. Based upon the design of the proposed system, mechanical deactivation is not anticipated to be a viable circumstance at the proposed facility.

Meltdown: Converters can literally melt down when conditions become so rich that raw fuel is discharged from the combustion chamber into the exhaust flow. Fuel in the exhaust flow can be ignited by a catalyst's high temperatures. Burning fuel within the converter creates so much additional heat that the ceramic catalyst is unable to withstand the high temperatures and begins to melt. Melting causes the ceramic monolith to collapse and the converter to be destroyed. A melted ceramic converter may significantly block exhaust flow and cause irreparable damage to the engine. This situation is not anticipated to occur with the engines chosen due to the lean burn design and the controls on each engine with respect to air-fuel ratios.

Converter meltdown can also be caused by other malfunctions including: faulty oxygen sensors, incorrect fuel mixtures, worn spark plugs or plug wires, faulty check valves, incorrect ignition timing, faulty fuel injectors and other ignition malfunctions.

Deteriorated Spark Plugs or Spark Plug Wires: spark plugs that don't fire, or misfire, can cause unburned fuel to be discharged into the exhaust system.

Improperly Operating Oxygen Sensor: an oxygen sensor failure can lead to incorrect readings of exhaust gasses. A faulty sensor can cause air / fuel ratios to be either too rich or too lean. A rich mixture can cause fuel to be discharged into the exhaust system. Lean mixtures produce conditions which diminish the rate at which hydrocarbons are oxidized.

Catalyst Fracture: fracture to the catalyst can be caused by the catalyst becoming loose or cracked. Once breakage occurs, pieces of the converter may dislodge and begin obstruct air flow. Airflow obstruction creates backpressure and increases heat in the exhaust system, which can ultimately lead to overheating.

For the above noted reasons, the use of NSCR (TWCs) on the Wartsila engines was rejected in favor of a more technically proven SCR/CO Catalyst control system.

References:

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2. Universal Emissions Technologies, Full Line Catalog, 3-way Catalysts
3. Miratech Emissions Solutions, www.miratechcorp.com , MIR 3 Way 04-04 Rev 1.
4. Miratech RICE NESHAPs Summary, www.miratechcorp.com
5. CleanAir Systems, A Caterpillar Company, CleanAir Assure TWC FAQ Sheet, www.clenairsys.com.
6. Johnson Matthey Catalysts, http://ect.jmcatalysts.com, 3-Way NSCR Catalysts.
7. RICE-Controlling NOx Under the CAA:A Menu of Options, STAPPA-ALAPCO (no date).
8. Control Costs for Existing Stationary SI RICE, ECR Inc., June 2010, Memorandum to Melanie King-EPA,OAPQS/SPPD/ESG.
9. Draft Estimates of Cost Effectiveness for NSCR for Rich-burn IC Engines, Jaime Pagan-EPA/OAQPS, 3-21-06.
10. Emissions Control Technology for Stationary ICEs, Status Report, MECA, Washington, D.C., July 1997.
11. RICE, NOx Emission Factor Analysis for Reasonable Progress, CDPHE-APCD, 2007.
12. NOx Control for Stationary Gas Engines, MARAMA Workshop, JM Catalysts, May 2011.
13. RICE NESHAPs Rule Summary, International Liquid Terminals Assoc., June 2010.
14. Alternative Control Techniques Document: Stationary Diesel Engines, ECR Inc., USEPA/OAQPS, March 2010.
15. Control of Compressor Engine Emissions-Related Costs and Considerations, Thomas Mark, 10/2003.
16. Engine Classification Matrix: Control Options and Costs, Argonne Nationla Laboratory, 3/2007.
17. Four Corners AQ Task Force-Report of Mitigation Options, Cumulative Effects Section, Use of SCR for NOx Control on Lean burn Engines, 11/2007.
18. NOx Emissions Control Costs for Stationary RICEs in NOx SIP Call States, E.H. Pechan and Associates, Inc., Revised Final Report, USEPA/OAQPS, 8/2000.
19. Air Emissions Regulations Affecting Natural Gas Transmission, 2011 CORE Symposium, J. McCarthy, 5/2011.
20. SOTA Manual for RICEs, NJDEP/DAQ, Section 3.13, 2003.

21. Catalyst Control Cost Information, ICCR Coordinating Committee, Sept 1998.
22. Control Costs for Existing Stationary CI RICE, ECR Inc., Memo to Melanie King-USEPA/OAQPS, Jan 2010.

Attachment F.6-2
SCR and CO Catalyst Cost-Effectiveness Screening Level Values

SCR and CO Catalyst Cost-Effectiveness Screening Level Values

The Applicant's SCR and CO catalyst systems are being designed and purchased as integral system to the Wartsila engines. As such, a breakout of individual system costs is difficult. The following table presents data extracted from the various sources noted in the NSCR discussion above and references below which the Applicant believes clearly shows that the chosen control technologies for NOx and CO are very cost effective.

Large Lean-burn SI Natural Gas-fired RICEs		
Cost Effectiveness Values, $/ton Reduced		
HP	NOx (SCR)	CO (Oxidation Catalyst)
250	$4280-$4810	-
1000	$1320-$1490	-
4000	$580-$660	-
100 to >500	$430-$4900	<$5000
1000	$2400-$3200	-
300-500*	$8800	-
500-100*	$10,300	-
Applicant's estimated data for the Wartsila engines.	*~$7500*	*~$2700*
*SCR as an incremental control to LEC.		

Preliminary screening level cost analyses for the proposed engine control systems are presented in the following tables.

References:

1. JM Catalysts, MARAMA Workshop, NOx Control For Stationary Gas Engines, W. Chu, May 2011.
2. Wartsila Air Emissions Solutions, Marketing and Application Development Presentation, R. Wettstein, Wartsila, June 2011.
3. Wartsila Low NOx Solutions, Scope and Experience, SFT-Oslo, H-P Nesse, Wartsila, May 2008.
4. Baltic NECA-Economic Impacts, Center for Maritime Studies, J. Kalli et al., Oct 2010.
5. SCR Presentation, J. Boij, Wartsila, March 2007.
6. See other references in the NSCR discussion above.

APPENDIX F.7

Mitigation of Impacts

Table F.7-1 (on the following page) presents the most recent listing of ERCs currently held in the SDAPCD bank as of August 11, 2010.

The Project, pursuant to the APCD NSR rule is **not** required to purchase or acquire sufficient emission reduction credits to offset the proposed project emissions due to its status as a non-major source. As a result of the AQIA for PM10 as required in Rule 20.2(d)(2)(i) and 20.2(d)(2)(v), PM10 offsets are also not required to mitigate PM10 impacts on State AAQS. NSR rule required amounts of ERCs are delineated in Table F.7-2.

TABLE F.7-2 SDAPCD EMISSION BANK CREDITS REQUIRED BY MMC

Emission Reduction Credits - TPY

	PM_{10}	VOC	NO_x	SO_2	CO
SDAPCD Offset Trigger Thresholds	100	50	50	100	100
Facility PTE*	33.1	46.5	44.8	5.74	56.5
Total Emission Credits Required to Mitigate Project Emissions Per District NSR Rules 20.1, 20.2, 20.3.	0	0	0	0	0
PM10 offsets per Rule 20.2(d)(2)(v) PM10 AQIA	0	-	-	-	-

*Values derived from Section 4.7.

The Project currently holds no ERC certificates or other forms of mitigation.

TABLE F.7-3 SDAPCD EMISSION BANK CREDITS HELD BY THE PROJECT AS OF AFC SUBMITTAL DATE

Emission Reduction Credits - TPY

	PM_{10}	VOC	NO_x	SO_2	CO
Total Emission Credits Held/Owned by QBPP at time of AFC/AQMD Application Submittal	0	0	0	0	0

Imposed mitigations pursuant to CEQA, per the CEC authority, will be negotiated, acquired, and implemented per CEC guidance. These mitigations may be one or a combination of the following strategies:

- Acquisition of existing ERCs from the District Bank.
- Development of emissions reductions meeting the requirements of Rules 26.0 through 26.10.

- Funding of the Carl Moyer program as negotiated with the CEC and APCD.
- Funding of other APCD clean air programs as negotiated with the CEC and APCD.

Table F.7-1

San Diego APCD ERC Banking Registry Summary

last update: August 11, 2010
"Subject to Verification"

CLASS A - ACTIVE ERC'S (TPY)				Cumulative Totals	
Company Name	**Certificate No.**	**NOx**	**VOC**	**NOx**	**VOC**
Cabrillo Enterprises, LLC	080527-01		1.25	0.00	1.25
Cabrillo Power II, LLC	978938-05	35.30		35.30	1.25
	981518-01	2.30		37.60	
Childrens Hospital	984240-02	0.54		38.14	1.25
City of San Diego, Metropolitan Wastewater Dept.	950766-06		0.38	38.14	1.63
	970821-02		22.76	38.14	24.39
Element Markets	070823-01	1.10		39.24	24.39
	070823-02		5.30	39.24	29.69
	070823-03		0.20	39.24	29.89
General Dynamics Properties, Inc.	970809-02	1.26		40.50	29.89
	970809-05		0.23	40.50	30.12
Gillis, Johm	070619-02		2.10	40.50	32.22
Grey K. Environmental Fund, LP	983809-01		25.10	40.50	57.32
	060328-01	1.90		42.40	57.32
	060328-02	2.20		44.60	57.32
	060328-03		2.90	44.60	60.22
	060328-04		0.54	44.60	60.76
	060328-05		0.10	44.60	60.86
	060328-06		0.30	44.60	61.16
	060803-02		36.70	44.60	97.86
	070731-01		20.70	44.60	118.56

CLASS A - ACTIVE ERC'S (TPY)				Cumulative Totals	
Company Name	**Certificate No.**	**NOx**	**VOC**	**NOx**	**VOC**
Hanson Aggregates, Pacific SW Region	980772-01	0.93		45.53	118.56
	980772-03		0.26	45.53	118.82
Hughes-Aircraft Co., Electro-Opti Cal Systems	940261-01		1.06	45.53	119.88
	940261-02		0.22	45.53	120.10
IG&E GP, LLC	090819-01		18.70	45.53	138.80
	090819-02		18.70	45.53	157.50
Muht-Hei, Inc.	981002-01		0.18	45.53	157.68
	981002-02		0.18	45.53	157.86
	981002-03		0.18	45.53	158.04
	981002-04		0.18	45.53	158.22
	981002-05		0.57	45.53	158.79
	981002-06		0.19	45.53	158.98
	981002-07		2.23	45.53	161.21
	981002-08		1.28	45.53	162.49
	981002-09		0.18	45.53	162.67
	981002-10		2.07	45.53	164.74
	981002-11		1.28	45.53	166.02
	981002-12		0.57	45.53	166.59
National Steel & Shipbuilding	40995-02	0.18		45.71	166.59
	40995-03		0.60	45.71	167.19
	40996-02	0.04		45.75	167.19
	40997-02	0.32		46.07	167.19
	40997-03		0.02	46.07	167.21
Naval Air Station, North Island	991014-01	8.00		54.07	167.21
	991015-01	3.30		57.37	167.21
	991016-01	18.70		76.07	167.21
Naval Station, San Diego	950949-01	4.83		80.90	167.21

CLASS A - ACTIVE ERC'S (TPY)				Cumulative Totals	
Company Name	**Certificate No.**	**NOx**	**VOC**	**NOx**	**VOC**
	940206-01	0.67		81.57	167.21
	940206-03		0.05	81.57	167.26
Navy Region Southwest	990223-01	12.02		93.59	167.26
Northrop-Grumman Ryan Aeronautical Center	975000-01		1.20	93.59	168.46
Olduvai Gorge LLC	070430-01	2.00		95.59	168.46
	070502-01	14.72		110.31	168.46
	070822-01	1.20		111.51	168.46
	070822-02		0.10	111.51	168.56
	070822-04		11.05	111.51	179.61
	071004-01		10.80	111.51	190.41
	071004-02	12.00		123.51	190.41
	080527-01		16.90	123.51	207.31
	080722-01		21.18	123.51	228.49
Otay Mesa Generating Co., LLC	000427-05	0.78		124.28	228.49
	000224-01	4.40		127.91	228.49
Performance Contracting Inc.	071217-01		1.00	127.91	229.49
SDG&E	983811-01	4.00		131.91	229.49
	060324-01		0.40	131.91	229.89
	060324-02	19.90		151.81	229.89
Sherwin Williams	987553-01		7.46	151.81	237.35
Shipyard Supplies, Inc.	06-0824-02		1.00	151.81	238.35
Solar Turbines	970123-04	10.00		161.81	238.35
	950562-01		0.60	161.81	238.95
Southern California Edison Company	950171-01	0.51		162.32	238.95
	950171-03		0.02	162.32	238.97
Surface Technologies	990325-01		1.48	162.32	240.45
United States Marine Corps	030507-01	3.00		165.32	240.45
US Foam	974375-03		0.10	165.32	240.55

CLASS A - ACTIVE ERC'S (TPY)				Cumulative Totals	
Company Name	**Certificate No.**	**NOx**	**VOC**	**NOx**	**VOC**
SW Division, Naval Facilities Engineering Cmd.	954185-01		2.00	165.32	242.55
	960709-01		9.00	165.32	251.55
	970311-01		13.00	165.32	264.55
	980511-03		3.15	165.32	267.70
	980521-02		13.25	165.32	280.95
	980529-02		7.40	165.32	288.35
Unisys Corporation	901238-01		3.66	165.32	292.01
	921410-01		1.25	165.32	293.26
	940577-01		2.95	165.32	296.21
USN Communications Station	940560-01	2.40		167.72	296.21
	940560-04		0.05	167.72	296.26
	940561-01	0.12		167.84	296.26
	940561-03		0.00	167.84	296.26
	940562-01	0.12		167.96	296.26
	940562-03		0.00	167.96	296.26
Veterans Administration Hospital	979555-01	1.90		169.86	296.26
Witte, Fred	070619-03		2.10	169.86	298.36
	TOTALS (tons/year) =			169.86	298.36

San Diego APCD ERC Banking Registry Summary

last update: August 11, 2010
"Subject to Verification"

CLASS A - ACTIVE ERC's (TPY)					Cumulative Totals		
Company Name	**Certificate No.**	**PM10**	**CO**	**SOx**	**PM10**	**CO**	**SOx**
Cabrillo Power II, LLC	978938-02		15.2		0.00	15.20	0.00
	978938-03	2.8			2.80	15.20	0.00
	978938-04			8.1	2.80	15.20	8.10
	981518-02		0.9		2.80	16.10	8.10
	981518-03	0.1			2.90	16.10	8.10
	981518-04			0.7	2.90	16.10	8.80
City of San Diego, Metropolitan Wastewater Dept.	950766-02		1.88		2.90	17.98	8.80
	950766-04	0.63			3.53	17.98	8.80
Element Markets	070823-04			0.30	3.53	17.98	9.10
	070823-05	0.30			3.83	17.98	9.10
	070823-06		1.30		3.83	19.28	9.10
General Dynamics, Convair	951022-01		64.80		3.83	84.08	9.10
	951022-04			0.10	3.83	84.08	9.20
	951022-07	1.50			5.33	84.08	9.20
General Dynamics Properties, Inc.	970809-01		1.17		5.33	85.25	9.20
	970809-03	0.46			5.79	85.25	9.20
	970809-04			0.02	5.79	85.25	9.22
Grey K Environmental Fund, LP	060328-10		0.70		5.79	85.95	9.22
	060328-08	0.20			5.99	85.95	9.22
	060328-09		2.00		5.99	87.95	9.22
	060328-07	0.40			6.39	87.95	9.22
Hanson Aggregates, Pacific SW Region	980772-02		2.20		6.39	90.15	9.22
	980772-04	0.09			6.48	90.15	9.22

CLASS A - ACTIVE ERC's (TPY)					Cumulative Totals		
Company Name	Certificate No.	PM10	CO	SOx	PM10	CO	SOx
H. G. Fenton Material Co.	41106-03	129.10			135.58	90.15	9.22
	930902-02		3.85		135.58	94.00	9.22
	930902-04	1.06			136.64	94.00	9.22
	930902-05			1.00	136.64	94.00	10.22
	975070-01		1.10		136.64	95.10	10.22
	975070-03	0.10			136.74	95.10	10.22
	975070-04			0.10	136.74	95.10	10.32
	975733-01		1.60		136.74	96.70	10.32
	975733-03	0.20			136.94	96.70	10.32
Jack Brunton	973039-02		24.20		136.94	120.90	10.32
National Steel & Shipbuilding	40994-01	0.10			137.04	120.90	10.32
	40995-01	0.09			137.13	120.90	10.32
	40995-05			0.27	137.13	120.90	10.59
	40995-06		3.40		137.13	124.30	10.59
	40996-01	0.01			137.14	124.30	10.59
	40996-03		0.02		137.14	124.32	10.59
	40996-04			0.35	137.14	124.32	10.94
	40997-01	0.45			137.59	124.32	10.94
	40997-04		0.06		137.59	124.38	10.94
	40997-05			0.04	137.59	124.38	10.98
0.03 tpy of Lead (Pb)	40997-06				137.59	124.38	10.98
Naval Station, San Diego	950949-02		0.75		137.59	125.13	10.98
	950949-03	1.09			138.68	125.13	10.98
	940206-02	0.04			138.72	125.13	10.98
	940206-04		0.12		138.72	125.25	10.98
	940206-05			0.04	138.72	125.25	11.02
NAVERUS, Inc.	040203-01		0.60		138.72	125.85	11.02

CLASS A - ACTIVE ERC's (TPY)					Cumulative Totals		
Company Name	Certificate No.	PM10	CO	SOx	PM10	CO	SOx
	040203-02	0.10			138.82	125.85	11.02
	978227-01		0.90		138.82	126.75	11.02
	978227-03	0.10			138.92	126.75	11.02
	981024-02	0.17			139.09	126.75	11.02
	981024-04		0.37		139.09	127.12	11.02
	981024-05			0.09	139.09	127.12	11.11
	981954-01		4.52		139.09	131.64	11.11
	981954-03			0.28	139.09	131.64	11.39
	981954-04	0.61			139.70	131.64	11.39
Olduvai Gorge LLC	071004-03		50.30		139.70	181.94	11.39
	071004-04	0.85			140.55	181.94	11.39
	071004-05			0.10	140.55	181.94	11.49
Ralston Purina	50055-01	0.50			141.05	181.94	11.49
	50055-02			4.60	141.05	181.94	16.09
	50055-05		3.40		141.05	185.34	16.09
SDG&E	921291-03		55.30		141.05	240.64	16.09
	921291-04	2.90			143.95	240.64	16.09
	979298-02		13.83		143.95	254.47	16.09
South Coast Materials Company	940101-01	10.80			154.75	254.47	16.09
Southern California Edison Company	950171-02		0.11		154.75	254.58	16.09
	950171-04	0.01			154.76	254.58	16.09
	950171-05			0.10	154.76	254.58	16.19
STMicroelectronics, Inc.	978887-01		1.50		154.76	256.08	16.19
	978887-04	0.10			154.86	256.08	16.19
SW Division, Naval Facilities Engineering Cmd.	970312-01	2.00			156.86	256.08	16.19
US Foam	974375-02		1.10		156.86	257.18	16.19
	974375-05	0.10			156.96	257.18	16.19

CLASS A - ACTIVE ERC's (TPY)					Cumulative Totals		
Company Name	**Certificate No.**	**PM10**	**CO**	**SOx**	**PM10**	**CO**	**SOx**
USN Communications Station	940560-02			0.49	156.96	257.18	16.68
	940560-03	0.34			157.30	257.18	16.68
	940560-05		1.05		157.30	258.23	16.68
	940561-02		0.03		157.30	258.26	16.68
	940561-04			0.01	157.30	258.26	16.69
	940561-05	0.00			157.30	258.26	16.69
	940562-02		0.03		157.30	258.29	16.69
	940562-04			0.01	157.30	258.29	16.71
	940562-05	0.00			157.31	258.29	16.71
					PM10	**CO**	**Sox**
	TOTALS (tons/year)=				**157.31**	**258.29**	**16.71**

San Diego APCD MERC Banking Registry Summary

last update: August 11, 2010

"Subject to Verification"

CLASS A - ACTIVE MERC'S (TPY)				Cumulative Totals	
Company Name	Certificate No.	NOx	VOC	NOx	VOC
COMCABWEST USMC	977891-01	4.30		4.30	0.00
Otay Mesa Generating Co. LLC	980626-01	2.53		6.83	0.00
	TOTALS (tons/year) =			6.83	0.00

Cumulative Impacts Analysis Protocol

Potential cumulative air quality impacts are not expected to occur or result from the Cogentrix QBPP Project due to the following; (1) emissions from the project are below the SDAPCD major source thresholds, (2) the low predicted impacts as delineated in Section 4.7, and (3) the scarcity of significant major sources within an 8 mile radius of the site. Notwithstanding the foregoing, a request has been made to the SDAPCD for the necessary source records (source locations, stack data, and emissions data) for any identified major stationary sources within the designated 8 mile radius. These records were not received prior to the AFC filing, and as such the cumulative analysis is being prepared for presentation at a later date.

Regional Impacts

Regional air quality impacts are possible for pollutants such as ozone, which involve photochemical processes that can take hours to occur. The Project is not required, per the San Diego Air Pollution Control District (SDAPCD) NSR Rule to supply emissions mitigation (see Appendix B.7), although mitigation for some pollutants may be required by the CEC.

Although the relative importance of VOC and NO_x emissions in ozone formation differs from region to region, and from day to day, most air pollution control plans in California require roughly equivalent controls (on a ton per year basis) for these two pollutants. The change in emissions of the sum of these pollutants, equally weighted, will be used to provide a reasonable estimate of the impact of the Project on ozone levels. The net change in emissions of ozone precursors from the Project will be compared with emissions from all sources within the SDAPCD (Table F.8-1).

Table F.8-1 Estimated SDAPCD Emissions Inventory for 2008 (tons/day)

Source Category	TOG	ROG	CO	NOx	SOx	PM10	PM2.5
Total Stationary Sources	357.7	32.3	22.2	9.1	0.5	8.6	6.1
Total Area Sources	58.3	35.8	28.1	2.7	0.2	94.5	16.1
Total Mobile Sources	96.5	88.1	771.9	157	1.3	10.8	8.8
Total Natural Sources	87	67.1	137.6	4.2	1.3	13.9	11.8
Air Basin Total (tons/day)	599.5	223.3	959.8	173	3.3	127.8	42.8
Air Basin Total (tons/yr)[1]	**218,818**	**81,505**	**350,327**	**63,145**	**1,205**	**46,647**	**15,622**

Source: CARB, 3/2011.

