PUNA GEOTHERMAL VENTURE

HAWAI'I

POSTMARK
OCT - 6 2014

0008-13

September 11, 2014

Mr. Nolan Hirai
Clean Air Branch
State Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

RE: Non-covered Source Permit (NSP) No. 0008-02-N
Request for Renewal and Modification

Dear Mr. Hirai:

In accordance with HAR Section 11-60.1-69, enclosed are the following documents regarding a request for a renewal and modification to Puna Geothermal Venture's (PGV) Non-covered Source Permit (NSP) No. 0008-02-N:

1. Form S-1 Standard Permit Application Form
2. Form C-1 Compliance Plan
3. Form S-9 Application for a Non-Covered source permit Renewal
4. Form S-12 Application for a Modification to a Non-covered Source

In general, PGV seeks to renew our permit and a single word of modification to our existing permit to change the word **initial to previous.** The modification is detailed as part of Form S-12.

We are requesting a modification to section F.2. of Attachment IIB: Special Conditions.

Enclosed please find PGV's check in the amount of $100.00, for the modification of the permit.

Sincerely,

Cliff Townsend
Plant Manager

C:\Users\gwells\Documents\NSP modification\1-140911cover.doc
We certify that this document and all attachments are true, accurate, and complete, pursuant to HAR 11-60.1-4.

Post Office Box 30 • 14-3860 Kapoho-Pāhoa Road
Pāhoa, Hawai'i 96778
Tel (808) 965-6233 • Fax (808) 965-7254
PunaGeothermalVenture.com
an ORMAT company

MA28024

Enclosures: Form S-1, with associated attachments
Form C-1, with associated attachments
Form S-12, with associated attachments
Modification Fee Check - $100.00

cc: Darin Lum - DOH
Ed Yamamoto – DOH
PGV File

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Puna Geothermal Venture
Check Request

Amount: $ 100.00
Date Required: 09/30/14
Time Required: _____
(Specify am or pm)

DATE: 09/24/14

PAYABLE TO: Clean Air Fund- NON
Name

ADDRESS: Hawaii Department Of Health
ATTN (If Applicable)
Environmental Management Division
Street
Clean Air Branch
P.O. Box (If Applicable)
P.O. Box 3378 Hon Hi. 96801
City, State and Zip Code

PURPOSE: Application Fee

METHOD OF PAYMENT: (Check box for selection)

	General Account	✓	Petty Cash Checking Account
	General Account – Monthly Pay Run		Petty Cash
	Sub Account		Wire Transfer

COST CENTER:

Cost Code	Amount	PO Number (If Applicable)
6681 - 9100	$ 100.00	
-	$	
-	$	
-	$	
-	$	
-	$	

SPECIAL INSTRUCTIONS: (Check box for selection)

✓	Return Check to Requestor		Mail Out (with Attachments)
	Hold for COD Delivery		Mail Out (w/out Attachments)
	To be Hand Delivered		

SIGNATURES:

Requestor: G. Wells _____ 9/24/14
Date

Dept Manager: _____
Date

Plant Manager: _____ 9/26/14
Date

Owner: _____
Date

T:\ADMIN\JLK\CHKREQ98.rtf

MD28024

OCT - 8 2014

File/Application No.: _____

S-1: Standard Air Pollution Control Permit Application Form

(Covered Source Permit and Noncovered Source Permit)

State of Hawaii
Department of Health
Environmental Management Division
Clean Air Branch
P.O. Box 3378 • Honolulu, HI 96801-3378 • Phone: (808) 586-4200

1. Company Name: Puna Geothermal Venture

2. Facility Name (if different from the Company): N/A

3. Mailing Address: P.O. Box 30

   City: Pahoa State: HI Zip Code: 96778

   Phone Number: 808-965-6233

4. Name of Owner/Owner's Agent: _____

   Title: _____ Phone: _____

   Mailing Address: _____

   City: _____ State: _____ Zip Code: _____

5. Plant Site Manager/Other Contact: Cliff N.Townsend

   Title: Plant Manager Phone: 808-965-2847

   Mailing Address: P.O. Box 30

   City: Pahoa State: HI Zip Code: 96778

6. Permit Application Basis: (Check all applicable categories.)

   ☐ Initial Permit for a New Source ☐ Initial Permit for an Existing Source

   ☒ Renewal of Existing Permit ☐ General Permit

   ☐ Temporary Source ☐ Transfer of Permit

   ☐ Modification to a Covered Source: → Is Modification? ☐ Significant ☐ Minor ☐ Uncertain

