South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178
(909) 396-2000 • www.aqmd.gov

October 21, 2010

DOCKET
09-AFC-7
DATE OCT 21 2010
RECD. OCT 21 2010

Mr. Alan Solomon
Project Manager
California Energy Commission
1516 9th Street MS-15
Sacramento, CA 95814-5512

Subject: Revised Determination for Compliance for Palen Solar Power Project (09-AFC-7) to be located off Corn Spring Road, Desert Center, CA 92239

Dear Mr. Solomon:

This is in reference to the Palen Solar Power Project (09-AFC-7) and the South Coast Air Quality Management District's (AQMD's) Preliminary Determination of Compliance (PDOC) issued on March 4, 2010 for the above described project. Thank you for your letter dated March 24, 2010 in which you provided written comments on the PDOC. This letter is to inform you that AQMD staff has completed review and evaluation of your written comments along with those provided by California Union for Reliable Energy (CURE), and Solar Millennium, LLC. Based on our analysis of all comments received, AQMD has prepared a Revised Determination of Compliance (DOC) that includes a revised engineering analysis that addresses the comments received on the PDOC. A copy of the Revised DOC is included with this letter.

Based upon our revised calculations, the facility is required to provide emission offsets in the form of Emission Reduction Credits (ERCs) under AQMD Rule 1303(b)(2) according to the following table:

PERMIT UNIT	VOC ERCs Required (lb/day)
Aux Boiler No.1	1
Aux Boiler No.2	1
Solar Thermal Power Generation System No.1	33
Solar Thermal Power Generation System No.2	33
Total ERCs	68

Due to the changes in the emissions for this project between issuance of our PDOC and the Revised DOC, the AQMD is issuing a new public notice with a 30 day comment period pursuant to the AQMD Rule 212. After the completion of the public comment period and review of comments, if any, AQMD will inform the California Energy Commission (CEC) if there needs to be any further revisions to the DOC. As you are aware, the proposed facility will be a new non-major stationary source. Based on the information submitted with the applications, the project as described will comply with the applicable Rules and Regulations of the AQMD. The AQMD's final Permit to Construct is contingent upon the CEC's approval of the project.

If you have any questions or wish to provide comments regarding this project, please call Mr. Kenneth L. Coats 909.396.2527 or Mr. John Yee 909.396.2531.

Very truly yours,

Mohsen Nazemi, P.E.
Deputy Executive Officer
Engineering and Compliance

Attachments

cc: Terry O'Brien, California Energy Commission
Ms Elizabeth Ingram, Solar Millennium, LLC
Mr. Russel Kingsley, AECOM

CERTIFIED MAIL
Return Receipt Required

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NOTICE OF INTENT TO ISSUE
"PERMITS TO CONSTRUCT AND OPERATE" PURSUANT TO RULE 212

This notice is to inform you that the South Coast Air Quality Management District (AQMD) has received eleven applications for permits to construct and operate a solar power plant at the location shown below. The AQMD is the air pollution control agency for all of Orange County and portions of Los Angeles, Riverside and San Bernardino Counties. Anyone wishing to install, operate, or modify equipment that could be a source of air pollution within this region must first obtain a permit from the AQMD. AQMD rules (Rule 212) require the applicants for certain projects to distribute a public notice prepared by the AQMD prior to the issuance of a permit. This notice is being distributed due to the level of emissions.

The AQMD has evaluated the permit applications for the following equipment and determined that the equipment will meet all requirements of applicable federal, state, and local air quality Rules and Regulations.

APPLICANT:	**PALEN SOLAR I, LLC**
APPLICATION NUMBERS:	**506827, 506828, 506829, 506830, 506831, 506833, 506834, 506835, 506836, 508665, & 508667**
LOCATION:	**CORN SPRING ROAD DESERT CENTER, CA 92239**
PROJECT DESCRIPTION:	**INSTALL AND OPERATE ONE 500 MW SOLAR POWER PLANT USING PARABOLIC TROUGH TECHNOLOGY TO GENERATE ELECTRICITY.**

Palen Solar I, LLC is proposing to install a solar power plant with the capability of generating a total of 500 megawatts (MW) of electrical power. This solar power plant will use solar parabolic trough technology to generate electricity. Palen Solar I, LLC will provide the generated electricity to the electrical grid. The electrical output of the plant is produced strictly by the use of solar energy, and no fossil fuels will be used for electricity production. This solar power plant consists of two 35 million BTU/hr propane-fired boilers, two diesel fired emergency fire pumps, two diesel fired emergency electrical generators, two activated carbon adsorption systems serving the heat transfer fluid (HTF) storage tanks, one bio-remediation (land treatment) unit used for soil decontamination, and two solar thermal power generation systems consisting of solar parabolic mirrors, HTF piping, ullage systems, steam turbine generators, and associated storage tanks,.

The solar power plant will use the best available control technology for controlling air pollution. The HTF to be used in the electricity generating process contains some volatile organic compounds (VOC) that may evaporate into the air due to occasional

leaks and repairs. Maximum VOC emissions from the solar power plant will be less than 57 pounds per day. In addition, a maximum of 13 pounds per day of carbon monoxide (CO), 4 pounds per day of oxides of nitrogen (NOx), 4 pounds per day of oxides of sulfur (SOx), and 4 pounds per day of particulate matter less than 10 microns (PM_{10}) could be emitted from the combustion of propane and diesel in the boilers and engines. Generally, the amount will be less as most companies do not operate at their maximum potential. The electricity generation process will emit small quantities of some toxic compounds. The combustion of propane in the boilers and diesel fuel in the emergency internal combustion engines as well as the occasional leaks and breakdown of HTF will result in emissions of small quantities of certain toxic compounds. The AQMD has evaluated the short term (acute) and long term (chronic) health impacts associated with the maximum potential emissions. Using worst case conditions, our evaluation shows that the chronic and acute health risks are both well below our rule's toxic thresholds (below a Hazard Index of 1). According to the state health experts, a hazard index of one or less means that the surrounding community including the most sensitive individuals such as very young children and the elderly will not experience any adverse health impacts due to the toxic nature of these emissions. In addition, the long term cancer risk from these emissions is far below the AQMD risk threshold of ten in a million.

The air quality analysis of this project is available for public review at the AQMD's headquarters in Diamond Bar. A copy of the draft permits to construct and operate can be viewed at www.aqmd.gov/webappl/PublicNotices/Search.aspx by entering the company's name. Information regarding the facility owner's compliance history submitted to the AQMD pursuant to California Health & Safety Code Section 42336, or otherwise known to AQMD, based on credible information, is also available from the AQMD for public review. Anyone wishing to comment on the proposed issuance of these permits should submit their comments in writing by November 26, 2010. If you are concerned primarily about zoning decisions and the process by which this facility will be sited at this location, you should contact the California Energy Commission at (916) 654-4960. Please submit comments related to air quality to Mr. Brian L. Yeh, Senior Manager, General Commercial and Energy Team, Engineering and Compliance, South Coast Air Quality Management District, 21865 Copley Drive, Diamond Bar, California 91765-4178. For additional information, please call Mr. Kenneth L. Coats at (909) 396-2527.

For your general information, anyone experiencing air quality problems such as dust or odor can telephone in a complaint to the AQMD by calling 1-800-CUT-SMOG (1-800-288-7664).

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT ENGINEERING AND COMPLIANCE DIVISION ENGINEERING ANALYSIS / EVALUATION	PAGES 47	PAGE 1
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	PROCESSED BY: Ken Coats	REVIEWED BY:

PALEN SOLAR POWER PROJECT
REVISED DETERMINATION OF COMPLIANCE

COMPANY NAME AND ADDRESS

Palen Solar I, LLC
1625 Shattuck Avenue, Suite 270
Berkeley, CA 94709

Contact: Ms. Elizabeth Ingram (510) 809-4663
AQMD Facility ID: 163054

EQUIPMENT LOCATION

Corn Spring Road
Desert Center, CA 92239

EQUIPMENT DESCRIPTION

SOLAR POWER GENERATING FACILITY CONSISTING OF:

A/N 506828
BOILER, AUXILLIARY STEAM, NEBRASKA, MODEL NB-201D-45-SH, 35 MMBTU/HR, WATER TUBE, PROPANE FIRED, 29,000 LB/HR STEAM AT 165 PSIG, 480 DEGREES FAHRENHEIT, EQUIPPED WITH A CB NATCOM, MODEL NO. P-37-G-22-1117 ULTRA-LOW NOx RAPID MIX BURNER.

A/N 506834
BOILER, AUXILLIARY STEAM, NEBRASKA, MODEL NB-201D-45-SH, 35 MMBTU/HR, WATER TUBE, PROPANE FIRED, 29,000 LB/HR STEAM AT 165 PSIG, 480 DEGREES FAHRENHEIT, EQUIPPED WITH A CB NATCOM, MODEL NO. P-37-G-22-1117 ULTRA-LOW NOx RAPID MIX BURNER.

A/N: 508665
INTERNAL COMBUSTION ENGINE, EMERGENCY, 2,922 BHP, CUMMINS, DIESEL FUELED, LEAN BURN, FOUR CYCLE, MODEL NO. QSK60-G6, TURBOCHARGED AND AFTERCOOLED, DRIVING AN ELECTRICAL GENERATOR RATED AT 2.18 MW

A/N: 508667
INTERNAL COMBUSTION ENGINE, EMERGENCY, 2,922 BHP, CUMMINS, DIESEL FUELED, LEAN BURN, FOUR CYCLE, MODEL NO. QSK60-G6, TURBOCHARGED AND AFTERCOOLED, DRIVING AN ELECTRICAL GENERATOR RATED AT 2.18 MW.

A/N 506831
INTERNAL COMBUSTION ENGINE, EMERGENCY, 300 BHP, DIESEL FUELED, CATERPILLAR, MODEL NO. 9CPXL08.8ESK, LEAN BURN, FOUR CYCLE, TURBOCHARGED AND AFTERCOOLED, DRIVING A FIRE WATER PUMP.

A/N 506836
INTERNAL COMBUSTION ENGINE, EMERGENCY, 300 BHP, DIESEL FUELED, CATERPILLAR, MODEL NO. 9CPXL08.8ESK, LEAN BURN, FOUR CYCLE, TURBOCHARGED AND AFTERCOOLED, DRIVING A FIRE WATER PUMP.

A/N 506829
SOLAR THERMAL POWER GENERATION SYSTEM NO. 1 CONSISTING OF:

1. SOLAR PARABOLIC MIRRORS
2. ONE ULLAGE SYSTEM, CONSISTING OF DISTILLATION COLUMNS AND PRESSURE VESSELS
3. EIGHT EXPANSION VESSELS, EACH WITH A CAPACITY OF 151,915 GALLONS, VENTED TO ACTIVATED CARBON ADSORPTION SYSTEM NO. 1 DESCRIBED BY A/N 506830.
4. HEAT TRANSFER FLUID (HTF) PIPING
5. STEAM TURBINE
6. ELECTRICAL GENERATOR, 250 MW

A/N 506833
SOLAR THERMAL POWER GENERATION SYSTEM NO. 2 CONSISTING OF:

1. SOLAR PARABOLIC MIRRORS
2. ONE ULLAGE SYSTEM, CONSISTING OF DISTILLATION COLUMNS AND PRESSURE VESSELS
3. EIGHT EXPANSION VESSELS, EACH WITH A CAPACITY OF 151,915 GALLONS, VENTED TO ACTIVATED CARBON ADSORPTION SYSTEM NO. 2 DESCRIBED BY A/N 506835.
4. HEAT TRANSFER FLUID (HTF) PIPING
5. STEAM TURBINE
6. ELECTRICAL GENERATOR, 250 MW

A/N 506827
SOIL BIO-REMEDIATION (LAND TREATMENT) UNIT, CONSISTING OF:

A. BIO-REMEDIATION LAND FARM, LENGTH: 800 FEET; WIDTH 200 FEET
B. IRRIGATION SYSTEM FOR BIOREMEDIATION OPERATIONS
C. BIO-REMEDIATION FERTILIZER AND ASSOCIATED COMPOUNDS

A/N 506830
ACTIVATED CARBON ADSORPTION SYSTEM NO. 1, WITH TWO CANNISTERS IN SERIES, TOTAL CAPACITY 4,000 POUNDS, VENTING THE EXPANSION VESSELS DESCRIBED BY A/N 506829.

A/N 506835
ACTIVATED CARBON ADSORPTION SYSTEM NO. 2, WITH TWO CANNISTERS IN SERIES, TOTAL CAPACITY 4,000 POUNDS, VENTING THE EXPANSION VESSELS DESCRIBED BY A/N 506833.

BACKGROUND / HISTORY

The Palen Solar Power Project (PSPP) is a new facility which will be located in the Southern California inland desert, off of Corn Spring Road, approximately 10 miles east of Desert Center in eastern Riverside County (see the plant layout diagram included in the next page). The project site will occupy 2,970 acres of public lands owned by the Federal Government. PSPP was originally submitted to AQMD as two separate facilities, each with identical equipment. The two original companies involved with the project were Solar Millennium LLC (AQMD ID No. 161483) and Chevron Energy Solutions (AQMD ID No. 161484). Although both companies were separate facilities with separate AQMD ID numbers, both companies in a joint venture, were proposing to construct and operate a 500 MW solar-thermal-electric power generating facility, with each facility adjacent to the other, and each rated at 250 MW. Table 1 below shows the original applications for Permit to Construct, submitted by both Chevron Energy Solutions and Solar Millennium, LLC and the corresponding equipment descriptions and permit processing fees. Neither facility requested expedited permit processing under Rule 301(v).

Table 1: Original Applications for Permit to Construct

Company	A/N	Equipment Description	Processing Fee
Chevron Energy Solutions	502597	Boiler, 35 MMBTU/hr	$4,478.51
	502598	Heater, 35 MMBTU/hr	$4,478.51
	502601	Emergency Fire Pump, 300 bhp	$3,244.91
	502602	Emergency Electrical Generator, 300 bhp	$3,244.91
	502599	Storage Tank / Ullage System	$4,478.51
	502600	Carbon Adsorption System	$3,244.91
		TOTAL FOR CHEVRON ENERGY SOLUTIONS	$23,170.26
Solar Millennium, LLC	502590	Boiler, 35 MMBTU/hr	$4,478.51
	502591	Heater, 35 MMBTU/hr	$4,478.51
	502594	Emergency Fire Pump, 300 bhp	$3,244.91
	502595	Emergency Electrical Generator, 300 bhp	$3,244.91
	502580	Storage Tank / Ullage System	$4,478.51
	502592	Carbon Adsorption System	$3,244.91
	502593	Land Treatment Unit	$4,478.51
		TOTAL FOR SOLAR MILLENNIUM, LLC	$27,648.77

The applications for both facilities listed in Table 1 above were initially deemed data inadequate on October 21, 2009 because the required processing fees submitted with the application package were insufficient and information pertaining to the specific equipment was also not included. The correct fees were submitted to the AQMD and AQMD agreed to deem the applications data adequate on October 23, 2009 with the understanding that the equipment specific information requested by AQMD would be submitted as it became available.

On February 2, 2010, AQMD was notified by AECOM, the applicant's consultant, that PSPP has underwent a change of ownership and the new owner, Palen Solar I, LLC, plans to combine the two facilities into one, eliminate the HTF heaters, increase the ratings of both electrical generators, and own and operate all of the equipment. New applications were submitted under Palen Solar I, LLC and a new facility ID and application numbers are pending. The applications for the previous two owners, listed in Table 1 above, have been cancelled.

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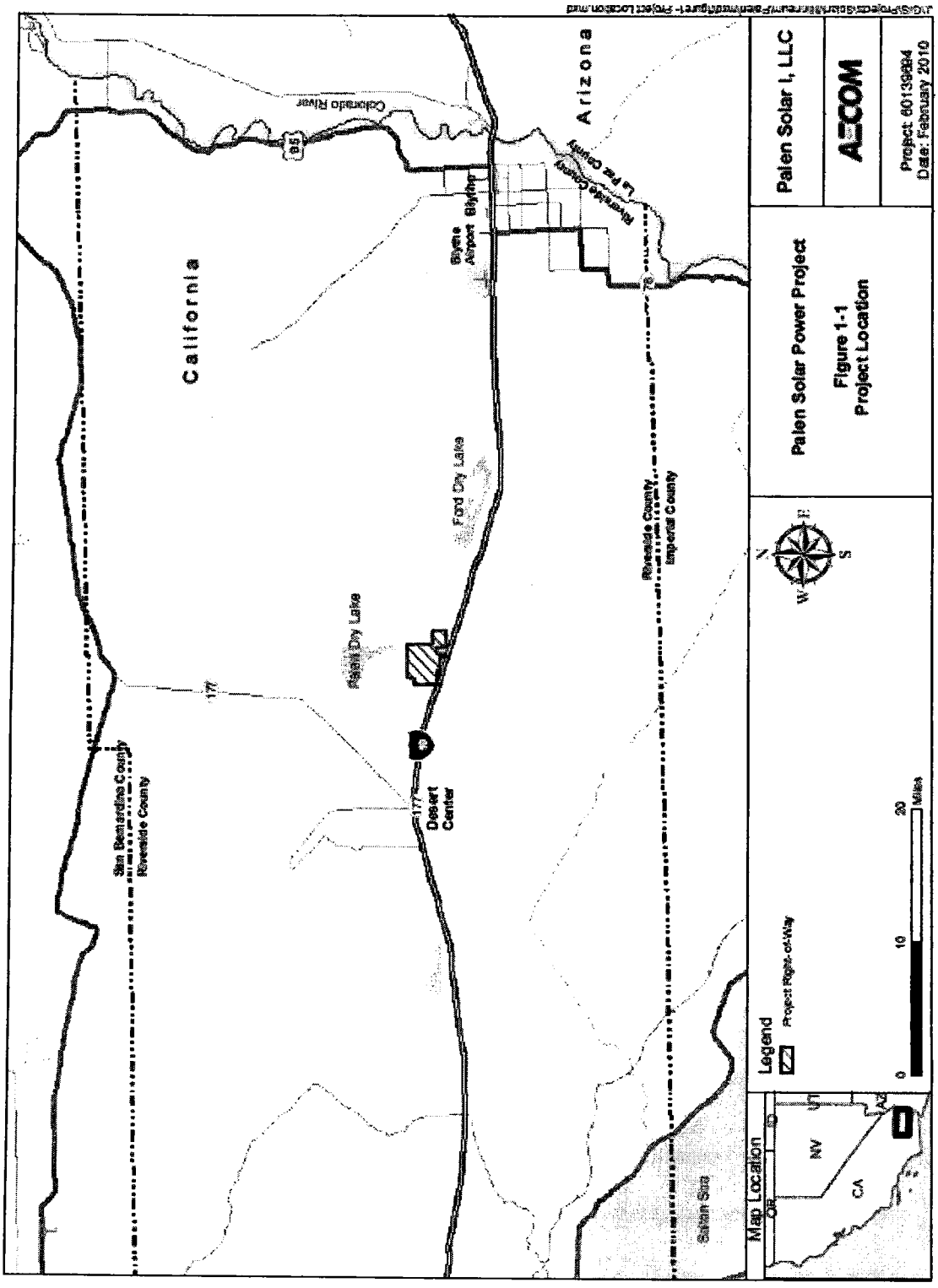
Plant Layout Diagram for the Proposed Palen Solar Power Plant



Processing Fee Summary

The two boilers are identical and therefore, one of the boilers receives a 50% lower fee of the original processing fee. In addition, both of the emergency fire pump IC engines and both of the emergency electrical generator IC engines are identical and therefore two of these devices receives a 50% lower fee of the original processing fee. The total fees are shown in table 2 below.