[1] based on 365 days/year.

Air quality impacts of fine particulate, PM_{10} and/or $PM_{2.5}$, have the potential to be either regional or localized in nature. On a regional basis, an analysis similar to that proposed above for ozone will be performed, looking at the three pollutants that can form PM_{10} in the atmosphere, i.e., VOC, SO_x, and NO_x, as well as directly emitted particulate matter. SDAPCD regulations do not require offsets to be provided for $PM_{10,}$ NOx, SOx, and VOC emissions from the project, i.e., the net increases are well below the SDAPCD offset trigger thresholds.

As in the case of ozone precursors, emissions of $PM_{10/2.5}$ precursors are expected to have approximately equivalent ambient impacts in forming $PM_{10/2.5}$, per ton of emissions on a regional basis. Table F.8-2 provides the comparison of emissions of the criteria pollutants from the Project with emissions from all sources within the SDAPCD as a whole.

Table F.8-2 Comparison of the Project Emissions to Estimated Inventory for 2008

Category	TOG	ROG[1]	CO	NOx	SOx	PM10	PM2.5
Project Emissions (tons/yr)	0	46.5	56.5	44.8	5.74	33.1	33.1
SDAPCD Total (tons/yr)	218,818	81,505	350,327	63,145	1,205	46,647	15,622
Project % of Air Basin Total (basis Tons/yr)	**0**	**0.057**	**0.016**	**0.071**	**0.48**	**0.071**	**0.212**

[1] Project VOC emissions compared to inventory ROG emissions.

Localized Impacts

Localized impacts from the Project could result from emissions of carbon monoxide, oxides of nitrogen, sulfur oxides, and directly emitted PM_{10}. A dispersion modeling analysis of potential cumulative air quality impacts will be performed for all four of these pollutants.

In evaluating the potential cumulative localized impacts of the Project in conjunction with the impacts of existing facilities and facilities not yet in operation but that are reasonably foreseeable, a potential impact area in which cumulative localized impacts could occur was identified as an area with a radius of 8 miles around the plant site. Based on the results of the proposed air quality modeling analyses described above, "significant" air quality impacts, as that term is defined in federal air quality modeling guidelines, will be determined. If the project's impacts do not exceed the significance levels, no cumulative impacts will be expected to occur, and no further analysis will be required. Otherwise, in order to ensure that other projects that might have significant cumulative impacts in conjunction with the Project are identified, a search area with a radius of 8 miles beyond the project's impact area will be used for the cumulative impacts analysis. Within this search area, three categories of projects with emissions sources will be used as criteria for identification:

- Projects which have recently commenced operations whose emissions may not be reflected in the ambient monitoring background data, i.e., commenced operations after January 2010.

- Projects which have filed for air pollution permits to construct which have not been issued, but that are reasonably anticipated to be issued, and subsequently constructed and operated.
- Foreseeable (reasonably known) projects that have not, to date, filed any applications for development.

The applicable inclusion dates for each of the above source categories will be discussed and approved by the SDAPCD staff. The requested source listings will incorporate these dates. Projects that are existing, and that have been in operation such that their emissions are reflected in the ambient air quality data that has been used to represent background concentrations require no further analysis. The cumulative impacts analysis adds the modeled impacts of selected facilities to the maximum measured background air quality levels, thus ensuring that these existing projects are taken into account.

Projects for which air pollution permits to construct have been issued but that were not operational will be identified through a request of permit records from the SDAPCD. The search will be requested to be performed at two levels. For permits that are considered "major modifications" (i.e., emissions increases greater than 40 tons/year of NO_x or SO_2, 25 tons/year of total suspended particulate, 15 tons/year of PM_{10}), a region within 8 miles of the proposed project site will be evaluated. For projects that had smaller emissions changes, but still greater than 15 tons/year, a region within 8 miles of the proposed project site will also evaluated. Projects that satisfy either of these criteria and that had a permit to construct issued after the applicable inclusion date, will be included in the cumulative air quality impacts analysis. The inclusion date, as noted above, will be selected based on the typical length of time a permit to construct is valid and typical project construction times, to ensure that projects that are not reflected in the current ambient air quality data are included in the analysis. Projects for which the emissions change was smaller than 15 tons/year will be assumed to be *de minimus*, and will not be included in the dispersion modeling analysis.

A list of projects within the project region meeting the above noted criteria has been requested from the SDAPCD staff.

Given the potentially wide geographic area over which the dispersion modeling analysis is to be performed, the Aermod model will be used to evaluate cumulative localized air quality impacts. The detailed modeling procedures, Aermod options, and meteorological data used in the cumulative impacts dispersion analysis were the same as those described in Section 4.7. The receptor grid will be spaced at 100 meters and cover the area in which the detailed modeling analysis (described above) indicates that the project will have impacts that may exceed any significance levels.

Cumulative Impacts Dispersion Modeling

The dispersion modeling analysis of cumulative localized air quality impacts for the proposed project will be evaluated in combination with other reasonably foreseeable projects and air quality levels attributable to existing emission sources, and the impacts were compared to state or federal air quality standards for significant impact. As discussed above, the highest second-highest modeled concentrations will be used to demonstrate compliance with standards based on short-term averaging periods (24 hours or less).

Supporting information to be used in the analysis includes the following:

- 2008 estimated emissions inventory for the SDAPCD (Table F.8-1);
- List of projects resulting from the screening analysis of permit files by the SDAPCD;
- Table delineating location data of sources included in the cumulative air quality impacts dispersion modeling analysis;
- Stack parameters for sources included in the cumulative air quality impacts dispersion modeling analysis; and
- Output files for the dispersion modeling analysis.

APPENDIX F.9

District Permitting Forms

Pursuant to the SDAPCD Rule 14, the following District permit application forms are included herein:

Form: APCD 116 (1)

Form: 34AJ (12)

Form: Certificate of Exemption (1)

These forms reference data contained in the AFC which is of higher detail than can be input on the actual form. This data is contained in the following specific sections of the AFC:

Section 2.0	Project Description
Section 4.7	Air Quality
Section 4.8	Public Health
Appendices	F.1 through F.10

APCD 116 (Rev. 04/07)

SAN DIEGO AIR POLLUTION CONTROL DISTRICT
10124 OLD GROVE ROAD, SAN DIEGO CA 92131-1649
PHONE (858) 586-2600 • FAX (858) 586-2601

PERMIT / REGISTRATION APPLICATION

SUBMITTAL OF THIS APPLICATION DOES NOT GRANT PERMISSION TO CONSTRUCT OR TO OPERATE EQUIPMENT EXCEPT AS SPECIFIED IN RULE 24(d)

IMPORTANT REMINDERS: Read instructions on the reverse side of this form prior to completing this application. Please ensure that all of the following are included before you submit the application:
☒ Appropriate Permit Fee ☒ Completed Supplemental Form(s) ☒ Signature on Application

REASON FOR SUBMITTAL OF APPLICATION: (check the appropriate item and enter Application (AP) or Permit to Operate (PO) number if required)

1. ☒ New Installation 2. ☐ Existing Unpermitted Equipment or Rule 11 Change 3. ☐ Modification of Existing Permitted Equipment
4. ☐ Amendment to Existing Authority to Construct or AP 5. ☐ Change of Equipment Location 6. ☐ Change of Equipment Ownership
7. ☐ Change of Permit Conditions 8. ☐ Change Permit to Operate Status to Inactive 9. ☐ Banking Emissions
10. ☐ Registration of Portable Equipment 11. ☐ Other (Specify) ______
12. List affected AP/PO#(s): ______

APPLICANT INFORMATION

13. Name of Business (DBA) Quail Brush Genco, LLC
14. Nature of Business Electrical power production
15. Does this organization own or operate any other APCD permitted equipment at this or any other adjacent locations in San Diego County? ☐Yes ☒No
If yes, list assigned location ID's listed on your PO's ______
16. Type of Ownership ☐ Corporation ☐ Partnership ☐ Individual Owner ☐ Government Agency ☒ Other Limited Liability Company
17. Name of Legal Owner (if different from DBA) ______

		A. Equipment Owner	**B. Authority to Construct (if different from A)**
18.	Name	Quail Brush Genco, LLC	
19.	Mailing Address	9405 Arrowpoint Blvd	
20.	City	Charlotte	
21.	State	NC Zip 28273	Zip
22.	Phone	(704) 525-3800 FAX (704) 527-4413	( ) FAX ( )
		C. Permit to Operate (if different from A)	**D. Billing Information (if different from A)**
23.	Name		
24.	Mailing Address		
25.	City		
26.	State	Zip	Zip
27.	Phone	( ) FAX ( )	( ) FAX ( )

EQUIPMENT/PROCESS INFORMATION: Type of Equipment: ☒ Stationary ☐ Portable.
If portable, will operation exceed 12 consecutive months at the same location ☐ Yes ☐ No

28. Equipment Location Address Sycamore Landfill Rd City Santee Parcel No. ______
29. State CA Zip ______ Phone ( ) ______ FAX ( ) ______
30. Site Contact ______ Title ______ Phone ( ) ______
31. General Description of Equipment/Process Fossil fuel-fired electrical generating plant - NAICS 221112
Peaker facility utilizing SI-IC engine technology
32. Application Submitted by ☒ Owner ☒ Operator ☐ Contractor ☐ Consultant Affiliation ______

EXPEDITED APPLICATION PROCESSING: ☒ I hereby request Expedited Application Processing and understand that:

33. a) Expedited processing will incur additional fees and permits will not be issued until the additional fees are paid in full (see Rule 40(d)(8)(iv) for details).
b) Expedited processing is contingent on the availability of qualified staff. c) Once engineering review has begun this request cannot be cancelled.
d) Expedited processing does not guarantee action by any specific date nor does it guarantee permit approval.

I hereby certify that all information provided on this application is true and correct.

34. SIGNATURE ______ Date 6/24/11
35. Print Name Richard W. Gray, Jr. Title Vice President
36. Company Quail Brush Genco, LLC Phone (704) 672-2823 E-mail Address RichardGray@Cogentrix.com

APCD USE ONLY

AP # ______ ID # ______ Cust. No. ______ Sector: ______ UTM's X ______ Y ______ SIC ______
Receipt # ______ Date ______ Amt Rec'd $ ______ Fee Code ______
Engineering Contact ______ Fee Code ______ AP Fee $ ______ T&M Renewal Fee $ ______
Refund Claim # ______ Date ______ Amt $ ______
Application Generated By NV# ______ NC # ______ Other ______ Date ______ Inspector ______

4.07 – TW/flm

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION
FEE SCHEDULE 34A-J

San Diego APCD Use Only
Appl. No.:
ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #1

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation ______ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: ______

Engine hp Rating: ______ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☒ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

☐ crankcase (blow-by) emission control equipment

(Specify) ______ Model ______

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. CEMS will be installed on each engine to comply with Title IV Acid Rain provisions.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor ______ cfm ☐ pump ______ gpm

☒ generator 9300 kw ☐ other (specify) ______

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☒ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

Gaseous Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

78685 scf/hr ________ ___/wk ________ scf/yr

Exhaust Emission*:	**LB/HR**	**g/HP-HR**	**g/HR**	**PPM**
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 °F

Fuel Supplier: SDG&E

Fuel Sulfur Content: ________ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: ____________________

EPA Certification No.: ____________________

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

1. **Ducted or Stack Emissions** (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	70					
Stack Diameter (or length/width) (ft)	4					
Exhaust Gas Temperature* (°F)	731					
Exhaust Gas Flow (actual cfm or fps)	61980					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~300					

* Use "70 °F" or "Ambient" if unknown

2. **Unducted Emissions** (For 1 or more emission points). Estimate if you are unsure.

Describe how unducted gases, vapors, and/or particles get into the outside air. Provide a brief description of the process or operation for each unducted emission point. If unducted emissions come out of building openings such as doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

If unducted emissions originate outside your buildings, estimate the **size of the emission zone** (example - paint spraying 2' x 2' x 2' bread boxes).

RECEPTOR DATA A receptor is a residence or business whose occupants could be exposed to toxic emissions from your facility. In order to estimate the risk to nearby receptors, please provide the distance from the emission point to the nearest residence and to the nearest business.

Distance to nearest residence ~2600 ft

Distance to nearest business ~2200 ft

Distance to nearest school ~4900 ft

Name of Preparer: Richard B. Booth **Title:** Sr. AQ Consultant

Phone No.: (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

NOTE TO APPLICANT:

Before acting on an application for Authority to Construct or Permit to Operate, the District may require further information, plans, or specifications. Forms with insufficient information may be returned to the applicant for completion, which will cause a delay in application processing and may increase processing fees. The applicant should correspond with equipment and material manufacturers to obtain the information requested on this supplemental form.

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION

FEE SCHEDULE
34A-J

San Diego APCD Use Only
Appl. No.:
ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #2

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation ________ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: ________

Engine hp Rating: ________ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☒ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

☐ crankcase (blow-by) emission control equipment

(Specify) ________ Model ________

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. CEMS will be installed on each engine to comply with Title IV Acid Rain provisions.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor ________ cfm ☐ pump ________ gpm

☒ generator 9300 kw ☐ other (specify) ________

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☒ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

Gaseous Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

78685 scf/hr ________ ___/wk ________ scf/yr

Exhaust Emission*:	**LB/HR**	**g/HP-HR**	**g/HR**	**PPM**
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 °F

Fuel Supplier: SDG&E

Fuel Sulfur Content: ________ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: ________________

EPA Certification No.: ________________

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

1. Ducted or Stack Emissions (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	70					
Stack Diameter (or length/width) (ft)	4					
Exhaust Gas Temperature* (°F)	731					
Exhaust Gas Flow (actual cfm or fps)	61980					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~300					

* Use "70 °F" or "Ambient" if unknown

2. Unducted Emissions (For 1 or more emission points). Estimate if you are unsure.

Describe how unducted gases, vapors, and/or particles get into the outside air. Provide a brief description of the process or operation for each unducted emission point. If unducted emissions come out of building openings such as doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

If unducted emissions originate outside your buildings, estimate the **size of the emission zone** (example - paint spraying 2' x 2' x 2' bread boxes).

RECEPTOR DATA A receptor is a residence or business whose occupants could be exposed to toxic emissions from your facility. In order to estimate the risk to nearby receptors, please provide the distance from the emission point to the nearest residence and to the nearest business.

Distance to nearest residence ~2600 ft

Distance to nearest business ~2200 ft

Distance to nearest school ~4900 ft

Name of Preparer: Richard B. Booth **Title:** Sr. AQ Consultant

Phone No.: (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

NOTE TO APPLICANT:

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SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION

FEE SCHEDULE
34A-J

San Diego APCD Use Only
Appl. No.:
ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #3

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation ______________ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: ______________

Engine hp Rating: ________ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☒ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

☐ crankcase (blow-by) emission control equipment

(Specify) ______________ Model ______________

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. CEMS will be installed on each engine to comply with Title IV Acid Rain provisions.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor ________ cfm ☐ pump ________ gpm

☒ generator 9300 kw ☐ other (specify) ______________

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☒ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

Gaseous Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

78685 scf/hr ________ ____/wk ________ scf/yr

Exhaust Emission*:	**LB/HR**	**g/HP-HR**	**g/HR**	**PPM**
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 °F

Fuel Supplier: SDG&E

Fuel Sulfur Content: ________ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: ________________

EPA Certification No.: ________________

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

1. Ducted or Stack Emissions (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	70					
Stack Diameter (or length/width) (ft)	4					
Exhaust Gas Temperature* (°F)	731					
Exhaust Gas Flow (actual cfm or fps)	61980					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~300					

* Use "70 °F" or "Ambient" if unknown

2. Unducted Emissions (For 1 or more emission points). Estimate if you are unsure.

Describe how unducted gases, vapors, and/or particles get into the outside air. Provide a brief description of the process or operation for each unducted emission point. If unducted emissions come out of building openings such as doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

If unducted emissions originate outside your buildings, estimate the **size of the emission zone** (example - paint spraying 2' x 2' x 2' bread boxes).

RECEPTOR DATA A receptor is a residence or business whose occupants could be exposed to toxic emissions from your facility. In order to estimate the risk to nearby receptors, please provide the distance from the emission point to the nearest residence and to the nearest business.

Distance to nearest residence ~2600 ft

Distance to nearest business ~2200 ft

Distance to nearest school ~4900 ft

Name of Preparer: Richard B. Booth **Title:** Sr. AQ Consultant

Phone No.: (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

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SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION

FEE SCHEDULE
34A-J

San Diego APCD Use Only

Appl. No.:

ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #4

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation __________ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: __________

Engine hp Rating: ______ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment:

☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☒ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

☐ crankcase (blow-by) emission control equipment

(Specify) __________ Model __________

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. CEMS will be installed on each engine to comply with Title IV Acid Rain provisions.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor ______ cfm ☐ pump ______ gpm

☒ generator 9300 kw ☐ other (specify) __________

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☒ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

Gaseous Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

78685 scf/hr ________ /wk ________ scf/yr

Exhaust Emission*:	**LB/HR**	**g/HP-HR**	**g/HR**	**PPM**
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 °F

Fuel Supplier: SDG&E

Fuel Sulfur Content: ________ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: ________________

EPA Certification No.: ________________

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

1. Ducted or Stack Emissions (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	70					
Stack Diameter (or length/width) (ft)	4					
Exhaust Gas Temperature* (°F)	731					
Exhaust Gas Flow (actual cfm or fps)	61980					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~300					

* Use "70 °F" or "Ambient" if unknown

2. Unducted Emissions (For 1 or more emission points). Estimate if you are unsure.

Describe how unducted gases, vapors, and/or particles get into the outside air. Provide a brief description of the process or operation for each unducted emission point. If unducted emissions come out of building openings such as doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

If unducted emissions originate outside your buildings, estimate the **size of the emission zone** (example - paint spraying 2' x 2' x 2' bread boxes).

RECEPTOR DATA A receptor is a residence or business whose occupants could be exposed to toxic emissions from your facility. In order to estimate the risk to nearby receptors, please provide the distance from the emission point to the nearest residence and to the nearest business.

Distance to nearest residence ~2600 ft

Distance to nearest business ~2200 ft

Distance to nearest school ~4900 ft

Name of Preparer: Richard B. Booth **Title:** Sr. AQ Consultant

Phone No.: (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

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SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION
FEE SCHEDULE 34A-J

San Diego APCD Use Only
Appl. No.:
ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #5

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation ______________ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: ____________

Engine hp Rating: ________ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☒ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

☐ crankcase (blow-by) emission control equipment

(Specify) ______________________ Model ____________

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. CEMS will be installed on each engine to comply with Title IV Acid Rain provisions.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor ________ cfm ☐ pump ________ gpm

☒ generator 9300 kw ☐ other (specify) ____________

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☒ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

Gaseous Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

78685 scf/hr ________ /wk ________ scf/yr

Exhaust Emission*:	**LB/HR**	**g/HP-HR**	**g/HR**	**PPM**
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 °F

Fuel Supplier: SDG&E

Fuel Sulfur Content: ________ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: ________

EPA Certification No.: ________

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

1. **Ducted or Stack Emissions** (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	70					
Stack Diameter (or length/width) (ft)	4					
Exhaust Gas Temperature* (°F)	731					
Exhaust Gas Flow (actual cfm or fps)	61980					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~300					

* Use "70 °F" or "Ambient" if unknown

2. **Unducted Emissions** (For 1 or more emission points). Estimate if you are unsure.

Describe how unducted gases, vapors, and/or particles get into the outside air. Provide a brief description of the process or operation for each unducted emission point. If unducted emissions come out of building openings such as doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

If unducted emissions originate outside your buildings, estimate the **size of the emission zone** (example - paint spraying 2' x 2' x 2' bread boxes).

RECEPTOR DATA A receptor is a residence or business whose occupants could be exposed to toxic emissions from your facility. In order to estimate the risk to nearby receptors, please provide the distance from the emission point to the nearest residence and to the nearest business.

Distance to nearest residence ~2600 ft

Distance to nearest business ~2200 ft

Distance to nearest school ~4900 ft

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Phone No.: (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

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SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION

FEE SCHEDULE 34A-J

San Diego APCD Use Only

Appl. No.:

ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #6

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation ________ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: ________

Engine hp Rating: ________ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☒ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

☐ crankcase (blow-by) emission control equipment

(Specify) ________ Model ________

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. CEMS will be installed on each engine to comply with Title IV Acid Rain provisions.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor ________ cfm ☐ pump ________ gpm

☒ generator 9300 kw ☐ other (specify) ________

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☒ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

Gaseous Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

78685 scf/hr ________ /wk ________ scf/yr

Exhaust Emission*:	**LB/HR**	**g/HP-HR**	**g/HR**	**PPM**
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 °F

Fuel Supplier: SDG&E

Fuel Sulfur Content: ________ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: ________________

EPA Certification No.: ________________

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions -** an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions -** anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

1. **Ducted or Stack Emissions** (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	70					
Stack Diameter (or length/width) (ft)	4					
Exhaust Gas Temperature* (°F)	731					
Exhaust Gas Flow (actual cfm or fps)	61980					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~300					

* Use "70 °F" or "Ambient" if unknown

2. **Unducted Emissions** (For 1 or more emission points). Estimate if you are unsure.

Describe how unducted gases, vapors, and/or particles get into the outside air. Provide a brief description of the process or operation for each unducted emission point. If unducted emissions come out of building openings such as doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

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Distance to nearest business ~2200 ft

Distance to nearest school ~4900 ft

Name of Preparer: Richard B. Booth **Title:** Sr. AQ Consultant

Phone No.: (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

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SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION
FEE SCHEDULE 34A-J

San Diego APCD Use Only
Appl. No.:
ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #7

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation ______________ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: ______________

Engine hp Rating: ________ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☒ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

☐ crankcase (blow-by) emission control equipment

(Specify) ______________ Model ______________

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. CEMS will be installed on each engine to comply with Title IV Acid Rain provisions.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor ________ cfm ☐ pump ________ gpm

☒ generator 9300 kw ☐ other (specify) ______________

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☒ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

Gaseous Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

78685 scf/hr ________ /wk ________ scf/yr

Exhaust Emission*:	LB/HR	g/HP-HR	g/HR	PPM
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 °F

Fuel Supplier: SDG&E

Fuel Sulfur Content: ________ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: ________

EPA Certification No.: ________

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

1. <u>Ducted or Stack Emissions</u> (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	70					
Stack Diameter (or length/width) (ft)	4					
Exhaust Gas Temperature* (°F)	731					
Exhaust Gas Flow (actual cfm or fps)	61980					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~300					

* Use "70 °F" or "Ambient" if unknown

2. <u>Unducted Emissions</u> (For 1 or more emission points). Estimate if you are unsure.