   ☒ Modification to a Noncovered Source

7. If renewal or modification, include existing permit number: NSP #0008-02-N

8. Does the Proposed Source require a County Special Management Area Permit? ☐ Yes ☒ No

9. Type of Source (Check One): ☐ Covered Source ☐ Covered and PSD Source

   ☒ Noncovered Source ☐ Uncertain

10. Standard Industrial Classification Code (SICC), if known: 4911

MD 2802 U

11. Proposed Equipment/Plant Location (e.g. street address): 14-3860 Kapoho Pahoa Road

City: Pahoa State: HI Zip Code: 96778

UTM Coordinates (meters): East: 301.00-301.66 North: 2154.84-2155.58

UTM Zone: 4 UTM Horizontal Datum: ☐ Old Hawaiian ☐ NAD-27 ☐ NAD-83

12. General Nature of Business: Power Generation

13. Date of Planned Commencement of Construction or Modification: Fourth quarter of 2014

14. Is ***any*** of the equipment to be leased to another individual or entity? ☐ Yes ☒ No

15. Type of Organization: ☐ Corporation ☐ Individual Owner ☒ Partnership

☐ Government Agency (Government Facility Code: _____)

☐ Other: _____

Any applicant for a permit who fails to submit any relevant facts or who has submitted incorrect information in any permit application shall, upon becoming aware of such failure or incorrect submittal, promptly submit such supplementary facts or corrected information. In addition, an applicant shall provide additional information as necessary to address any requirements that become applicable to the source after the date it filed a complete application, but prior to the issuance of the noncovered source permit or release of a draft covered source permit. (HAR §11-60.1-64 & 11-60.1-84)

RESPONSIBLE OFFICIAL (as defined in HAR §11-60.1-1)

Name (Last): Townsend (First): Cliff Townsend (MI): N.

Title: Plant Manager Phone: 808-965-2847

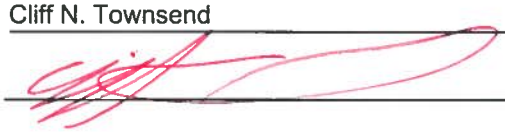
Mailing Address: P.O. Box 30

City: Pahoa State: HI Zip Code: 96778

Certification by Responsible Official (pursuant to HAR §11-60.1-4)

I certify that I have knowledge of the facts herein set forth, that the same are true, accurate and complete to the best of my knowledge and belief, and that all information not identified by me as confidential in nature shall be treated by the Department of Health as public record. I further state that I will assume responsibility for the construction, modification, or operation of the source in accordance with the Hawaii Administrative Rules (HAR), Title 11, Chapter 60.1, Air Pollution Control, and any permit issued thereof.

NAME (Print/Type): Cliff N. Townsend

(Signature):  Date: 9/11/14

FOR AGENCY USE ONLY:

File/Application No.: _____

Island: _____

Date Received: _____

Submit the following documents as part of your application:

A. The ***Emissions Units Table***, filled in as completely as possible. Use separate sheets of paper as needed. General instructions include the following:

1. Identify each **emission point** with a unique number for this plant site, consistent with emission point identification used on the location drawing and previous permits; if known, provide the SICC number. Emission points shall be identified and described in sufficient detail to establish the basis for **fees** and applicability of requirement of HAR, Chapter 11-60.1. Examples of emission point names are: heater, vent, boiler, tank, baghouse, fugitive, etc. Abbreviations may be used.
   a. For each emission point use as many lines as necessary to list regulated and hazardous air pollutant data. For hazardous air pollutants, also list the Chemical Abstracts Service number (CAS#).
   b. Indicate the emission points that discharge together for any length of time.
   c. The **Equipment Date** is the date of equipment construction, reconstruction, or modification. Provide supporting documentation.

2. State the **maximum emission rates** in terms sufficient to establish compliance with the applicable requirements and standard reference test methods. Provide all supporting emission calculations and assumptions:
   a. Include all regulated and hazardous air pollutants and air pollutants for which the source is major, as defined in HAR §11-60.1-1. Examples of regulated pollutant names are: Carbon Monoxide (CO), Nitrogen Oxides (NO_X), Sulfur Dioxide (SO_2), Volatile Organic Compounds (VOC), particulate matter (PM), and particulate less than 10 microns (PM_{10}). Abbreviations may be used.
   b. Include fugitive emissions.
   c. **Pounds per hour (#/HR)** is the maximum potential emission rate expected by applicant.
   d. **Tons per year** is the annual maximum potential emissions expected by the applicant, taking into account the typical operating schedule.