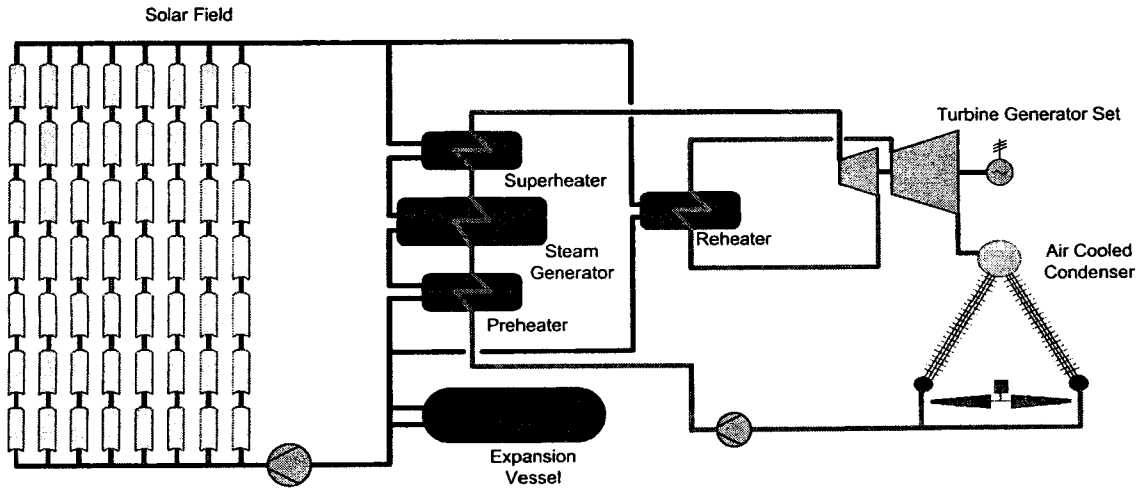
Table 2 - Summary of Permit Processing Fees for Palen Solar I, LLC

A/N	Submittal Date	Equipment	Schedule	Processing Fee
506828	2/3/2010	Boiler, 35 MMBTU/hr	D	$4,478.51
506834	2/3/2010	Boiler, 35 MMBTU/hr	D	$2,239.26
508665	3/9/2010	IC Engine, 2,922 BHP, Emergency Power	B	$2,051.52
508667	3/9/2010	IC Engine, 2,922 BHP, Emergency Power	B	$1,025.76
506831	2/3/2010	IC Engine, 300 BHP, Emergency Fire Pump	B	$2,051.52
506836	2/3/2010	IC Engine, 300 BHP, Emergency Fire Pump	B	$1,025.76
506829	2/3/2010	Storage Tank / Ullage System	C	$3,244.91
506833	2/3/2010	Storage Tank / Ullage System	C	$1,622.46
506830	2/3/2010	Carbon Adsorption System	C	$3,244.91
506835	2/3/2010	Carbon Adsorption System	C	$1,622.46
506827	2/3/2010	Land Treatment Unit	D	$4,478.51
			TOTAL	$27,085.58

PROCESS DESCRIPTION

PSPP will use solar parabolic trough technology to generate electricity. Arrays of parabolic mirrors focus solar radiation on a receiver tube located at the focal point of the parabola to collect heat energy. Heat transfer fluid (HTF) is heated to approximately 750 degrees F as it circulates through the receiver tubes. The heated HTF is then piped through a series of heat exchangers where it releases its stored heat to generate high pressure steam. The steam is next piped to a traditional steam turbine generator (STG) where electricity is produced. The electrical output of the plant is therefore produced strictly by the use of solar energy, and no fossil fuels will be used for electricity production. The thermodynamic cycle is illustrated in below (Figure 1) and described in the steps which follow:

Figure 1 - Thermodynamic Cycle for PSPP



In Figure 1 above, HTF flows from the top to the bottom of the figure, arriving from the solar field and transferring heat in the superheater and reheater, then to the solar steam generator (SSG) and lastly in the preheater before returning to the solar field to be heated again. The steps below illustrate the fluid flow for both the HTF and the power-cycle working fluid (water) in the thermodynamic cycle of Figure 1:

Step 1
Water from the de-aerator and feedwater heaters is pumped from low to high pressure and piped to the solar preheater. HTF provides heat to the preheater which heats the feedwater to its saturation temperature.

Step 2
The high pressure saturated water enters the SSG where it is heated by warmer HTF. The water boils and exits as saturated steam.

Step 3
The saturated steam flows through to the superheater where hot HTF takes the saturated steam at constant pressure up to higher temperature prior to being fed to the high pressure (HP) section of the steam turbine.

Step 4
The superheated steam expands through the HP section of the steam turbine turning the generator to produce electricity.

Step 5
The steam let down from the turbine's HP section is then reheated in a solar reheater which is fed with hot HTF. The reheated steam is then fed to the intermediate pressure (IP) section of the steam turbine.

Step 6
The IP steam exhausts into the low pressure (LP) section of the steam turbine. All sections of the STG decrease the temperature and pressure of the steam, with the LP section extracting the last available power from the steam.

Step 7
The wet steam from the LP section then enters the air-cooled condenser (ACC) where it is cooled at a constant low pressure to become a saturated liquid. The condensed liquid returns to the feedwater heater train and the beginning of the steam cycle to begin the process again.

Electrical power will be generated only during daylight hours. The solar plant will operate according to the following operational modes:

Stand-by
A propane-fired auxiliary boiler rated at 35 MMBTU/hr and a capacity of 25,000 lb/hr steam provides steam for maintaining steam cycle equipment vacuum overnight and for start-up. Steam generated by the auxiliary boiler will be at a relatively low pressure, approximately 165 psig. Sealing steam is used to prevent air from entering the steam turbine while the condenser is under vacuum. This method reduces start-up time for the plant compared to relying on solar generated steam as the sealing steam source.

Unlike a gas fired power plant, a solar thermal plant must wait for the sun to rise to start generating steam and has a finite time to generate electricity. If the plant does not have a secondary source of steam, plant start-up will be delayed and the total daily electrical generation will be reduced. By using the auxiliary boiler as a secondary source of sealing steam (the primary source being the sun), daily start-up times can be reduced by up to 60 minutes. Conservatively assuming the STG is on-line 30 minutes sooner each day, at a minimum of 25 MW, 350 days per year yields an additional 4,500 MW-hr of renewable energy each year.

Warm-up

In the mornings, this mode brings the HTF flow rate and temperatures up to their steady state operating conditions by positioning all required valves, starting the required numbers of HTF main pumps for establishing a minimum flow within the solar field, and tracking the solar field collectors into the sun. Normal operational conditions (565 degrees F at solar field inlet and 739 degrees F at solar field outlet) are usually achieved within 30 minutes or less. At the beginning of warm-up, HTF is circulated through a bypass around the power block heat exchangers until the outlet temperature reaches the residual steam temperature in the heat exchangers. HTF is then circulated through the heat exchangers and the bypass is closed. As the HTF temperature at the solar field outlet continues to rise, steam pressure builds up in the heat exchangers until the minimum turbine inlet conditions are reached, at which time the turbine is started and run up to speed. The turbine is synchronized and loaded according to the design specification until its power output matches the full steady state solar field thermal output.

Solar Field Control Mode

The Distributed Control System (DCS), which coordinates and integrates power block, HTF system and solar field operation, automatically enters the solar field control mode after completing the warm-up mode. It regulates the flow by controlling the HTF main pump speeds to maintain the solar field outlet temperature of 739°F. Several HTF pumps will generally be operated in parallel at the speed required to provide the required flow in the field, but in exceptional cases (e.g., during maintenance), lower numbers of pumps may be used alone, providing up to 70 percent of full flow at nominal pump capacity. If the thermal output of the solar field is higher than the capacity of the steam generation system, collectors within the solar field are de-focused to maintain design operating temperatures

Shutdown

If the minimal thermal input to the turbine required by the operating strategy cannot be met under the prevalent weather conditions, then shutdown is indicated. Operators would track all solar collectors into the stow position, reduce the number of HTF main pumps to a minimum, and stop the HTF flow to the power block heat exchangers.

Freeze Protection

To avoid the problem of HTF freezing, one or both of the auxiliary boilers will be used to ensure system temperature stays above 54°F whenever the solar field is off-line. A freeze protection system will be used to prevent freezing of the HTF piping systems during cold winter nights. Since the HTF freezes at a relatively high temperature, warm HTF will be circulated at low flow rates from the boiler(s) through the solar field.

The following is a description of the major energy conversion components of the PSPP, including the solar collection system, SSG, STG, auxiliary boilers, and HTF freeze protection heat exchanger. The PSPP will

be a parabolic trough solar power plant that has a nominal (gross) output of 500 MW. The plant will consist of a conventional steam Rankine-cycle power block, a parabolic trough solar field, a HTF system and steam generation system, as well as a variety of ancillary facilities (sometimes referred to collectively as "balance-of-plant" [BOP]), such as water treatment, electrical switchgear, administration, warehouse, and maintenance facilities, etc

Solar Collector Assemblies

The solar field will be a modular, distributed system of solar collector assemblies (SCAs) connected in a series-parallel arrangement via a system of insulated pipes. The collectors will be equipped with a sun tracking mechanism that moves the reflecting panels toward the sun to the optimum angle for solar energy collection. The SCAs are oriented north-south to rotate east-west to track the sun as it moves across the sky throughout the day. HTF will flow from the HTF pumping area in the power block to the cold HTF header that distributes it to the collector loops of SCAs in the solar field. The SCAs collect heat by means of linear troughs of parabolic reflectors which focus sunlight onto a straight line of heat collection elements (HCEs) welded along the focus of the parabolic trough. The HCE is mounted on a mechanical support system that includes a steel support structure, pylons and bearings. Each SCA includes local measurement instrumentation, a hydraulic drive system, and a controller which independently tracks the sun to maintain mirror focus on the HCEs, and protects the HCEs from overheating.

Mirrors

The parabolic mirrors to be used in the Project are low-iron glass mirrors, and are known to be one of the most reliable components in the solar collection assemblies. No long-term degradation of the mirrors has been observed, and older mirrors can be brought back to nearly full reflectivity with simple cleaning. Typical life spans of the reflective mirrors are expected to be 30 years or more.

Heat Collection Elements

The HCEs of the solar plant are comprised of steel tubes surrounded by evacuated glass tube insulators. The steel tube has a coated surface which enhances its heat transfer properties with a high absorption rate for direct solar radiation, accompanied by low emissivity. Glass to metal seals and metal bellows are incorporated into the HCE to ensure a vacuum-tight enclosure. The enclosure protects the coated surface and reduces heat losses by acting as an insulator. The glass tube cylinder has anti-reflective coating on both the inner and outer surfaces to reduce reflective losses off the glass tube, thereby increasing the transmissivity. Usually, to maintain the tube's insulating properties, getters, or scavengers, are installed in the vacuum space to absorb hydrogen and other gases that may permeate into the vacuum cylinder over time.

Parabolic Trough Collector Loop

Each of the collector loops consist of two adjacent rows of SCAs, each row about 1,300 feet long. The two rows are connected by a crossover pipe. HTF is heated in the loop and enters the hot header, which returns hot HTF from all loops to the power block where the steam generating equipment is located. In normal operation, HTF enters the field at 565°F and leaves the field at 739°F.

HTF Expansion Vessels / Ullage System

Each HTF system collectively consists of the HTF piping, eight expansion vessels, and an ullage system to capture, recover, and recondition the HTF. The ullage system consists of several vessels, as explained below. The HTF piping system includes the valves, flanges, pumps, pressure relief devices that would

potentially emit fugitive VOC emissions. The HTF is a liquid synthetic hydrocarbon mixture of diphenyl ether and biphenyl. Similar formulations are marketed by different manufacturers under the names of Therminol® or Dowtherm®. It has a freeze point of about 54°F.

Expansion Vessels

Thermal HTF expansion is accommodated in the expansion vessels – a pressurized device with nitrogen blanketing. With rising HTF temperatures, HTF in the expansion vessels reaches the design working level and overflows into additional expansion vessels. With falling HTF temperatures, one of four overflow return pumps supplies HTF back to the first expansion vessel. Each system will be equipped with eight expansion vessels for a total of sixteen expansion vessels. The expansion vessels are elevated to provide net positive suction head to the HTF main pumps. Expansion vessels have approximately 5,000 cubic feet (ft^3) of fillable volume and are 37 feet long and 14 feet in diameter. Each expansion vessel is supported about six meters above finish grade on a steel frame structure which may be integrated into the HTF pumping area pipe support rack. Underneath all HTF vessels is a concrete containment pit sized to accommodate the entire volume of HTF in all vessels when full. The pit is also the central drain location for fugitive HTF leaks in the HTF pumping and handling area of the plant. The pit basin is drained by a sump pump to a collection tank that is regularly emptied and transported offsite for recycling and reprocessing. The collection tank has a design capacity of 2,200 ft^3. Some internal structures within the expansion vessel allow distribution of feed HTF to the ullage system for stripping of gaseous contamination of low boiling point HTF degradation products such as benzene and removal of high boiling point residuals.

Ullage System

To maintain the HTF contamination levels within specifications, the contaminants must be removed at a rate equaling the HTF degradation rate. The proposed ullage system is designed to remove those contaminants. The ullage system is a two-stage flash distillation system consisting of various distillation columns and heat exchangers. When the ullage system is periodically operated, a side stream of hot HTF (740°F) from an expansion tank is routed to the ullage system. Hot HTF is a gas held in the liquid state via pressure. When the hot HTF enters the ullage system, the pressure is reduced rapidly, and the HTF "flashes" to the gaseous phase. The gaseous HTF is then cooled using an air cooled condenser to condense the HTF; however, the temperature of the gas stream remains high enough that any light hydrocarbons that were present in the hot HTF working fluid remain in the gaseous phase. At this point in the process, the condensed HTF has been purified by the removal of the light hydrocarbons, and is returned to the expansion tanks for reuse. The gas phase containing the light hydrocarbons is vented through a carbon adsorption unit to atmosphere.

Specifically, each ullage system will utilize a 2-stage condensing system to reclaim usable HTF liquids and carbon filtration to control emissions of HTF low-boiling derivates. The mixture of gas (i.e., nitrogen and hydrocarbon vapors) from the expansion vessel enters the ullage system via ullage vessel #1. The HTF vapor within the mixture condenses and is recirculated to the HTF loop. If necessary, the HTF content of the first ullage vessel is cooled by recirculation through an air cooler. Leaving the first ullage vessel, residual mixture of gas enters the second ullage vessel, where it will be further condensed. The second ullage vessel is 15 feet tall and 8 feet in diameter with a capacity of approximately 600 ft^3. The content of the second ullage vessel is cooled by recirculation through a second air cooler. By cooling, the hydrocarbons within the gaseous mixture condense to a large extent and are collected in the ullage drain vessel. Residual gaseous components are vented to the vessel pit through an active carbon adsorption

system reducing VOC concentration by 98 percent. The volume of collected liquid residuals and vented gas will depend upon the final operating temperature during the previous day of operation and the temperature of the system overnight. The liquid residuals are stored in a reclamation drain vessel with a capacity of approximately 350 ft^3. To maintain sufficient system pressure within the HTF cycle, nitrogen is introduced simultaneously with the venting. A diagram of the ullage system is included in the next page. The applicant estimated the VOC emissions from the ullage system to be 1.5 lb/day. AQMD's calculated the 30 day average emissions for the ullage system to be 0.83 lb/day.

Solar Steam Generator System

The SSG system transfers the latent heat from the HTF to the feedwater. The steam generated in the SSG is piped to a Rankine-cycle reheat steam turbine. Heat exchangers are included as part of the SSG system to preheat and boil the condensate, superheat the steam, and reheat the steam. Steam from the SSG is sent to the STG. The steam expands through the STG turbine blades to drive the steam turbine, which in turn drives the generator, converting mechanical energy to electrical energy. The Project's STG is expected to be a three-stage casing type with HP, IP and LP steam sections. The STG is equipped with accessories required to provide efficient, safe, and reliable operation.

Steam Cycle Heat Rejection System

The cooling system for heat rejection from the steam cycle consists of a forced draft air-cooled condenser (ACC) or "dry cooling" system. The dry cooling system receives exhaust steam from the LP section of the STG and condenses it to liquid for return to the SSG. There will be two ACC units for the PSPP

Bioremediation Unit

The PSPP will use a bioremediation unit (LTU) to treat soil contaminated with HTF. The LTU will be designed in accordance with Regional Water Quality Control Board requirements including the use of multiple High Density Polyethylene (HDPE) liners and a leachate collection and removal system (LCRS). The LTU is expected to comprise an area of about 8 acres. In a passive mode (i.e., landfarming), the LTU would utilize indigenous bacteria to digest hydrocarbons contained in HTF-contaminated soil. If enhanced bioremediation is needed, nutrients including nitrogen and phosphorus would be added in addition to water and aeration to enhance the bacterial activity within the contaminated soil. The soil would remain in the LTU until HTF concentrations are reduced to an average concentration of less than 100 milligrams of HTF per kilogram of soil, typically within two to three months. Land treatment will be conducted at ambient temperatures. For hydrocarbon concentrations less than 1,000 ppm, natural attenuation of the contaminants is proposed through the soil bacteria. For hydrocarbon concentrations greater than or equal to 1000 ppm but less than or equal to 10,000 ppm, enhanced remediation will be employed through the addition of soil nutrients, bugs, and moisture. For hydrocarbon concentrations greater than 10,000 ppm the contaminated soil will be disposed of at an off-site landfill.

Basis of LTU Design

The LTU will not incorporate a liner containment system or leak detection and removal system, but will be constructed with a prepared base consisting of 2 feet of compacted, low permeability, lime-treated material. This base will serve as a competent platform for land treatment activities, and will serve to slow the rate of surface water infiltration in the treatment area. The compacted lime-treated and native soil beneath the LTU is designated as a "treatment zone" to a depth of 5 feet. Although the LTU will be taking vehicle traffic, no hard surface will be required, as there is no liner system to protect. A staging area is

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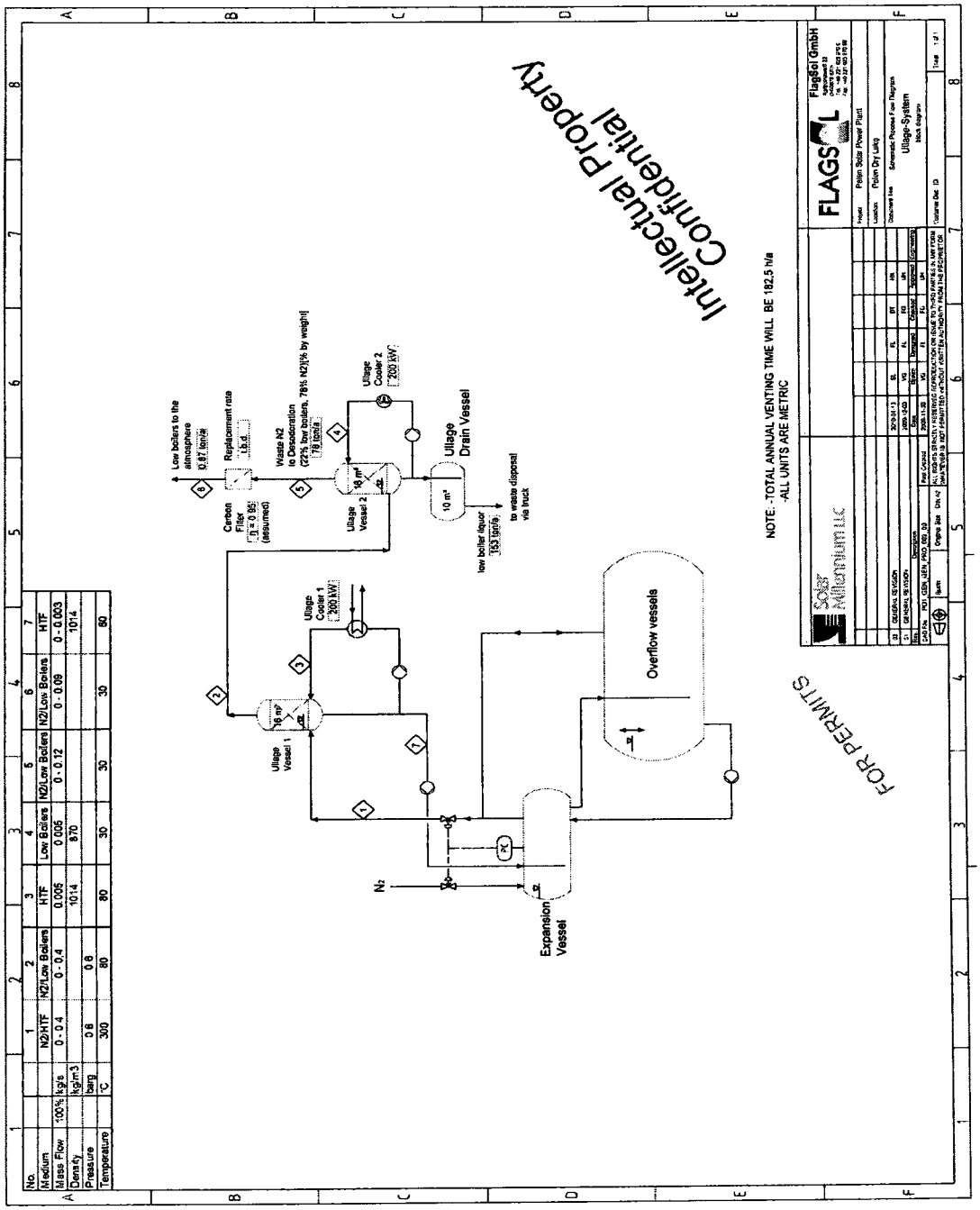
ENGINEERING ANALYSIS / EVALUATION	PROCESSED BY: Ken Coats	REVIEWED BY:



No.	1	2	3	4	5	6	7
Medium		N2/HTF	N2/Low Boilers	HTF	Low Boilers	N2/Low Boilers	N2/Low Boilers	HTF
Mass. Flow	100% kg/s	0 - 0.4	0 - 0.4	0.005	0.005	0 - 0.12	0 - 0.09	0 - 0.003
Density	kg/m-3			1014	870			1014
Pressure	barg	0.6	0.6					
Temperature	°C	300	80	80	30	30	30	80

allocated in the LTU for storage of HTF-impacted soils while they are being characterized. Soil characterized as hazardous will be removed from the site; therefore, no additional liner system is required in the LTU to cater for the hazardous waste. The LTU will be surrounded on all sides by a 2-foot high compacted earthen berm with side slopes of approximately 3:1 (horizontal: vertical). These berms will control and prevent potential inflow (run on) of surface storm water into the LTU or runoff of storm water from the unit. The LTU is sized based on data from an existing solar farm that uses an LTU to bioremediate HTF-impacted soil and the following basis:

1. HTF-impacted soil is generated at a rate consistent with existing solar farm experience. A similar solar power facility, Kramer Junction, is a 150 MW facility that generates an average of 500 cubic yards (cyd) of HTF-impacted soil per year (DTSC correspondence, 1995). This rate is approximately 3.3 cyd/year/MW.