Describe how unducted gases, vapors, and/or particles get into the outside air. Provide a brief description of the process or operation for each unducted emission point. If unducted emissions come out of building openings such as doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

If unducted emissions originate outside your buildings, estimate the **size of the emission zone** (example - paint spraying 2' x 2' x 2' bread boxes).

<u>RECEPTOR DATA</u> A receptor is a residence or business whose occupants could be exposed to toxic emissions from your facility. In order to estimate the risk to nearby receptors, please provide the distance from the emission point to the nearest residence and to the nearest business.

Distance to nearest residence ~2600 ft

Distance to nearest business ~2200 ft

Distance to nearest school ~4900 ft

Name of Preparer: Richard B. Booth **Title:** Sr. AQ Consultant

Phone No.: (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

NOTE TO APPLICANT:

Before acting on an application for Authority to Construct or Permit to Operate, the District may require further information, plans, or specifications. Forms with insufficient information may be returned to the applicant for completion, which will cause a delay in application processing and may increase processing fees. The applicant should correspond with equipment and material manufacturers to obtain the information requested on this supplemental form.

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION
FEE SCHEDULE 34A-J

San Diego APCD Use Only
Appl. No.:
ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #8

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation __________ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: ________

Engine hp Rating: ______ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment:
- ☒ turbocharger
- ☐ aftercooler
- ☐ 4-degree retard of fuel injection
- ☐ exhaust gas recirculation
- ☒ lean burn
- ☐ pre-chamber combustion
- ☒ air/fuel controller
- ☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)
- ☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

- ☐ crankcase (blow-by) emission control equipment

(Specify) __________ Model ________

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. CEMS will be installed on each engine to comply with Title IV Acid Rain provisions.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives:
- ☐ compressor ______ cfm
- ☐ pump ______ gpm
- ☒ generator 9300 kw
- ☐ other (specify) ________

Equipment is:
- ☐ portable
- ☒ stationary
- ☐ continuous service
- ☒ peak shaving electrical supply
- ☐ cogeneration
- ☐ emergency electrical supply
- ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

Gaseous Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

78685 scf/hr ________ ____/wk ________ scf/yr

Exhaust Emission*:	**LB/HR**	**g/HP-HR**	**g/HR**	**PPM**
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 °F

Fuel Supplier: SDG&E

Fuel Sulfur Content: ________ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: ________________

EPA Certification No.: ________________

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

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Exhaust Gas Flow (actual cfm or fps)	61980					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~300					

* Use "70 °F" or "Ambient" if unknown

2. Unducted Emissions (For 1 or more emission points). Estimate if you are unsure.

Describe how unducted gases, vapors, and/or particles get into the outside air. Provide a brief description of the process or operation for each unducted emission point. If unducted emissions come out of building openings such as doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

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Distance to nearest residence ~2600 ft

Distance to nearest business ~2200 ft

Distance to nearest school ~4900 ft

Name of Preparer: Richard B. Booth **Title:** Sr. AQ Consultant

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SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION

FEE SCHEDULE
34A-J

San Diego APCD Use Only

Appl. No.:

ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #9

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation ________________ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: ____________

Engine hp Rating: ________ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☒ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

☐ crankcase (blow-by) emission control equipment

(Specify) ______________________ Model ____________

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. CEMS will be installed on each engine to comply with Title IV Acid Rain provisions.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor ________ cfm ☐ pump ________ gpm

☒ generator 9300 kw ☐ other (specify) ____________

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☒ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

Gaseous Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

78685 scf/hr ________ ____/wk ________ scf/yr

Exhaust Emission*:	**LB/HR**	**g/HP-HR**	**g/HR**	**PPM**
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 °F

Fuel Supplier: SDG&E

Fuel Sulfur Content: ________ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: ________________

EPA Certification No.: ________________

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

1. **Ducted or Stack Emissions** (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	70					
Stack Diameter (or length/width) (ft)	4					
Exhaust Gas Temperature* (°F)	731					
Exhaust Gas Flow (actual cfm or fps)	61980					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~300					

* Use "70 °F" or "Ambient" if unknown

2. **Unducted Emissions** (For 1 or more emission points). Estimate if you are unsure.

Describe how unducted gases, vapors, and/or particles get into the outside air. Provide a brief description of the process or operation for each unducted emission point. If unducted emissions come out of building openings such as doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

If unducted emissions originate outside your buildings, estimate the **size of the emission zone** (example - paint spraying 2' x 2' x 2' bread boxes).

RECEPTOR DATA A receptor is a residence or business whose occupants could be exposed to toxic emissions from your facility. In order to estimate the risk to nearby receptors, please provide the distance from the emission point to the nearest residence and to the nearest business.

Distance to nearest residence ~2600 ft

Distance to nearest business ~2200 ft

Distance to nearest school ~4900 ft

Name of Preparer: Richard B. Booth **Title:** Sr. AQ Consultant

Phone No.: (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

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SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION
FEE SCHEDULE 34A-J

San Diego APCD Use Only
Appl. No.:
ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #10

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation ________ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: ________

Engine hp Rating: ________ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☒ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

☐ crankcase (blow-by) emission control equipment

(Specify) ________ Model ________

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. CEMS will be installed on each engine to comply with Title IV Acid Rain provisions.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor ________ cfm ☐ pump ________ gpm

☒ generator 9300 kw ☐ other (specify) ________

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☒ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

Gaseous Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

78685 scf/hr ________ ____/wk ________ scf/yr

Exhaust Emission*:	**LB/HR**	**g/HP-HR**	**g/HR**	**PPM**
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 °F

Fuel Sulfur Supplier: SDG&E

Fuel Sulfur Content: ________ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: ________________

EPA Certification No.: ________________

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

1. **Ducted or Stack Emissions** (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	70					
Stack Diameter (or length/width) (ft)	4					
Exhaust Gas Temperature* (°F)	731					
Exhaust Gas Flow (actual cfm or fps)	61980					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~300					

* Use "70 °F" or "Ambient" if unknown

2. **Unducted Emissions** (For 1 or more emission points). Estimate if you are unsure.

Describe how unducted gases, vapors, and/or particles get into the outside air. Provide a brief description of the process or operation for each unducted emission point. If unducted emissions come out of building openings such as doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

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Distance to nearest residence ~2600 ft

Distance to nearest business ~2200 ft

Distance to nearest school ~4900 ft

Name of Preparer: Richard B. Booth **Title:** Sr. AQ Consultant

Phone No.: (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

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SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION
FEE SCHEDULE 34A-J

San Diego APCD Use Only
Appl. No.:
ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #11

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation ______ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: ______

Engine hp Rating: ______ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☒ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

☐ crankcase (blow-by) emission control equipment

(Specify) ______ Model ______

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B PROCESS DESCRIPTION

Engine Drives: ☐ compressor ______ cfm ☐ pump ______ gpm

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C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

Gaseous Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

78685 scf/hr ________ ____/wk ________ scf/yr

Exhaust Emission*:	**LB/HR**	**g/HP-HR**	**g/HR**	**PPM**
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 ______ ^{0}F

Fuel Supplier: SDG&E

Fuel Sulfur Content: ________ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm ____ % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: ______________________

EPA Certification No.: ______________________

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FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

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1. Ducted or Stack Emissions (For 1 or more emission points). Estimate values if you are unsure.

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Raincap? (None, Flapper Valve, Raincap)	None					
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Phone No.: (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

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SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION
FEE SCHEDULE 34A-J

San Diego APCD Use Only
Appl. No.:
ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC Fire Pump Engine

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation ________ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Clarke Model: JU4H-UFADW8 S/N: ________

Engine hp Rating: 144 Fuel Type: ☒ diesel* ☐ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☐ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) ________

☐ crankcase (blow-by) emission control equipment

(Specify) ________ Model ________

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. Mfg's spec sheet in Appendix F.1.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor ______ cfm ☒ pump ______ gpm

☐ generator ______ kw ☐ other (specify) ________

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☐ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	1	1	50
Maximum	1	1	50

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: 10 gal/hr 10 gal/wk 500 gal/yr

Gaseous Fuel: ________ gal/hr ________ gal/wk ________ gal/yr

________ ____/hr ________ ____/wk ________ ____/yr

Exhaust Emission*:	LB/HR	g/HP-HR	g/HR	PPM
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 1040 °F

Fuel Supplier: TBD

Fuel Sulfur Content: .0015 % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: ________ % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: U-R-004-0429

EPA Certification No.: ________

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

1. **Ducted or Stack Emissions** (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	15					
Stack Diameter (or length/width) (ft)	.33					
Exhaust Gas Temperature* (°F)	1040					
Exhaust Gas Flow (actual cfm or fps)	740					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~250					

* Use "70 °F" or "Ambient" if unknown

2. **Unducted Emissions** (For 1 or more emission points). Estimate if you are unsure.

Describe how unducted gases, vapors, and/or particles get into the outside air. Provide a brief description of the process or operation for each unducted emission point. If unducted emissions come out of building openings such as doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

If unducted emissions originate outside your buildings, estimate the **size of the emission zone** (example - paint spraying 2' x 2' x 2' bread boxes).

RECEPTOR DATA A receptor is a residence or business whose occupants could be exposed to toxic emissions from your facility. In order to estimate the risk to nearby receptors, please provide the distance from the emission point to the nearest residence and to the nearest business.

Distance to nearest residence ~2600 ft

Distance to nearest business ~2200 ft

Distance to nearest school ~4900 ft

Name of Preparer: Richard B. Booth **Title:** Sr. AQ Consultant

Phone No.: (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

NOTE TO APPLICANT:

Before acting on an application for Authority to Construct or Permit to Operate, the District may require further information, plans, or specifications. Forms with insufficient information may be returned to the applicant for completion, which will cause a delay in application processing and may increase processing fees. The applicant should correspond with equipment and material manufacturers to obtain the information requested on this supplemental form.

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION
CERTIFICATE OF EXEMPTION
Rule 11

San Diego APCD Use Only
Appl. No:
ID No.:

CERTIFICATE OF EXEMPTION (COE)

Company Name: Quail Brush Genco, LLC

Equipment Address: Sycamore Landfill Rd., Santee, CA.

1. Describe the process, operation, or equipment and the source of associated air emissions. List all raw materials used and provide MSDS for each material. (Attach separate supporting document or drawings.)

2 - Warm Start Heaters, each rated at 4 mmbtu/hr fired exclusively on natural gas

1 - Fuel Gas heater, rated at 4 mmbtu/hr, fired exclusively on natural gas

*** See Section 4.7 (Air Quality) of the AFC and Appendix F.1 for operational specifications and emissions for these units.

2. List the manufacturer, make, model # and serial # of the equipment, or other identifying information.

TBD

3. If known, list any other operations in San Diego County that have similar types of equipment/operations:

None

4. How are air emissions limited from this source? (Mechanical, operational, usage or other limits.)

1, use of clean fuels (nat gas), low unit heat rates, moderate use rates, Low NOx Burners

5. What are the estimated average and maximum daily emissions from this source?

Average see #1 lbs/day Maximum:_______ lbs/day of ☐ VOC, ☐ PM10, ☐ Nox (Check One)

6. Provide emission calculations and/or explain how emission estimates were determined.

*** See Section 4.7 (Air Quality) of the AFC and Appendix F.1 for operational specifications and emissions for these units.

I certify that the information provided above is correct to the best of my knowledge. The above equipment, process or operation will not be modified in such a manner as to result in an increase in emissions without prior written approval of the San Diego Air Pollution Control District.

Signature: ____________ Title: Vice President.

Name: Richard W. Gray, Jr. Phone: (704) 672-2823

JFO-Revised 02/10/98

APPENDIX F.10

Miscellaneous Support Data

This appendix contains miscellaneous support data (text, tables, or figures) that were deemed not consistent for inclusion in Appendices F.1 through F.9.

CALIFORNIA
ENERGY
COMMISSION

CALIFORNIA ENERGY DEMAND 2008-2018 STAFF REVISED FORECAST

Chapter 4 (only)

STAFF FINAL REPORT

NOVEMBER 2007
CEC-200-2007-015-SF2

Arnold Schwarzenegger, *Governor*

CHAPTER 4: SAN DIEGO GAS & ELECTRIC PLANNING AREA

The San Diego Gas & Electric (SDG&E) planning area includes (1) SDG&E bundled retail customers, (2) customers served by non-utility energy service providers (ESPs) using the SDG&E distribution system, and (3) customers served by the city of Escondido.

This chapter first presents forecasts of total and per capita consumption and peak loads for the planning area. It then compares the revised 2008-2018 forecast values to both the draft 2008-2018 and *CED 2006* forecasts. It also discusses the forecasted load factor, jointly determined by the consumption and peak load estimates. The chapter then presents sector consumption and peak load forecasts and compares them at the sector level to both previous forecasts. Finally, the chapter presents estimates of conservation savings embedded in the revised forecast.

Forecast Results

Tables 21 and **22** present comparisons of the planning area electricity consumption and peak demand forecasts for selected years. The revised electricity consumption forecast, presented in Table 21, is less than 1 percent higher than the draft forecast. This is caused by a revision to historical self-generation estimates that increased historical consumption values. The long-term growth rate of the revised forecast is virtually identical to the draft forecast.

Table 21: SDG&E Planning Area
Electricity Consumption Forecast Comparison

Consumption (GWH)					
	CED 2006	Staff Draft	Staff Revised	Percent Difference Staff Revised/CED 2006	Percent Difference Staff Revised/Staff Draft
1990	14,926	14,926	14,926	0.00%	0.00%
2000	19,295	19,295	19,294	0.00%	0.00%
2005	19,988	19,595	19,910	-0.39%	1.61%
2008	21,051	21,130	21,304	1.20%	0.82%
2013	22,614	22,812	23,002	1.71%	0.83%
2016	23,490	23,742	23,960	2.00%	0.92%
Average Annual Growth Rates					
1990-2000	2.60%	2.60%	2.60%		
2000-2005	0.71%	0.31%	0.63%		
2005-2008	1.74%	2.55%	2.28%		
2008-2016	1.38%	1.47%	1.48%		
Historic values are shaded					

Source: California Energy Commission, 2007

Table 22 similarly compares peak forecasts. Differences between the revised peak forecast and the draft forecast are similar to those seen in the electricity consumption comparison.

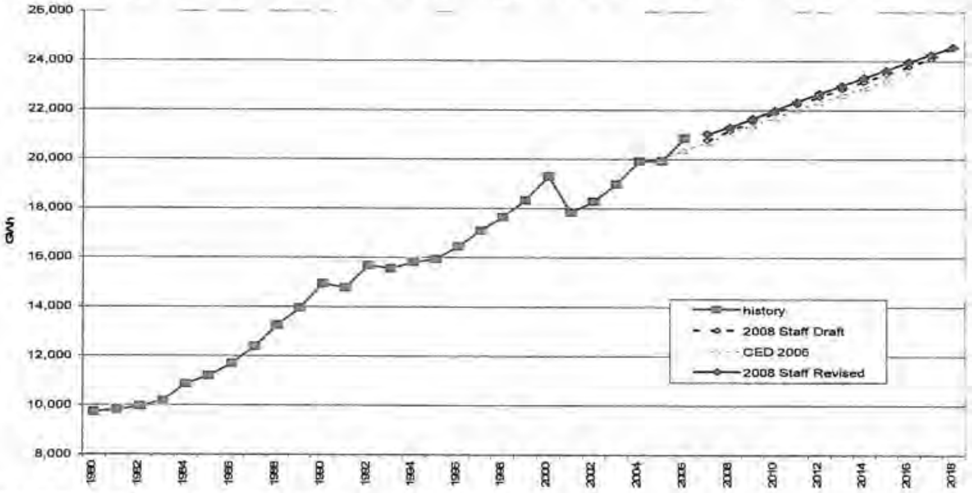
Table 22: SDG&E Planning Area Peak Forecast Comparison

Peak (MW)					
	CED 2006	Staff Draft	Staff Revised	Percent Difference Staff Revised/CED 2006	Percent Difference Staff Revised/Staff Draft
1990	2,961	2,949	2,956	-0.17%	0.23%
2000	3,472	3,471	3,476	0.11%	0.13%
2005	4,231	4,052	4,003	-5.40%	-1.22%
2008	4,451	4,578	4,568	2.63%	-0.21%
2013	4,784	4,899	4,925	2.95%	0.52%
2016	4,970	5,084	5,131	3.23%	0.92%
Average Annual Growth Rates					
1990-2000	1.60%	1.64%	1.63%		
2000-2005	4.03%	3.14%	2.86%		
2005-2008	1.70%	4.15%	4.51%		
2008-2016	1.39%	1.32%	1.46%		
Historic values are shaded					

Source: California Energy Commission, 2007.

As shown in **Figure 75**, the revised forecast is only slightly higher than the draft consumption forecast. Projected growth rates of the forecasts are essentially the same.

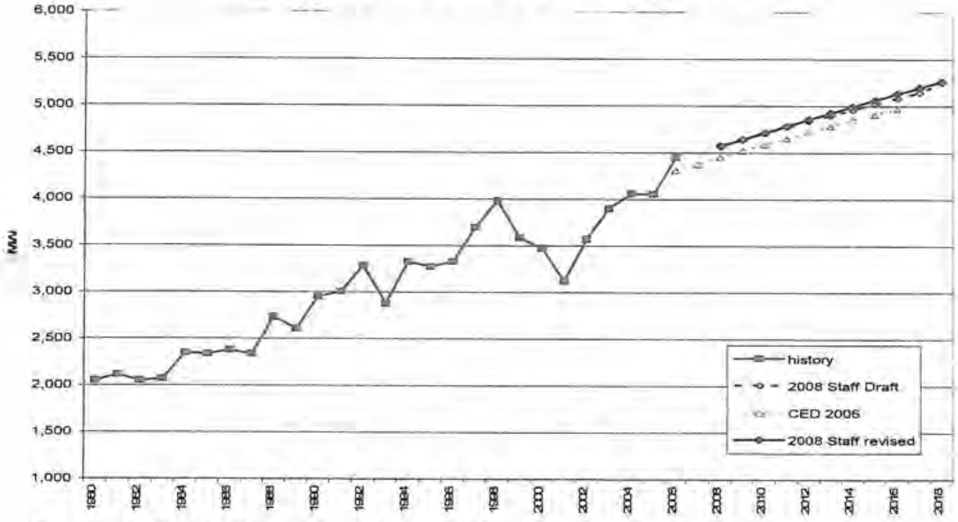
Figure 75: SDG&E Planning Area Electricity Forecast



Source: California Energy Commission, 2007.

Figure 76 compares the various peak forecasts. The revised peak demand forecast has a similar growth rate as the draft forecast. The starting point of the revised forecast is consistent with the updated 2008 peak forecast adopted in June 2007.

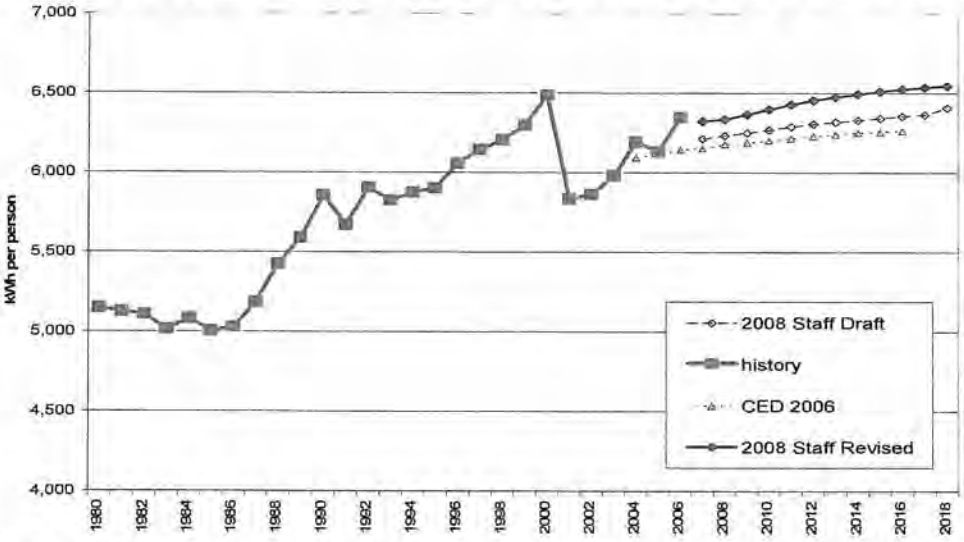
Figure 76: SDG&E Planning Area Peak



Source: California Energy Commission, 2007.

Figure 77 compares forecasted per capita residential electricity consumption. Per capita consumption in the revised forecast is higher than in the draft forecast because of upward revisions to historical consumption estimates and higher projected growth in per capita income.

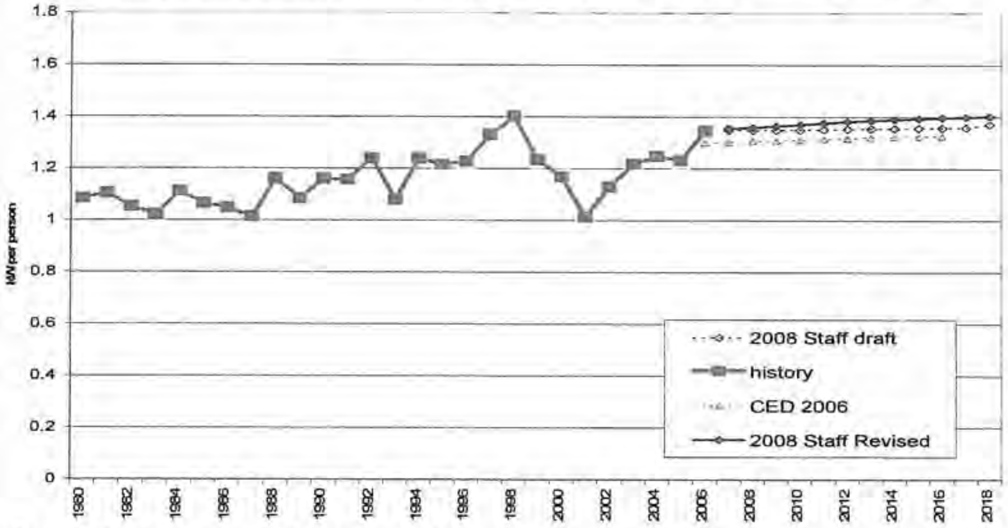
Figure 77: SDG&E Planning Area per Capita Electricity Consumption



Source: California Energy Commission, 2007.