3. Describe ***Stack Source Parameters***:
   a. **Stack Height** is the height above the ground.
   b. **Direction** refers to the exit direction of stack emissions: up, down or horizontal.
   c. **Flow Rate** is the actual, not the calculated, flow rate.

4. Provide any additional information, if applicable, as follows:
   a. If combinations of different fuels are used that cause any of the stack source parameters to differ, complete one row for each possible set of stack parameters and identify each fuel in the **Equipment Description**.
   b. For a rectangular stack, indicate the length and width.
   c. Provide any information on stack parameters or any stack height limitations developed pursuant to Section 123 of the Clean Air Act.

B. A **process flow diagram** identifying all equipment used in the process, including the following:
1. Identify and describe each emission point.
2. Identify the locations of safety valves, bypasses, and other such devices which when activated may release air pollutants to the atmosphere.

C. A **facility location map**, drawn to a reasonable scale and showing the following:
1. The property involved and all structures on it. Identify property/fence lines plainly.
2. Layout of the facility.
3. Location and identification of the proposed emissions unit on the property.
4. Location of the property and equipment with respect to streets and all adjacent property. Show the location of all structures within 100 meters of the applicant's emissions unit. Provide the building dimensions (height, length, and width) of all structures that have heights greater than 40% of the stack height of the emissions unit.

D. Provide a description of any proposed modifications or permit revisions. Include any justification or supporting information for the proposed modifications or permit revisions.

ATTACHMENT 1 TO FORM S-1
EMISSION UNITS TABLE - FACILITY

POWER PLANT POINT SOURCES

Reference System P-1.

Vapor Recovery Maintenance Unit (VRMU): The VRMU is used to evacuate and recover pentane before venting non-condensable gases from the pentane system (turbines, cooler, heat exchanger, etc.). The VRMU utilizes a 4-step recovery and an activated carbon filtering system. The recovered pentane is returned to the pentane storage vessels. Attachment 4 to Form S-1 contains a description of the methods used to calculate the emission rates for this unit.

Reference System P-2.

Vapor Recovery Unit (VRU): The VRU is normally used to remove pentane before venting non-condensable gases form the pentane system (turbines, cooler, heat exchanger, etc.). The VRU uses a two-stage refrigeration cycle to achieve recovery of pentane. The recovered pentane is returned to the pentane storage vessels. Attachment 4 to Form S-1 contains a description of the methods used to calculate the emission rates for this unit.

Reference System P-3.

Sulfa-Treat System: The Sulfa-Treat system collects and abates fugitive hydrogen sulfide (H_2S) emissions which result from upset conditions of the steam turbine seals. The system operates on a vacuum to collect the fugitive emissions from the seals and then uses a system currently comprised (which may change from time to time) of two abatement reactors in series to chemically abate the H_2S emissions. Attachment 4 to Form S-1 contains a description of the methods used to calculate the emission rates for this unit.

POWER PLANT AND WELLFIELD FUGITIVE SOURCES

Reference System F-1.

Power Plant - Steam, Turbine-Generator, and Condensate Systems: This system has the potential for fugitive H_2S emissions through leaking seals, flanges, valves, and other fugitive emission points. Sensors with alarms set for 10 ppm are located on each turbine/generator unit. The alarms, which are activated in the control room, immediately alert personnel of fugitive H_2S emissions so that corrective action can be taken.

Reference System F-2.

Power Plant - Non-Condensable Gas (NCG) System: This system has the potential for fugitive H_2S emissions through leaking seals, flanges, valves, and other fugitive emission points. Sensors with alarms set for 5 ppm are located strategically throughout the system. The alarms, which are activated in the control room, immediately alert personnel of fugitive H_2S emissions so that corrective action can be taken.

Reference System F-4.

Pad A Wellfield: KS-9 and KS-10 Production Wells, KS-1A, KS-11 and KS-13 Injection Wells, and Associated System: These wells and associated equipment have the potential for fugitive H_2S emissions. Sensors are strategically located throughout the wellfield. H_2S emissions during maintenance operations are abated using a portable H_2S abatement vessel.