2. The Palen facility is estimated to generate ~1,666 cyd/year of HTF-impacted soil.

3. HTF-impacted soil is treated in 6-inches thicknesses, so, on average, 90,000 square feet or 2.1 acres is needed for HTF-impacted generated per year.

4. The LTU will be used for either placement of HTF-impacted soil or treatment of HTF-impacted soil. That is at any one time the LTU is used to place material to be treated as it is generated or being used for soil treatment. HTF-impacted soil treatment is estimate to take 1 to 4 months to complete bio remediation; however the design of the LTU will allow soil placed at the beginning of the year to have up to twelve months to complete bioremediation and removal.

5. To address above average spill events, the Kramer Junction facility has additional capacity in the LTU or a factor of safety for HTF-impacted soil treatment. Kramer Junction has a capacity to treat 1,944 cyd/year and generates an average of 500 cyd/year of HTF-impacted soil. Therefore, the facility has ~ a 3.9 factor of safety. Applying this factor of safety to the proposed Palen facility, the total area estimated for LTU is approximately 350,000 square feet or 8 acres.

OPERATING SCHEDULE

The applicant has revised the operating schedule from that listed in the listed in the PDOC. The auxiliary boilers will be used for HTF freeze protection as well as start-up of the steam turbine. The revised boiler operating schedule is shown below. Palen is proposing the following operating schedule for each of the components:

- The auxiliary boilers are used for startup of the steam turbine and HTF freeze protection. On a normal operating day, boiler operation will be 2 hours at maximum load and 12 hours per day at 25% load (idle). The annual operation is expected to be 730 hours at full load and 4,380 hours at 25% load for a total of 5,110 hours of operation.

- The fire water pump engines will be readiness tested once per week for a period not to exceed one hour, with annual operation not to exceed 50 hours. The operation of the engines will be restricted to 200 hours per year or less.

- The emergency generator engines will be readiness tested once per week for a period not to exceed one hour, with annual operation not to exceed 50 hours. The operation of the engines will be restricted to 200 hours per year or less.
- The ullage systems, expansion vessels, and HTF piping systems will be used periodically (non-continuous operation) for up to 2 hours per day, 2 to 3 days per week to remove contaminants from the HTF fluid. Total annual operation is expected to be 400 hours/year or less.
- The LTU will be operated continuously operated to treat HTF contaminated soil due to leaks and spills.
- The cooling tower is required for auxiliary equipment cooling, estimated at 16 hours per day and 3,700 hours per year.

EVENTS SINCE PDOC ISSUANCE

The PDOC for this project was issued on March 4, 2010. The Public Notice was published in the Riverside Press Enterprise on April 15, 2010. In addition, copies of the Public Notice were submitted to interested agencies and parties including U.S. Environmental Protection Agency (USEPA), U.S. Forest Service, Federal Land Manager, California Air Resources Board (CARB), California Energy Commission (CEC), California Union for Reliable Energy (CURE), Palen Solar I, LLC (applicant), and the Lake Tamarisk Library located in Desert Center in proximity to the proposed project site. The applicant also was required to circulate the Public Notice to all residents within a ¼ mile radius of the proposed project site. The applicant distributed copies of the Public Notice on April 14, 2010 through the United States Postal Service (USPS). The applicant identified a total of six (6) residents within the ¼ mile radius. AQMD received no comments from the general public for whom the distributed copies of the Public Notice were sent. AQMD received two formal comment letters from interested agencies. AQMD received written comments from CEC dated March 24, 2010, and during the 30 day public comment period, which ended May 14, 2010, AQMD received written comments from CURE. Below is a summary of the written comments from both CEC, CURE, and a summary of the applicant's comments along with AQMD's responses.

Comments Received from CURE

Comment No. 1

AQMD's determination of emission factors for fugitive VOC emissions from the heat transfer fluid systems and land treatment unit is erroneous.

AQMD Response

AQMD conducted an extensive analysis to review and compare fugitive emission results for the proposed Palen Solar Power Project, which included review and evaluation of emission factors and processes from refinery, oil & gas production, and synthetic organic chemical manufacturing industry (SOCMI) facilities. Based on AQMD's independent research, the most appropriate industry classification and calculation procedures for determining fugitive emissions from the proposed project would be the use of the SOCMI emission correlation equations assuming light liquid use. Also the emissions from the LTU are expected to be insignificant due to the fact that the HTF will be at ambient temperature during the bioremediation process. See the "Emissions" section for a more extensive discussion of AQMD's independent analysis regarding determination of fugitive emissions from the proposed Palen Solar Power Plant.

Comment No. 2
The PDOC does not comply with AQMD rules requiring a determination of offsets.

AQMD Response
AQMD has considered various comments from interested parties along with the proposed operational changes proposed by the applicant. In light of these comments and proposed operational changes, AQMD has determined that the project as proposed will require offsets for VOC in accordance with Rule 1303(b)(2).

Comment No. 3
The District's analysis is inconsistent and not adequately supported. (Tables containing vague descriptions, no definition of acronyms, some tables missing units of measurement, HRA and air quality modeling analysis do not contain enough supporting documentation).

AQMD Response
AQMD has considered this comment and has amended the analysis where appropriate.

Comment No. 4
The revised PDOC must analyze and permit the project's land treatment units

AQMD Response
AQMD has reviewed the proposed land treatment unit and its proposed operations and has determined that the unit has the potential to cause the issuance of air contaminants. As such, the land treatment unit is considered a" permit unit" and will require a written Permit to Construct in accordance with AQMD Rule 201.

Comment No. 5
Depending on the purchase date of the emergency generators, USEPA Tier 4 emission factors may apply rather than the Tier 2 emission factors applied in the PDOC.

AQMD Response
AQMD has reviewed the applicability of Tier 4 emission standards as they apply to emergency electrical generators rated at 2,922 bhp. USEPA currently requires emergency generators of this size (>750 bhp) to comply with Tier 2 emission standards as Tier 4 controls are not yet available. Therefore, these engines are subject to the Tier 2 emission standards as required by USEPA. Also, since this facility is not a major source, Best Available Control Technology (BACT) is determined at the time the application is deemed complete.

Comment No. 6
The District's emission calculations fail to account for all toxic air contaminants

AQMD Response
AQMD has reviewed the toxic air contaminant emissions calculations from the proposed project. The applicant has revised the toxic air contaminant analysis to include the risk component due to fugitive sources. The contributions of the individual toxic air compounds are included as appropriate.

Comment No. 7
The PDOC fails to impose all conditions. (The PDOC assumes the HTF ullage system would be vented approximately 400 hours per year, but here is no condition which will ensure that the system vents no greater than 400 hours per year).

AQMD Response
AQMD has added a condition to require the system be vented no greater than 400 hours per year, and will be verified through recordkeeping and periodic inspections.

Comments Received from CEC
Comment No. 1
PDOC Tables 2 and 3 use the original operating basis for the auxiliary boilers and should be updated to reflect the revised operating basis. Staff also believes there are similar discrepancies with the air toxics emissions tables in the PDOC.

AQMD Response
AQMD concurs with this comment and has revised the tables accordingly.

Comment No. 2
It appears that the SOx and PM2.5 values were inadvertently switched in PDOC tables 4 and 5 for the fire water pump engines.

AQMD Response
AQMD has reviewed and made the necessary amendments where appropriate.

Comment No. 3
It appears the VOC emissions for heat transfer fluid (HTF of Therminol VP-1) shown in PDOC Table 8 are for a single unit and are shown as uncontrolled (denoted by R1) and controlled (denoted by R2). Staff recommends that it be clearly noted that the total facility emissions from these sources as twice the single unit emissions presented in Table 8 and that the meaning of R1 and R2 be defined under Table 8 for clarity.

AQMD Response
AQMD has reviewed and made the necessary amendments where appropriate.

Comment No. 4
The applicant uses heavy oil emission factors from the referenced 1995 U.S. Environmental Protection Agency (USEPA) guidance document; however, those factors are for crude oil. Therefore, if light liquid emission factors are not used, then heavy liquid emission factors associated with organic chemical facilities should be used in lieu of heavy oil emission factors. Staff believes that light liquid emission factors are most representative of the HTF during the day when it is heated, but heavy liquid emission factors may be appropriate overnight. Staff would like to make sure that the District uses both physically appropriate emission factors and emission factors that are consistent with District permits for projects with this type of emission source.

AQMD Response
AQMD conducted an extensive analysis to review and compare fugitive emission results for the proposed Palen Solar Power Project, which included review and evaluation of emission factors and processes from Refinery, Oil & Gas Production, and SOCMI facilities. Based on AQMD's independent research, the most appropriate industry classification and calculation procedures for determining fugitive emissions from the proposed solar power plant would be the use of the SOCMI emission correlation equations assuming light liquid use. See the "Emissions" section for a more extensive discussion of AQMD's independent analysis regarding determination of fugitive emissions from the proposed Palen Solar Power Plant.

Comment No. 5
Staff believes that the Prohibitory Rule evaluation section of the PDOC should be expanded to note the applicability of NSPS Subpart Dc for the auxiliary boilers and Subpart IIII for the emergency engines.

AQMD Response
AQMD has addressed this issue and made the necessary amendments as appropriate in the Revised DOC.

Comment No. 6
Staff believes it is appropriate to specify the grade of propane or liquefied petroleum gas (lpg) fuel used in the auxiliary boiler to ensure fuel quality is controlled.

AQMD Response
AQMD has revised the permit to require the use of LPG which meets the requirements of AQMD Rule 431.1 and the standards specified in CCR Tile 13, Section 2292.6 for California motor vehicles.

Comment No. 7
Staff recommends that condition no. 5 for the auxiliary boiler be re-written to limit annual fuel use in gallons rather than mmcf.

AQMD Response
AQMD concurs and has amended this condition to reflect annual fuel use limitation in units of gallons.

Comment No. 8
No conditions exist for the auxiliary boilers establishing appropriate emission limits for NOx and CO during start-up and shutdown. Staff recommends adding the appropriate emission limits for NOx and CO to control emissions during start-up and shutdown.

AQMD Response
The emission limits of 9 ppmv and 50 ppmv for NOx and CO respectively are BACT for the auxiliary boilers. The BACT limits are typically applicable at steady state operations. The applicant has provided information from the manufacturer that the BACT limits can be achieved at loads as low as 25%. A normal start-up period will last no longer than 15 minutes, at which 100% controlled emissions can be achieved. However, since there is no practicable method to control emissions during the startup or shutdown periods, AQMD has included conditions to limit the duration of both start-up and shutdown periods to no greater than 15 minutes to require compliance with the BACT emission limits as quickly as possible.

Comment No. 9
The applicant changed their maximum operating basis 5,000 hours per year to 5,100 hours per year. Auxiliary boiler condition 11 should be revised to account for this change.

AQMD Response
AQMD has concurs with this request and has amended the condition to reflect the revised operating schedule.

Comment No. 10
Staff recommends that the District add a condition to establish an emission limit for the storage tanks / ullage system and require a source test to establish that the source can meet the established emission limit.

AQMD Response
Emissions from this equipment will be controlled by a two-stage carbon adsorption unit along with routine inspections. The carbon is monitored on a scheduled basis to ensure that the system is functioning properly. In addition, a condition was added to establish an emission limit based on a concentration in the exhaust (5 ppmv).

Comment No. 11
Add operating conditions to the land treatment unit.

AQMD Response
The land treatment unit along with the ullage system will contain conditions and be subject to periodic inspections under an appropriate inspection and maintenance program. AQMD has added necessary conditions for an enhanced inspection and maintenance program including appropriate monitoring, reporting and recordkeeping.

Comment No. 12
Staff requests the District to confirm that it does not require permits or include permit conditions for fugitive VOC piping systems within stationary sources such as refineries.

AQMD Response
A permit is required for the VOC piping system which is part of a larger system consisting of the ullage system and its associated components. As a result, permit conditions for the fugitive piping system are included in the permit for the ullage system. The emissions from such sources are evaluated and counted toward the facility's total NSR emissions and are subject to offset requirements under NSR. An appropriate inspection and maintenance program has also been incorporated to ensure that fugitive leaks are minimized and properly recorded and accounted for.

Comment No. 13
Staff recommends that emissions of diesel particulate matter (DPM) from onsite mobile sources and from the cooling towers be included in the HRA for the proposed solar power plant.

AQMD Response
AQMD Rule 1401 which addresses HRA from toxic air contaminants is applicable to stationary sources and not mobile sources or cooling towers. The risk from such sources will be addressed as part of the CEQA process. AQMD does however perform a screening analysis for all non-permitted equipment to determine if Rule 1401 standards mandate permit issuance for this normally permit exempt equipment.

Comments received from Solar Millennium, LLC
Solar Millennium provided a letter to AQMD dated April 5, 2010 in which they provided a number of comments to the PDOC issued on March 4, 2010. Solar Millennium requested several editorial changes including modifications to the proposed equipment wording and descriptions, rule evaluation, background and history. Solar Millennium also provided updated information on the proposed operating schedules for the boilers resulting in changes to the criteria pollutant and toxic emission calculations. Finally, Solar Millennium requested changes to permit conditions for the boilers, and emergency IC engines to reflect the revised operating conditions.

AQMD Response
AQMD staff has evaluated these comments and incorporated the requested changes throughout this report as appropriate.

EMISSIONS
This section provides an overview of the assumptions and calculation methods used to estimate equipment emissions. PSPP will operate the following devices at the site:

- Facility-wide fugitive VOC emissions
- Two 35-MMBtu/hr propane-fired auxiliary boilers used for system start up and freeze protection;
- Two 300-hp diesel-fired emergency fire water pump engines;
- Two 2,922-hp diesel-fired emergency generator engines; and
- A single LTU to manage HTF-contaminated soil will also be used.

Determination of Fugitive VOC Emissions
In response to comments received from both CURE and CEC, AQMD conducted the independent, in-house research and analysis shown below in order to determine the most appropriate methods and emission factors for calculating fugitive VOC emissions from the proposed Palen Solar Power Plant. The analysis which follows shows the fugitive emissions from the proposed project using three of the four different calculation approaches for determination of fugitive emissions as described in the November 1995 EPA Protocol for Equipment Leak Emission Estimates (EPA Protocol). The four approaches for estimating equipment leaks described in the EPA Protocol are numbered in order of increasing refinement: (1) Average Emission Factor Approach, (2) Screening Ranges Approach, (3) EPA Correlation Approach, and (4) Unit-Specific Correlation Approach. The Unit-Specific Correlation Approach was not used in this analysis since actual process data was not available.

Specifications of Therminol VP-1 (HTF):
73.5% Diphenyl Ether, cas: 101848
26.5% Biphenyl, cas 92524
Boiling Point 495 F
Liquid Range: 54 F to 750 F
Vapor Range: 500 F to 750 F
Normal Solar Temp Range : 54 F to 739 F
Vapor Pressure at 20 C = <0.0026 kPa
Temp at VP of 0.3 kPa = > 280 F
Valve count = 6,100
Pump Seal count = 8
Connector count = 15,188
Pressure Relief Valve count = 20

References:

Synthetic Organic Chemical Manufacturing Industry (SOCMI)

Includes the primary production of SOCMI chemicals listed in 40 CFR Chapter I, Part 60, Subpart YYY – Standards of Performance for VOC Emissions from SOCMI Wastewater, Table 1 which lists the production of over 720 specific chemicals including Diphenyl Ether and Biphenyl.

EPA 450/3-83-006: Control of VOC Leaks from Synthetic Organic Chemical and Polymer Manufacturing Equipment, March 1984

Section 2.3.1.2 Model Unit Components: "Data from petroleum facilities indicate that emission rates of sources decrease as the vapor pressure (volatility) of the process fluid decreases. Three classes of volatility have been established based on the petroleum refinery data. These include gas/vapor service, light liquid service, and heavy liquid service. The split between light and heavy liquids for the refinery data is between naptha and kerosene. Since similar stream names may have different vapor pressures, depending on site specific factors, it is difficult to quantify the light-heavy split. The break point is approximately at a vapor pressure of 0.3 kPa at 20°C."

EPA-453/R-95-017: Protocol for Equipment Leak Emission Estimates, November 1995

The protocol describes 4 approaches for estimating equipment leaks. The approaches are listed in order of increasing refinement:

1) Average Emission Factor Approach
2) Screening Ranges Approach
3) EPA Correlation Approach
4) Unit-Specific Correlation Approach

Except for the Average Emission Factor Approach, all of the approaches require screening data. Screening data are collected by using a portable monitoring instrument to sample air from potential leak interfaces on individual pieces of equipment. In addition to equipment counts and screening data, the Unit-Specific Correlation Approach requires bagging data. Each of the approaches is applicable to any chemical-handling facility. However, EPA has developed more than one set of emission factors and correlations, and the type of process unit being considered governs which set must be used to estimate emissions. Historical data collection on emissions from equipment leaks in SOCMI, refineries, marketing terminals, and oil and gas production operations have yielded emission factors and correlations for these source categories. Emission factors and correlations for other source categories have not been developed. For process units in source categories for which emission factors and/or correlations have not

been developed, the factors and/or correlations already developed can be utilized. Criteria for determining the appropriateness of applying existing emission factors and correlations to another source category may include one or more of the following: (1) process design, (2) process operation parameters (i.e. pressure and temperature), (3) types of equipment used, and (4) types of material handled.

EPA AP-42, Compilation of Air Pollutant Emission Factors, 5th edition, January 1995 with supplements and updates though June 2010

Although this document does not have a specific chapter dealing with VOC fugitive emissions at a Solar Thermal Energy facility, a reference towards VOC fugitive emissions is discussed under Section 5.1.3 – Fugitive Emissions and Controls of Chapter 5.1 Petroleum Refining of AP-42. This section states that fugitive emission factors can be found in the following reference: EPA-453/R-93-026: Protocol for Equipment Leak Emission Estimates, June 1993, or subsequent updates. Emissions Calculations are calculated pursuant to AP-42, January 1995 with supplements and updates through June 2010.