Revised per capita peak demand, shown in **Figure 78**, grows at a slightly greater rate than in the draft forecast. This is caused by both a change in the mix of nonresidential sector consumption projections and an increase in the growth of per capita income over the forecast period. The projections of per capita peak demand still remain below pre-electricity crisis levels until the end of the forecast period.

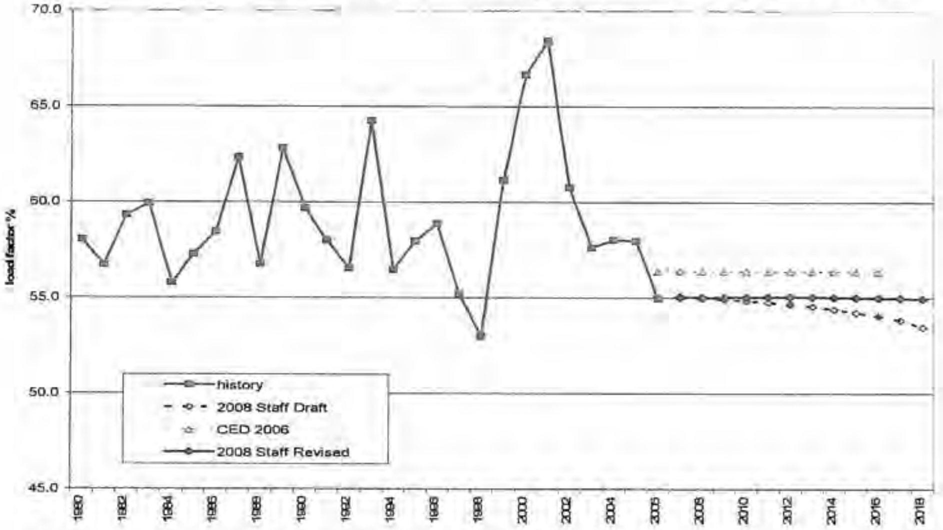
Figure 78: SDG&E Planning Area per Capita Peak Demand



Source: California Energy Commission, 2007.

Figure 79 provides a comparison of the respective forecast load factors. High load factors observed from 1998 to 2005 are a product of lower-than-average temperatures reducing peaks compared with what would have been expected, and a reaction to the energy crisis when consumers voluntarily reduced their air conditioning usage. The projected load factor, based on higher, 1-in-2 peak temperatures and a return to normal air conditioning use patterns, should be lower than these recent values. The forecasted load factor is relatively constant at the lower end of the historical spectrum, reflecting an increase in air conditioning use in the SDG&E territory.

Figure 79: SDG&E Planning Area Peak Load Factor



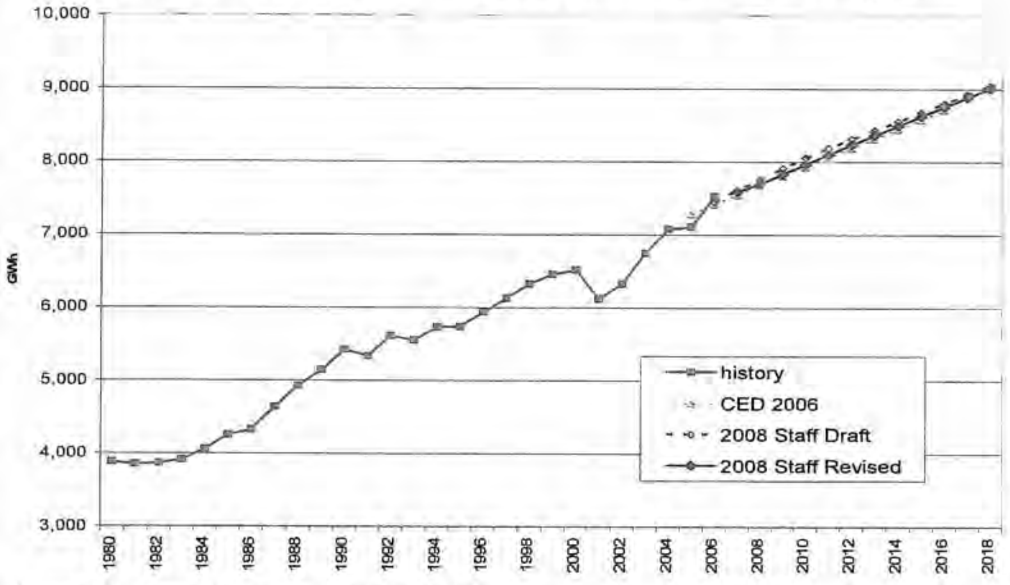
Source: California Energy Commission, 2007.

Sector Level Results and Input Assumptions

Residential

Figure 80 provides comparisons of the residential electricity forecasts. The revised forecast is slightly lower than the draft forecast and slightly higher than the *CED 2006* forecast. These differences are caused by incorporation of the new DOF long-term population forecast for the SDG&E planning area. The new population forecast is slightly lower than the one used in both previous forecasts. However, the lower population forecast is partially offset by faster growth in the revised household income forecast. The draft forecast used December 2006 economic projections from Economy.com; the revised forecast uses their May 2007 projections.

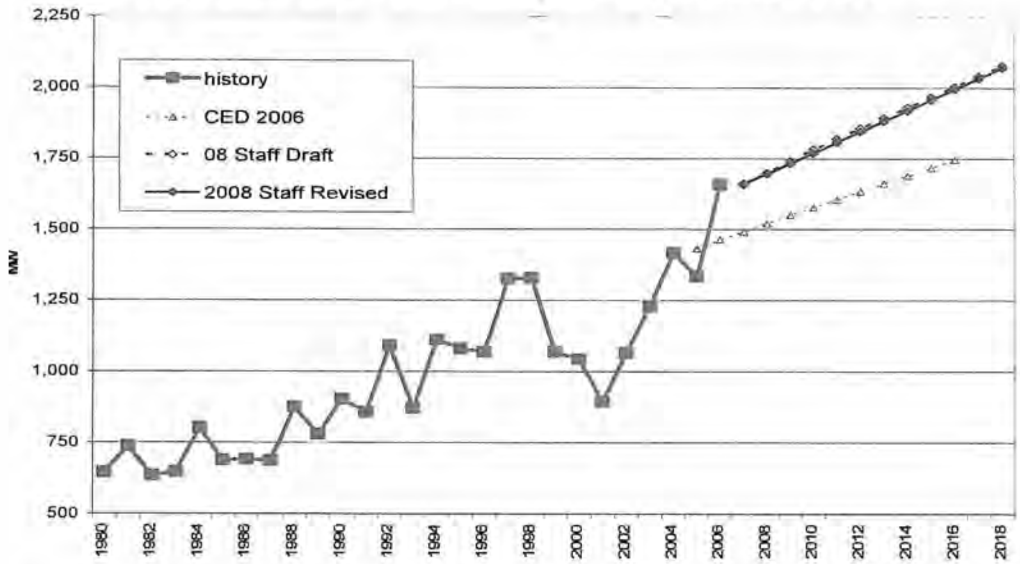
Figure 80: SDG&E Planning Area Residential Consumption



Source: California Energy Commission, 2007

Figure 81 compares the revised 2008-2018 residential peak demand forecasts with both the draft 2008-2018 and *CED 2006* forecasts. The differences in the respective electricity forecasts drive differences between the revised and draft forecasts.

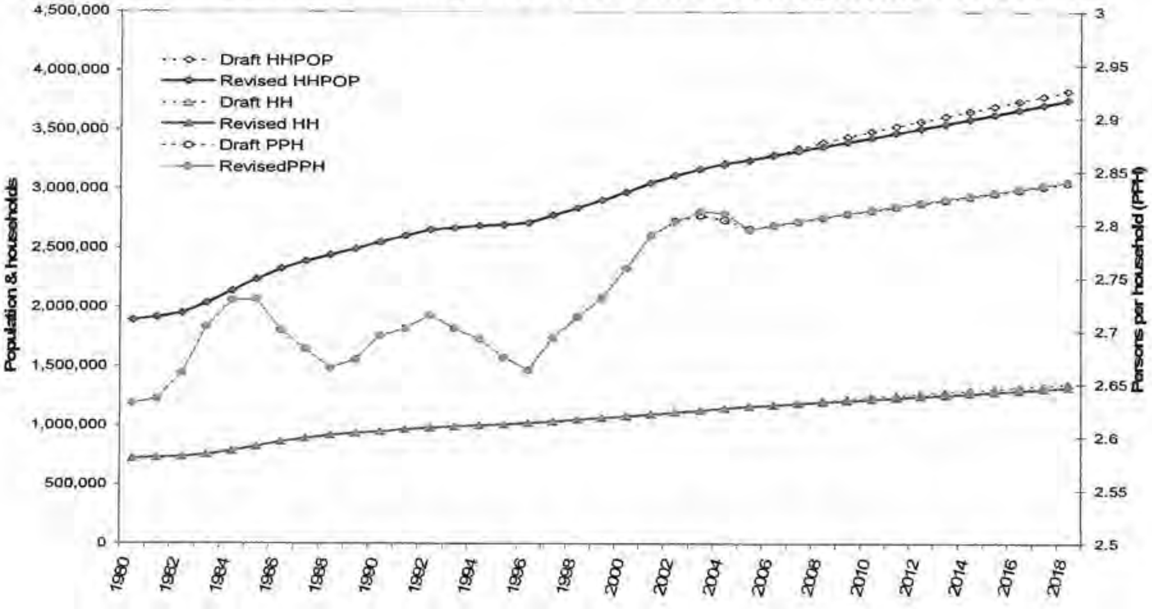
Figure 81: SDG&E Planning Area Residential Peak



Source: California Energy Commission, 2007

Figures 82 and **83** provide comparisons of the residential drivers used in the revised forecast with those used in the draft forecast. Figure 82 provides comparisons of total population, total households, and persons per household projections. The revised 2008 forecast of total population is slightly lower than the draft 2008 forecast. This produces a slightly lower revised household forecast.

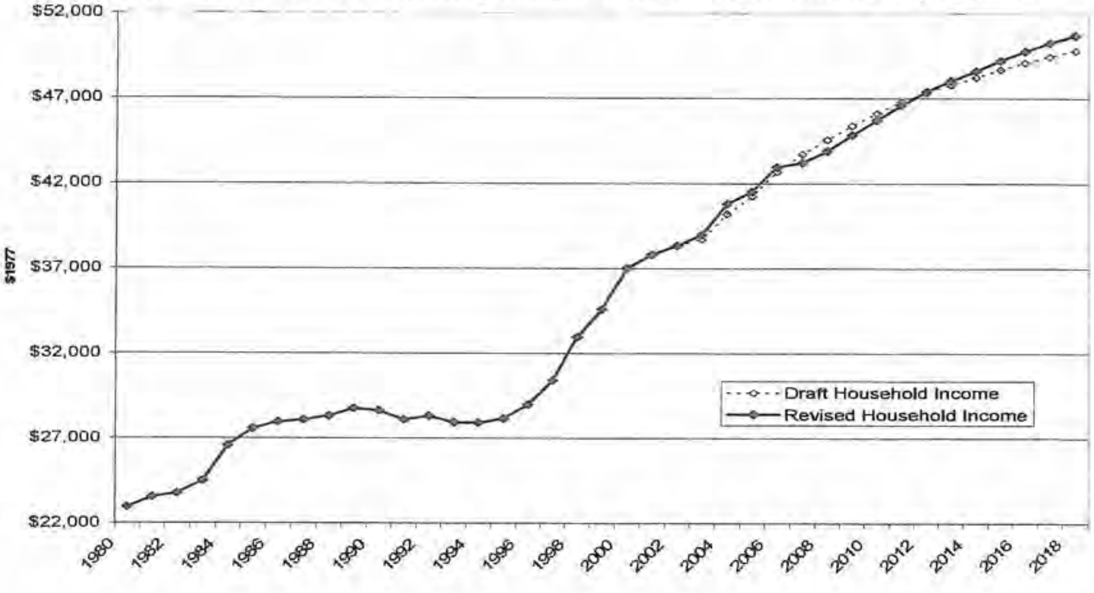
Figure 82: SDG&E Planning Area Residential Demographic Projections



Source: California Energy Commission, 2007

Figure 83 provides a comparison of household income projections used in the revised forecast with those used in the draft forecast. The revised projection, using the May 2007 Economy.com forecast, is lower in the short term but grows at a faster rate over the forecast period than the December 2006 projection that was used in the draft forecast.

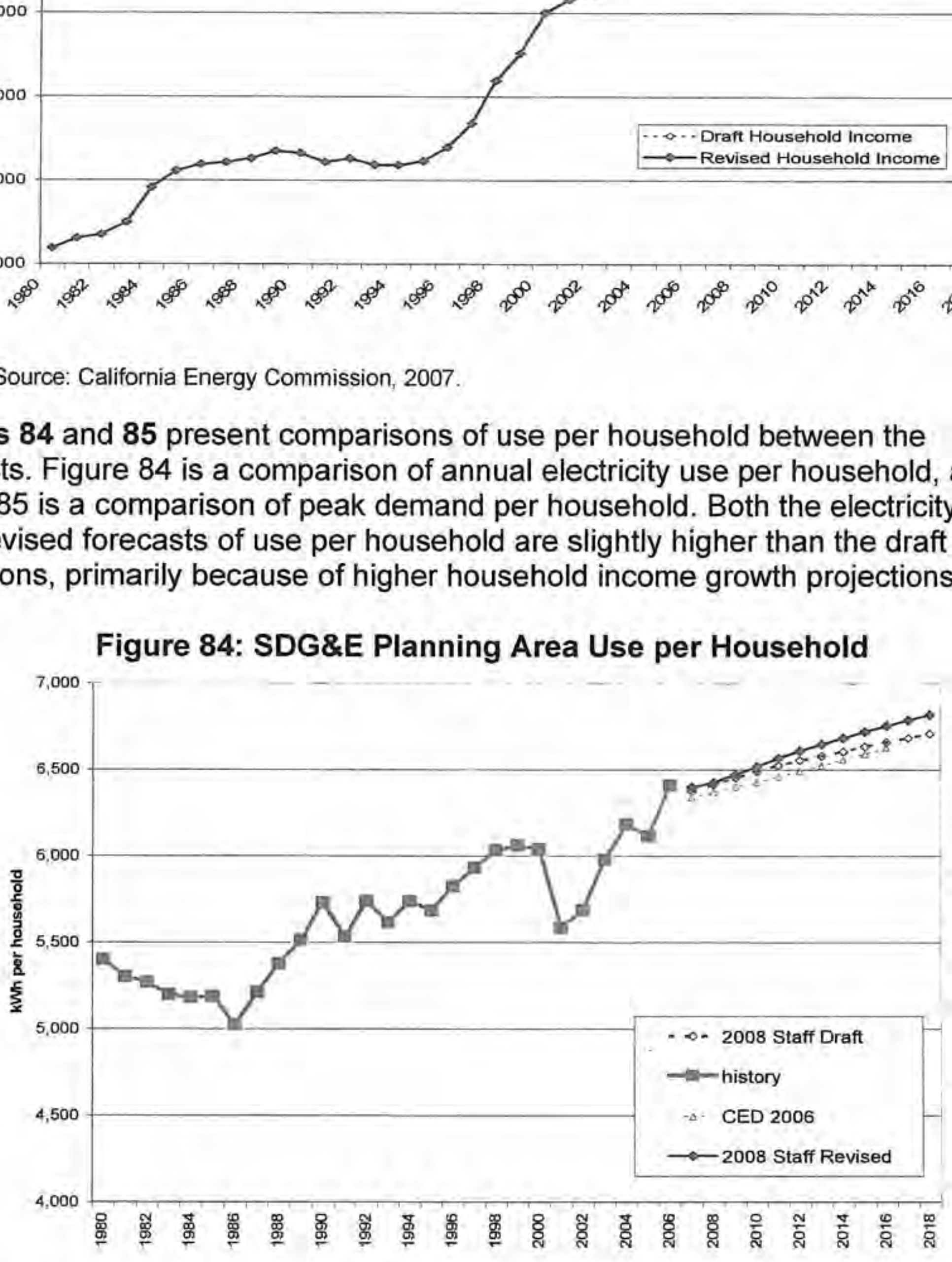
Figure 83: SDG&E Planning Area Household Income Projections



Source: California Energy Commission, 2007.

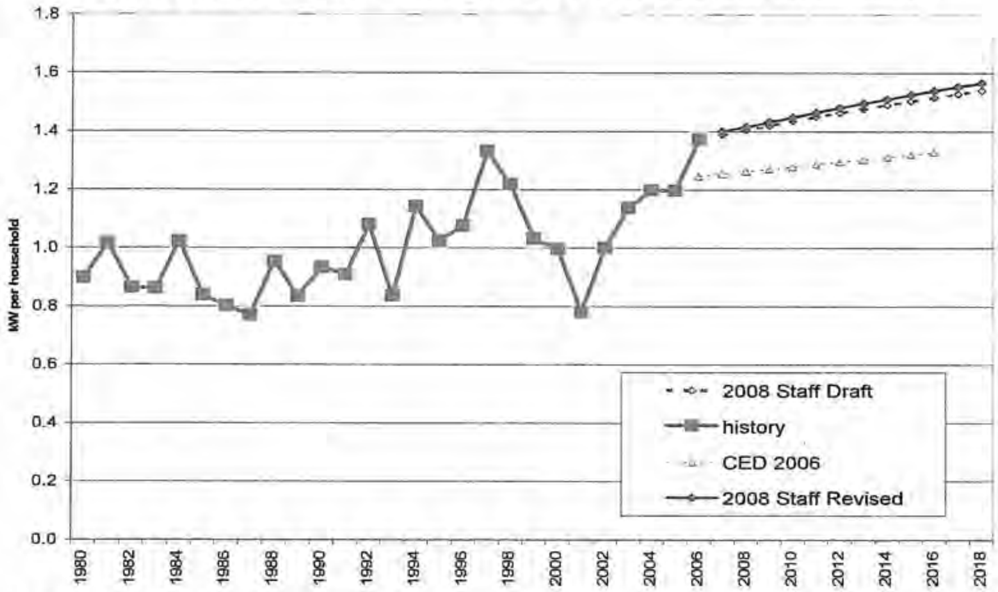
Figures 84 and **85** present comparisons of use per household between the forecasts. Figure 84 is a comparison of annual electricity use per household, and Figure 85 is a comparison of peak demand per household. Both the electricity and peak revised forecasts of use per household are slightly higher than the draft projections, primarily because of higher household income growth projections.

Figure 84: SDG&E Planning Area Use per Household



Source: California Energy Commission, 2007

Figure 85: SDG&E Planning Area Peak Use per Household

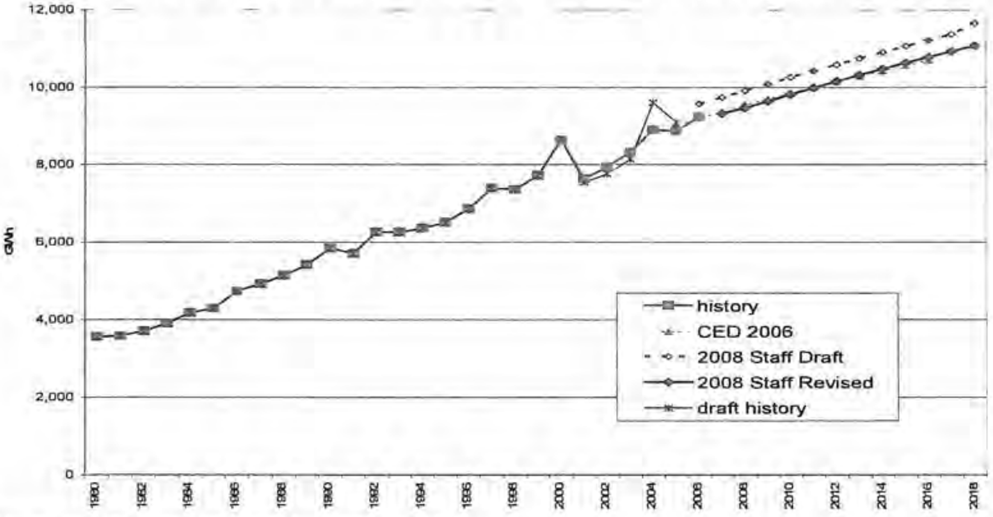


Source: California Energy Commission, 2007

Commercial Building Sector

Figures 86 and **87** provide a comparison of the commercial building sector forecasts. The revised forecast is lower than the draft forecast. This difference is caused by lower estimates of historic consumption, provided by SDG&E, of both commercial retail sales and self-generation. The forecasted growth rates of the forecasts are essentially the same.