Reference System F-5.

Pad E Wellfield: KS-3 Injection Well, KS-5, KS-6 and KS-14 Production Wells and Associated System: These wells and associated equipment have the potential for fugitive H_2S emissions. H_2S emissions during maintenance operations are abated using a portable H_2S abatement vessel.

Reference System F-7

Pad B Wellfield: KS-15 Production Wells and Associated System: These wells and associated equipment have the potential for fugitive H_2S emissions. H_2S emissions during maintenance operations are abated using a portable H_2S abatement vessel.

COMPANY NAME: Puna Geothermal Venture

File No.: _____

LOCATION: 14-3860 Kapoho-Pahoa Road, Pahoa HI, 96778

(Make as many copies of this page as necessary)

PAGE ___ OF

EMISSIONS UNITS TABLE

REVIEW OF APPLICATIONS AND ISSUANCE OF PERMITS WILL BE EXPEDITED BY SUPPLYING ALL NECESSARY INFORMATION ON THIS TABLE.

AIR POLLUTANT DATA: EMISSION POINTS				AIR POLLUTANT	AIR POLLUTANT EMISSION RATE		UTM COORDINATES			STACK SOURCE PARAMETERS					
STACK NO.	UNIT NO.	EQUIPMENT NAME/DESCRIPTION and SICC Code	EQUIP. DATE (1)	REGULATED/ HAZARDOUS AIR POLLUTANT NAME (CAS#)	#/ HR.	TONS/ YR.	ZONE	EAST (mtrs)	NORTH (mtrs)	HEIGHT ABOVE GROUND (mtrs)	DIRECT. (2)	INSIDE DIA. (mtrs)	VEL. (m/s)	ACTUAL FLOW RATE (m^3/s)	TEMP. (° K)
S-1	P-1	Vapor Recovery Maintenance Unit (see description in attachment 1)	2009	N-Pentane 109-66-0	57.3	1.72		301.49	2155.32	.15	up				
S-2	P-2	Vapor Recovery Unit (see description in attachment 1)	1993	N-Pentane 109-66-0	57.3	1.72		301.49	2155.32	2.52	up				
S-3	P-3	Sulfa-Treat System (see description in attachment 1)	1993	H2S 7783-06-4	.0056	.025		301.49	2155.32	3.35	up	0.1	3.53	.03	286
	F-1	Power Plant- Steam, Turbine-Generator, and condensate systems	1991	H2S 7783-06-4	See in attachment 1	See in attachment 3									
	F-2	Power Plant- Non Condensable Gas System	1991	H2S 7783-06-4	See in attachment 1	See in attachment 3									
	F-3	Power Plant- Pentane System	1991	N-Pentane 109-66-0	See in attachment 1	See in attachment 3									
	F-4	Pad A Wellfield: KS-9 and KS-10 Production Wells, KS-1A Injection Well, and associated system		H2S 7783-06-4	See in attachment 1	See In attachment 3									
	F-5	Pad E Wellfield: KS-5, KS-6 and KS-14 Production Wells, KS-3 Injection Wells and associated systems		H2S 7783-06-4	See in attachment 1	See in attachment 3									

	F-6	Pad D power plant: Integrated Two Level Unit (ITLU)	2009	N-Pentane 109-66-0	See in attachment 1	See in attachment 3									

(1) Date of Equipment Construction, Reconstruction, or Modification. Provide supporting documentation.
(2) Exit direction of stack emissions: up, down, or horizontal.
(3) See attachment 4 to form S-1 for emission rate calculations.

ATTACHMENT 2 TO FORM S-1
EMISSION UNITS TABLE - FACILITY UPSET/EMERGENCY CONDITIONS

Reference System U-1.

Diesel-Driven, Emergency Water Pump (262 Hp nominal), Wellfield: This pump is available for emergency use at the production wells and will also be used in the event of the need to secure a well. The pump may be used in the annually required mechanical integrity test (MIT) of the reinjection wells. Emissions of combustion products are minimized due to its infrequent use.

Reference System U-2.

Portable H_2S *Abatement System, Power Plant:* This portable two-tank system is used to abate potential emissions when maintenance work is performed on systems that may contain residual H_2S gas. This system could also be used in the wellfield.

Reference System U-3.