Determination of Type, Count, Industry and Service of Fugitive Component

Industry Classification: Heat Transfer Fluid circulation within a closed circuit piping system is not specifically classified as one of the EPA identified fugitive source categories of SOCMI, Refinery, Marketing Terminals, or Oil and Gas production operations. The process operational parameters of pressure and temperature corresponds closest to SOCMI manufacturing operations. The type of equipment which includes piping, heating and cooling would generally apply to SOCMI. Finally, the type of materials handled is clearly specified in the SOCMI manufacturing listing in several EPA definitions for this industry. Based upon the above discussion, the most appropriate industry classification other than establishing a new classification would be the use of the SOCMI emission factors and/or correlations.

Service Classification: The HTF operates between a temperature range of 54 F to 739 F during a normal operating day. For approximately 8 hours per day, the HTF is not heated by the solar array and the temperature drops well below the boiling point of 495 F. For the remaining 16 hours, the HTF will operate at an elevated level with a maximum temperature of 739 F. To be conservative, AQMD has determined that light liquid is the most appropriate service classification.

Determination of Appropriate Approach

1) Average Emission Factor Approach
   EPA Protocol Table 2-1 provides SOCMI average emission factors for gas, light liquid, and heavy liquid for each component type. This approach is the least refined and is best used when no monitoring data is available or if a leak detection and repair (LDAR) plan is not in effect. Since permit conditions will place an LDAR plan into effect, AQMD can move to a more refined approach for emission calculations.

2) Screening Ranges Approach
   EPA Protocol Table 2-5 provides SOCMI screening ranges emission factors for gas, light liquid, and heavy liquid for each component type. This approach is the more refined than the average emission factor approach and is best used when a LDAR plan is in effect. Since permit conditions will place an LDAR plan into effect which require recording of exact leak measurements in ppm

and not just a measurement of 10,000 ppm or greater as required under the screening ranges approach, AQMD can move to a more refined approach for emission calculations.

3) EPA Correlation Approach
The EPA Correlation Approach is preferred when actual screening values are available. Correlations can be used to estimate emissions for the entire range of non-zero screening values from the highest potential screening value to the screening value that represents the minimum detection limit of the monitoring device. This approach involves entering the non-zero, non-pegged screening value into the correlation equation, which predicts the TOC mass emission rate based on the screening value. Since the LDAR plan requires leak fixing once a measured screening value of 100 ppmv is exceeded, this value of 100 ppmv will be used in the correlation equation to determine emissions factors (see Table 3 below). EPA Protocol Table 2-9 lists the SOCMI correlation equations for non-zero screening values while EPA Protocol Table 2-11 lists the SOCMI default-zero emission rates. Note that AP-42 states that the SOCMI light liquid pump correlation equations are acceptable to be used to estimate emissions for compressor seals, and pressure relief valves.

Table 3: SOCMI Correlation Equations

Equipment Type	SOCMI Correlation Equations	Emission Factor at SV=100 ppmv (kg/hr-component)	Emission Factor at SV=100 ppmv (lb/hr-component)
Light Liquid Valves	$kg/hr = 6.41E-06 \times (SV)^{0.797}$	0.0002517	0.0005547
Light Liquid Pumps	$kg/hr = 1.90E-05 \times (SV)^{0.824}$	0.0008448	0.0018619
Compressors seals	$kg/hr = 1.90E-05 \times (SV)^{0.824}$	0.0008448	0.0018619
Pressure Relief Valves	$kg/hr = 1.90E-05 \times (SV)^{0.824}$	0.0008448	0.0018619
Connectors	$kg/hr = 3.05E-06 \times (SV)^{0.885}$	0.0001796	0.0003958

4) Unit-Specific Correlation Approach
Since AQMD will not be seeking to determine a new correlation factor for this type of process, this approach will not be utilized.

Calculation of Emissions

AQMD has reviewed three different calculation methodologies for determination of fugitive VOC emissions from the proposed Palen Solar Power Project. The three methods are described below:

CEC/CURE Methodology

CEC and CURE based the fugitive emissions for the proposed Palen Solar Power Project on the Ridgecrest Solar Power Project, a plant very similar to the proposed Palen Solar Power Plant. The analysis assumed light liquids at 16 hours/day and heavy liquids at 8 hours/day. The light liquid factor for valves and pump seals was based on SOCMI correlation equations with a screening level of 100 ppmv. The light liquid factor for PRVs was based on the SOCMI screening range emission factors with a screening level of 10,000 ppmv. The light liquid factor for connectors was based on the default-zero factors for SOCMI process units. The basis for using the default-zero emission factor for connectors was not sufficiently explained. Further review of the methodology indicated that this approach was not appropriate over all operational scenarios.

Palen Methodology

AQMD staff reviewed Palen's approach in Table 4 below to determine the fugitive emissions from the proposed Palen Solar Power Plant. Palen calculated the VOC emissions from the proposed project by using the correlation equations for oil & gas production operations and the emission factors for heavy oil found in the EPAs 1995 Protocol for Equipment Leak Emission Estimates over a 24 hour period. Please note that this calculation was based on the component counts that were previously provided by Palen. These component counts were subsequently changed. The VOC emissions as calculated by Palen are shown below at 1.595 TPY for the entire facility:

Table 4: Palen Solar Power's Calculation Procedure

Equipment	Component Count	Emission Factor (kg/hr-component)	Emission Factor (lb/hr-component)	Hours	Emissions (lb/day)
Valves: heavy oil	6,100	0.0000084	0.0000185	24	2.7087
Pump Seals: water/oil	8	0.0000240	0.0000529	24	0.0101
Connectors: heavy oil	15,188	0.0000075	0.0000165	24	6.0144
PRVs: heavy oil	20	0.0000084	0.0000185	24	0.0089
				TOTAL EMISSIONS	8.7422
					1.595 TPY

However, the use of correlation equations for oil and gas production and the emission factors for heavy oil are not appropriate when the HTF is heated to high temperatures (well above its boiling point of 495 degrees F). At this point, the HTF will expand and exhibit an increased volatility and thus higher VOC emissions. Palen's approach was pointed out to be non-conducive with the level of LDAR program proposed or deemed acceptable by AQMD. Therefore, AQMD staff does not believe that the Palen approach is appropriate for determining fugitive VOC emissions from the proposed project.

AQMD Methodology

AQMD's methodology included review of three EPA procedures to determine the fugitive emissions from the proposed Palen Solar Power Project. The first procedure is based on the EPA SOCMI Average Emission Factors listed in Table 2-1 of the November 1995 Protocol for Leak Emission Estimates using the service classification data. The second procedure is based on the EPA SOCMI Screening Range Emission Factors listed in Table 2-5 of the November 1995 Protocol for Leak Emission Estimates with the screening values less than 10,000 ppmv. The third procedure is based on the EPA SOCMI Correlation Equations in Table 2-9 of the November 1995 Protocol for Leak Emission Estimates using a screening value of 100 ppmv and operating 24 hours/day, 365 days/year. The range of emissions from the three different procedures shows the results to be widely scattered and that there is currently no single industry group or fugitive emission calculation procedure which would best fit the solar power plant industry. Therefore, it was concluded that based on the process operational parameters of temperature and pressure, the type of equipment and materials handled, including piping, heating and cooling, AQMD staff considered that the most appropriate calculation procedure would be the use of the SOCMI correlation equations and light liquid emission factors for valves, pump seals, connectors, and PRVs.

Based upon AQMD's experience, it was estimated that the percentage of leaks from chemical and oil refinery facilities with a Rule 1173 inspection plan was less than 1% for the entire range of source component types (flanges, valves, connectors, pumps, and pressure relief valves (PRVs)). Therefore, to ensure that a conservative approach is used to estimate fugitive emissions from losses through the range of source component types, the 1% of leaks is appropriate for solar plants to determine fugitive emissions from the HTF until such time actual compliance data from solar power plants is available. As a result, AQMD further refined the procedure by calculating the fugitive emissions by assuming that 1% of these components would leak at 100 ppmv and that the remaining 99% of these components would leak at 50

ppmv or half of the action level selected. This refinement is based on results obtained from inspection and maintenance (I&M) programs currently in place at existing facilities. AQMD staff indicated, and Palen representatives agreed to the inclusion of an extensive I&M program for the proposed project.

To accurately determine the fugitive VOC emissions from the proposed project, Palen has submitted a revised component count per AQMD's request. This revised component count is used to calculate the fugitive VOC emissions from the proposed facility. Also, the applicant has elected to use rupture disks upstream of the PRV's and therefore, no VOC emissions are expected from the PRVs.

Based on AQMD's independent internal research along with the revised component count from the proposed facility, as provided by Palen representatives and their consultant, the fugitive emissions from the proposed Palen Solar Power Plant as determined using the SOCMI correlation equations (as shown in Table 5 below) and the above assumptions with a screening value of 100 ppmv are estimated as shown in Table 6 below:

Assumptions:

1. For valves, pump seals and connectors, assume leak rate and SV are variable, with 1% of the components leaking at SV = 100 ppmv and the remaining 99% of the components leaking at ½ SV = 50 ppmv.
2. Operating schedule: 24/7/365
3. Emissions from valves, pump seals, and connectors are based on SOCMI Screening Value Correlation Equations in Table 2-9 of the EPA document 453/R-95-017: Protocol for Equipment Leak Emission Estimates, November 1995.
4. Emissions from the PRVs are zero because they will either vent to the expansion tanks or be equipped with rupture disks.

Table 5: SOCMI Correlation Equations

Equipment Type	SOCMI Correlation Equations
Light Liquid Valves	$kg/hr = 6.41E\text{-}06 \times (SV)^{0.797}$
Light Liquid Pumps	$kg/hr = 1.90E\text{-}05 \times (SV)^{0.824}$
Connectors	$kg/hr = 3.05E\text{-}06 \times (SV)^{0.885}$

SOCMI Correlation Equation Results:

Valves = $3,937[6.41EE\text{-}6 \times (100)^{0.797} \times 0.01] + 3,937[6.41EE\text{-}6 \times (50)^{0.797} \times 0.99] = 0.5745$ kg/hr

Pump Seals = $18[1.90EE\text{-}5 \times (100)^{0.824} \times 0.01] + 18[1.90EE\text{-}5 \times (50)^{0.824} \times 0.99] = 0.0.0087$ kg/hr

Connectors = $4,182[3.05EE\text{-}6 \times (100)^{0.885} \times 0.01] + 4,182[3.05EE\text{-}6 \times (50)^{0.885} \times 0.99] = 0.4101$ kg/hr

Annual Emissions:

Valves = 0.5745 kg/hr * 2.205 lb/kg * 8,760 hr/yr * 1 ton/2,000 lb = 5.5485 TPY

Pump Seals = 0.0087 kg/hr * 2.205 lb/kg * 8,760 hr/yr * 1 ton/2,000 lb = 0.0836 TPY

Connectors = 0.4101 kg/hr * 2.205 lb/kg * 8,760 hr/yr * 1 ton/2,000 lb = 3.9611 TPY

Monthly Emissions

Monthly Emissions = (Annual Emissions, ton/yr)(2,000 lb/ton)(1 yr/12 months)

30 Day Average

30DA = (Monthly Emissions, lb/month)(1 month/30 days)

Table 6 - Fugitive VOC Emissions from Proposed Palen Solar Power Plant

Component	Revised Component Count	SOCMI Correlation Equation Result, kg/hr	Annual Emissions, TPY	Annual Emissions, lb/yr	Monthly Emissions, lb/month	30DA (lb/day)
Valves	3,937	0.5745	5.5485	1,1097.02	924.75	30.83
Pump Seals	18	0.0087	0.0836	167.19	13.93	0.464
Connectors	4,182	0.4101	3.9611	7,922.22	660.18	22.01
		TOTAL	**9.5932**	**19,186.44**	**1,598.87**	**53.30**

Auxiliary Boilers

The auxiliary boilers will be operated under the following assumptions and are the basis for emission calculations

- Propane will be the only fuel used by the boilers;
- Boilers will be equipped with ultra-low-NOx (9 parts per million by volume) burners;
- Normal operation of each boiler will be 2 hours/day at full load and 12 hours/day at 25% load;
- Annual operation of each boiler will be based on 730 hours at full load and 4,380 hours at 25% load for a total of 5,110 hours of annual operation;
- 100 percent of the PM10 emissions are PM2.5

The criteria pollutant emission factors used for the NOx and CO emission estimates are based on the current BACT requirements of ≤ 9 ppmv and ≤ 50 ppmv respectively, each at 3% O2, dry basis. The BACT Guidelines for Minor Sources indicates no BACT requirements for VOC and the use of natural gas for PM10. The PM10 and VOC emission factors are based on vendor performance warranties (0.01 lb/MMBTU for PM10 and 0.005 lb/MMBTU for VOC, respectively), and the SOx emission factor was taken from the SCAQMD 2008 Annual Emission Report General Instruction Book for external propane combustion (0.0113 lb/MMBTU). Boiler criteria pollutant emissions for a single boiler and two boilers are shown in the calculation sheets at the end of this engineering evaluation and summarized in Tables 7 and 8 below, respectively (Note 30-DA means 30-day average emissions).

Table 7: Auxiliary Boiler Criteria Polluant Emissions (One Boiler)

Pollutant	Emission Factor (lb/MMBTU)	Maximum Hourly (lb/hr)	Maximum Daily (lb/day)	Annual (lb/yr)	Monthly (lb/month)	30-DA (lb/day)
NOx	0.0111	0.3885	1.943	709.01	59.08	1.97
VOC	0.0050	0.1750	0.875	319.38	26.62	0.89
CO	0.0376	1.3160	6.580	2,401.70	200.14	6.67
PM10	0.0100	0.3500	1.750	638.75	53.23	1.77
PM2.5	0.0100	0.3500	1.750	638.75	53.23	1.77
SOx	0.0113	0.3955	1.978	721.79	60.15	2.00

Table 8: Auxiliary Boiler Criteria Polluant Emissions (Two Boilers)

Pollutant	Emission Factor (lb/MMBTU)	Maximum Hourly (lb/hr)	Maximum Daily (lb/day)	Annual (lb/yr)	Monthly (lb/month)	30-DA (lb/day)
NOx	0.0111	0.7770	3.885	1,418.03	118.17	3.94
VOC	0.0050	0.3500	1.750	638.75	53.23	1.77
CO	0.0376	2.6320	13.160	4,803.40	400.28	13.34
PM10	0.0100	0.7000	3.500	1,277.50	106.46	3.55
PM2.5	0.0100	0.7000	3.500	1,277.50	106.46	3.55
SOx	0.0113	0.7910	3.955	1,443.58	120.30	4.01

Emergency Fire Water Pump Engines

The assumptions made regarding emergency fire pump engine operation are listed below:

- Engines will use ultra-low sulfur (15 parts per million by weight) diesel fuel;
- Engines have Tier 3 Certification;
- Engine emissions are based on a single one-hour test per week per engine, not to exceed 50 hours per year, and will be limited to an annual maximum of 200 hr/yr emergency use. Note the 200 hr/yr limit is inclusive of the allotted 50 hr/yr for maintenance and testing;

Emission estimates are based on emission factors for EPA Tier 3 certified engines, as determined by the BACT Guidelines for Minor Sources. Emission estimates for SOx are based on estimated fuel use of 15.3 gallons per hour for each engine with a heating value of 137,000 Btu per gallon and fuel sulfur content of 15 ppm by weight. Fire pump engine criteria pollutant emissions for a single engine and two engines are shown per the calculation sheets at the end of this engineering evaluation and summarized in Tables 9 and 10 below, respectively.

Table 9: Emergency Fire Water Pump Emissions (One Engine)

Pollutant	Emission Factor (gm/bhp-hr)	Hourly (lb/hr)	Annual (lb/yr)	Monthly (lb/month)	30-DA (lb/day)
NOx	2.85	1.88	94.16	7.85	0.2616
VOC	0.15	0.099	4.96	0.41	0.0138
CO	2.60	1.72	85.90	7.16	0.2386
PM10	0.15	0.099	4.96	0.41	0.0138
PM2.5	0.15	0.099	4.96	0.41	0.0138
SOx		0.0033	0.17	0.01	0.0005

Table 10: Emergency Fire Water Pump Emissions (Two Engines)

Pollutant	Emission Factor (gm/bhp-hr)	Hourly (lb/hr)	Annual (lb/yr)	Monthly (lb/month)	30-DA (lb/day)
NOx	2.85	3.76	188.32	15.70	0.5234
VOC	0.15	0.20	9.92	0.82	0.0276
CO	2.60	3.44	171.80	14.32	0.4772
PM10	0.15	0.20	9.92	0.82	0.0276
PM2.5	0.15	0.20	9.92	0.82	0.0276
SOx		0.0066	0.34	0.02	0.0010

Emergency Electrical Generators

The assumptions made regarding emergency electrical generator engine operation are listed below:

- Engines will use ultra-low sulfur (15 parts per million by weight) diesel fuel;
- Engines have Tier 2 Certification;
- Engine emissions are based on a single one-hour test per week per engine, not to exceed 50 hours per year, and will be limited to an annual maximum of 200 hr/yr emergency use. Note the 200 hr/yr limit is inclusive of the allotted 50 hr/yr for maintenance and testing;

Emission estimates are based on emission factors for EPA Tier 2 certified engines, as determined by the BACT Guidelines for Minor Sources. Emission estimates for SOx are based on estimated fuel use of 141.4 gallons per hour for each engine and fuel sulfur content of 15 ppm by weight. Emergency electrical generator engine emissions for a single engine and two engines are shown in the calculation sheets at the end of the engineering evaluation and summarized in Tables 11 and 12 below, respectively.

Table 11: Emergency Electrical Generator Emissions (One Engine)

Pollutant	Emission Factor (gm/bhp-hr)	Hourly (lb/hr)	Annual (lb/yr)	Monthly (lb/month)	30-DA (lb/day)
NOx	4.56	29.35	1,467.44	122.28	4.076
VOC	0.24	1.54	77.23	6.44	0.214
CO	2.60	16.73	836.70	69.72	2.324
PM10	0.15	0.965	48.27	4.02	0.134
PM2.5	0.15	0.965	48.27	4.02	0.134
SOx		0.0305	1.53	0.13	0.004

Table 12: Emergency Electrical Generator Emissions (Two Engines)

Pollutant	Emission Factor (gm/bhp-hr)	Hourly (lb/hr)	Annual (lb/yr)	Monthly (lb/month)	30-DA (lb/day)
NOx	4.56	58.70	2,934.88	244.56	8.152
VOC	0.24	3.08	154.46	12.88	0.428
CO	2.60	33.46	1,673.40	139.44	4.648
PM10	0.15	1.93	96.54	8.04	0.268
PM2.5	0.15	1.93	96.54	8.04	0.268
SOx		0.061	3.06	0.26	0.008

Ullage System Vent Emissions

The VOC emissions from the HTF expansion/ullage tank and the proposed operation schedule were estimated by the consultant based on experience gained from the operations of a similarly sized solar power plant currently in operation in Spain. This plant is periodically monitored by personnel on site at least once per week by manually testing the HTF for contaminants. The ullage system in operation on the plant in Spain is activated manually by site personnel when the percentage of high-end volatiles in the HTF exceeds a certain maximum concentration. The assumptions made regarding HTF ullage system proposed for the Palen Solar Power Plant are as follows:

- Two HTF ullage systems
- The VOC emissions are controlled with the use of two carbon adsorption canisters in series with an overall control efficiency of 98 percent;
- Maximum VOC emissions are 0.75 lb/hr or 1.5 lb/day after pollution control;
- The HTF ullage system are vented for a maximum of two hours per day; and
- The maximum annual operation (i.e., venting of the ullage system to atmosphere, through controls) is estimated at 400 hours per year.

According to the applicant, the ullage system being proposed at the Palen Solar Power Plant will be operated periodically on an as-needed basis when the hydrocarbon contaminant percentage in the HTF reach a significant level. It is anticipated that there will be a total of 38,000 pounds of hydrocarbons removed annually from the HTF. The flash system is anticipated to operate 2 hours per day, 2 to 3 times per week over a 52 week period, which equates to 312 hours/year. Therefore the applicant's proposal to operate the system for a maximum of 400 hours/year should be adequate. The applicant has indicated that the two carbon adsorption systems will each contain 2000 pounds of activated carbon. The applicant has agreed to provide AQMD with monitoring and test data for the ullage system as a means to confirm adequacy of the proposed operation of 400 hours/year and proposed carbon replacement schedule of 5 times per month. In addition, the applicant will be required to maintain at least 10 extra canisters of activated carbon on-site to ensure sufficient activated carbon is available for the carbon adsorption system at all times.