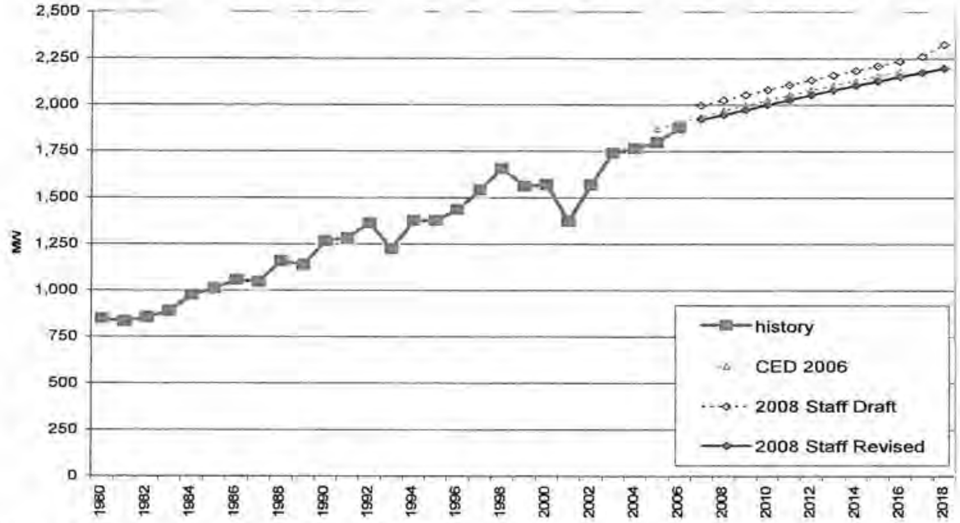
Figure 86: SDG&E Planning Area Commercial Consumption



Source: California Energy Commission, 2007.

Figure 87 provides a comparison of the commercial building sector peak demand forecasts. These differences mirror the differences in energy forecasts.

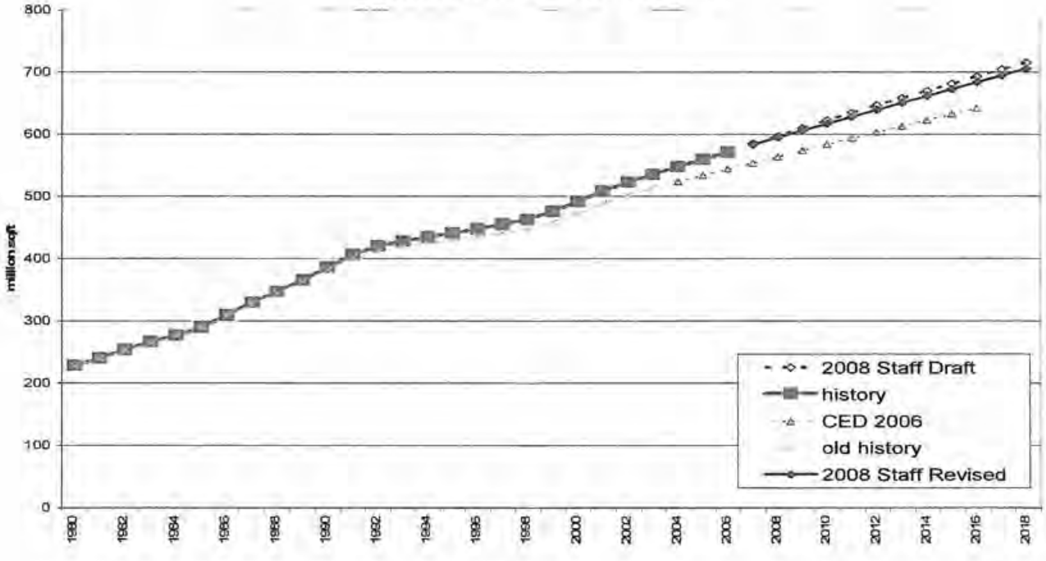
Figure 87: SDG&E Planning Area Commercial Sector Peak



Source: California Energy Commission, 2007.

In staff's commercial building sector forecasting model, projected floor space by building type, such as retail, schools, and offices, is the key driver of forecasted energy use. **Figure 88** provides a comparison of total commercial floor space projections. The revised 2008 floor space forecast is slightly lower than the draft 2008 forecast, primarily because of the lower population forecast.

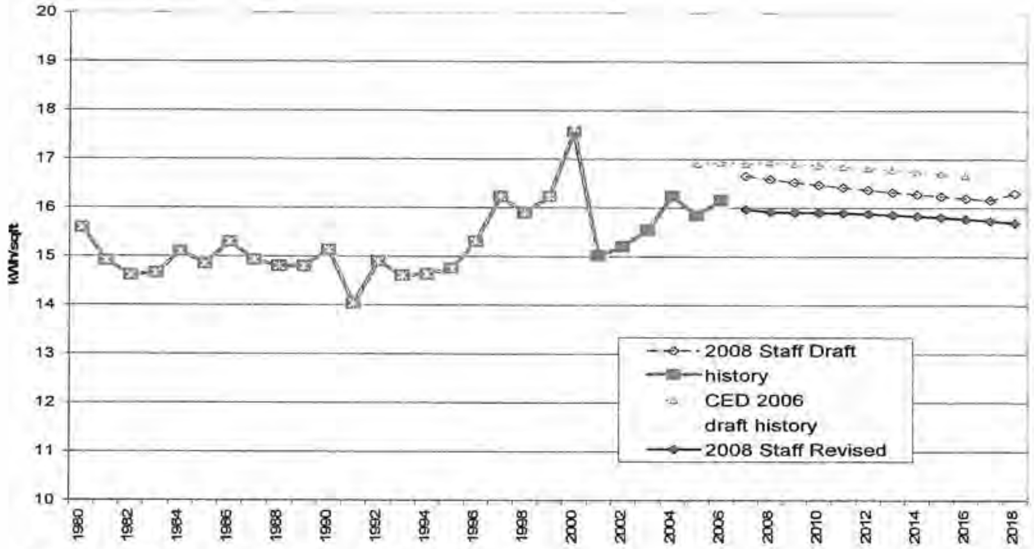
Figure 88: SDG&E Planning Area Commercial Floor Space



Source: California Energy Commission, 2007.

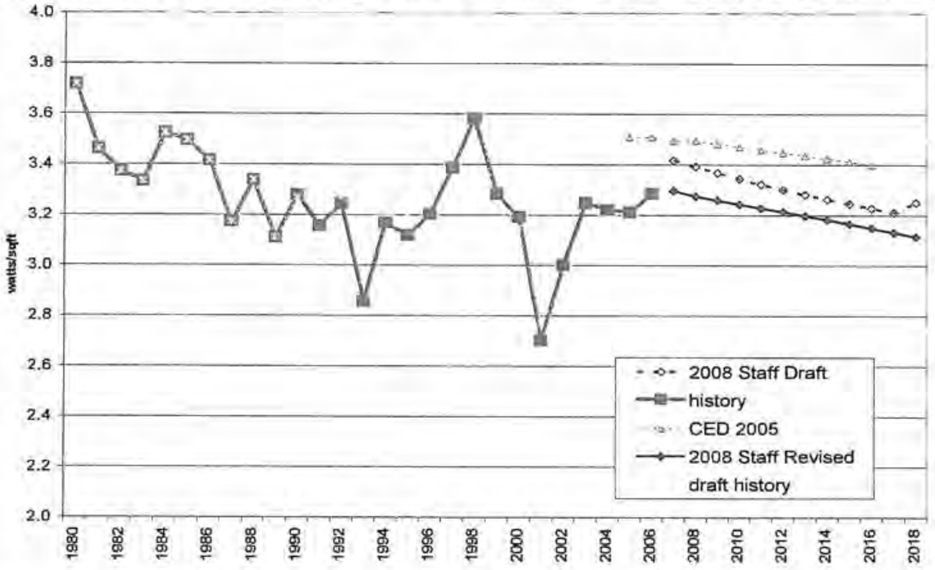
Figures 89 and **90** present historic and projected commercial sector annual and peak use per square foot, respectively. The lower values seen in the revised forecast is related to changes in historical commercial consumption estimates described previously. The revised annual use per square foot forecast, shown in Figure 89, is projected to decline at a slower rate than the draft forecast. However, the revised forecast of commercial peak use per square foot, shown in Figure 90, is projected to decline at a similar rate to the draft forecast. The energy and peak forecasts of use per square foot decline over the forecast period because of projected impacts of commercial building and appliance standards considered to be committed.

Figure 89: SDG&E Planning Area Commercial kWh per Square Foot



Source: California Energy Commission, 2007.

Figure 90: SDG&E Planning Area Commercial Watts per Square Foot

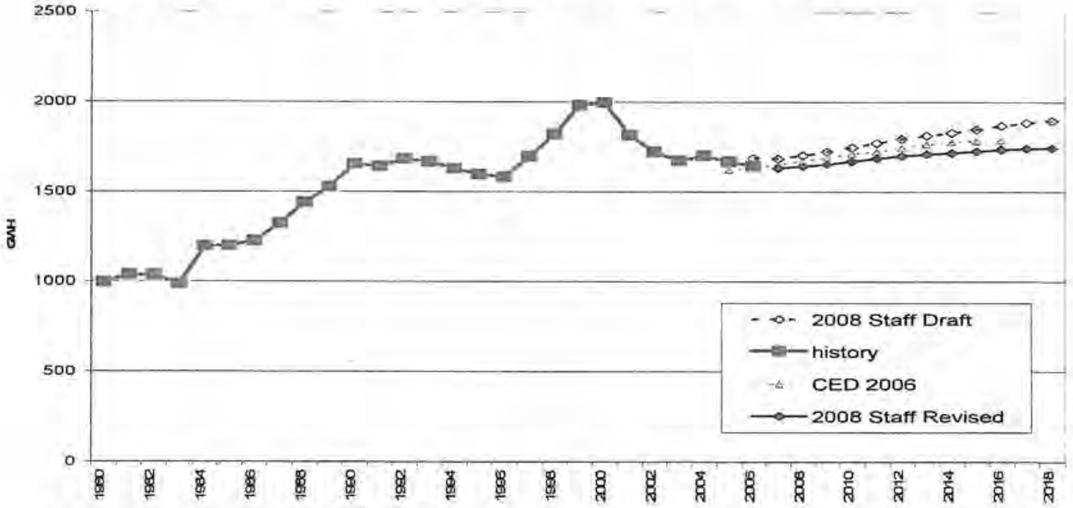


Source: California Energy Commission, 2007.

Industrial Sector

Figure 91 provides a comparison of the industrial sector electricity consumption forecasts for the SDG&E planning area. The revised forecast is lower throughout the entire forecast period than the draft forecast. This is caused by a lower 2006 starting point and revised estimates of energy intensity trends.

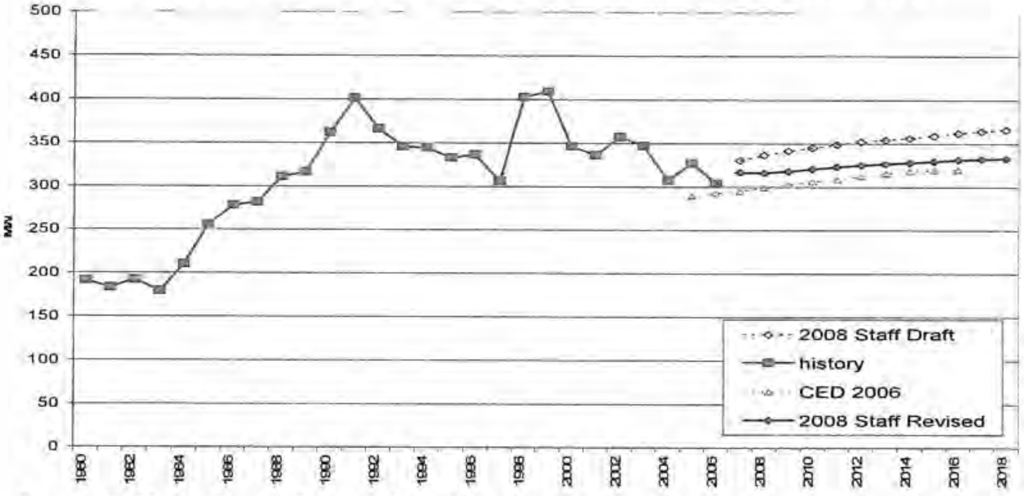
Figure 91: SDG&E Planning Area Industrial Consumption



Source: California Energy Commission, 2007.

Figure 92 provides a comparison of the industrial sector peak forecasts. The peak forecast differences are driven by differences in the electricity consumption forecasts. As was the case for industrial sector consumption, the revised growth rate of peak demand is slightly lower than that projected in the draft forecast.

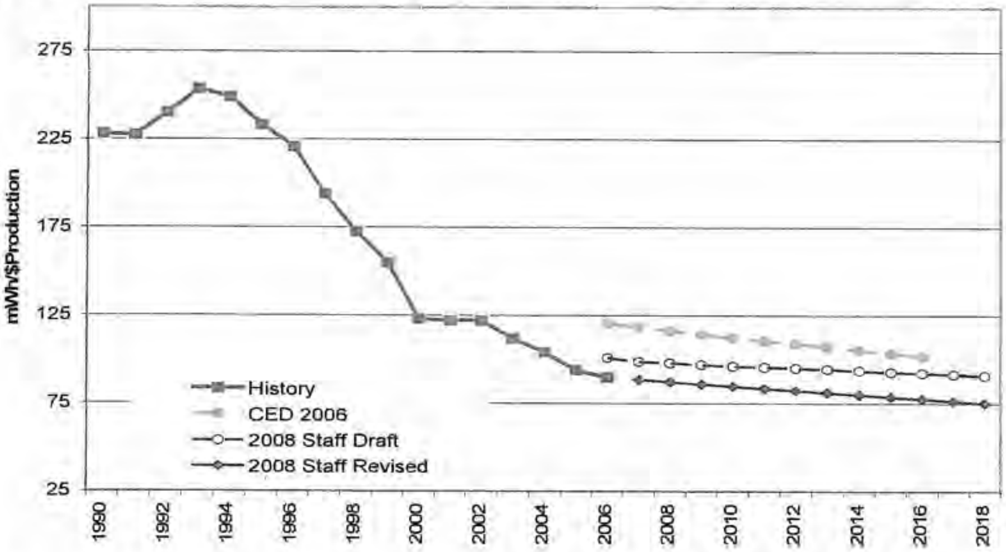
Figure 92: SDG&E Planning Area Industrial Sector Peak



Source: California Energy Commission, 2007

Figure 93 provides a comparison of use per dollar value of production between the forecasts. The difference in kWh per dollar of industrial value added in the forecasts is caused by different estimated starting points. The revised forecast of use per dollar of value added declines at a slightly faster rate than the draft forecast. Staff reviewed the historical energy use trends and revised the forecast model assumptions to be more consistent with observed patterns of declining use per dollar of production.

Figure 93: SDG&E Planning Area Industrial Use per Production Unit



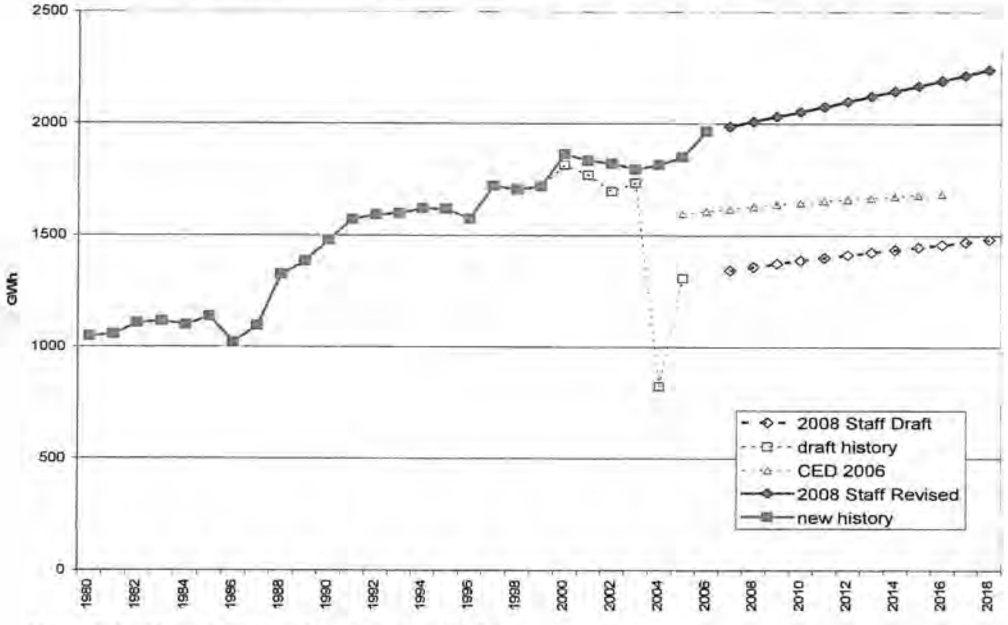
Source: California Energy Commission, 2007

Other Sectors

Figures 94 and **95** provide comparisons of the remaining sector electricity consumption forecasts. Figure 94 provides a comparison of the transportation, communication, and utilities (TCU) sector forecasts. The revised forecast is higher than the draft forecast due to reallocation of additional historical consumption to the TCU sector based on estimates from SDG&E.

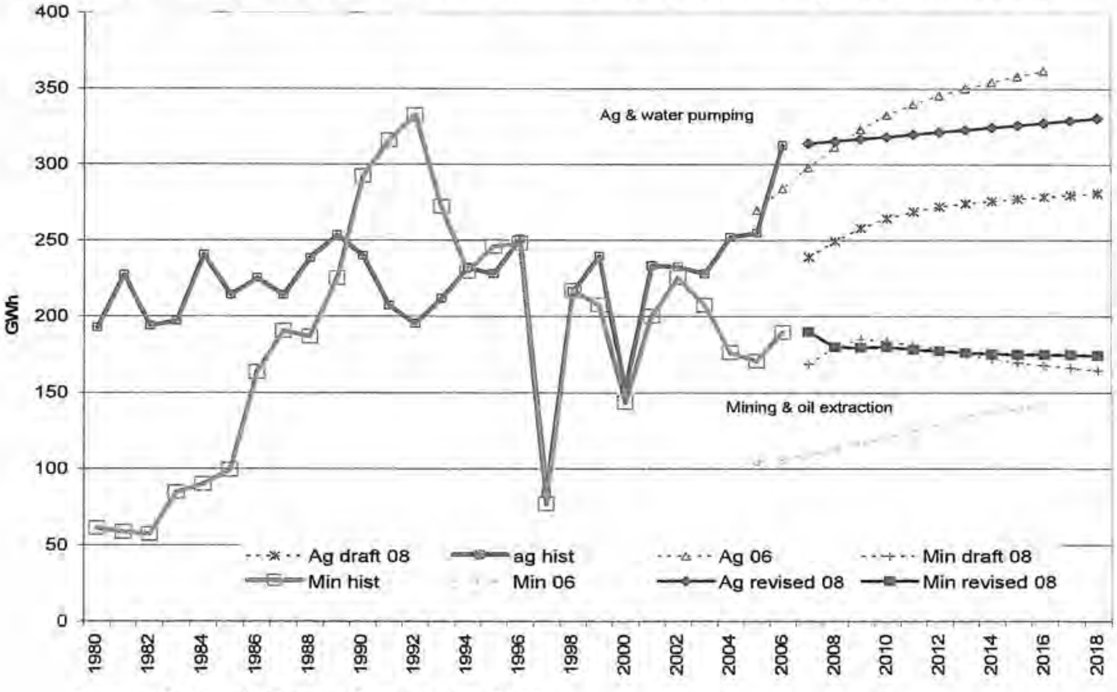
Figure 95 provides comparisons of the agriculture and water pumping and mining and oil extraction sector forecasts. The revised agriculture and water pumping forecast is higher than the draft forecast because inclusion of 2006 consumption data created a higher starting point. The revised mining and oil extraction forecast has a higher starting point because of changes in the unclassified consumption distribution. The lower growth rate of the revised forecast compared to *CED 2006* reflects the pattern of Economy.com's forecast of mining sector employment, which is used as the forecast driver.

Figure 94: SDG&E Planning Area Transportation, Communication, and Utilities Sector Electricity Consumption



Source: California Energy Commission, 2007

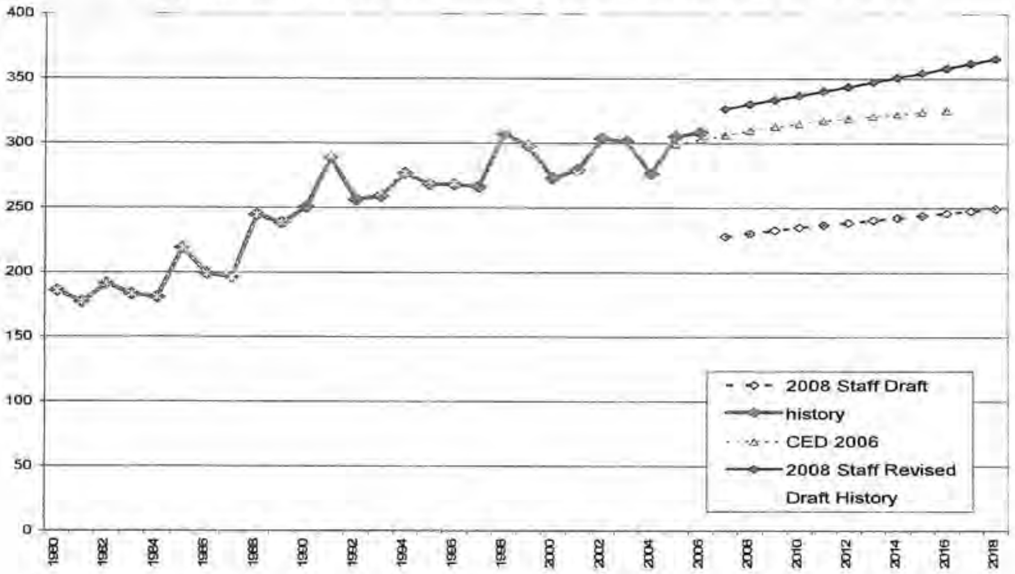
Figure 95: SDG&E Planning Area Agriculture and Water Pumping and Mining and Oil Extraction Electricity Consumption Forecasts



Source: California Energy Commission, 2007

Figure 96 provides a comparison of the combined Other Sector peaks for the draft and revised 2008 forecasts and *CED 2006* forecast. The revised 2008 forecast starts at a higher level than the draft forecast, as does the consumption forecast, because of revised historic consumption data. Both forecasts have a similar growth rate.

Figure 96: SDG&E Planning Area Other Sector Peak



Source: California Energy Commission, 2007.