Portable H_2S *Abatement Vessel, Wellfield:* This portable abatement system for H_2S is used during well maintenance operations. This system could also be used in the power plant.

Reference System U-4.

Emergency Steam Release Facility (ESRF): This system, including associated tanks and equipment, is designed to handle emergency situations such as a problem with the electrical transmission line(s) out of the power plant, upset of the geothermal fluid injection system, or if the pressure in the steam line exceeds the set points. The ESRF is used for upset conditions to prevent a release of unabated H_2S to the atmosphere.

Reference System U-5.

Turbine/Generator Modules - Steam System PSE (rupture disk) & PSV (pressure safety valve) (2 per module): During normal power plant operations, no H_2S emissions from PSEs and PSVs will occur. It is only during an upset, abnormal, or emergency condition that a potential for emissions would exist.

Reference System U-6.

Turbine/Generator Modules - Pentane System PSE & PSV: During normal power plant operations, no pentane emissions from PSEs and PSVs will occur. It is only during an upset, abnormal, or emergency condition that a potential for emissions exists.

Reference System U-7.

Injection Wells PSE & PSV's (KS-1A, KS-3, KS-11 & KS-13) Emissions of H_2S gas would occur only if an upset, abnormal, or emergency condition exists.

Reference System U-8.

Production Wells PSEs and PSVs (KS-5, KS-6, KS-9, KS-10 and KS-14): This serves as a secondary safety system that would activate only in the event of an upset, abnormal, or emergency condition where the steam system causes an overpressure in combination with a malfunction of the ESRF.

Reference System U-9.

Moisture Primary and Secondary Flash Separators PSE & PSV's (3 units): This system will not have an emission of H_2S gas during normal operation. Emissions of H_2S gas would occur only if an upset, abnormal, or emergency condition exists. This serves as a secondary safety system protection for the separator vessel.

COMPANY NAME: Puna Geothermal Venture

LOCATION: 14-3860 Kapoho-Pahoa road, Pahoa HI 96778

(Make as many copies of this page as necessary)

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EMISSIONS UNITS TABLE

REVIEW OF APPLICATIONS AND ISSUANCE OF PERMITS WILL BE EXPEDITED BY SUPPLYING ALL NECESSARY INFORMATION ON THIS TABLE.

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STACK NO.	UNIT NO.	EQUIPMENT NAME/DESCRIPTION and SICC Code	EQUIP. DATE (1)	REGULATED/ HAZARDOUS AIR POLLUTANT NAME (CAS#)	#/ HR.	TONS/ YR.	ZONE	EAST (mtrs)	NORTH (mtrs)	HEIGHT ABOVE GROUND (mtrs)	DIRECT. (2)	INSIDE DIA. (mtrs)	VEL. (m/s)	ACTUAL FLOW RATE (m^3/s)	TEMP. (° K)
S-1	U-1	Diesel driven, Emergency water pump (262 HP Nominal). Wellfield	1993	Combustion products	See description in attachment 2	See description in attachment 2									
S-2	U-2	Portable H2S Abatement System, Power plant		H2S 7783-06-4	See description in attachment 2	See description in attachment 2									
	U-3	Portable H2S Abatement System, Wellfield		H2S 7783-06-4	See description in attachment 2	See description in attachment 2									
	U-4	Emergency Steam Release Facility (ESRF)		H2S 7783-06-4	See description in attachment 2	See description in attachment 2									
	U-5	Turbine/Generator Modules-Steam System PSE (Rupture Disk) and PSV (Pressure Safety Valve)		H2S 7783-06-4	See description in attachment 2	See description in attachment 2									
	U-6	Turbine/Generator Modules- Pentane System PSE & PSV		H2S 7783-06-4	See description in attachment 2	See description in attachment 2									
	U-7	Injection Wells KS1A, KS3, KS11, KS13 PSE & PSV		H2S 7783-06-4	See description in attachment 2	See description in attachment 2									
	U-8	Production Wells KS4, KS5, KS6, KS9, KS10, & KS14 PSE & PSV		H2S 7783-06-4	See description in attachment 2	See description in attachment 2									
	U-9	Moisture/Primary/Secondary Flash (3) Separators PSE & PSV		H2S 7783-06-4	See description in attachment 2	See description in attachment 2									

(1) Date of Equipment Construction, Reconstruction, or Modification. Provide supporting documentation.
(2) Exit direction of stack emissions: up, down, or horizontal.