It is assumed that the VOC emissions from the HTF storage tank(s) are negligible, as HTF has a negligible vapor pressure below about 300°F. Similarly, it is assumed that there will no VOC emissions from waste load out of heavy ends from the ullage system as the heavy ends are expected to have a vapor pressure that is substantially lower than the HTF fluid itself, and the vapor pressure of HTF at ambient conditions is negligible. The ullage system emissions (excluding fugitives) are shown in the calculation sheets at the end of this engineering evaluation and summarized in Table 13 for a single system and Table 14 for both systems:

Table 13: Ullage System VOC Emissions (One system)

Source	Hourly Uncontrolled (lb/hr)	Hourly Controlled (lb/hr)	Max Hourly Uncontrolled (lb/hr)	Max Hourly Controlled (lb/hr)	Max Daily Uncontrolled (lb/day)	Max Daily Controlled (lb/day)	Annual (lb/yr)	Monthly (lb/month)	30-DA (lb/day)
Ullage System Vent	1.71	0.034	37.50	0.75	75.00	1.50	300	25	0.833

Table 14: Ullage System VOC Emissions (Two systems)

Source	Hourly Uncontrolled (lb/hr)	Hourly Controlled (lb/hr)	Max Hourly Uncontrolled (lb/hr)	Max Hourly Controlled (lb/hr)	Max Daily Uncontrolled (lb/day)	Max Daily Controlled (lb/day)	Annual (lb/yr)	Monthly (lb/month)	30-DA (lb/day)
Ullage System Vent	3.42	0.068	75.00	1.50	150.00	3.0	600	50	1.67

Bio-Remediation (Land Treatment) Unit VOC Emissions

The vapor pressure of the VOC contaminants at ambient temperature is expected to be less than 0.0004 psia based on information submitted by the HTF manufacturer. Therefore, the expected VOC emissions from the bio-remediation unit are assumed to be negligible and have not been estimated for this application.

Project Emissions Summary

Table 15 below shows the annual emissions from the entire facility. Note the emissions from the emergency fire pump and emergency electrical generator were computed assuming the annual operation for the engines is 50 hours/year.

Table 15: Emissions from the Proposed Palen Solar Power Plant

Source	Pollutant (lb/yr)					
	NOx	VOC	CO	PM10	PM2.5	SOx
Auxiliary Boilers	1,418.03	638.75	4,803.40	1,277.50	1,277.50	1,443.58
Emergency Fire Water Pump Engines[1]	188.32	9.92	171.80	9.92	9.92	0.34
Emergency Generator Engines[1]	2,934.88	154.46	1,673.40	96.54	96.54	3.06
Ullage System	---	600.00	---	---	---	---
Fugitive Emissions	---	19,186.40	---	---	---	---
LTU	---	0	---	---	---	---
Facility Total (lb/yr)	**4,541.23**	**20,589.53**	**6,648.60**	**1,383.96**	**1,383.96**	**1,446.98**
Facility Total (TPY)	**2.27**	**10.29**	**3.32**	**0.69**	**0.69**	**0.72**
Facility Total (lb/month)	**378.44**	**1,715.80**	**554.05**	**115.33**	**115.33**	**120.58**
Facility 30DA (lb/day)	**12.61**	**57.19**	**18.47**	**3.84**	**3.84**	**4.02**

[1] Note the emergency internal combustion engines are exempt from modeling and offsets under AQMD Rule 1304(a)(4)

Project Emissions Subject to Offsets

Table 16 below shows that only VOC emissions from the proposed Palen Solar Power Plant will exceed the facility threshold in AQMD Rule 1304(a)(4). Therefore, only VOC emissions are subject to offsets. See Table 19 for further details regarding offsets.

Table 16: Emissions from the Proposed Palen Solar Power Plant Subject to Offsets (Excludes IC engines)

Source	Pollutant					
	NOx	VOC	CO	PM10	PM2.5	SOx
Auxiliary Boilers (lb/yr)	1,418.03	638.75	4,803.40	1,277.50	1,277.50	1,443.58
Ullage System + Fugitive (lb/yr)	---	19,786.40	---	---	---	---
Auxiliary Boilers (lb/month)	118.17	53.23	400.28	106.46	106.46	120.30
Ullage System + Fugitive (lb/month)	---	1,648.87	---	---	---	---
Auxiliary Boilers 30DA (lb/day)	3.94	1.77	13.34	3.55	3.55	4.01
Ullage System + Fugitive 30DA (lb/day)	---	54.97	---	---	---	---
LTU	---	0	---	---	---	---
Facility Total (lb/yr)	**1,418.03**	**20,425.15**	**4,803.40**	**1,277.50**	**1,277.50**	**1,443.58**
Facility Total (TPY)	**0.709**	**10.21**	**2.40**	**0.639**	**0.639**	**0.722**
Facility Threshold (TPY)	**4**	**4**	**29**	**4**	**4**	**4**
Subject to Offsets (Yes/No)	**No**	**Yes**	**No**	**No**	**No**	**No**
Facility Total (lb/month)	**118.17**	**1,702.10**	**400.28**	**106.46**	**106.46**	**120.30**
Facility 30DA (lb/day)	**3.94**	**56.74**	**13.34**	**3.55**	**3.55**	**4.01**

Toxic Air Contaminants

Toxic air contaminant (TAC) emissions are estimated for normal operations of each emissions unit. The TAC emissions from the auxiliary boilers, emergency fire water pump and generator engines, and HTF ullage system vent were calculated.

Auxiliary Boiler and HTF Heater TAC Emission Calculations

AP-42 does not provide TAC emission factors for the combustion of propane, so the TAC emissions from the auxiliary boilers were estimated based on EPA AP-42 emission factors for natural gas combustion.

Emergency Engine TAC Emission Calculations

TAC emissions from the emergency fire water pump and generator engines were quantified for routine testing and maintenance operation, which will be no more than one hour per day, 50 hours per year, per engine. Emissions are not calculated for emergency use. The TAC emissions were characterized as aggregate particulate emissions (diesel particulate matter [DPM]) from diesel-fired engines. The DPM emissions are assumed to be equal to the PM10 emissions.

HTF Ullage System Vent TAC Emissions

The total uncontrolled TAC emissions from the HTF ullage tank vent were estimated based on data provided by an existing solar thermal parabolic trough plant and extrapolated to account for HTF system size. HTF is composed of approximately 75 percent diphenyl ether and 25 percent biphenyl. For this application, because both of these compounds contain benzene rings, it was conservatively assumed that the HTF breakdown products would consist primarily (approximately 99 percent) of benzene. Controlled emissions were calculated based on the use of two carbon adsorption canisters in series with an overall control efficiency of 98 percent.

Fugitive TAC Emissions

The toxic emissions (benzene) due to fugitives is assumed to be 1% of the total fugitive emissions or 0.01(19,186 lb/yr) = 191.86 lb/yr. Since there are two ullage systems, the toxic emissions per system are (191.86 lb/yr)/2 = 96 lb/yr. The toxic emissions per ullage system = 300 lb/yr(0.99) = 297 lb/yr. Therefore, the total benzene emissions from a single ullage system (including fugitives) are 96 lb/yr + 297 lb/yr = 393 lb/yr, shown in Table 17 below.

Table 17 below lists the breakdown of the TAC emissions for each permit unit.

Table 17: TAC Emissions By Permit Unit (Note that TAC emissions below represent a single permit unit. The totals for both units are shown in the bottom row)

Pollutant	Auxiliary Boiler		Fire Water Pump		Generator		Ullage System		
	Hourly lb/hr	Annual lb/yr	Hourly lb/hr	Annual lb/yr	Hourly lb/hr	Annual lb/yr	Hourly (R1) lb/hr	Hourly (R2) lb/hr	Annual lb/yr
7,12-Dimethylbenz(a)anthracene	5.49E-07	9.47E-04							
Acenaphthene	6.18E-08	1.07E-04							
Acenaphthylene	6.18E-08	1.42E-04							
Anthracene	8.24E-08	1.42E-04							
Benz(a)anthracene	6.18E-08	1.07E-04							
Benzene	7.21E-05	1.24E-01					3.75E+01	7.50E-01	3.93E0+2
Benzo(a)pyrene	4.12E-08	7.01E-05							
Benzo(b)fluoranthene	6.18E-08	1.07E-05							
Benzo(g,h,i)perylene	4.12E-08	7.01E-05							
Benzo(k)fluoranthene	6.18E-08	1.07E-05							
Biphenyl	0	--					3.75E-03	7.50E-05	3.00E-02
Chrysene	6.18E-08	1.07E-04							
Dibenz(a,h)anthracene	4.12E-08	7.01E-05							

Table 17: TAC Emissions By Permit Unit (Note that TAC emissions below represent a single permit unit. The totals for both units are shown in the bottom row)

Pollutant	Auxiliary Boiler		Fire Water Pump		Generator		Ullage System		
	Hourly lb/hr	Annual lb/yr	Hourly lb/hr	Annual lb/yr	Hourly lb/hr	Annual lb/yr	Hourly (R1) lb/hr	Hourly (R2) lb/hr	Annual lb/yr
Dichlorobenzene	4.12E-05	7.01E-02							
Diesel Particulate Matter	0	--	9.91E-02	4.96E+00	9.65E-01	4.83+01			
Fluoranthene	1.03E-07	1.78E-04							
Formaldehyde	2.57E-03	4.44E+00							
Hexane	6.18E-02	1.07E-02							
Indeno(1,2,3-cd)pyrene	6.18E-08	1.01E-03							
Naphthalene	2.09E-05	3.61E+02							
Phenanthrene	5.83E-07	1.01E-03							
Pyrene	1.72E-07	2.96E-04							
Toluene	1.17E-04	2.01E-01							
TOTAL FOR SINGLE SYSTEM	0.0646	111.42	9.91E-02	4.96	9.91E-02	4.83	37.50	0.75	393
TOTAL FOR BOTH SYSTEMS	0.1292	222.84	1.982E-01	9.92	1.98E-01	9.66	75.00	1.50	786

PROHIBITORY RULE EVALUATION

RULE 212 - Standards for Approving Permits

Rule 212 requires that a person shall not build, erect, install, alter, or replace any equipment, the use of which may cause the issuance of air contaminants or the use of which may eliminate, reduce, or control the issuance of air contaminants without first obtaining written authorization for such construction from the Executive Officer. Rule 212(c) states that a project requires written notification if there is an emission increase for ANY criteria pollutant in excess of the daily maximums specified in Rule 212(g), if the equipment is located within 1,000 feet of the outer boundary of a school, or if the MICR is equal to or greater than one in a million (1EE-6). The VOC emissions from this facility are expected to exceed the daily maximum limit of 30 lb/day and the revised HRA indicates the MICR is expected to be 1.32EE-6 for ullage system no. 1. Therefore, a public notice is required for the PSPP. A Public Notice will be prepared and published in a local newspaper in accordance with the applicable AQMD Rules and Regulations.

RULE 401 - Visible Emissions

This rule limits visible emissions to an opacity of less than 20 percent (Ringlemann No.1), as published by the United States Bureau of Mines. The applicant will use equipment configured with BACT and will be burning propane in the auxiliary boilers. Therefore, during normal operation, no visible emissions are expected. Compliance with this rule is expected.

RULE 402 - Nuisance

A person must not discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health or safety of any such persons or the public, or which cause, or have a natural tendency to cause, injury or damage to business or property. Due to the application of BACT on each emission source and the distance from the emission sources to any potential receptors, the Project will comply with this rule.

RULE 403 - Fugitive Dust

The purpose of this rule is to reduce the amount of particulate matter entrained in the ambient air as a result of man-made fugitive dust sources by requiring actions to prevent, reduce, or mitigate fugitive dust

emissions. The provisions of this rule apply to any activity or man-made condition capable of generating fugitive dust. This rule prohibits emissions of fugitive dust beyond the property line of the emission source. The applicant will be taking steps to prevent and/or reduce or mitigate fugitive dust emissions from the project site. Such measures include covering loose material on haul vehicles, watering, and using chemical stabilizers when necessary. The PSPP is expected to comply with this rule.

RULE 431.1 - Sulfur Content of Gaseous Fuels

The purpose of this rule is to reduce SOx emissions from the burning of gaseous fuels in stationary equipment requiring a PTO by the District. PSPP will use propane fuel for the boilers which complies with the sulfur requirement of this rule.

RULE 463 - Storage of Organic Liquids

No person is allowed to place, store or hold in any tank with a capacity of 39,630 gallons or greater, any organic liquid having a true vapor pressure of 25.8 millimeters mercury (mmHg) (0.5 pounds per square inch [psi]) absolute or greater under actual storage conditions, and in any tank of more than 75,000 liters (19,815 gallons) capacity, any organic liquid having a true vapor pressure of 77.5 mm Hg (1.5 psi) absolute or greater under actual storage conditions, unless such tank is a pressure tank maintaining working pressures sufficient at all times to prevent organic vapor loss to the atmosphere, or is designed and equipped with an approved vapor control device. The PSPP will have insulating mineral oil (transformers), hydraulic oil (steam turbine and other equipment), and lubricating oil on site, all of which are stored in quantities less than 39,630 gallons and which have a true vapor pressure less than 1 psi at 68°F. The Project also will store diesel, which has a vapor pressure of 0.008 psia (0.40 mm of mercury), on site in quantities less than 39,630 gallons. HTF will be stored in 15,900-gallon tanks. The vapor pressure of HTF is 0.019 mmHg at 80°F. Because these vapor pressures are below prescribed limits for these tank volumes, the project will comply with this rule.

RULE 474 - Fuel Burning Equipment-Oxides of Nitrogen

A person is not allowed to discharge into the atmosphere from any non-mobile fuel burning equipment NOx in excess of the concentrations specified in the rule. The Project is expected to comply with this rule with the use of ultra-low-NOx burners and propane fuel in the auxiliary boilers. The fire water pumps and emergency generator engines comply with this requirement through the use of Tier 2 & Tier 3 compliance engines.

Rule 1110.2 - Emissions from Gaseous and Liquid-Fueled Internal Combustion Engines

The purpose of Rule 1110.2 is to reduce NOx, VOC, and CO from internal combustion engines. The diesel engines proposed for this Project are low-usage engines which will each operate less than 200 hours per year and which will be used for firefighting and emergency purposes, and are therefore exempt from the requirements of this rule. Elapsed operating time meters will be installed and maintained on each engine to substantiate compliance.

Rule 1146 - Emissions of Oxides of Nitrogen from Industrial, Institutional and Commercial Boilers, Steam Generators and Process Heaters

The purpose of this rule is to limit NOx emissions from boilers, steam generators, and process heaters of greater than 5 MMBtu per hour rated input capacity used in industrial, institutional, and commercial operations with several listed exceptions. The rule specifies NOx limits and CO compliance plans for boilers, steam generators, and process heaters by size process function. The boilers will burn propane

exclusively and, will comply with NOx and CO BACT which is less than the 30 ppm NOx and 400 ppm CO limits in this rule. Compliance is expected.

Rule 1166 - Volatile Organic Compound Emissions from Decontamination of Soil

This rule sets forth requirements to control the VOC emissions from excavating, grading, handling and treating VOC-contaminated soil as a result of leakage from storage or transfer operations, accidental spillage, or other deposition. The requirements of this rule do not apply to:

- Decontamination of less than one cubic yard of contaminated soil;
- Contaminated soil removed for the sole purpose of sampling;
- Accidental spillage of five gallons or less of VOC-containing material; and
- Soil excavation or handling as a result of an emergency as declared by an authorized health officer, agricultural commissioner, fire protection officer, or other authorized agency officer. Whenever possible, the Executive Officer must be notified by telephone prior to commencing.

The soil decontamination planned for the Project is land farming or bioremediation of soils contaminated with HTF due to equipment leaks or spills. At ambient conditions, the HTF has a very low vapor pressure, and consequently the VOC emissions from this operation are expected to be negligible. However, the SCAQMD does not have an exemption for de minimis activities; thus the Project will comply with the rule by obtaining and commencing operation pursuant to a mitigation plan approved by the Executive Officer and applying the appropriate control measures, which may include covering the pile or applying a wetting agent. However, the applicant will be required to comply with an enhanced inspection and maintenance program to detect, report and repair leaks in the HTF piping system.

NEW SOURCE REVIEW (NSR) ANALYSIS

This regulation sets forth pre-construction review requirements for new, modified, or relocated facilities to ensure that the operation of such facilities does not interfere with progress in attainment of the National Ambient Air Quality Standards (NAAQS), and that future economic growth within the District is not unnecessarily restricted. The specific air quality goal of this regulation is to achieve no net increases from new or modified permitted sources of nonattainment air contaminants or their precursors. In addition to nonattainment air contaminants, this regulation also limits emission increases of ammonia and ozone depleting compounds from new, modified or relocated facilities by requiring the use of BACT on each permit unit.

BACT

The Executive Officer shall deny the Permit to Construct for any new source which results in an emission increase of any non-attainment air contaminant, any ozone depleting compound, or ammonia unless the applicant can demonstrate that BACT is employed for the new source. PSPP is a new source with a potential for an increase in emissions and therefore, BACT is required. The PSPP is a non-major source and as such BACT is determined in accordance with the BACT Guidelines for Non-Major Polluting Facilities – Part D. Below is an analysis of the BACT requirements for the major components of the PSPP. (Note for attainment contaminants, CO BACT is addressed under Regulation XVII section).

Auxiliary Boiler, 35 MMBTU/hr

Pollutant	Minor Source BACT	Proposed BACT	Comply (Yes/No)
NOx	≤9 ppmv @ 3% O2, dry	≤9 ppmv @ 3% O2, dry	Yes
VOC	None	None	Yes
PM10	Natural Gas	Propane fired	Yes
SOx	Natural Gas	Propane fired	Yes

Emergency Fire Pump, 300 bhp (300≤ bhp < 750)

Pollutant	Minor Source BACT (Tier 3)	Proposed BACT (Tier 3)	Comply (Yes/No)
NOx+NMHC	3.0 gm/bhp-hr	3.0 gm/bhp-hr	Yes
PM10	0.15 gm/bhp-hr	0.15 gm/bhp-hr	Yes
SOx	Fuel with sulfur content less than or equal to 15 ppm by weight	Fuel with sulfur content less than or equal to 15 ppm by weight	Yes

Emergency Electrical Generator, 2,922 bhp (bhp ≥ 750)

Pollutant	Minor Source BACT (Tier 2)	Proposed BACT (Tier 2)	Comply (Yes/No)
NOx+NMHC	4.8 gm/bhp-hr	4.8 gm/bhp-hr	Yes
PM10	0.15 gm/bhp-hr	0.15 gm/bhp-hr	Yes
SOx	Fuel with sulfur content less than or equal to 15 ppm by weight	Fuel with sulfur content less than or equal to 15 ppm by weight	Yes

HTF Expansion Tanks

Pollutant	Minor Source BACT	Proposed BACT	Comply (Yes/No)
NOx	None	None	Yes
VOC	Vapor recovery system with an overall system efficiency of 95%	Two-stage carbon adsorption system with overall control efficiency of 98%	Yes
PM10	None	None	Yes
SOx	None	None	Yes

Fugitive Emissions

Pollutant	Minor Source BACT	Proposed BACT	Comply (Yes/No)
VOC	Compliance with AQMD approved Inspection and Maintenance Program	AQMD approved Enhanced Inspection and Maintenance Program and PRVs equipped with rupture disks	Yes

Based on the above tables, the equipment will comply with the current minor source BACT requirements.