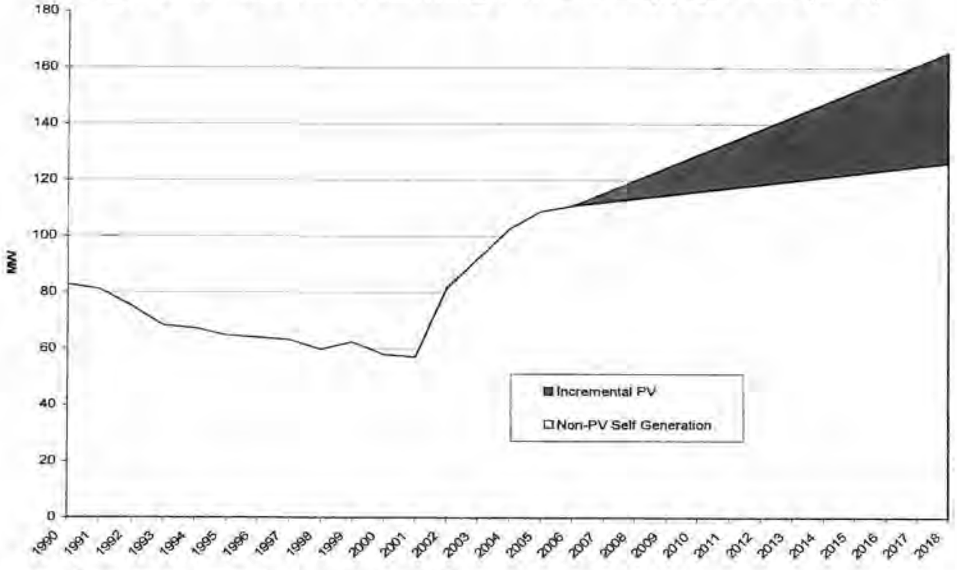
Electricity Prices

As in the draft forecast, the revised 2008 forecast used prices that are held constant (in real terms) at the 2005 level for all sectors. This is in contrast to the declining price forecast that was used in the *CED 2006* price forecast.

Self-Generation

As discussed in Chapter 1, the peak demand forecast is reduced by staff's estimate of the effects of the Self-Generation Incentive Program and California Solar Initiative programs. Both programs are forecast based on the recent trend of installations. **Figure 97** shows the resulting forecast of cumulative peak impacts. Annual impacts are reported as "Private Supply" in Forms 1.2 and 1.4 following this chapter. Because the actual energy consumption and coincident peak impacts of PV are not reported to the Energy Commission, and therefore are not included in the consumption forecast, only the incremental impacts of new PV installations are forecast and subtracted from the peak demand forecast.

Figure 97: SDG&E Planning Private Supply Peak (MW)



Source: California Energy Commission, 2007.

Conservation Savings Embedded in the Forecast

Savings from all building and appliance standards adopted through 2005 are accounted for in the Energy Commission residential and commercial demand forecast models. Savings from public agency and utility programs funded through 2008 are also included. However, there may be some overlap with effects embedded in the demand forecast with uncommitted program impacts; see Chapter 1 for a discussion of this issue. To determine the magnitude of these savings, the models are run without these programs in effect (in the chronological order of the programs' occurrence). The savings are then calculated by subtracting the results of the run with the program in effect from the results without the program in effect. A condensed version of the results of this analysis is presented here as an estimate of savings that are accounted for in the baseline forecast. Additional detail is shown in the tables at the end of this chapter. **Table 23** presents electricity consumption savings, by broad program category, for selected years. **Table 24** presents similar estimates of peak savings.

Table 23: SDG&E Planning Area Electricity Conservation Savings Estimates

	1990	2000	2005	2008	2013	2018
Residential Energy Savings (GWH)						
Building Standards	85	166	208	253	322	387
Appliance Standards	270	636	807	885	1002	1108
Utility and Public Agency Programs	28	19	51	73	73	75
Market and Price Effects	168	288	300	300	300	300
Total Residential Savings	551	1110	1365	1510	1698	1869
Commercial Energy Savings (GWH)						
Building Standards	158	437	687	857	1160	1480
Appliance Standards	99	268	399	487	636	785
Utility and Public Agency Programs	68	287	302	364	356	349
Market and Price Effects	645	524	620	621	693	740
Total Commercial Savings	970	1516	2007	2329	2845	3354
Total Energy Savings	1521	2625	3373	3839	4543	5223

Source: California Energy Commission, 2007.

Table 24: SDG&E Planning Area Peak Conservation Savings Estimates

	1990	2000	2005	2008	2013	2018
Residential Energy Savings (MW)						
Building Standards	53	102	128	145	169	191
Appliance Standards	35	83	105	115	130	144
Utility and Public Agency Programs	9	6	19	27	27	28
Market and Price Effects	39	66	69	69	69	69
Total Residential Savings	136	258	321	357	396	432
Commercial Energy Savings (GWH)						
Building Standards	36	101	158	197	267	340
Appliance Standards	23	62	92	112	146	181
Utility and Public Agency Programs	13	55	57	69	68	67
Market and Price Effects	148	120	143	143	159	170
Total Commercial Savings	221	337	450	521	640	758
Total Energy Savings	356	595	771	878	1036	1190

Source: California Energy Commission, 2007

Form 1.1 - SDG&E Planning Area
California Energy Demand 2008-2018 Staff Revised Forecast
Electricity Consumption by Sector (GWh)

Year	Residential	Commercial	Industrial	Mining	Agricultural	TCU	Street lighting	Total Consumption
1980	3,879	3,555	994	61	193	955	92	9,729
1981	3,848	3,577	1,037	58	227	968	89	9,804
1982	3,858	3,701	1,035	57	194	1,024	82	9,950
1983	3,909	3,900	987	85	197	1,038	77	10,192
1984	4,056	4,174	1,195	90	240	1,021	78	10,854
1985	4,249	4,291	1,199	99	214	1,058	77	11,187
1986	4,323	4,728	1,224	163	225	944	76	11,684
1987	4,638	4,917	1,322	190	214	1,019	77	12,377
1988	4,928	5,130	1,440	187	238	1,250	74	13,246
1989	5,144	5,406	1,527	225	253	1,311	73	13,939
1990	5,421	5,841	1,653	292	240	1,405	73	14,926
1991	5,333	5,698	1,640	316	207	1,495	76	14,764
1992	5,609	6,257	1,680	332	195	1,515	76	15,665
1993	5,549	6,253	1,665	272	212	1,521	77	15,549
1994	5,729	6,352	1,628	229	232	1,542	79	15,791
1995	5,734	6,503	1,595	246	228	1,537	81	15,923
1996	5,935	6,850	1,581	248	251	1,491	82	16,437
1997	6,123	7,384	1,694	77	84	1,637	83	17,082
1998	6,319	7,355	1,819	217	216	1,611	93	17,630
1999	6,453	7,716	1,979	207	239	1,624	93	18,312
2000	6,513	8,628	1,995	143	153	1,767	96	19,294
2001	6,116	7,629	1,813	200	233	1,736	98	17,825
2002	6,326	7,942	1,721	225	232	1,725	96	18,267
2003	6,745	8,322	1,671	207	228	1,691	105	18,968
2004	7,074	8,892	1,699	176	252	1,713	102	19,908
2005	7,105	8,863	1,667	170	255	1,746	105	19,910
2006	7,522	9,222	1,641	189	312	1,857	108	20,851
2007	7,586	9,312	1,630	190	314	1,879	109	21,019
2008	7,697	9,460	1,641	180	315	1,900	110	21,304
2009	7,833	9,634	1,653	179	317	1,922	111	21,650
2010	7,962	9,808	1,668	180	318	1,942	112	21,991
2011	8,099	9,977	1,685	178	320	1,964	113	22,337
2012	8,235	10,146	1,699	177	321	1,986	114	22,677
2013	8,363	10,310	1,708	176	323	2,008	115	23,002
2014	8,490	10,470	1,716	175	324	2,030	116	23,322
2015	8,622	10,625	1,725	175	326	2,052	118	23,643
2016	8,753	10,775	1,736	175	327	2,075	119	23,960
2017	8,881	10,923	1,741	174	329	2,098	120	24,265
2018	9,010	11,067	1,743	174	331	2,121	121	24,567

Annual Growth Rates (%)

1980-1990	3.4	5.1	5.2	16.9	2.2	3.9	-2.2	4.4
1990-2000	1.9	4.0	1.9	-6.9	-4.4	2.3	2.7	2.6
2000-2006	2.4	1.1	-3.2	4.7	12.7	0.8	1.9	1.3
2006-2011	1.5	1.6	0.5	-1.2	0.5	1.1	1.0	1.4
2011-2018	1.5	1.5	0.5	-0.3	0.5	1.1	1.0	1.4
2006-2018	1.5	1.5	0.5	-0.7	0.5	1.1	1.0	1.4

Form 1.1b - SDG&E Planning Area
California Energy Demand 2008-2018 Staff Revised Forecast
Electricity Sales by Sector (GWh)

Year	Residential	Commercial	Industrial	Mining	Agricultural	TCU	Street lighting	Total Consumption
1980	3,879	3,555	994	61	193	955	92	9,729
1981	3,848	3,577	1,037	58	227	968	89	9,804
1982	3,858	3,695	1,028	57	194	1,024	82	9,938
1983	3,909	3,867	967	85	194	1,038	77	10,136
1984	4,056	4,118	1,131	90	238	991	78	10,701
1985	4,249	4,193	1,115	99	212	983	77	10,928
1986	4,323	4,603	1,109	163	225	861	76	11,360
1987	4,638	4,751	1,125	190	214	923	77	11,918
1988	4,927	4,924	1,191	187	238	1,148	74	12,690
1989	5,144	5,221	1,278	225	253	1,195	73	13,388
1990	5,421	5,663	1,424	292	239	1,284	73	14,397
1991	5,333	5,536	1,406	316	206	1,373	76	14,246
1992	5,609	6,112	1,456	332	195	1,404	76	15,184
1993	5,549	6,107	1,463	272	211	1,433	77	15,112
1994	5,729	6,201	1,441	229	232	1,450	79	15,361
1995	5,734	6,354	1,414	246	228	1,453	81	15,509
1996	5,935	6,701	1,400	248	251	1,412	82	16,028
1997	6,123	7,234	1,522	77	84	1,556	83	16,678
1998	6,319	7,212	1,658	217	216	1,533	93	17,247
1999	6,453	7,570	1,807	207	239	1,543	93	17,913
2000	6,513	8,489	1,843	143	153	1,687	96	18,924
2001	6,116	7,488	1,697	200	233	1,627	98	17,459
2002	6,326	7,700	1,592	225	232	1,574	96	17,745
2003	6,745	7,993	1,516	207	228	1,584	105	18,378
2004	7,074	8,528	1,543	176	252	1,577	102	19,252
2005	7,105	8,499	1,504	170	255	1,575	105	19,213
2006	7,522	8,862	1,484	189	312	1,664	108	20,141
2007	7,585	8,941	1,472	190	314	1,683	109	20,293
2008	7,694	9,078	1,481	180	315	1,703	110	20,561
2009	7,829	9,240	1,491	179	317	1,722	111	20,890
2010	7,957	9,402	1,505	180	318	1,740	112	21,214
2011	8,093	9,559	1,520	178	320	1,760	113	21,542
2012	8,226	9,715	1,532	177	321	1,779	114	21,865
2013	8,353	9,868	1,539	176	323	1,799	115	22,173
2014	8,480	10,016	1,546	175	324	1,819	116	22,476
2015	8,610	10,159	1,553	175	326	1,839	118	22,779
2016	8,740	10,298	1,562	175	327	1,859	119	23,080
2017	8,866	10,434	1,565	174	329	1,880	120	23,368
2018	8,994	10,566	1,565	174	331	1,901	121	23,652

Annual Growth Rates (%)

1980-1990	3.4	4.8	3.7	16.9	2.2	3.0	-2.2	4.0
1990-2000	1.9	4.1	2.6	-6.9	-4.4	2.8	2.7	2.8
2000-2006	2.4	0.7	-3.5	4.7	12.7	-0.2	1.9	1.0
2006-2011	1.5	1.5	0.5	-1.2	0.5	1.1	1.0	1.4
2011-2018	1.5	1.4	0.4	-0.3	0.5	1.1	1.0	1.3
2006-2018	1.5	1.5	0.4	-0.7	0.5	1.1	1.0	1.3

Form 1.2 - SDGE
California Energy Demand 2008-2018 Staff Revised Forecast
Net Energy for Load (GWh)

Year	Total Consumption	Net Losses	Gross Generation	Non-PV Self Generation	Incrementa l PV	Total Private Supply	Net Energy for Load
1980	9,729	690	10,419	0	0	0	10,419
1981	9,804	695	10,499	0	0	0	10,499
1982	9,950	705	10,655	13	0	13	10,642
1983	10,192	719	10,911	56	0	56	10,855
1984	10,854	759	11,613	154	0	154	11,459
1985	11,187	775	11,962	259	0	259	11,703
1986	11,684	805	12,489	324	0	324	12,165
1987	12,377	845	13,222	459	0	459	12,763
1988	13,246	900	14,146	557	0	557	13,589
1989	13,939	949	14,888	551	0	551	14,337
1990	14,926	1,021	15,947	529	0	529	15,418
1991	14,764	1,010	15,774	519	0	519	15,256
1992	15,665	1,077	16,741	480	0	480	16,261
1993	15,549	1,071	16,620	436	0	436	16,184
1994	15,791	1,089	16,880	430	0	430	16,450
1995	15,923	1,100	17,023	414	0	414	16,609
1996	16,437	1,136	17,573	409	0	409	17,164
1997	17,082	1,182	18,264	404	0	404	17,860
1998	17,630	1,223	18,853	383	0	383	18,470
1999	18,312	1,270	19,582	399	0	399	19,183
2000	19,294	1,342	20,636	370	0	370	20,265
2001	17,825	1,238	19,063	365	0	365	18,697
2002	18,267	1,258	19,525	522	0	522	19,003
2003	18,968	1,303	20,271	590	0	590	19,681
2004	19,908	1,365	21,273	657	0	657	20,617
2005	19,910	1,362	21,272	697	0	697	20,576
2006	20,851	1,428	22,279	710	0	710	21,569
2007	21,019	1,439	22,458	717	9	726	21,733
2008	21,304	1,459	22,763	725	18	743	22,020
2009	21,650	1,483	23,133	733	27	760	22,373
2010	21,991	1,507	23,498	741	36	777	22,721
2011	22,337	1,531	23,867	749	45	795	23,073
2012	22,677	1,554	24,231	757	54	812	23,419
2013	23,002	1,577	24,579	766	63	829	23,750
2014	23,322	1,599	24,921	774	73	846	24,074
2015	23,643	1,621	25,264	782	82	863	24,400
2016	23,960	1,643	25,603	790	91	881	24,722
2017	24,265	1,664	25,929	798	100	898	25,032
2018	24,567	1,685	26,252	806	109	915	25,337

Annual Growth Rates (%)

1990-2000	2.6	2.8	2.6	-3.5		-3.5	2.8
2000-2006	1.3	1.0	1.3	11.5		11.5	1.0
2006-2011	1.4	1.4	1.4	1.1		2.3	1.4
2011-2018	1.4	1.4	1.4	1.1	13.3	2.0	1.3
2006-2018	1.4	1.4	1.4	1.1		2.1	1.4

Form 1.3 - SDG&E Planning Area
California Energy Demand 2008-2018 Staff Revised Forecast
Coincident Peak Demand by Sector (MW)

Year	Residential	Commercial	Industrial	Agricultural	Other	Total Demand
1980	645	848	191	24	161	1,870
1981	737	830	183	26	151	1,928
1982	633	854	192	24	167	1,871
1983	647	887	179	24	160	1,896
1984	801	974	210	27	154	2,166
1985	687	1,010	256	28	191	2,172
1986	689	1,056	278	29	169	2,222
1987	686	1,046	282	26	170	2,209
1988	874	1,157	311	30	214	2,587
1989	779	1,137	316	29	209	2,470
1990	902	1,266	362	27	223	2,780
1991	856	1,282	401	27	262	2,828
1992	1,091	1,363	366	21	235	3,076
1993	870	1,223	345	24	235	2,697
1994	1,111	1,375	344	28	249	3,107
1995	1,079	1,375	333	27	241	3,055
1996	1,068	1,433	336	30	238	3,105
1997	1,326	1,540	306	21	245	3,438
1998	1,328	1,657	402	28	280	3,695
1999	1,068	1,561	409	29	268	3,335
2000	1,042	1,568	346	19	254	3,230
2001	894	1,373	336	25	254	2,882
2002	1,064	1,568	357	27	277	3,294
2003	1,229	1,739	347	26	275	3,616
2004	1,416	1,763	308	26	250	3,764
2005	1,332	1,797	327	28	277	3,761
2006	1,657	1,874	304	33	275	4,143
2007	1,661	1,922	317	35	292	4,226
2008	1,695	1,946	316	35	295	4,288
2009	1,733	1,974	318	35	299	4,358
2010	1,769	2,001	321	35	302	4,427
2011	1,807	2,027	323	35	305	4,497
2012	1,845	2,053	325	35	308	4,567
2013	1,881	2,079	327	35	312	4,634
2014	1,919	2,104	328	36	315	4,701
2015	1,957	2,128	329	36	319	4,769
2016	1,994	2,151	331	36	322	4,835
2017	2,032	2,174	332	36	326	4,900
2018	2,069	2,197	333	36	329	4,964

Annual Growth Rates (%)

1980-1990	3.4	4.1	6.6	1.1	3.3	4.0
1990-2000	1.5	2.2	-0.4	-3.5	1.3	1.5
2000-2006	8.0	3.0	-2.2	9.7	1.3	4.2
2006-2011	1.7	1.6	1.2	1.3	2.1	1.7
2011-2018	2.0	1.2	0.4	0.3	1.1	1.4
2006-2018	1.9	1.3	0.8	0.7	1.5	1.5

Form 1.4 - SDG&E Planning Area
California Energy Demand 2008-2018 Staff Revised Forecast
Peak Demand (MW)

Year	Total End Use Load	Net Losses	Gross Generation	Non-PV Self Generation	Incremental PV	Total Private Supply	Net Peak Demand	Load Factor (%)
1980	1,870	180	2,050	0	0	0	2,050	58
1981	1,928	185	2,113	0	0	0	2,113	56.7
1982	1,871	179	2,050	2	0	2	2,048	59.4
1983	1,896	181	2,077	9	0	9	2,068	60.2
1984	2,166	206	2,372	24	0	24	2,348	56.5
1985	2,172	205	2,377	41	0	41	2,336	58.5
1986	2,222	208	2,430	51	0	51	2,380	60.0
1987	2,209	205	2,414	72	0	72	2,342	64.6
1988	2,587	240	2,827	87	0	87	2,740	59.1
1989	2,470	229	2,699	86	0	86	2,613	65.2
1990	2,780	259	3,039	83	0	83	2,956	59.5
1991	2,828	264	3,092	81	0	81	3,011	57.8
1992	3,076	288	3,364	75	0	75	3,289	56.4
1993	2,697	252	2,949	68	0	68	2,881	64.1
1994	3,107	292	3,399	67	0	67	3,332	56.4
1995	3,055	287	3,342	65	0	65	3,277	57.9
1996	3,105	292	3,397	64	0	64	3,333	58.8
1997	3,438	324	3,762	63	0	63	3,699	55.1
1998	3,695	349	4,044	60	0	60	3,984	52.9
1999	3,335	314	3,650	62	0	62	3,587	61.0
2000	3,230	304	3,534	58	0	58	3,476	66.6
2001	2,882	271	3,153	57	0	57	3,096	68.9
2002	3,294	308	3,602	82	0	82	3,520	61.6
2003	3,616	338	3,954	92	0	92	3,862	58.2
2004	3,764	351	4,115	103	0	103	4,012	58.7
2005	3,761	351	4,112	109	0	109	4,003	58.7
2006	4,143	387	4,530	111	0	111	4,419	55.7
2007	4,226	395	4,621	112	3	115	4,506	55.1
2008	4,288	401	4,688	113	7	120	4,568	55.0
2009	4,358	407	4,765	115	10	125	4,641	55.0
2010	4,427	414	4,841	116	13	129	4,712	55.0
2011	4,497	420	4,917	117	16	134	4,784	55.1
2012	4,567	427	4,994	119	20	138	4,856	55.1
2013	4,634	433	5,068	120	23	143	4,925	55.1
2014	4,701	440	5,141	121	26	147	4,994	55.0
2015	4,769	446	5,215	122	30	152	5,063	55.0
2016	4,835	452	5,287	124	33	156	5,131	55.0
2017	4,900	458	5,359	125	36	161	5,198	55.0
2018	4,964	464	5,429	126	39	166	5,263	55.0

Annual Growth Rates (%)

1980-1990	4.0	3.7	4.0				3.7	0.3
1990-2000	1.5	1.6	1.5	-3.5		-3.5	1.6	1.1
2000-2006	4.2	4.1	4.2	11.5		11.5	4.1	-2.9
2006-2011	1.7	1.7	1.7	1.1		3.8	1.6	-0.2
2011-2018	1.4	1.4	1.4	1.1	13.3	3.1	1.4	0.0
2006-2018	1.5	1.5	1.5	1.1		3.4	1.5	-0.1

Form 1.5 - SDG&E Planning Area
California Energy Demand 2008-2018 Staff Revised Forecast
Peak Demand (MW)

Year	1-in-2 Temperatures	1-in-5 Temperatures	1-in-10 Temperatures	1-in-20 Temperatures	1-in-5 Multiplier	1-in-10 Multiplier	1-in-20 Multiplier
2006	4,419	4,720	4,808	5,078	1.068	1.088	1.149
2007	4,506	4,812	4,902	5,177	1.068	1.088	1.149
2008	4,568	4,879	4,970	5,249	1.068	1.088	1.149
2009	4,641	4,956	5,049	5,332	1.068	1.088	1.149
2010	4,712	5,032	5,127	5,414	1.068	1.088	1.149
2011	4,784	5,109	5,205	5,497	1.068	1.088	1.149
2012	4,856	5,186	5,283	5,579	1.068	1.088	1.149
2013	4,925	5,260	5,358	5,659	1.068	1.088	1.149
2014	4,994	5,333	5,433	5,738	1.068	1.088	1.149
2015	5,063	5,407	5,509	5,817	1.068	1.088	1.149
2016	5,131	5,480	5,582	5,895	1.068	1.088	1.149
2017	5,198	5,551	5,655	5,972	1.068	1.088	1.149