ATTACHMENT 3 TO FORMS A-1
EMISSION UNITS TABLE - EXEMPT SOURCES

Reference Unit E-1.

Diesel-Driven, Emergency Firewater Pump (370 Hp nominal), Power Plant: This pump is exempt from noncovered source permit requirements, as specified under Hawaii Administrative Rules (HAR) 11.60.1-62(d)(7) which exempts standby generators and pumps which are used to protect the health and welfare of personnel and the public and which are used only during power outages, maintenance, and testing. The engine uses diesel fuel and does not trigger PSD or covered source review.

Reference Unit E-2.

Standby Diesel Generator (1,400 kW nominal), Power Plant: This generator is exempt from noncovered source permit requirements, as specified under HAR 11.60.1-62(d)(7) which exempts standby generators and pumps which are used to protect the health and welfare of personnel and the public and which are used only during power outages, maintenance, and testing. The engine uses diesel fuel and does not trigger PSD or covered source review.

Reference Unit E-3.

Pentane Storage Tanks (two 10,000-gallon nominal capacity tanks): These two pentane storage tanks are exempt from noncovered source permit requirements, as specified under HAR 11.60.1-62(d)(7) which exempts storage tanks containing volatile organic compounds (VOCs) with capacity equal to or less than 40,000 gallons.

Reference Unit E-4.

Diesel Storage Tank (less than 100 gallon nominal capacity) for Emergency Water Pump, Wellfield: This diesel storage tank is exempt from noncovered source permit requirements, as specified under HAR 11.60.1-62(d)(7) which exempts storage tanks containing volatile organic compounds (VOCs) with capacity equal to or less than 40,000 gallons.

Reference Unit E-5.

Diesel Storage Tank (500 gallon nominal capacity) for Diesel-Driven Emergency Firewater Pump, Power Plant: This diesel storage tank is exempt from noncovered source permit requirements, as specified under HAR 11.60.1-62(d)(7) which exempts storage tanks containing volatile organic compounds (VOCs) with capacity equal to or less than 40,000 gallons.

Reference Unit E-6.

Diesel Storage Tank (1,500 gallon nominal capacity) for Standby Generator, Power Plant: This diesel storage tank is exempt from noncovered source permit requirements, as specified under HAR 11.60.1-62(d)(7) which exempts storage tanks containing volatile organic compounds (VOCs) with capacity equal to or less than 40,000 gallons.

Reference Unit E-7.

Diesel Storage Tank (1,000 gallon nominal capacity), Vehicle Use: This diesel storage tank is exempt from noncovered source permit requirements, as specified under HAR 11.60.1-62(d)(7) which exempts storage tanks containing volatile organic compounds (VOCs) with capacity equal to or less than 40,000 gallons.

Reference Unit E-8.

Unleaded Gasoline Storage Tank (1,000 gallon nominal capacity), Vehicle Use: This gasoline storage tank is exempt from noncovered source permit requirements, as specified under HAR 11.60.1-62(d)(7) which exempts storage tanks containing volatile organic compounds (VOCs) with capacity equal to or less than 40,000 gallons.

Reference Unit E-9.

Diesel Storage Tank (13,000 gallon nominal capacity), to fill Day Tanks for Engines used for Drilling Rig: This diesel storage tank is exempt from noncovered source permit requirements, as specified under HAR 11.60.1-62(d)(7) which exempts storage tanks containing volatile organic compounds (VOCs) with capacity equal to or less than 40,000 gallons.

Reference Unit E-10.

Diesel Storage Day Tanks (approx. 40 gallon nominal capacity each), one for each of three Waukesha Engines (Drilling Rig) and one shared for the two Caterpillar Engines (Drilling Rig): These diesel storage day tanks are exempt from noncovered source permit requirements, as specified under HAR 11.60.1-62(d)(7) which exempts storage tanks containing volatile organic compounds (VOCs) with capacity equal to or less than 40,000 gallons.

Reference Unit E-11.

Diesel Storage Day Tank (not-to-exceed 3,000 gallon nominal capacity), for Top Drive Engine used for Drilling Rig: This diesel storage day tank is exempt from noncovered source permit requirements, as specified under HAR 11.60.1-62(d)(7) which exempts storage tanks containing volatile organic compounds (VOCs) with capacity equal to or less than 40,000 gallons.

Reference Unit E-12.