Offsets

The emissions from the proposed Palen Solar Power Plant are shown in Table 18 below:

Table 18: Facility Exemption Thresholds

Pollutant	Facility PTE (TPY)	Exemption Thresholds (TPY)
Nitrogen Oxides (NOx)	0.709	4
Volatile Organic Compounds (VOC)	10.21	4
Sulfur Oxides (SOx)	0.722	4
Particulate Matter < 10 microns (PM10)	0.639	4
Carbon Monoxide (CO)	2.40	29

As indicated in Table 18 above, VOC emissions are greater than the exemption thresholds shown. Therefore, the VOC emissions are required to be offset in accordance with Rule 1303(b)(2). The VOC's originate from boilers 1 & 2, ullage systems 1 & 2, and as fugitive emissions from the ullage systems,

including the expansion vessels and HTF piping systems. Therefore VOC ERCs are required for these permit units as shown in Table 19 below:

Table 19-Required VOC ERCs

PERMIT UNIT	VOC 30-DA (lb/day)	Offset Factor	VOC ERCs Required (lb/day)
Aux Boiler No.1	0.89	1.2	1
Aux Boiler No.2	0.89	1.2	1
Ullage System No.1 + Fugitives	27.48	1.2	33
Ullage System No.2 + Fugitives	27.48	1.2	33
		TOTAL ERCs REQUIRED	68

The total required VOC ERCs for the proposed Palen Solar Power Plant will be provided by Solar Millennium, LLC for each permit unit for a facility total of 68 lb/day. In addition, note that the emergency internal combustion engines are exempt from offsets under AQMD Rule 1304(a)(4). Compliance is expected.

PM2.5 Analysis

Effective July 15, 2008, EPA required AQMD to implement the New Source Review (NSR) program for fine particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers. Listed below are the definitions and requirements of this rule

Thresholds for Major Sources & Significant Emission Rates

- Major Source threshold for PM2.5 in attainment areas under PSD is 100 tpy for certain source categories listed in 40CFR 51.166(b)(1)(i)(a) & 52.21(b)(1)(i)(a) and 250 tpy for all other sources.
- Major source threshold for PM2.5 in non-attainment areas under NSR is 100 tpy.
- Significant Emission Rate threshold for PM2.5 is 10 tpy.

Requirements:

Attainment Areas (PSD)

- Effective date of the rule for both delegated and SIP-Approved State or Local (S/L) is July 15, 2008.
- Implementation date deadline for EPA & delegated S/L (40CFR 52.21) is July 15, 2008.
- Implementation date deadline for SIP-Approved S/L (40CRF 51.166) is July 15, 2011, until which time S/L follow PM10 surrogate policy.
- BACT applies to emission units at new major sources with significant emissions.
- BACT applies to all emission units that are part of a major modification at a major source.

Non-Attainment Areas (NA NSR)

- Effective date of the rule for both EPA (NA NSR rules in 40CFR part 51 Appendix S) and SIP-Approved S/L is July 15, 2008.
- Implementation date deadline for EPA under Appendix S is July 15, 2008, and can no longer use PM10 surrogate program any more.
- Implementation date deadline for S/L with SIP-Approved NA NSR rules is July 15, 2011 to revise SIP consistent with 40CFR 51.165, however until then and effective July 15, 2008, S/L must follow Appendix S requirements for PM2.5 and can no longer use PM10 surrogate. This

basically means that effective July 15, 2008 EPA and all S/L have to implement PM2.5 NA NSR through Appendix S.

- LAER, Offsets & other requirements for PM2.5 apply on effective date of Appendix S, or July 15, 2008 for emission units at new major sources or major modifications to an existing major source.

Palen Solar Power Project is located in the Salton Sea Air Basin, which is presently considered to be an attainment area for PM2.5. Therefore, BACT applies to both emission units at new major sources with significant emissions and to all emission units that are part of a major modification. Emissions calculations consider that all PM10 emissions are PM2.5 for all combustion devices. Based upon the facility's potential to emit, the PM2.5 emissions from the operations of Palen Solar Power Project will be significantly less than 100 tons/yr definition of a major source for PM2.5, and therefore is not subject to any requirements of the Federal PM2.5 NSR Rule.

Modeling

The applicant must substantiate with modeling that the new facility or modification will not cause a violation, or make significantly worse an existing violation according to Appendix A of Rule 1303, or other analysis approved by the Executive Officer or designee, of any state or national ambient air quality standards at any receptor location in the District. If the emission from the individual permit units are greater than the amounts in Table 20 below, then modeling is required. (Note that the emissions listed in Table 20 below are for a single auxiliary boiler rated at 35 MMBTU/hr. The emergency IC engines are exempt from modeling under AQMD Rule 1304(a)(4) because they operate less than 200 hours/year and no emissions of NOx, CO, or PM10 are expected from the HTF expansion tanks and associated equipment. There is also no modeling requirement for VOC or SOx.

Table 20: Auxiliary Boiler, 35 MMBTU/hr

Pollutant	Emissions lb/hr	Screening Modeling Thresholds[1] lb/hr	Comply (Yes/No)
NOx	0.39	1.31	Yes
CO	1.31	72.1	Yes
PM10	0.35	7.9	Yes

The emissions from the boiler(s) are below the screening levels listed in Table 20 above. Therefore, no modeling is required for the auxiliary boilers.

In addition, Palen informed AQMD that it intends to relocate power block no. 1 to the south of its original location by approximately 2,000 feet. Power block no. 2 will not be moved. AQMD requested and Palen submitted additional information including revised drawings and updated UTM coordinates for the proposed relocation of power block no. 1. AQMD modeling staff reviewed the proposed relocation and updated information of power block no. 1. Modeling staff concluded that although the property boundaries will change, the health risks will not vary significantly from what was previously modeled because the source is being relocated further away from the nearest receptor. Therefore no additional modeling is necessary.

[1] From Appendix A, Table A-1 of Rule 1303.

Rule 1401 – New Source Review of Toxic Air Contaminants

This rule specifies limits for maximum individual cancer risk (MICR), acute hazard index (HIA), chronic hazard index (HIC) and cancer burden (CB) from new permit units, relocations, or modifications to existing permits which emit toxic air contaminants. These requirements are summarized in Table 21 as follows:

Table 21 - Rule 1401 Requirements

Parameters and Specifications	Rule 1401 Requirements
MICR, without T-BACT	≤ 1EE-6
MICR, with T-BACT	≤ 1EE-5
Acute Hazard Index	≤ 1.0
Chronic Hazard Index	≤ 1.0
Cancer Burden	≤ 0.5

The applicant originally performed a Tier 4 health risk assessment using the Hot Spots Analysis and Reporting Program (HARP) on September 15, 2009. The analysis included an estimate of the MICR for the nearest residential and commercial receptors, as well as the acute and chronic hazard indices. However, this HRA did not include the toxic air contaminants associated with the fugitive emissions from the HTF piping system. As a result, Solar Millennium, LLC has revised the original HRA for the Palen Solar Power Project to add impacts and public exposure associated with emissions of toxic air contaminants due to the fugitive emissions of benzene from the piping network that will be used to transport HTF throughout the PSPP facility.

The fugitive emissions were modeled as 4 area sources (2 area sources per ullage system), encompassing the area where the pipes are proposed to be located. The results of the revised Tier 4 HRA for the facility using the results from the AERMOD dispersion model are shown in Tables 22 and 23 below: (Note that Palen is subject to an enhanced inspection and maintenance program for leak detection and repair and will also be required to install rupture disks upstream of the pressure relief valves to mitigate fugitive emissions. The enhanced inspection and maintenance program and the use of rupture disks will satisfy T-BACT). The applicant also computed the cumulative risk for both ullage systems no. 1 & 2 (a conservative estimate given that Rule 1401 requires compliance on a permit unit basis) and the results are shown in Table 24 below.

Table 22 - Revised HRA Results (Ullage system No.1)

Parameter	MICR
Residential	1.32EE-6
Risk Threshold w/T-BACT	10EE-6
Comply (Yes/No)	Yes

Table 23 - Revised HRA Results (Ullage system no. 2)

Parameter	MICR
Residential	0.061EE-6
Risk Threshold w/T-BACT	10EE-6
Comply (Yes/No)	Yes

Table 24 Cumulative Revised HRA (Ullage systems no. 1 & 2)

Parameter	MICR	HIA	HIC
Resident	1.39EE-6	0.12	0.0008
Commercial	0.27EE-6	0.12	0.0008
Threshold	10EE-6	1.0	1.0
Comply (Yes/No)	Yes	Yes	Yes

The results of the revised HRA, shown in Tables 22, 23, and 24 above, indicate that even with consideration of the toxic emissions due to the fugitive VOCs, the ullage system will remain in compliance with Rule 1401. AQMD modeling staff reviewed the applicants HRA analysis and concluded that applicant's modeling analysis was consistent with AQMD HRA procedures.

Rule 1470-Requirements for Stationary Diesel-Fueled Internal Combustion and Other CI Engines:
Paragraph (c)(1) requires the use of CARB Diesel fuel. The use of No. 2 diesel fuel will satisfy this requirement. Paragraph (c)(2)(A) imposes operating requirements for engines located within 500 feet from a school. Since the engine is located greater than 500 feet to the nearest school, the requirements of this section are not applicable.

Paragraph (c)(2)(B) allows operation of this device during an impending rotating electric power outage only if:

1. The permit specifically allows this operation
2. The utility company has actually ordered the outage
3. The engine is in a specific location covered by the outage.
4. The engine is operated no more than 30 minutes prior to the outage, and
5. The engine operation is terminated immediately after the outage.

AQMD will require a condition to limit the maintenance and testing to less than 50 hours per year per engine. These engines are expected to meet these requirements.

Paragraph (c)(2)(C) limits hours for maintenance and testing to 50 hours per year for PM_{10} emissions up to 0.15 gm/bhp-hr, and a maximum of 100 hours per year for PM_{10} emissions up to 0.01 gm/bhp-hr. Therefore, the engine will comply with paragraph (c)(2)(C). Also, part (iv) of paragraph (c)(2)(C) requires that the engine meet the standards for off road engines in Title 13, CCR section 2423. Each engine will comply with the 0.15 gm/bhp-hr PM10 emission requirements of this rule and therefore each engine can operate for up to a maximum of 50 hours/year for maintenance and testing. Therefore, compliance with Rule1470 is expected.

REGULATION XVII-Prevention of Significant Deterioration
On July 25, 2007 AQMD and EPA have signed a new Partial PSD Delegation Agreement intended to delegate the authority and responsibility to AQMD for issuance of initial PSD permits and for PSD permit modifications where the applicant does not seek to use the emissions calculation methodologies promulgated in 40 CFR 52.21 (NSR Reform) but not set forth in AQMD Regulation XVII. The Partial Delegation agreement also does not delegate authority and responsibility to AQMD to issue new or modified PSD permits based on Plant-wide Applicability Limits (PALS) provisions of 40 CFR 52.21. Therefore, consistent with the Partial Delegation Agreement, for all new and modified PSD permits, AQMD will only use Regulation XVII as the bases for the PSD analysis. The SEDAB, where the project is to be located, is in attainment for NOx, SO_2, and CO emissions. Therefore PSD applies to these pollutants. For the proposed project a significant emission increase is 40 tpy or more of NOx or SO_2 or 100 tons per year or more of CO. The emissions from the proposed PSPP will not exceed these thresholds. Therefore a PSD analysis is not required.

Rule 1703(a)(2) requires each permit unit be constructed using BACT for each attainment air contaminant for which there is a net emission increase. The BACT requirements for CO as well as the applicant's BACT proposals are listed below: As shown below, the equipment will comply with PSD BACT requirements for major sources.

Auxiliary Boiler, 35 MMBTU/hr

Pollutant	Minor Source BACT	Proposed BACT	Comply (Yes/No)
CO	≤50 ppmv @ 3% O2, dry	≤50 ppmv @ 3% O2, dry	Yes
NOx	9 ppmv @ 3% O2, dry	9 ppmv @ 3% O2, dry	Yes
SO2	Natural Gas	Propane fired	Yes

Emergency Fire Pump, 300 bhp (300≤ bhp < 750)

Pollutant	Minor Source BACT (Tier 3)	Proposed BACT (Tier 3)	Comply (Yes/No)
CO	2.6 gm/bhp-hr	2.6 gm/bhp-hr	Yes
NOx+VOC	3.0 gm/bhp-hr	3.0 gm/bhp-hr	Yes
SO2	Fuel with sulfur content less than or equal to 15 ppm by weight	Fuel with sulfur content less than or equal to 15 ppm by weight	Yes

Emergency Electrical Generator, 2,922 bhp (bhp ≥ 750)

Pollutant	Minor Source BACT (Tier 2)	Proposed BACT (Tier 2)	Comply (Yes/No)
CO	2.6 gm/bhp-hr	2.6 gm/bhp-hr	Yes
NOx+VOC	4.8 gm/bhp-hr	4.8 gm/bhp-hr	Yes
SO2	Fuel with sulfur content less than or equal to 15 ppm by weight	Fuel with sulfur content less than or equal to 15 ppm by weight	Yes

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

The California Energy Commission (CEC) in conjunction with the Bureau of Land Management are the lead agencies for the PSPP (09-AFC-7) and will be addressing CEQA compliance.

NEW SOURCE PERFORMANCE STANDARDS

40 CFR 60 Subpart Dc - Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units

This regulation applies to each steam generating unit for which construction, modification, or reconstruction is commenced after June 9, 1989 and that has a maximum design heat input capacity of 29 megawatts (MW) (100 million British thermal units per hour (MMBTU/hr)) or less, but greater than or equal to 2.9 MW (10 MMBtu/hr) which combust coal or any combination of coal and other fuels. Since the auxiliary boilers will use propane exclusively, this regulation does not apply to the auxiliary boilers proposed for construction for the Palen Solar Power Project.

40 CFR 60 Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

The emergency diesel electrical generators being proposed are rated at 2,922 bhp and must meet the federal Tier 2 standards. These engines will comply with the Tier 2 standards listed in 40 CFR 89.112.

For the emergency fire pumps, the operator of the fire pump engines with a displacement of less than 30 liters per cylinder must comply with the emission standards in table 4 to this subpart, for all pollutants. The applicant has provided manufacturer performance data which shows that the engine will comply with the emission limits in Table 4 of this subpart.

REGULATION XXX – Title V

Not applicable because this project is located in the South East Desert Air Basin (SEDAB) and the major source thresholds for VOC NOx, SOx, CO and PM10 are not exceeded.

OVERALL EVALUATION / RECOMMENDATION(S)

Issue Permits to Construct with the following permit conditions.

PERMIT CONDITIONS

AUXILIARY BOILERS

1. OPERATION OF THIS EQUIPMENT SHALL BE CONDUCTED IN ACCORDANCE WITH ALL DATA AND SPECIFICATIONS SUBMITTED WITH THE APPLICATION UNDER WHICH THIS PERMIT IS ISSUED UNLESS OTHERWISE NOTED BELOW.

2. THIS EQUIPMENT SHALL BE PROPERLY MAINTAINED AND KEPT IN GOOD OPERATING CONDITION AT ALL TIMES.

3. THIS EQUIPMENT SHALL BE FIRED EXCLUSIVELY WITH LIQUEFIED PETROLEUM GAS (LPG) WHICH MEETS THE REQUIREMENTS OF AQMD RULE 431.1 AND THE STANDARDS SPECIFIED IN CCR TILE 13, SECTION 2292.6 FOR CALIFORNIA MOTOR VEHICLES.

4. THE OPERATOR SHALL CONDUCT AND INITIAL SOURCE TEST(S) FOR THE POLLUTANT(S) IDENTIFIED BELOW.

POLLUTANT TO BE TESTED	REQUIRED TEST METHOD(S)	AVERAGING TIME	TEST LOCATION
NOX EMISSIONS	DISTRICT METHOD 100.1	1 HOUR	STACK
CO EMISSIONS	DISTRICT METHOD 100.1	1 HOUR	STACK
SOX EMISSIONS	APPROVED DISTRICT METHOD	DISTRICT APPROVED AVERAGING TIME	FUEL SAMPLE
VOC EMISSIONS	APPROVED DISTRICT METHOD	1 HOUR	STACK
PM10 EMISSIONS	APPROVED DISTRICT METHOD	DISTRICT APPROVED AVERAGING TIME	STACK

THE TEST SHALL BE CONDUCTED AFTER AQMD APPROVAL OF THE SOURCE TEST PROTOCOL, BUT NO LATER THAN 180 DAYS AFTER INITIAL START-UP. THE AQMD SHALL BE NOTIFIED OF THE DATE AND TIME OF THE TEST AT LEAST 10 DAYS PRIOR TO THE TEST. THE TEST SHALL BE CONDUCTED TO DETERMINE THE OXYGEN LEVELS IN THE EXHAUST. IN ADDITION, THE TESTS SHALL MEASURE THE FUEL FLOW RATE (GALLONS/HOUR), AND THE FLUE GAS FLOW RATE.

THE TEST SHALL BE CONDUCTED IN ACCORDANCE WITH AQMD APPROVED TEST PROTOCOL. THE PROTOCOL SHALL BE SUBMITTED TO THE AQMD ENGINEER NO LATER THAN 45 DAYS BEFORE THE PROPOSED TEST DATE AND SHALL BE APPROVED BY THE AQMD BEFORE THE TEST COMMENCES. THE TEST PROTOCOL SHALL INCLUDE THE PROPOSED OPERATING CONDITIONS OF THE TURBINE DURING THE TESTS, THE IDENTITY OF THE TESTING LAB, A STATEMENT FROM THE TESTING LAB CERTIFYING THAT IT MEETS THE CRITERIA OF RULE 304, AND A DESCRIPTION OF ALL SAMPLING AND ANALYTICAL PROCEDURES.

THE TEST SHALL BE CONDUCTED WHEN THIS EQUIPMENT IS OPERATING AT MAXIMUM, AVERAGE, AND MINIMUM LOADS.

5. THE OPERATOR SHALL LIMIT THE FUEL USAGE TO NO MORE THAN 698,087 GALLONS IN ANY ONE YEAR. FOR THE PURPOSE OF THIS CONDITION, ONE YEAR SHALL BE DEFINED AS A PERIOD OF TWELVE (12) CONSECUTIVE MONTHS DETERMINED ON A ROLLING BASIS WITH A NEW 12 MONTH PERIOD BEGINNING ON THE FIRST DAY OF EACH CALENDAR MONTH.

   FOR THE PURPOSE OF THIS CONDITION, FUEL USAGE SHALL BE DEFINED AS THE TOTAL PROPANE USAGE OF A SINGLE BOILER. THE OPERATOR SHALL MAINTAIN RECORDS IN A MANNER APPROVED BY THE DISTRICT TO DEMONSTRATE COMPLIANCE WITH THIS CONDITION.

6. THE OPERATOR SHALL LIMIT THE FUEL USAGE TO NO MORE THAN 58,174 GALLONS IN ANY ONE MONTH.

   FOR THE PURPOSE OF THIS CONDITION, FUEL USAGE SHALL BE DEFINED AS THE TOTAL PROPANE USAGE OF A SINGLE BOILER. THE OPERATOR SHALL MAINTAIN RECORDS IN A MANNER APPROVED BY THE DISTRICT TO DEMONSTRATE COMPLIANCE WITH THIS CONDITION.

7. THE OPERATOR SHALL INSTALL AND MAINTAIN A(N) FLOW METER TO ACCURATELY INDICATE THE FUEL USAGE BEING SUPPLIED TO THE BOILER. THE OPERATOR SHALL ALSO INSTALL AND MAINTAIN A DEVICE TO CONTINUOUSLY RECORD THE PARAMETER BEING MEASURED

8. THE OPERATOR SHALL PROVIDE TO THE AQMD A SOURCE TEST REPORT IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

   SOURCE TEST RESULTS SHALL BE SUBMITTED TO THE AQMD NO LATER THAN 60 DAYS AFTER THE SOURCE TEST WAS CONDUCTED.

   EMISSION DATA SHALL BE EXPRESSED IN TERMS OF CONCENTRATION (PPMV) CORRECTED TO 3 PERCENT OXYGEN (DRY BASIS), MASS RATE (LB/HR), AND LB/MMCF. IN ADDITION, SOLID PM EMISSIONS, IF REQUIRED TO BE TESTED, SHALL ALSO BE REPORTED IN TERMS OF GRAINS/DSCF.

   ALL EXHAUST FLOW RATE SHALL BE EXPRESSED IN TERMS OF DRY STANDARD CUBIC FEET PER MINUTE (DSCFM) AND DRY ACTUAL CUBIC FEET PER MINUTE (DACFM).

   ALL MOISTURE CONCENTRATION SHALL BE EXPRESSED IN TERMS OF PERCENT CORRECTED TO 3 PERCENT OXYGEN.

   SOURCE TEST RESULTS SHALL ALSO INCLUDE THE OXYGEN LEVELS IN THE EXHAUST, FUEL FLOW RATE (CFH), THE FLUE GAS TEMPERATURE.