Form 2.2 - SDG&E Planning Area
California Energy Demand 2008-2018 Staff Revised Forecast
Planning Area Economic and Demographic Assumptions

Year	Population	Households	Persons per Household	Real Personal Income (Millions 2005$)	Industrial Value Added (Millions 2005$)	Commercial Floorspace (MM Sqft.)
1980	1,890,510	718,312	2.63	718,312	980	228
1981	1,913,432	725,903	2.64	725,903	1,026	240
1982	1,948,429	732,411	2.66	732,411	1,024	253
1983	2,033,615	752,124	2.70	752,124	976	266
1984	2,136,850	783,080	2.73	783,080	1,183	276
1985	2,235,850	819,194	2.73	819,194	1,189	289
1986	2,323,871	860,569	2.70	860,569	1,216	309
1987	2,388,259	890,272	2.68	890,272	1,315	329
1988	2,442,254	916,425	2.66	916,425	1,431	347
1989	2,495,065	933,395	2.67	933,395	1,516	365
1990	2,549,875	946,084	2.70	946,084	1,653	386
1991	2,604,754	964,042	2.70	964,042	1,640	406
1992	2,653,615	977,591	2.71	977,591	1,680	420
1993	2,670,770	988,476	2.70	988,476	1,665	428
1994	2,688,860	998,758	2.69	998,758	1,628	434
1995	2,699,012	1,008,967	2.68	1,008,967	1,595	441
1996	2,714,332	1,019,262	2.66	1,019,262	1,581	447
1997	2,780,839	1,032,431	2.69	1,032,431	1,694	455
1998	2,842,512	1,047,694	2.71	1,047,694	1,819	463
1999	2,908,551	1,064,929	2.73	1,064,929	1,979	476
2000	2,975,401	1,078,423	2.76	1,078,423	1,995	491
2001	3,055,475	1,095,189	2.79	1,095,189	1,813	508
2002	3,117,845	1,112,350	2.80	1,112,350	1,721	523
2003	3,173,141	1,128,303	2.81	1,128,303	1,671	535
2004	3,216,011	1,144,173	2.81	1,144,173	1,699	548
2005	3,248,466	1,162,228	2.80	1,162,228	1,667	560
2006	3,286,746	1,173,942	2.80	1,173,942	1,641	571
2007	3,324,761	1,185,992	2.80	1,185,992	1,630	583
2008	3,363,216	1,198,158	2.81	1,198,158	1,641	594
2009	3,402,115	1,210,445	2.81	1,210,445	1,653	606
2010	3,437,594	1,221,612	2.81	1,221,612	1,668	617
2011	3,475,667	1,233,711	2.82	1,233,711	1,685	628
2012	3,514,141	1,245,927	2.82	1,245,927	1,699	639
2013	3,553,025	1,258,255	2.82	1,258,255	1,708	650
2014	3,592,324	1,270,696	2.83	1,270,696	1,716	661
2015	3,632,036	1,283,258	2.83	1,283,258	1,725	672
2016	3,672,175	1,295,936	2.83	1,295,936	1,736	683
2017	3,712,737	1,308,733	2.84	1,308,733	1,741	694
2018	3,753,730	1,321,647	2.84	1,321,647	1,743	705

Annual Growth Rates (%)

1980-1990	3.0	2.8	0.2	2.8	5.4	5.4
1990-2000	1.6	1.3	0.2	1.3	1.9	2.4
2000-2006	1.7	1.4	0.2	1.4	-3.2	2.5
2006-2011	1.1	1.0	0.1	1.0	0.5	1.9
2011-2018	1.1	1.0	0.1	1.0	0.5	1.7
2006-2018	1.1	1.0	0.1	1.0	0.5	1.8

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ATTACHMENT 4

CUMULATIVE AQ LETTER

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ATMOSPHERIC DYNAMICS, INC
Meteorological & Air Quality Modeling

December 22, 2011

Mr. Ralph DeSiena
San Diego Air Pollution Control District
10124 Old Grove Road
San Diego, CA. 92131-1649

Re: Quail Brush Generation Project NAAQS and Increment Analyses

Dear Ralph:

We are in the process of preparing the required additional modeling analyses for the Prevention of Significant Deterioration permit application for the Quail Brush Generation Project (QBGP). Quail Brush Genco, LLC, has proposed to construct and operate the QBGP located on Sycamore Landfill Road, west of Santee, California. The project will be a nominal 102.3 MW facility utilizing natural gas-fired internal reciprocating engine technology. The engines proposed for use are Wartsila 20V34SG-C2's. Each engine is rated at approximately 9.3 MW. In addition to the power cycle engines, the facility will have a dry "radiator" cooling system, fuel gas and warm start heaters, and an emergency fire pump system. The facility is located at the following UTM coordinates (NAD 27): 497321.03 meters Easting, 3634765.63 meters Northing.

The Environmental Protection Agency (EPA) Prevention of Significant Deterioration (PSD) requirements will apply to the proposed source for NO$_x$, PM10, and PM2.5. The project will also trigger California Energy Commission (CEC) modeling requirements for cumulative impacts. It should be noted that the project only triggers the PSD modeling requirements for NO$_x$ and PM10/2.5 based on the project emissions of GHGs rather than the rather than the pollutants of NO$_x$, CO, SO$_X$, and PM. In support of the PSD and CEC permitting processes, we will need to obtain the following information from the District:

- PM10 and PM2.5 increment inventory for the region
- NAAQS inventory for PM10, PM2.5 and NO$_2$
- For the CEC cumulative modeling assessment, we will also need to obtain a list of recently permitted sources (2010 onwards) within 8 miles of the project location.

Attached with this letter are three (3) San Diego APCD *Request for Public Records* forms that have been submitted via facsimile to the District that summarize the three required data sets needed for the permit process.

SILs

As you know, under the EPA's PSD regulations, an applicant must conduct a "source impact analysis", which demonstrates that "allowable emission increases from the source in conjunction with all other applicable emissions increases or reductions (including secondary emissions), would not cause or contribute to air pollution in violation of: (1) Any NAAQS in any region; or (2) Any applicable maximum allowable increase over the baseline concentration in any area." 40 CFR § 52.21(k).

Subparagraph (1) is required to assure that the source's emissions will not cause a violation of the NAAQS. Subparagraph (2) is the "increment consumption analysis", which assures that, in those locations currently meeting the federal NAAQS (*i.e.*, those deemed "attainment" or "unclassifiable"), the concentration of a given pollutant cannot increase by an amount greater than the “maximum allowable increase” specified by the Clean Air Act and/or the PSD regulations for the particular pollutant.

For purposes of the PSD program, EPA has traditionally applied “significant impact levels” (“SILs”) as a *de minimis* value, which represents the offsite concentration predicted to result from a source’s emissions that does not warrant additional analysis or mitigation. EPA has recently promulgated the final SILs and PSD increments for PM2.5. EPA has also recently proposed draft 1-hour NO_2 SILs but has not yet proposed a PSD increment.

If a source’s modeled impact at any offsite location exceeds the relevant SIL, the source owner must then conduct a “multi-source” (or “cumulative”) air quality analysis to determine whether or not the source’s emissions will cause or contribute to a violation of the relevant NAAQS or applicable PSD increment. SILs have also been widely used in the PSD program as a screening tool for determining when a new major source or major modification that wishes to locate in an attainment or unclassifiable area must conduct a more extensive air quality analysis to demonstrate that it will not cause or contribute to a violation of the NAAQS or PSD increment in the attainment or unclassifiable area. The EPA considers a source whose individual impact falls below a SIL to have a *de minimis* impact on air quality concentrations. Thus, a source that demonstrates its impact does not exceed a SIL at the relevant location is not required to conduct more extensive air quality analysis or modeling to demonstrate that its emissions, in combination with the emissions of other sources in the vicinity, will not cause or contribute to a violation of the NAAQS at that location.

Based on the significant major source emission rates for NO_x, PM10, and PM2.5, the modeled concentrations of these pollutants exceeded the applicable Class II SILs for 1-hour NO_2, 24-hour PM10 and PM2.5, and annual PM2.5, thus triggering the requirements for a NAAQS and PSD increment analyses as appropriate. Figures 1 through 3 present the areal extent of the SILs for 24-hour PM10 and 24-hour and annual PM2.5. According to EPA guidance, the impact area was established by taking the distance from the project site to the farthest of these locations and then drawing a circle with that distance as its radius. From this maximum distance, a 50 kilometer screening radius will also be added to the appropriate SIL distance in order to obtain the background source inventories.

The 24-hour PM10 SIL radius is 5.2 kilometers or 55.2 kilometers including the screening area. The 24-hour PM2.5 SIL radius is 16 kilometers or 66 kilometers with the screening area while the annual SIL radius is 4.5 kilometers or 54.5 kilometers with the screening area. The 1-hour NO_2 SIL radius is 21 kilometers or 71 kilometers including the screening area. The annual SILs for NO_2 and PM10 were not exceeded. While the 1-hour SO_2 interim SIL was exceeded, the project is not a major source for this pollutant, thus no NAAQS or increment analyses are required.

Increment Consumption Analyses

Increments are the maximum increases in concentration that are allowed to occur above baseline concentrations for each pollutant for which an increment has been established. Currently, increments have been established for PM10 and PM2.5. These allowable increments are shown in the table below.

Class II Increments

Pollutant/Averaging Time	Allowable Class Increments ($\mu g/m^3$)
PM2.5	
24-Hour	9
Annual	4
PM10	
24-Hour	30
Annual	17

The baseline concentrations are defined for each pollutant and averaging time, and are the ambient concentrations of each pollutant existing at the time that the first complete PSD application affecting the area is submitted. Federal and District regulations (APCD Rule 20.3) establish the dates after which major and minor source impacts on increment consumption need to be considered in an increments analysis, as follows:

- Major source baseline date: The date after which actual emissions associated with modifications at a major stationary source affect the available increment.
- Trigger date: The date after which the minor source baseline date may be established.
- Minor source baseline date: The earliest date after the trigger date on which a complete PSD application is received by the reviewing agency. After this date, actual emission changes (including increases in throughput or production that do not require permit changes) from all sources (major and minor stationary sources, area sources and mobile sources) affect the available increment.

For PM10 the baseline and trigger dates are as follows:

	PM_{10}
Major Source Baseline Date	January 6, 1975
Trigger Date	August 7, 1977
Minor Source Baseline Date[a]	to be determined

[a] For PM10, baseline dates are established on a county-specific basis; therefore, the baseline date will reflect the date of submittal of a complete PSD application for TSP in San Diego County.

For PM2.5, the Major Source Baseline Date is the date at which the first major PSD permit application in the District for PM2.5 was deemed complete by EPA Region 9. The first major source for PM2.5 appears to be the Pio Pico Energy Center which has not yet obtained a completeness determination. It is assumed for this project that the completeness date will occur over the next few months. Thus, the Pio Pico Energy Center will trigger the Major Source Baseline Date for PM2.5.

Once the impact area is established, sources consuming increment within the impact area must be identified and emission inventories developed for those sources. The sources include not only those located within the impact area, but also those located outside the impact area whose emissions could contribute to ambient impacts there. These inventories must account for the change in emissions between the pollutant-specific baseline date and the date of the permit application for the new source or modification. Based on these inventories, the changes in emissions are modeled to determine the amount of increment consumed for each pollutant.

In order to ensure that other emission sources that might have significant impacts on the PM10 and PM2.5 impact area in conjunction with QBGP are identified, we will request from District staff a list of facilities that meet the following criteria:

- Major PM10 Sources: All sources within 55 kilometers of the PM10 impact area that have had significant permitted increases in PM10 (greater than 15 tons per year) since the PM_{10} major source baseline date (January 6, 1975).

- Major PM2.5 Sources: All major sources within 66 kilometers of the PM2.5 impact area that have had any permitted increases in PM2.5 of 10 tons per year since the PM2.5 major source baseline date.

Per SDAPCD Rule 20.3. (d)(3)(vii), the Air Pollution Control Officer tracks all increment consuming sources within the district for which baseline has been triggered. Because the increments analysis is intended to evaluate changes in ambient impacts since the baseline date due to increment-consuming sources, the analysis should compare impacts from emissions during the appropriate baseline period (two years prior to the baseline date) and from current emissions. In addition to point sources, and based on USEPA guidelines, all area and mobile sources affecting increment are to be included in the increments analysis. We may also request a gridded inventory of mobile and area source PM10 and PM2.5 emissions changes since the appropriate minor source baseline dates for use in modeling increment consumption from these sources. Emissions changes will be allocated to 5 km square grid cells in these inventories.

Therefore, the ambient impact of all changes in PM10 emissions since January 6, 1975 (for major modifications to major sources) and February 8, 1985 (for all sources) that affect the applicable impact area must be considered in the PM10 increments analysis. Additionally, for PM2.5, the ambient impact of all changes in PM2.5 emissions since December 31, 2011 for all sources must be considered in the PM2.5 increments analysis.

NAAQS Compliance Demonstration. To demonstrate that the emissions from the proposed projects will not cause or contribute to a violation of the 24-hour PM2.5/PM10 NAAQS, the annual PM2.5 NAAQS, or the 1-hour NO_2 NAAQS, a multi-source cumulative modeling analysis will be conducted in accordance with EPA requirements. This analysis will consider both the existing background concentrations, as established by ambient monitoring data, and the contribution from additional sources, which might not be reflected by the monitoring data, but could interact with the facility's potential impacts. Both Appendix W and the *Draft NSR Workshop Manual* require that the cumulative impacts analysis 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." 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", Appendix W leaves identification of nearby sources to the "professional judgment" of the permitting agency.

If, after adding in the background concentration, the modeled contribution from the source and any other modeled sources, the result is less than the relevant NAAQS at all locations, then no violation would occur and the cumulative impacts analysis is complete. If a violation is predicted by the model, the source may still demonstrate that it does not "cause or contribute to" a violation of the NAAQS by demonstrating that its own contribution is lower than the SIL at the particular location and time of the modeled violation.[1] This is referred to as a culpability analysis.

Therefore, as required for the NAAQS analyses, the following NAAQS source inventory will need to be prepared for NO_2, PM10, and PM2.5:

- All PM2.5 sources within 66 kilometers from the QBGP
- All PM10 sources within 55 kilometers from the QBGP
- All NO_2 sources within 71 kilometers from the QBGP.

The applicant will work with the SDAPCD and EPA Region 9 to develop a cumulative source inventory for NO_2 and PM10/2.5.

---

[1] *Draft NSR Workshop Manual*, Draft October 1990, at C.52 ("The source will not be considered to cause or contribute to the violation if its own impact is not significant at any violating receptor at the time of each predicted violation.")

<u>CEC Cumulative Source Impact Analysis</u>.

For the CEC cumulative impact assessment, QBGP in conjunction with the impacts of existing facilities immediately adjacent to the project site and facilities not yet in operation but that are reasonably foreseeable will be assessed. The potential impact area in which cumulative localized impacts could occur is identified as an area with a radius of 8 miles around the plant site. Within this 8 mile area, three categories of projects with emissions sources will be used as criteria for identification:

- Stationary sources which have received permits to construct but have not yet commenced construction within the last 24 months.
- Projects that have recently commenced operations whose emission may not be reflected in the ambient monitoring background data, i.e., commenced operations after January 2010.
- Foreseeable (reasonably known) projects that have not, to date, filed any applications for development.

The cumulative impacts analysis adds the modeled impacts of selected facilities to the maximum measured background air quality levels, thus ensuring that these existing projects are taken into account.

We look forward to working with you. If you have any questions, please do not hesitate to call me at (831) 620-0481. Thank you for your attention in this matter.

Sincerely,

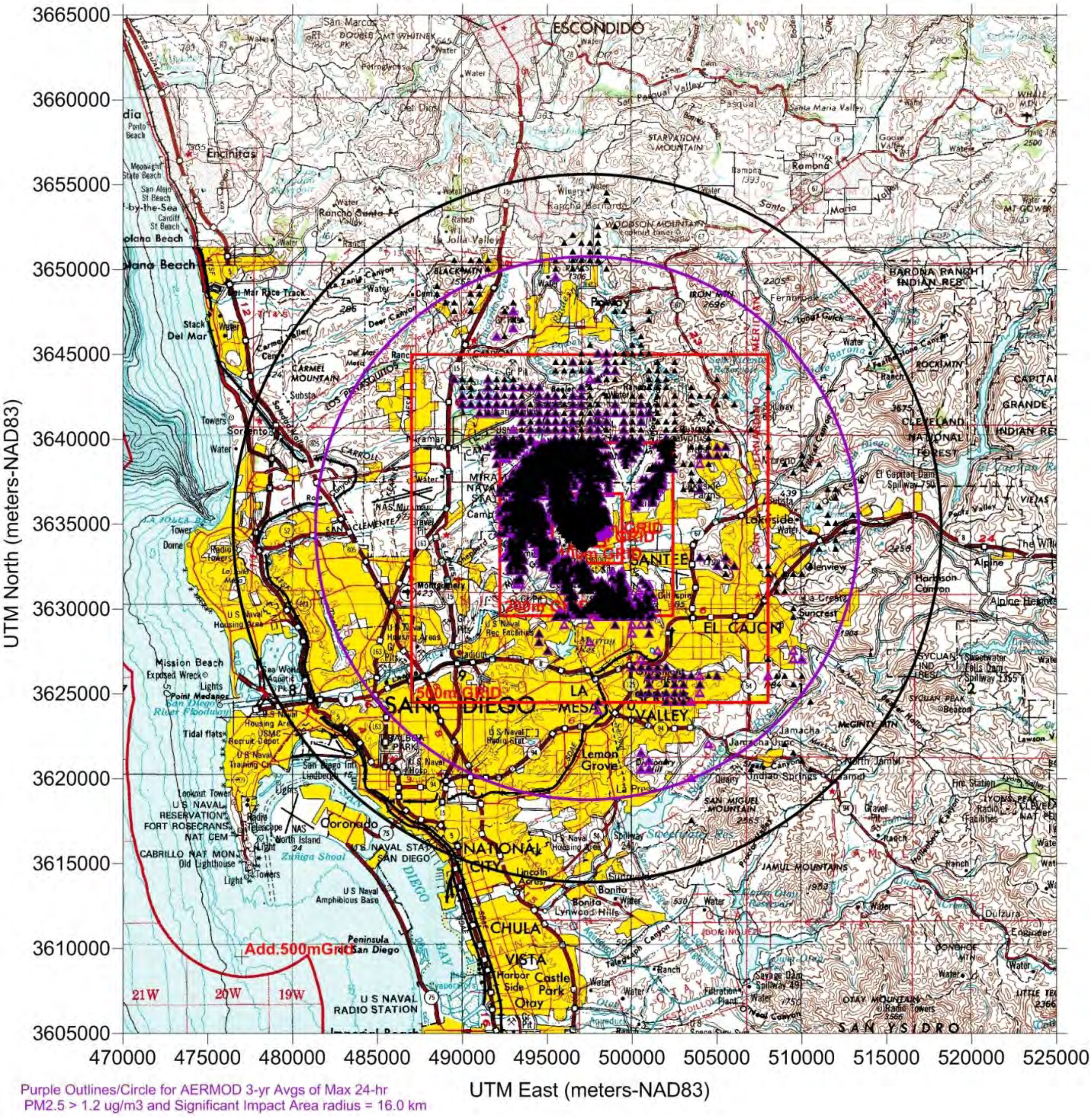
Atmospheric Dynamics, Inc.