Diesel Storage Day Tanks (not-to-exceed approximately 500 gallon nominal capacity each), one for each of the engines listed as Stack #S-DR4 through #S-DR7: These diesel storage day tanks are exempt from non-covered source permit requirements, as specified under HAR 11.60.1-62(d)(7) which exempts storage tanks containing volatile organic compounds (VOCs) with capacity equal to or less than 40,000 gallons.

Reference Unit E-13.

Pad D Pentane Storage Tank (10,000-gallon nominal capacity tanks): This pentane storage tank is exempt from the non-covered source permit requirements, as specified under HAR 11.60.1-62(d)(7) which exempts storage tanks containing volatile organic compounds (VOCs) with capacity equal to or less than 40,000 gallons.

ATTACHMENT 4 TO FORM S-1
EMISSION RATE CALCULATIONS

VAPOR RECOVERY UNIT

Emissions from the vapor recovery unit (VRU) were estimated using operating data recorded from the VRU unit. The VRU flow totalizer records the total amount of condensed liquid pentane that travels through the VRU. The totalizer readings were used to determine both annual and maximum hourly volumes of pentane condensed. The mass of pentane condensed can be calculated by:

$$\text{Pentane Recovered}\left(\frac{\text{lb}}{\text{Time}}\right)=\frac{\text{Volume (gal)}}{\text{Time}}\ \text{x Density}\left(\frac{\text{lb}}{\text{gal}}\right)$$

The total amount of pentane (or uncontrolled emissions) passing through the VRU can be calculated using a recovery efficiency as follows:

$$\text{Uncontrolled Emissions}\left(\frac{\text{lb}}{\text{Time}}\right)=\frac{\text{Pentane Recovered}\left(\frac{\text{lb}}{\text{Time}}\right)}{\left(\frac{\%\text{Recovery}}{100}\right)}$$

The emissions of pentane can then be calculated as the difference between the total pentane through the system and the amount condensed:

$$\text{Controlled Emissions}\left(\frac{\text{lb}}{\text{Time}}\right)=\text{Uncontrolled Emissions}\left(\frac{\text{lb}}{\text{Time}}\right)-\text{Pentane Recovered}\left(\frac{\text{lb}}{\text{Time}}\right)$$

More generically, the controlled pentane emissions can be estimated based on the amount recovered by:

$$\text{ControlledEmissions}\left(\frac{\text{lb}}{\text{Time}}\right)=\frac{\text{Pentane Recovered}\left(\frac{\text{lb}}{\text{Time}}\right)}{\frac{\%\text{Recovery}}{100}}-\text{Pentane Recovered}\left(\frac{\text{lb}}{\text{Time}}\right)$$

rearranging,

$$\text{Controlled Emissions}\left(\frac{lb}{Time}\right)=\text{Pentane Recovered}\left(\frac{lb}{Time}\right)\text{x}\left(\frac{1}{\frac{\%\,\text{Recovery}}{100}}-1\right)$$

A recovery efficiency of 95% was used for calculational purposes. This results in a conservative emission estimate and allows for variations in both hourly and annual emissions. Maximum and average hourly emissions were based on the flow totalizer readings from the past two and a half years (3rd Quarter '96 – 3rd Quarter '97). Using these values, and the density of pentane (5.29 lb/gal), maximum and average hourly emission estimates were calculated as follows:

$$\text{Maximum Controlled Emissions}\left(\frac{\text{lb}}{\text{hr}}\right)=\frac{206\,(\text{gal})}{\text{hour}}\text{ x }5.29\left(\frac{\text{lb}}{\text{gal}}\right)\text{x}\left(\frac{1}{\frac{95}{100}}-1\right)=57.3\left(\frac{\text{lb}}{\text{hr}}\right)$$

$$\text{Average Controlled Emissions}\left(\frac{\text{lb}}{\text{hr}}\right)=\frac{106\,(\text{gal})}{\text{hour}}\text{ x }5.29\left(\frac{\text{lb}}{\text{gal}}\right)\text{x}\left(\frac{1}{\frac{95}{100}}-1\right)=29.6\left(\frac{\text{lb}}{\text{hr}}\right)$$