9. THE NOX EMISSIONS FROM THIS EQUIPMENT SHALL NOT EXCEED 9 PPMV, MEASURED OVER 60 MINUTE AVERAGING TIME PERIOD AT 3% O2.

10. THE CO EMISSIONS FROM THIS EQUIPMENT SHALL NOT EXCEED 50 PPMV, MEASURED OVER 60 MINUTE AVERAGING TIME PERIOD AT 3% O2.

11. THE 9 PPM NOX EMISSION LIMITS SHALL NOT APPLY DURING START-UP AND SHUTDOWN PERIODS. START-UP AND SHUTDOWN PERIODS EACH SHALL NOT EXCEED 15 MINUTES. WRITTEN RECORDS OF START-UPS AND SHUTDOWNS SHALL BE MAINTAINED AND MADE AVAILABLE UPON REQUEST FROM THE EXECUTIVE OFFICER.

12. THE 50 PPM CO EMISSION LIMITS SHALL NOT APPLY DURING START-UP AND SHUTDOWN PERIODS. START-UP AND SHUTDOWN PERIODS EACH SHALL NOT EXCEED 15 MINUTES. WRITTEN RECORDS OF START-UPS AND SHUTDOWNS SHALL BE MAINTAINED AND MADE AVAILABLE UPON REQUEST FROM THE EXECUTIVE OFFICER.

13. THE OPERATOR SHALL LIMIT EMISSION FROM THIS EQUIPMENT AS FOLLOWS:

CONTAMINANT	EMISSION LIMIT
PM10	639 LBS IN ANY ONE YEAR
NOX	709 LBS IN ANY ONE YEAR
SOX	722 LBS IN ANY ONE YEAR

THE OPERATOR SHALL CALCULATE THE MONTHLY EMISSIONS FOR VOC, PM10 AND SOX USING THE EQUATION BELOW AND THE FOLLOWING EMISSION FACTORS: NOX: 1.02 LB/1,000 GAL;; PM10: 0.92 LB/1,000 GAL; AND SOX:1.03 LB/1,000 GAL.

YEARLY EMISSIONS, LB/YEAR = X (E.F.)

WHERE X = YEARLY FUEL USAGE IN 1,000 GAL/YEAR AND E.F. = EMISSION FACTOR INDICATED ABOVE.

FOR THE PURPOSE OF THIS CONDITION, THE YEARLY EMISSION LIMIT SHALL BE DEFINED AS A PERIOD OF TWELVE (12) CONSECUTIVE MONTHS DETERMINED ON A ROLLING BASIS WITH A NEW 12 MONTH PERIOD BEGINNING ON THE FIRST DAY OF EACH CALENDAR MONTH.

14. THE OPERATOR SHALL LIMIT EMISSION FROM THIS EQUIPMENT AS FOLLOWS:

CONTAMINANT	EMISSION LIMIT
PM10	53 LBS IN ANY ONE MONTH
NOX	59 LBS IN ANY ONE MONTH
SOX	60 LBS IN ANY ONE MONTH
VOC	27 LBS IN ANY ONE MONTH

THE OPERATOR SHALL CALCULATE THE MONTHLY EMISSIONS FOR VOC, PM10 AND SOX USING THE EQUATION BELOW AND THE FOLLOWING EMISSION FACTORS: NOX: 1.02 LB/1,000 GAL; VOC: 0.46 LB/1,000 GAL; PM10: 0.92 LB/1,000 GAL; AND SOX:1.03 LB/1,000 GAL.

MONTHLY EMISSIONS, LB/YEAR = X (E.F.)

WHERE X = MONTHLY FUEL USAGE IN 1,000 GAL/MONTH AND E.F. = EMISSION FACTOR INDICATED ABOVE.

15. THE OPERATOR SHALL LIMIT THE ANNUAL OPERATION OF THIS EQUIPMENT TO NO GREATER THAN 5,110 HOURS IN ANY ONE YEAR.

16. THE BOILER SHALL NOT BE OPERATED AT LOADS OF LESS THAN 25% EXCEPT DURING INITIAL START-UP AND SHUTDOWN.

EMERGENCY FIRE WATER PUMPS

1. OPERATION OF THIS EQUIPMENT SHALL BE CONDUCTED IN ACCORDANCE WITH ALL DATA AND SPECIFICATIONS SUBMITTED WITH THE APPLICATION UNDER WHICH THIS PERMIT IS ISSUED UNLESS OTHERWISE NOTED BELOW.

2. THIS EQUIPMENT SHALL BE PROPERLY MAINTAINED AND KEPT IN GOOD OPERATING CONDITION AT ALL TIMES.

3. THE OPERATOR SHALL INSTALL AND MAINTAIN A(N) NON-RESETTABLE TOTALIZING FUEL METER TO ACCURATELY INDICATE THE FUEL USAGE OF THE ENGINE.

4. THE OPERATOR SHALL ONLY USE DIESEL FUEL CONTAINING SULFUR LESS THAN OR EQUAL TO 15 PPM BY WEIGHT.

5. THIS EQUIPMENT SHALL COMPLY WITH RULE 431.2 AND 1470.

6. AN OPERATIONAL NON-RESETTABLE TOTALIZING TIME METER SHALL BE INSTALLED AND MAINTAINED TO INDICATE THE ENGINE ELAPSED OPERATING TIME.

7. THIS ENGINE SHALL NOT BE OPERATED MORE THAN 200 HOURS IN ANY ONE YEAR, WHICH INCLUDES NO MORE THAN 50 HOURS PER YEAR AND 4.2 HOURS PER MONTH FOR MAINTENANCE AND TESTING AS REQUIRED IN RULE 1470(C)(2)

8. THE OPERATOR SHALL KEEP A LOG OF ENGINE OPERATIONS DOCUMENTING THE TOTAL TIME THE ENGINE IS OPERATED EACH MONTH AND THE SPECIFIC REASON FOR OPERATION AS:

   A. EMERGENCY USE
   B. MAINTENANCE AND TESTING
   C. OTHER (BE SPECIFIC)

   IN ADDTION, FOR EACH TIME THE ENGINE IS MANUALLY STARTED, THE LOG SHALL INCLUDE THE DATE OF ENGINE OPERATION, THE SPECIFIC REASON FOR OPERATION, AND THE TOTALIZING HOUR METER READING (IN HOURS AND TENTHS OF HOURS) AT THE BEGINNING AND THE END OF THE OPERATION. ON OR BEFORE JANUARY 15TH OF EACH YEAR, THE OPERATOR SHALL RECORD IN THE ENGINE OPERATING LOG:

   A. THE TOTAL HOURS OF ENGINE OPERATION FOR THE PREVIOUS CALENDAR YEAR, AND
   B. THE TOTAL HOURS OF ENGINE OPERATION FOR MAINTENANCE AND TESTING FOR THE PREVIOUS CALENDAR YEAR

   ENGINE OPERATION LOG(S) SHALL BE RETAINED ON SITE FOR A MINIMUM OF THREE CALENDAR YEARS AND SHALL BE MADE AVAILABLE TO THE EXECUTIVE OFFICER OR REPRESENTATIVE UPON REQUEST.

9. THIS EQUIPMENT SHALL COMPLY WITH THE FOLLOWING BACT EMISSION LIMITS

CONTAMINANT	EMISSION LIMIT (GM/BHP-HR)
NOx + VOC	3.0
CO	2.6
PM10	0.15

EMERGENCY ELECTRICAL GENERATORS

1. OPERATION OF THIS EQUIPMENT SHALL BE CONDUCTED IN ACCORDANCE WITH ALL DATA AND SPECIFICATIONS SUBMITTED WITH THE APPLICATION UNDER WHICH THIS PERMIT IS ISSUED UNLESS OTHERWISE NOTED BELOW.

2. THIS EQUIPMENT SHALL BE PROPERLY MAINTAINED AND KEPT IN GOOD OPERATING CONDITION AT ALL TIMES.

3. THE OPERATOR SHALL INSTALL AND MAINTAIN A(N) NON-RESETTABLE TOTALIZING FUEL METER TO ACCURATELY INDICATE THE FUEL USAGE OF THE ENGINE.

4. THIS EQUIPMENT SHALL COMPLY WITH RULE 431.2 AND 1470.

5. AN OPERATIONAL NON-RESETTABLE TOTALIZING TIME METER SHALL BE INSTALLED AND MAINTAINED TO INDICATE THE ENGINE ELAPSED OPERATING TIME.

6. THIS ENGINE SHALL NOT BE OPERATED MORE THAN 200 HOURS IN ANY ONE YEAR, WHICH INCLUDES NO MORE THAN 50 HOURS PER YEAR AND 4.2 HOURS PER MONTH FOR MAINTENANCE AND TESTING AS REQUIRED IN RULE 1470(C)(2)

7. OPERATION BEYOND THE ALLOTTED TIME FOR ENGINE MAINTENANCE AND TESTING SHALL BE ALLOWED ONLY IN THE EVENT OF A LOSS OF GRID POWER OR UP TO 30 MINUTES PRIOR TO A ROTATING OUTAGE, PROVIDED THAT THE UTILITY DISTRIBUTION COMPANY HAS ORDERED ROTATING OUTAGES IN THE CONTROL AREA WHERE THE ENGINE IS LOCATED OR HAS INDICATED THAT IT EXPECTS TO ISSUE SUCH AN ORDER AT A CERTAIN TIME, AND THE ENGINE IS LOCATED IN A UTILITY SERVICE BLOCK THAT IS SUBJECT TO THE ROTATING OUTAGE. ENGINE OPERATION SHALL BE TERMINATED IMMEDIATELY AFTER THE UTILITY DISTRIBUTION COMPANY ADVISES THAT A ROTATING OUTAGE IS NO LONGER IMMINENT OR IN EFFECT.

8. THIS ENGINE SHALL NOT BE USED AS PART OF AN INTERRUPTIBLE SERVICE CONTRACT IN WHICH A FACILITY RECEIVES A PAYMENT OR REDUCED RATES IN RETURN FOR REDUCING ELECTRIC LOAD ON THE GRID WHEN REQUESTED BY THE UTILITY OR THE GRID OPERATOR

9. THE OPERATOR SHALL KEEP A LOG OF ENGINE OPERATIONS DOCUMENTING THE TOTAL TIME THE ENGINE IS OPERATED EACH MONTH AND THE SPECIFIC REASON FOR OPERATION AS:

   A. EMERGENCY USE
   B. MAINTENANCE AND TESTING
   C. OTHER (BE SPECIFIC)

   IN ADDTION, FOR EACH TIME THE ENGINE IS MANUALLY STARTED, THE LOG SHALL INCLUDE THE DATE OF ENGINE OPERATION, THE SPECIFIC REASON FOR OPERATION, AND THE TOTALIZING HOUR METER READING (IN HOURS AND TENTHS OF HOURS) AT THE BEGINNING AND THE END OF THE OPERATION. ON OR BEFORE JANUARY 15TH OF EACH YEAR, THE OPERATOR SHALL RECORD IN THE ENGINE OPERATING LOG:

   A. THE TOTAL HOURS OF ENGINE OPERATION FOR THE PREVIOUS CALENDAR YEAR, AND
   B. THE TOTAL HOURS OF ENGINE OPERATION FOR MAINTENANCE AND TESTING FOR THE PREVIOUS CALENDAR YEAR

   ENGINE OPERATION LOG(S) SHALL BE RETAINED ON SITE FOR A MINIMUM OF THREE CALENDAR YEARS AND SHALL BE MADE AVAILABLE TO THE EXECUTIVE OFFICER OR REPRESENTATIVE UPON REQUEST.

10. THIS EQUIPMENT SHALL COMPLY WITH THE FOLLOWING BACT EMISSION LIMITS

CONTAMINANT	EMISSION LIMIT (GM/BHP-HR)
NOx + VOC	4.8
CO	2.6
PM10	0.15

ULLAGE, EXPANSION TANK, OVERFLOW TANK, AND HTF PIPING SYSTEMS

1. OPERATION OF THIS EQUIPMENT SHALL BE CONDUCTED IN ACCORDANCE WITH ALL DATA AND SPECIFICATIONS SUBMITTED WITH THE APPLICATION UNDER WHICH THIS PERMIT IS ISSUED UNLESS OTHERWISE NOTED BELOW.

2. THIS EQUIPMENT SHALL BE PROPERLY MAINTAINED AND KEPT IN GOOD OPERATING CONDITION AT ALL TIMES.

3. THE HTF EXPANSION VESSELS SHALL BE VENTED TO THE ACTIVATED CARBON ADSORPTION SYSTEM NO. 1 (2), WHICH IS IN FULL OPERATION AND WHICH HAS BEEN ISSUED A PERMIT TO CONSTRUCT UNDER A/N 506830 (506835).

4. THE OPERATOR SHALL DEVELOP AND IMPLEMENT A COMPREHENSIVE INSPECTION AND MAINTENANCE (I&M) PROGRAM TO DETERMINE, REPAIR OR REPLACE, AND REPORT LEAKS IN THE HTF PIPING NETWORK AND EXPANSION VESSELS. SUCH I&M PROGRAM SHALL BE SUBMITTED TO THE EXECUTIVE OFFICER FOR APPROVAL NO LATER THAN 180 DAYS FROM THE ISSUANCE OF A PERMIT TO CONSTRUCT FOR THIS EQUIPMENT. I&M PROGRAM RECORDS AND AS WELL AS ANY RELATED RECORDS SHALL BE KEPT ON FILE FOR A PERIOD OF 3 YEARS AND BE MADE AVAILABLE TO THE EXECUTIVE OFFICER UPON REQUEST. IN ADDITION, THE OPERATOR SHALL SUBMIT A PROTOCOL TO THE EXECUTIVE OFFICER WITHIN THE FIRST 60 DAYS OF FULL OPERATION DESCRIBING THE METHODOLOGY TO BE USED TO PERFORM THE FOLLOWING TASKS:

   a. ALL PUMPS CONNECTORS, AND PRESSURE RELIEF VALVES (PRVs) AND ASSOCIATED RUPTURE DISKS SHALL BE ELECTRONICALLY, VISUALLY OR BY AUDIO, INSPECTED ONCE EVERY OPERATING DAY.

   b. ALL ACCESSIBLE VALVES, CONNECTORS, AND PRV's (INCLUDING RUPTURE DISKS) SHALL BE INSPECTED QUARTERLY USING AN AQMD RULE 1173 APPROVED LEAK DETECTION DEVICE CALIBRATED FOR METHANE.

   c. VOC LEAKS GREATER THAN 100 PPMV SHALL BE RECORDED AND REPAIRED OR REPLACED WITHIN 7 DAYS OF DETECTION

   d. VOC LEAKS GREATER THAN 10,000 PPMV SHALL BE RECORDED AND REPAIRED OR REPLACED WITHIN 24 HOURS OF DETECTION.

   e. THE OPERATOR SHALL MAINTAIN WRITTEN RECORDS OF ALL VOC LEAKS EXCEEDING 100 PPMV. THE RECORDS SHALL INDICATE THE LOCATION OF THE LEAK, THE TYPE OF LEAK, AND THE REPAIR(S) OR REPLACEMENT MADE. THE RECORDS SHALL BE KEPT ON FILE FOR A PERIOD OF 3 YEARS AND SHALL BE MADE AVAILABLE TO THE EXECUTIVE OFFICER UPON REQUEST.

   f. PRESSURE-SENSING EQUIPMENT SHALL BE INSTALLED AND OPERATED WHICH WILL BE CAPABLE OF DETECTING A MAJOR LEAK, RUPTURE OR SPILL WITHIN THE HTF NETWORK

5. THE OPERATOR SHALL MAINTAIN WRITTEN RECORDS OF THE AMOUNT OF HEAT TRANSFER FLUID (HTF) REPLACED ON A MONTHLY BASIS. SUCH RECORDS SHALL BE KEPT ON FILE FOR A PERIOD OF 3 YEARS AND SHALL BE MADE AVAILABLE TO THE EXECUTIVE OFFICER UPON REQUEST.

6. THE FOLLOWING COMPONENT COUNT SHALL BE USED TO DETERMINE THE FUGITIVE VOC EMISSIONS.

EQUIPMENT	COUNT
VALVES	1,969
PUMP SEALS	9
CONNECTORS	2,091

THE OPERATOR SHALL PROVIDE AQMD WITH A FINAL COMPONENT COUNT WITHIN 90 DAYS OF COMPLETION OF CONSTRUCTION.

7. ALL EXPANSION VESSELS SHALL BE KEPT CLOSED EXCEPT DURING MAINTENANCE, INSPECTION, REPAIR OR REPLACEMENT.

8. THIS EQUIPENT SHALL BE MAINTAINED AND OPERATED ACCORDING TO MANUFACTURER'S SPECIFICATION TO ENSURE COMPLIANCE WITH APPLICABLE AQMD, STATE, AND FEDERAL RULES AND REGULATIONS.

9. WRITTEN RECORDS SHALL BE USED TO DEMONSTRATE COMPLIANCE WITH ALL APPLICABLE AQMD, STATE, OR FEDERAL RULES AND REGULATIONS, INCLUDING RECORDS OF ANY INCIDENTAL OR SUPPORTING OPERATIONAL DATA NEEDED TO JUSTIFY FINDINGS.
10. THE EMISSIONS FROM THE ULLAGE SYSTEM, INCLUDING ALL FUGITIVES SHALL NOT EXCEED THE FOLLOWING LIMITS:

COMPOUND	EMISSION LIMITS	
	(LB/MONTH)	(TONS/YEAR)
VOLATILE ORGANIC COMPOUNDS (VOC)	824.40	4.95

COMPLIANCE WITH THE MAXIMUM MONTHLY EMISSION LIMIT SHALL BE VERIFIED BY THE OPERATOR EACH MONTH THE SOURCE IS OPERATED. COMPLIANCE WITH THE MAXIMUM MONTHLY EMISSION LIMIT SHALL BE VERIFIED USING APPROPRIATE OPERATIONAL DATA AND RECORDKEEPING TO FULLY DOCUMENT THE MAXIMUM MONTHLY EMISSION RATE. WRITTEN RECORDS OF SUCH DOCUMENTATION OF COMPLIANCE SHALL BE RETAINED FOR A PERIOD OF 3 YEARS AND MADE AVAILABLE TO THE EXECUTIVE OFFICER UPON REQUEST.

11. THE EXPANSION TANK SHALL ONLY BE VENTED TO THE ATMOSPHERE THROUGH THE CARBON ADSORPTION SYSTEM ISSUED A PERMIT TO CONSTRUCT UNDER A/N 506830 (506835). IN NO EVENT SHALL THE ULLAGE SYSTEM BE OPERATED FOR MORE THAN 400 HOURS IN ANY ONE YEAR. THE OPERATOR SHALL MAINTAIN WRITTEN RECORDS OF ELAPSED OPERATIONAL TIME OF THE ULLAGE SYSTEM AND SUCH RECORDS SHALL BE MADE AVAILABLE TO THE EXECUTIVE OFFICER UPON REQUEST.

13. THE OPERATOR SHALL ENSURE THAT ALL PRESSURE RELIEF VALVES (PRVs) WHICH VENT TO THE ATMOSPHERE SHALL ARE EQUIPPED WITH RUPTURE DISKS.

14. THE OPERATOR SHALL MONITOR AND TEST THE ULLAGE SYSTEM ON A QUARTERLY BASIS FOR HTF CONTAMINATION IN ACCORDANCE WITH THE PROCEDURES OUTLINED IN THE THERMINOL ANALYTICAL EVALUATION GUIDELINES PROVIDED BY THE MANUFACTURER. THE ULLAGE SYSTEM SHALL BE OPERATED WHENEVER THE PERCENTAGE OF TOTAL CONTAMINANTS IN THE HTF SAMPLE REACHES A MAXIMUM OF 2 PERCENT BY VOLUME.

BIO-REMEDIATION (LAND TREATMENT) UNIT

1. OPERATION OF THIS EQUIPMENT SHALL BE CONDUCTED IN ACCORDANCE WITH ALL DATA AND SPECIFICATIONS SUBMITTED WITH THE APPLICATION UNDER WHICH THIS PERMIT IS ISSUED UNLESS OTHERWISE NOTED BELOW.