Gregory S. Darvin
Senior Meteorologist

cc:
Carol Bohnenkamp, EPA Region 9

Figure 1

Significant AERMOD Receptors Based On 3-Year Average of Maximum 1-Hour NO2 and 24-hr PM2.5 Impacts



Purple Outlines/Circle for AERMOD 3-yr Avgs of Max 24-hr PM2.5 > 1.2 ug/m3 and Significant Impact Area radius = 16.0 km

Black Triangles/Circle for AERMOD 3-yr Avg of Max 1-hour NO2 > 7.5 ug/m3 and Significant Impact Area radius = 20.9 km

Figure 2

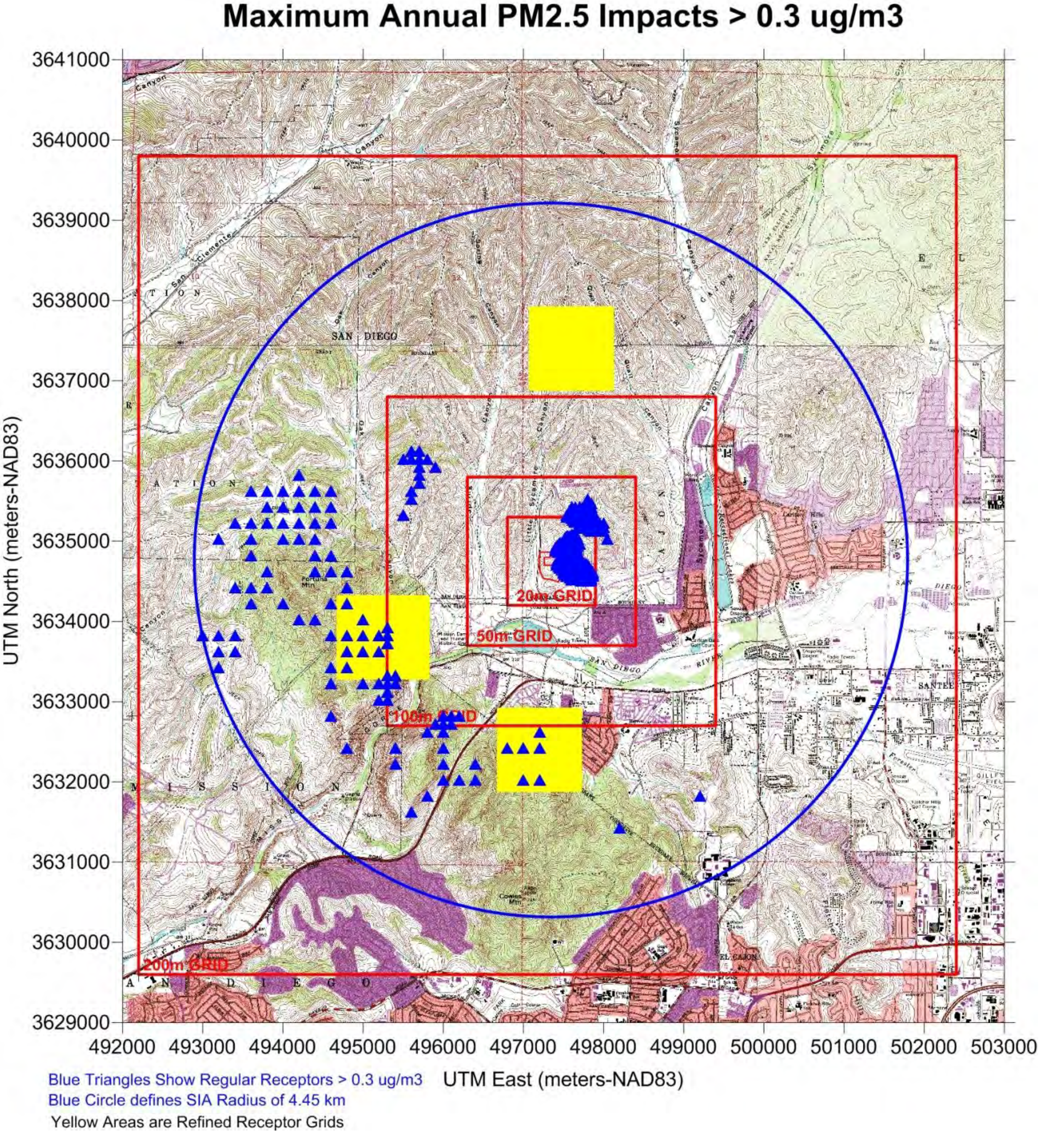
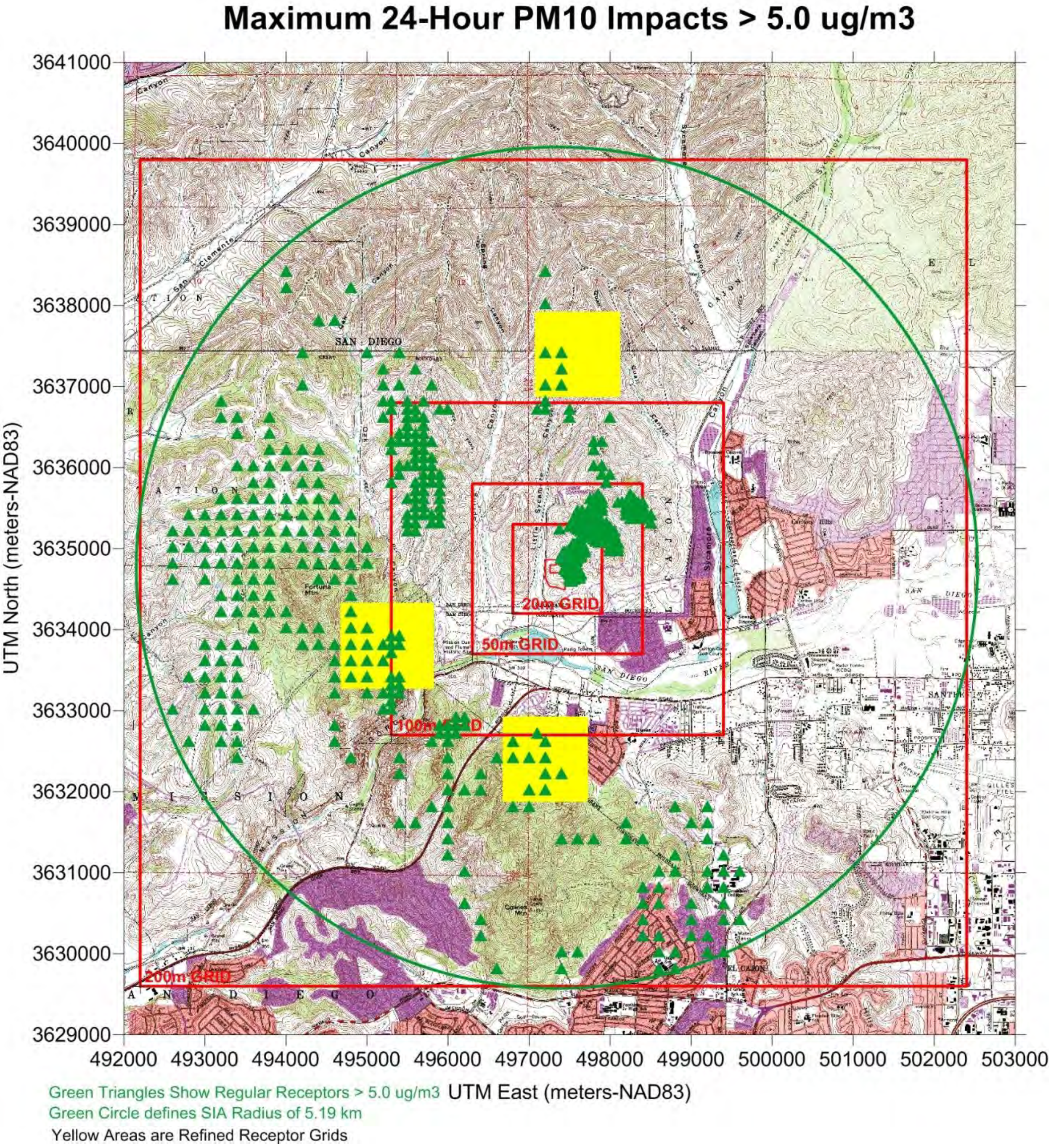

Maximum Annual PM2.5 Impacts > 0.3 ug/m3
UTM North (meters-NAD83)
UTM East (meters-NAD83)
3641000
3640000
3639000
3638000
3637000
3636000
3635000
3634000
3633000
3632000
3631000
3630000
3629000
492000
493000
494000
495000
496000
497000
498000
499000
500000
501000
502000
503000
20m GRID
50m GRID
100m GRID
200m GRID
Blue Triangles Show Regular Receptors > 0.3 ug/m3
Blue Circle defines SIA Radius of 4.45 km
Yellow Areas are Refined Receptor Grids

Figure 3


Maximum 24-Hour PM10 Impacts > 5.0 ug/m3
UTM North (meters-NAD83)
UTM East (meters-NAD83)
3641000
3640000
3639000
3638000
3637000
3636000
3635000
3634000
3633000
3632000
3631000
3630000
3629000
492000
493000
494000
495000
496000
497000
498000
499000
500000
501000
502000
503000
20m GRID
50m GRID
100m GRID
200m GRID
Green Triangles Show Regular Receptors > 5.0 ug/m3
Green Circle defines SIA Radius of 5.19 km
Yellow Areas are Refined Receptor Grids

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

REQUEST FOR PUBLIC RECORDS

Date: December 18, 2011

Name: Gregory Darvin

Agency: Atmospheric Dynamics, Inc.

Address: P.O. Box 5907

City: Carmel-by-the-Sea State: CA Zip: 93921

Phone: (831) 620-0481 Fax: (831) 620-0482

I request to inspect the following Public Records (please be specific): Atmospheric Dynamics, Inc. (ADI) is currently participating in the air quality and emissions analysis for the proposed Cogentrix Quail Brush Generation Project, which will is located west-northwest of the City of Santee. The site is located on the north side of Highway 52, adjacent to and east of Sycamore Landfill Road. The facility is located at the following UTM coordinates (NAD 27): 497321.03 meters Easting, 3634765.63 meters Northing.

The application numbers are: APCD2011-APP-001822 through 001833. Our air quality analysis will be part of the EPA Region 9/SDAPCD/CEC-AFC document, which has already been submitted for review. As part of the EPA Region 9 Prevention of Significant Deterioration (PSD) review process, the EPA is requiring that the air quality impact analysis for the proposed facility include an increment analysis for PM10 and PM2.5. As per SDAPCD Rule 20.3. (d)(3)(vii), the Air Pollution Control Officer tracks all increment consuming sources within the district for which baseline has been triggered. Baseline has been triggered PM10 and PM2.5. In order to produce the required analysis we must obtain the list of all PM10 and PM2.5 increment consuming sources within the entire San Diego APCD. This list should also contain the emissions of PM10 and PM2.5, the stack and/or release parameters, location (UTM or latitude-longitude), and operational parameters and permitted limits.

We understand that such a request requires the expenditure of district staff time and resources and we understand that a charge will be made for the preparation and delivery of the requested data.

Your timely response to this inquiry would be greatly appreciated. Please feel free to contact me at 831-620-0481 or by e-mail (darvin@atmosphericdynamics.com) if you have any questions regarding this request.

INSPECTION OF PUBLIC RECORDS

The district shall make a determination if the records requested are available with the exception of those records specifically exempted from disclosure by state law and those records labeled as "TRADE SECRET" which are not emission data, within ten (10) days of the date of the receipt of the request. If, for good cause, the determination cannot be made within the ten (10) working days, the District will notify the requesting person the reasons for the delay and when the determination is expected to be made within an additional 14 days, as prescribed by law. Those records labeled as “TRADE SECRETS” shall be governed by the procedure set forth in District Rule 177 Section (g).

If you have any questions, please contact Public Records at (858) 586-2618.

Mail or fax completed form to:

San Diego APCD
Public Records
10124 Old Grove Road
San Diego, CA 92131 Phone: (858) 586-2600 Fax No.: (858) 586-2601

01/06

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

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The application numbers are: APCD2011-APP-001822 through 001833. Our air quality analysis will be part of the EPA Region 9/SDAPCD/CEC-AFC document, which has already been submitted for review. As part of the EPA Region 9 Prevention of Significant Deterioration (PSD) review process, the EPA is requiring that the air quality impact analysis for the proposed facility include a cumulative NAAQS analysis for 1- hour NO$_2$, 24-hour PM10 and 24-hour and annual PM2.5. Under EPA's PSD regulations, an applicant must conduct a "source impact analysis", which demonstrates that "allowable emission increases from the source in conjunction with all other applicable emissions increases or reductions (including secondary emissions), would not cause or contribute to air pollution in violation of any NAAQS in any region" 40 CFR § 52.21(k).

This is required to assure that the source's emissions will not cause a violation of the NAAQS, which, in this case, consist of the 24-hour PM10 and PM2.5, annual PM2.5 and the 1-hour NO$_2$ standards.

In order to produce the required analysis we must obtain the list of all NO$_2$, PM10 and PM2.5 NAAQS sources within the following radii of the project:

- 24-hour PM10: 55 kilometers
- 24-hour PM2.5: 66 kilometers
- Annual PM2.5: 55 kilometers
- 1-hour NO$_2$: 71 kilometers

This list should also contain the emissions of NO_2, PM10 and PM2.5, the stack and/or release parameters, location (UTM or latitude-longitude), and operational parameters and permitted limits. The

We understand that such a request requires the expenditure of district staff time and resources and we understand that a charge will be made for the preparation and delivery of the requested data.

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01/06

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The application numbers are: APCD2011-APP-001822 through 001833. Our air quality analysis will be part of the SDAPCD/CEC-AFC document, which has already been submitted for review. As part of the CEC review process, the CEC is requiring that the air quality impact analysis for the proposed facility include a cumulative emissions and impact analysis for all sources located within eight (8) miles of the proposed site. In order to produce the required analysis we must obtain a reasonably accurate source inventory for the radius area, which delineates emissions (criteria pollutants only), stack and/or release parameters, location (UTM or latitude-longitude), and operational parameters for the following categories of sources within the radius area:

- Stationary sources which have received permits to construct but have not yet commenced construction within the last 24 months.
- Projects that have recently commenced operations whose emission may not be reflected in the ambient monitoring background data, i.e., commenced operations after January 2010.
- Foreseeable (reasonably known) projects that have not, to date, filed any applications for development.

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01/06

ATTACHMENT 5

PROJECT LAYOUT

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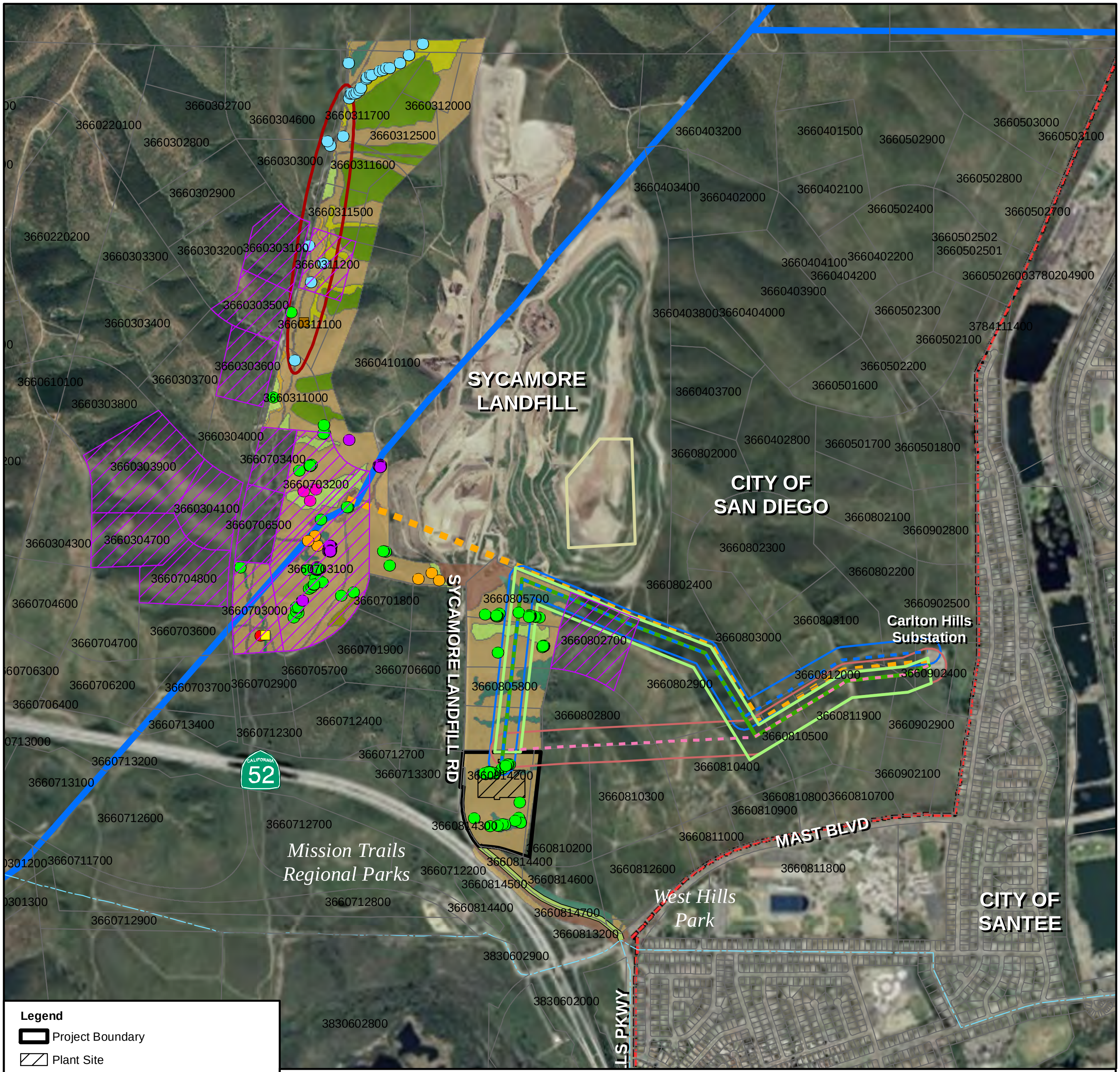
Printing Date: 1/19/2012 10:01:22 AM
Path: P:\GIS\Projects\4346_QuailBrush\MXD\Project_Description\2.1-2_Project_Layout_011712_BIO.mxd



Legend

- ▭ Project Boundary
- ▨ Plant Site
- ▨ Potential Mitigation Parcels
- Preferred Gentie Route with 300 foot Cultural Survey Buffer
- Alternative A Gentie Route with 400 foot Cultural Survey Buffer
- Alternative b Gentie Route with 300 foot Cultural Survey Buffer
- Proposed Gas Lateral
- Existing SDG&E Gas Line
- Existing 138 kV T-Line
- Existing SDG&E 230 kV T-Lines (2)
- Proposed Construction Laydown Area (5 acres within this 20 acre area)
- City Boundary
- ▭ Assessors Parcel Number

As the Project is not within a sectioned part of the county, section, township, and range information cannot be provided.

Cogentrix

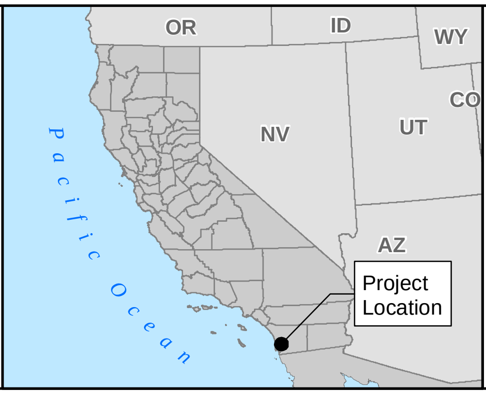
Sensitive Plants
- ● Barrel Cactus
- ● Variegated Dudleya
- ● Willowy Monardella
- ● Heart-Leaved Pitcher Sage

Quino Host Plants
- ● Dwarf Plantain
- ● Purple Owl's Clover

Sensitive Wildlife Species
- ■ Cooper's Hawk
- ■ Rufous-Crowned Sparrow

- ▭ Hermes Copper Habitat

Plant Communities (Holland Code)
- ■ Diegan Coastal Sage Scrub (32500)
- ■ Diegan Coastal Sage Scrub w/NNG (32500)
- ■ Disturbed Habitat (11300)
- ■ Granitic Chamise Chaparral (37210)
- ■ Granitic Chamise Chaparral w/NNG (37210)
- ■ Granitic Southern MIxed Chaparral w/NNG (31721)
- ■ Non-Native Grassland (NNG) (42200)
- ■ Non-Vegetated Channel (64200)
- ■ Southern Sycamore-Alder Riparian Woodland (62400)



QUAIL BRUSH GENERATION PROJECT

FIGURE 2.1-2
PROJECT LAYOUT

0 750 1,500 3,000
Feet

TETRA TECH EC, INC.

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ATTACHMENT 6

CEC BIO AGENCY CONFERENCE CALL NOTES

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COGENTRIX QUAIL BRUSH PROJECT CONFERENCE CALL NOTES

DATE: January 12, 2012

SUBJECT: **Biological Resources Conference Call**

ATTENDEES:

California Energy Commission
Andrea Martine
Rick York

U.S. Fish and Wildlife Service
Patrick Gower

California Dept. of Fish and Game
Bryand Duke

Michael Brandman and Associates
Scott Crawford

City of San Diego
Jean Cameron

Cogentrix
Rick Neff

Tetra Tech
Connie Farmer
Sarah McCall

eGIS
Dwight Mudry

MEETING NOTES:

1. Change in gen tie route for project
   a. Cogentrix is preparing a supplement to the AFC to address new route.
   b. SDG&E requested Cogentrix to go to 138 kV line instead of 230 kV line.
   c. Change is to turn east and parallel the existing 138 kV right-of-way into existing substation with two open bays. The number of access roads needed decreases to zero. This also eliminates the need for a 5 acre substation. The gen tie is approximately 1.25 miles.
   d. Maps will be provided in the near future including a project impact map with a biological resources overlay. Habitats should also be shown on the maps.
   e. The gen tie will be above ground.
2. Protocols for spring surveys
   a. Previous surveys included the original gen tie route, project site, and project substation. Follow up with same set of surveys done last season but incorporating additional survey areas. The areas surveyed last year will be resurveyed this year.
   b. Ran new CNDDB search
   c. Preliminary biological assessment of new habitat – non-native grassland and sage scrub
   d. Utilize USFWS protocol surveys for coastal California gnatcatcher, quino checkerspot butterfly, Hermes copper butterfly, and 15 plant species that have a moderate to high potential to occur. Last season the surveys occurred in May. This season the surveys will begin in late April/early May.
   e. Last season found 4 species on the site.
   f. Quino season may start early this year and typically lasts 5 weeks. Final report anticipated in May.
   g. Gnatcatcher can start in March and is a 6 week survey. Final report anticipated in May.
   h. Hermes copper and sensitive plant surveys anticipated by the end of July.
3. Resource agency concerns

    a. Biological report will be updated with construction laydown areas, parking areas, tower locations, and project impacts.
    b. Vernal pools are in area but there are not any on the project site.
    c. The CDFG streambed group should be notified if there are any concerns.

4. City permitting update
    a. Cogentrix originally planned to submit the Community Plan Amendment and Rezone applications in November but due to change in gen tie Cogentrix decided to hold the applications to address the gen tie change.
    b. Planning to submit the applications in the next few weeks.
5. CEQA process
    a. CEC is lead agency for CEQA and is the lead for power projects that produce heat of 50 MW or larger.
    b. The final decision is the final CEQA document for the project and this will include all conditions to comply with LORS.
    c. The Warren-Alquist Act allows the CEC *in lieu* permit authority. CEC needs to be diligent to coordinate with other agencies when writing permits. Even though the CEC does not issue Federal permits, the analysis should include all the requirements of a Federal permit that a project would need.
    d. The Community Plan Amendment, Rezone, and Boundary Adjustment will be issued by the City directly.
    e. Several mitigation parcels are under consideration. Cogentrix is in discussion with Mission Trails Regional Park and the City of San Diego Real Estate Department.
    f. The CEC permit authority does not come from a Federal agency. If a Federally endangered species is found, then an HCP would need to be prepared as these species are not covered under the MSCP. Eric Solorio confirmed that the project has a Federal nexus because the applicant has submitted an application for a PSD permit to US EPA, therefore EPA shall consult with USFWS under Section 7.
6. Project schedule
    a. The project is moving forward on the original schedule. Eric Solorio is working on the schedule this week.
    b. The action item memo from the December 2 meeting will be filed next week. The supplement for the new gen tie will be filed prior to the first public workshop on 1/25. The intent of the gen tie supplement is to provide the CEC with as much information as possible so that CEC can generate requests.
    c. By the end of this year we will possibly be going to hearings and the final decision is possible in 2013.
    d. CEC will begin coordinating with agency contacts to develop data requests. CEC intends to have everyone involved and recommending conditions of certification for project compliance and proper mitigation.