2. THIS EQUIPMENT SHALL BE PROPERLY MAINTAINED AND KEPT IN GOOD OPERATING CONDITION AT ALL TIMES.

3. THE OPERATOR SHALL MEASURE VOC EMISSIONS 3 INCHES ABOVE THE SOIL SURFACE USING A FLAME IONIZATION DETECTOR (FID) OR PHOTO-IONIZATION DETECTOR (PID) OR OTHER DEVICE APPROVED BY THE EXECUTIVE OFFICER. THE OPERATOR SHALL MAINTAIN WRITTEN RECORDS OF WEEKLY VOC EMISSONS FROM THE BIO-REMEDIATION UNIT DURING PERIODS WHEN THE UNIT IS IN OPERATION. THE OPERATOR SHALL SUBMIT A WRITTEN PROTOCOL TO THE EXECUTIVE OFFICER TO INCORPORATE THE PROPOSED MONITORING, REPORTING AND RECORDKEEPING REQUIREMENTS FOR THE BIO-REMEDIATION UNIT TO BE REVIEWED AND APPROVED BY AQMD STAFF PRIOR TO INITIAL OPERATION OF THE BIO-REMEDIATION UNIT.

   A. IF THE SOIL IN THE BIO-REMEDIATION UNIT REGISTERS A VOC READING OF LESS THAN 1,000 PPMV CALIBRATED AS METHANE AND MEASURED 3 INCHES ABOVE THE SOIL SURFACE WITH A PID, FID, OR OTHER AQMD APPROVED DEVICE, THE OPERATOR SHALL USE NATURALLY OCCURING SOIL BACTERIA TO TREAT THE HTF CONTAMINATED SOIL. DURING OPERATIONS, THE BIOREMEDIATION

UNIT SHALL BE COVERED WITH A MINIMUM OF 10-MIL PLASTIC SHEETING TO CONTROL VOC EMISSIONS.

B. IF THE SOIL IN THE BIOREMEDIATION UNIT REGISTERS A VOC READING OF GREATER THAN OR EQUAL TO 1,000 PPMV AND BUT LESS THAN OR EQUAL TO 10,000 PPMV, THE OPERATOR SHALL USE ENHANCED BIO-REMEDIATION PROCEDURES TO TREAT THE HTF CONTAMINATED SOIL USING ACCEPTED ENVIRONMENTAL ENGINEERING PRACTICES. SOIL STOCKPILES SHALL BE CONDITIONED AS NECESSARY THROUGH THE ADDITION OF NUTRIENTS, MOISTURE, AND AIR, TO MAINTAIN CONDITIONS SUITABLE FOR BIO-REMEDIATION OPERATIONS. DURING OPERATIONS, THE BIOREMEDIATION UNIT SHALL BE COVERED WITH A MINIMUM OF 10-MIL PLASTIC SHEETING TO CONTROL VOC EMISSIONS.

C. IF THE SOIL IN THE BIOREMEDIATION UNIT REGISTERS A VOC READING OF GREATER THAN 10,000 PPMV, THE OPERATOR SHALL STORE THE CONTAMINATED SOIL INSEALED CONTAINERS WHILE ONSITE. THE OPERATOR SHAL DISPOSE OF THE HTF CONTAMINATED SOIL AT AN OFF-SITE LANDFILL SUITABLE FOR DIPOSAL OF SUCH MATERIALS.

D. IF THE BIO-REMEDIATION OPERATION IS NOT EFFECTIVE AFTER 2 MONTHS OF CONTINUOUS OPERATION, THE OPERATOR SHALL SUBMIT ANOTHER WRITTEN PROTOCOL TO PROPOSE AN ALTERNATE METHOD OF SOIL REMEDIATION FOR APPROVAL BY THE EXECUTIVE OFFICER.

4. WRITTEN RECORDS SHALL BE USED TO DEMONSTRATE COMPLIANCE WITH ALL APPLICABLE AQMD, STATE, OR FEDERAL RULES AND REGULATIONS, INCLUDING RECORDS OF ANY INCIDENTAL OR SUPPORTING OPERATIONAL DATA NEEDED TO JUSTIFY FINDINGS.

5. THE OPERATOR SHALL SUBMIT A VOC-CONTAMINATED SOIL HANDLING PLAN IN ACCORDANCE WITH AQMD RULE 1166 TO THE EXECUTIVE OFFICER FOR APPROVAL NO LATER THAN 180 DAYS FROM THE ISSUANCE OF A PERMIT TO CONSTRUCT FOR THIS EQUIPMENT.

AIR POLLUTION CONROL SYSTEMS (ACTIVATED CARBON ADSORPTION)

1. OPERATION OF THIS EQUIPMENT SHALL BE CONDUCTED IN ACCORDANCE WITH ALL DATA AND SPECIFICATIONS SUBMITTED WITH THE APPLICATION UNDER WHICH THIS PERMIT IS ISSUED UNLESS OTHERWISE NOTED BELOW.

2. THIS EQUIPMENT SHALL BE PROPERLY MAINTAINED AND KEPT IN GOOD OPERATING CONDITION AT ALL TIMES.

3. THE OPERATOR SHALL MONITOR FOR BREAKTHROUGH BETWEEN THE FIRST AND SECOND CARBON BEDS WHILE THE CARBON SYSTEM IS IN USE USING AN OVA OR OTHER MONITORING DEVICE AS APPROVED BY THE EXECUTIVE OFFICER. BREAKTHROUGH SHALL OCCCUR WHEN THE OVA OR OTHER APPROVED MONITORING DEVICE SHOWS A VOC CONCENTRATION OF 5 PPMV OR GREATER DOWNSTREAM OF THE FIRST CARBON BED. THE CARBON IN THE FIRST BED SHALL BE REPLACED WITH FRESH CARBON AT LEAST 5 TIMES PER MONTH AS NECESSARY OR AT THE OCCURRENCE OF BREAKTHROUGH, WHICHEVER COMES FIRST, PRIOR TO OCCURRENCE OF BREAKTHROUGH IN THE SECOND CARBON BED.

4. THE OPERATOR SHALL AT ANY GIVEN TIME PERIOD, MAINTAIN AT LEAST TEN EXTRA CARBON ADSORPTION CANNISTERS ON THE PREMISES TO ENSURE THAT THE ACTIVATED CARBON ADSORPTION SYSTEMS CAN CONTINUOUSLY OPERATE WITHOUT INTERRUPTION WHENEVER THE ULLAGE SYSTEM IS IN OPERATION.

5. THE OPERATOR SHALL INSTALL A NON-RESETTABLE, TOTALIZING ELAPSED TIME METER TO ACCURATELY INDICATE THE CUMULATIVE OPERATIONAL TIME, IN HOURS, OF THE ACTIVATED CARBON ADSORPTION SYSTEM.

6. AN INITIAL SOURCE TEST PLAN/PROTOCOL SHALL BE SUBMITTED TO THE EXECUTIVE OFFICER 60 DAYS PRIOR TO THE TEST AND SHALL BE APPROVED BEFORE THE TEST BEGINS. THE PLAN SHALL INCLUDE THE PROPOSED OPERATING CONDITIONS OF THE OF THE EQUIPMENT DURING THE TEST, THE TEST METHODS, THE IDENTITY OF THE TESTING LABORATORY, A STATEMENT FROM THE TESTING LABORATORY CERTIFYING THAT IT MEETS THE NO CONFLICT REQUIREMENTS OF THE AQMD AND A DESCRIPTION OF ALL SAMPLING AND ANALYTICAL PROCEDURES TO BE USED.

7. THE INITIAL SOURCE TEST SHALL BE PERFORMED WITHIN 60 DAYS AFTER FULL OPERATION BUT NO LATER THAN 180 DAYS AFTER THE INITIAL START-UP OF THE EQUIPEMENT.

8. A WRITTEN REPORT OF THE SOURCE TEST RESULTS SHALL BE SUBMITTED TO THE EXECUTIVE OFFICER AND SHALL CONTAIN, AT A MINIMUM, THE VOC CONCENTRATION, IN PPM, AT THE INLET TO THE FIRST CARBON BED, BETWEEN THE FIRST AND SECOND CARBON BED, AND AT THE OUTLET FROM THE SECOND BED, SPECIATED FOR BENZENE. THE TEST REPORT SHALL INCLUDE THE OVERALL CONTROL EFFICIENCY FOR THE CARBON ADSORPTION SYSTEM.

PALEN SOLAR POWER PROJECT
Fugitive VOC Emissions (2 Power Blocks)

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Assumptions: (1) For valves, pump seals and connectors, assume leak rate and SV are variable, with 1% of the components leaking at SV =100 ppm and the remaining 99% of the components leaking at 1/2 SV = 50 ppm
(2) Operating Schedule: 24/7/365
(3) Emissions from valves, pump seals, and connectors are based on SOCMI Screening Value Correlation Equations in Table 2-9 of the EPA Document (light liquid valves, light liquid pumps, and connectors)
(4) Emissions from the PRVs are zero because they will be equipped with rupture disks

Component	Component Count	Calculation Method	SV, ppmv	Leak Rate, percent	SOCMI Correlation Equation Result, kg/hr	Annual Emissions, TPY	Annual Emissions lb/yr	Monthly Emissions lb/month	30DA lb/day
Valves	3,937	SOCMI Corr	100	1	0.5745	5.5485	11097.02	924.75	30.83
Pump Seals	18	SOCMI Corr	100	1	0.0087	0.0836	167.19	13.93	0.46
Connectors	4182	SOCMI Corr	100	1	0.4101	3.9611	7922.22	660.19	22.01
					TOTALS	**9.5932**	**19186.44**	**1598.87**	**53.30**

SAMPLE CALCULATIONS:
SOCMI Correlation Equation Result
Valves = 3,937 * [6.41EE-6 * (100) ^ 0.797 * 0.01] + 3,937 * [6.41EE-6 * (50) ^ 0.797 * 0.99] = 0.5745 kg/hr
Pump Seals = 18 * [1.90EE-5 * (100) ^ 0.824 * 0.01] + 18 * [1.90EE-5 * (50) ^ 0.824 * 0.99] = 0.0087 kg/hr
Connectors = 4,182 * [3.05EE-6 * (100) ^ 0.885 * 0.01] + 4,182 * [3.05EE-6 * (50) ^ 0.885 * 0.99] = 0.4101 kg/hr

Annual Emissions, TPY:
Connectors = 0.4101 kg/hr * 2.205 * 8760/2000 = 3.9611 TPY
Pump Seals = 0.0087 kg/hr * 2.205 * 8760/2000 = 0.0836 TPY
Valves = 0.5745 kg/hr * 2.205 * 8760/2000 = 5.5485 TPY

Highlight SV = Screening value, ppmv

PALEN SOLAR POWER PROJECT
Auxiliary Boiler Emissions

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Data:

Emission Rate = Emission Factor (lb/MMBTU) * Heat Input (MMBTU/hr)

NOx = 9 ppm @ 3% O_2, CO = 50 ppm @ 3% O_2

Maximum daily operation of each boiler is 2 hr/day at full load and 12 hr/day at 25% load

Maximum annual operation of each boiler is 730 hrs at full load and 4380 hours at 25% load

Total annual operation for each boiler is 5110 hours

PM2.5 emissions are equivalent to PM10 emissions

Boilers fired exclusively with propane

30DA means 30-day average

One Boiler

Pollutant	Emission Factor	Units	Emission Factor (lb/MMBTU)	Maximun Hourly (lb/hr)	Maximum Daily (lb/day)	Annual Emissions (lb/yr)	Monthly Emissions (lb/month)	30DA (lb/day)
NOx	9	ppmv	0.0111	0.3885	1.943	709.01	59.08	1.97
VOC	0.005	lb/MMBTU	0.0050	0.1750	0.875	319.38	26.61	0.89
CO	50	ppmv	0.0376	1.3160	6.580	2401.70	200.14	6.67
PM10	0.01	lb/MMBTU	0.0100	0.3500	1.750	638.75	53.23	1.77
SOx	0.0113	lb/MMBTU	0.0113	0.3955	1.978	721.79	60.15	2.00

Two Boilers

Pollutant	Emission Factor	Units	Emission Factor (lb/MMBTU)	Maximun Hourly (lb/hr)	Maximum Daily (lb/day)	Annual Emissions (lb/yr)	Monthly Emissions (lb/month)	30DA (lb/day)
NOx	9	ppmv	0.0111	0.7770	3.885	1418.03	118.17	3.94
VOC	0.005	lb/MMBTU	0.0050	0.3500	1.750	638.75	53.23	1.77
CO	50	ppmv	0.0376	2.6320	13.160	4803.40	400.28	13.34
PM10	0.01	lb/MMBTU	0.0100	0.7000	3.500	1277.50	106.46	3.55
SOx	0.0113	lb/MMBTU	0.0113	0.7910	3.955	1443.58	120.30	4.01

PALEN SOLAR POWER PROJECT

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Auxiliary Boiler Emissions

BY	DATE
KLC	5/4/2010

Determination of Emission Factors
NOx EF = (9/1,000,000)(8710 scf/MMBTU)(46 lb/mol)(1 mol/379 scf)(20/20-3) = 0.0111 lb/MMBTU

Pollutant	ppmv	F-Factor	MW (lb/mol)	MV (scf/mol)	%O2 Corr	EF lb/MMBTU
NOx	0.000009	8710	46	379	1.176470588	0.01119
CO	0.000050	8710	28	379	1.176470588	0.03785
VOC						0.00500
PM10						0.01000
SOx						0.01130

VOC and PM10 emisson factors based on vendor supplied data
SOx emission factor taken from SCAQMD 2009 AER General Reporting Instructions Book for LPG

Mass Emissions Sample Calculations (single boiler)
NOx Max Hourly = (35 MMBTU/hr)(0.0111 lb/MMBTU) = 0.3885 lb/hr
NOx Max Daily = (0.3885 lb/hr)(2 hr/day)(100%) + (0.3885 lb/hr)(12 hr/day)(25%) = 1.943 lb/hr
NOx Annual = (0.0111 lb/MMBTU)(35 MMBTU/hr)(730 hr/yr)(100%) + (0.0111 lb/MMBTU)(35 MMBTU/hr)(4380 hr/yr)(25%) = 709.01 lb/yr
NOx Monthly = (709.01 lb/yr)(1 yr/12 months) = 59.08 lb/month
NOx 30DA = (709.01 lb/yr)(1 yr/12 months)(1 month/30 days) = 1.97 lb/day

Boiler Fuel Consumption (single boiler)
FC = (35,000,000 BTU/hr)(730 hr*100% + 4,380 hr*25%)/(91,500 BTU/gallon) = 698,087 gallons/yr

PALEN SOLAR POWER PROJECT
Emergency Generator Emissions

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Data:
Standard Conditions: 29.92 inches Hg and 68 degrees Fahrenheit
Manufacturer: Caterpillar
Model No.: 9CPXL08.8ESK
Type of Fuel: Diesel w/ 15 ppm sulfur by weight
Rated Power: 2,922 bhp
Engine Design: Lean Burn
Maximum Rated Fuel Consumption: 141.3 gph
MW SO2 = 64 lb/lb-mol
MW S = 32 lb/lb-mol
Diesel Density = 7.2 lb/gal

Assumptions:
Maximum hours of operation: 50 hours/year
Steady speed, steady load operations

Pollutant	Emission Factor (gm/BHP-hr)	Maximum Rated Power (BHP)	Conversion Factor (gm/lb)	Emission Rate (lb/hr)	Annual Emission Rate (lb/year)	Monthly Emission Rate (lb/month)	30 Day Average (lb/day)
NOx	4.56	2,922	454	29.349	1,467.44	122.29	**4.0762**
VOC	0.24	2,922	454	1.545	77.23	6.44	**0.2145**
CO	2.60	2,922	454	16.734	836.70	69.72	**2.3242**
PM10	0.15	2,922	454	0.965	48.27	4.02	**0.1341**
SOx				0.0305	1.53	0.13	**0.0042**

Mass Emission Sample Calculations (single engine)
NOx Hourly = (4.56 gm/bhp-hr)(2922 bhp)(1 lb/454 gm) = 29.349 lb/hr
NOx Annual = (29.349 lb/hr)(50 hr/yr) = 1,467.44 lb/yr
NOx Monthly = (1,467.44 lb/yr)(1 yr/12 months) = 122.29 lb/month
NOx 30DA = (1,467.44 lb/yr)(1 yr/12 months)(1 month/30 days) = 4.076 lb/day
SOx Hourly = (15/1,000,000)(141.3 gal/hr)(7.2 lb/gal)(64 lb/mol SO2 / 32 lb/mol S) = 0.0.0305 lb/hr

PALEN SOLAR POWER PROJECT
Emergency Fire Water Pump Emissions

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Data:
Standard Conditions: 29.92 inches Hg and 68 degrees Fahrenheit
Manufacturer: Caterpillar
Model No.: 9CPXL08.8ESK
Type of Fuel: Diesel w/ 15 ppm sulfur by weight
Rated Power: 300 bhp
Engine Design: Lean Burn
Maximum Rated Fuel Consumption: 15.3 gph
MW SO2 = 64 lb/lb-mol
MW S = 32 lb/lb-mol
Diesel Density = 7.2 lb/gal

Assumptions:
Maximum hours of operation: 50 hours/year
Steady speed, steady load operations

Pollutant	Emission Factor (gm/BHP-hr)	Maximum Rated Power (BHP)	Conversion Factor (gm/lb)	Emission Rate (lb/hr)	Annual Emission Rate (lb/year)	Monthly Emission Rate (lb/month)	30 Day Average (lb/day)
NOx	2.85	300	454	1.883	94.16	7.85	**0.2616**
VOC	0.15	300	454	0.099	4.96	0.41	**0.0138**
CO	2.60	300	454	1.718	85.90	7.16	**0.2386**
PM10	0.15	300	454	0.099	4.96	0.41	**0.0138**
SOx				0.0033	0.17	0.01	**0.0005**

Mass Emission Sample Calculations (single engine)
NOx Hourly = (2.85 gm/bhp-hr)(300 bhp)(1 lb/454 gm) = 1.883 lb/hr
NOx Annual = (1.883 lb/hr)(50 hr/yr) = 94.16 lb/yr
NOx Monthly = (94.16 lb/yr)(1 yr/12 months) = 7.85 lb/month
NOx 30DA = (94.16 lb/yr)(1 yr/12 months)(1 month/30 days) = 0.2616 lb/day
SOx Hourly = (15/1,000,000)(15.3 gal/hr)(7.2 lb/gal)(64 lb/mol SO2 / 32 lb/mol S) = 0.0033 lb/hr

PALEN SOLAR POWER PROJECT
Ullage System Emissions (Excludes Fugitives)

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Parameter	Value	Units	Reference
Daily Operating Hours	2	hours/day	Design Basis
Annual Operating Hours	400	hours/year	Design basis
Controlled Emissions	0.75	lb/hr	Assumed
	1.5	lb/day	Assumed
Control Efficiency	98%		Design Basis

Single Ullage System

	Hourly Uncontrolled lb/hr	Hourly Controlled lb/hr	Max Hourly Uncontrolled lb/hr	Max Hourly Controlled lb/hr	Max Daily Uncontrolled lb/day	Max Daily Controlled lb/day	Annual lb/yr	Monthly lb/month	30 DA lb/day
VOC Emissions	1.71	0.034	37.50	0.75	75.00	1.50	300.00	25.00	0.833

Two Ullage Systems

	Hourly Uncontrolled lb/hr	Hourly Controlled lb/hr	Max Hourly Uncontrolled lb/hr	Max Hourly Controlled lb/hr	Max Daily Uncontrolled lb/day	Max Daily Controlled lb/day	Annual lb/yr	Monthly lb/month	30 DA lb/day
VOC Emissions	3.42	0.068	75.00	1.50	150.00	3.00	600.00	50.00	1.67

Mass Emissons
Max Hourly Controlled = (37.50 lb/hr)(1-0.98) = 0.75 lb/hr
Max Daily Uncontrolled = (37.50 lb/hr)(2 hr/day) = 75 lb/day
Max Daily Controlled = (0.75 lb/hr)(2 hr/day) = 1.5 lb/day
Annual = (0.75 lb/hr)(400 hr/yr) = 300 lb/yr
Monthly = (300 lb/yr)(1 yr/12 months) = 25 lb/month
30DA = (300 lb/yr)(1 yr/12 months)(1 month/30 days) = 0.833 lb/day