From operating logs, the VRU operates approximately 16 hours per year during purges and approximately 100 hours per year during maintenance activities. Based on these hours of operation and the average hourly emission rate, the average annual controlled emission rate was calculated as follows:

$$\text{Controlled Emissions} = 29.6\left(\frac{\text{lb}}{\text{hr}}\right)\text{ x }116\left(\frac{\text{hrs}}{\text{yr}}\right) = 3{,}434\left(\frac{\text{lb}}{\text{yr}}\right) = 1.72\left(\frac{\text{tons}}{\text{yr}}\right)$$

Uncontrolled emissions were also calculated for the VRU. The maximum hourly and annual uncontrolled emissions estimates were calculated by adding the amounts of pentane recovered with the amount of pentane emissions calculated above to get the total uncontrolled pentane emission rates as follows:

$$\text{Uncontrolled Emissions}\left(\frac{\text{lb}}{\text{hr}}\right) = 57.3\left(\frac{\text{lb}}{\text{hr}}\right)+\frac{206\text{ gal}}{\text{hour}}\text{ x }5.29\left(\frac{\text{lb}}{\text{gal}}\right) = 1{,}146\left(\frac{\text{lb}}{\text{hr}}\right)$$

$$\text{Uncontrolled Emissions}\left(\frac{\text{ton}}{\text{yr}}\right) = 3{,}434\left(\frac{\text{lb}}{\text{yr}}\right)+\frac{106\text{ gal}}{\text{hour}}\text{x}5.29\left(\frac{\text{lb}}{\text{gal}}\right)\text{x}116\left(\frac{\text{hrs}}{\text{yr}}\right) = 68{,}500\left(\frac{\text{lb}}{\text{yr}}\right) = 34.3\left(\frac{\text{ton}}{\text{yr}}\right)$$

SULFA-TREAT SYSTEM

The H_2S emission rates for the Sulfa-Treat system were estimated based on system operating parameters obtained from operation log sheets maintained by PGV. The following typical operating parameters were used in the calculations:

C_{inlet}	=	20,000 parts per million by volume H_2S
C_{exit}	=	18 parts per million by volume H_2S
Q	=	60 ft^3 / minute
P_{inlet}	=	1.2 atmosphere
P_{exit}	=	1 atmosphere
T_{inlet}	=	130°F (589.67°R)
T_{exit}	=	80°F (539.67°R)

where;

C_{inlet}	=	Concentration (molar) of H_2S at the inlet of the Sulfa-Treat system;
C_{exit}	=	Concentration (molar) of H_2S at the exit of the Sulfa-Treat system;
Q	=	Volumetric flow rate of the gas stream;
P_{inlet}	=	Total Pressure at the inlet of the Sulfa-Treat system;
P_{exit}	=	Total Pressure at the exit of the Sulfa-Treat system;
T_{inlet}	=	Temperature of the gas stream at the inlet of the Sulfa-Treat system; and
T_{exit}	=	Temperature of the gas stream at the exit of the Sulfa-Treat system.

Uncontrolled and controlled the H_2S emissions were calculated using typical inlet and outlet concentrations for the Sulfa-Treat system, respectively. These molar concentrations, in parts per million by volume) for H_2S are converted to a mass concentration using the ideal gas law.

$$C = \frac{P_i \times MW}{R \times T} \text{ where } P_i = \frac{n_i \; x \; P \text{ Total}}{n}$$

where;

C	= The mass concentration of H_2S in the influent/effluent gas stream;
Pi	= The partial pressure of H_2S in the influent/effluent gas stream;
MW	= The moleclar weight of H_2S (34.1 lb/lb-mole);
R	= The ideal gas constant (0.7302 ft^3 atm/lb-mole °R);
Ni/n	= C_{inlet} or C_{exit} = The molar concentration of H_2S at reactor inlet/exit; and
T	= Temperature of gas stream at reactor inlet/outlet.

The concentration at the inlet to the Sulfa-Treat system is calculated as:

$$C = \frac{20{,}000 \times 10^{-6} \frac{moles\ H_2S}{mole\ air} \times 1.2\ atm \times 34.1 \frac{lb}{lb\text{-}mole}}{0.7302 \frac{ft^3\ atm}{lb-mole\ ^\circ R}} = 1.90 \times 10^{-3}\ lb/ft$$

The concentration at the exit is calculated as:

$$C = \frac{18 \times 10^{-6} \frac{moles\ H_2S}{mole\ air} \times 1\ atm \times 34.1 \frac{lb}{lb\text{-}mole}}{0.7302 \frac{ft^3\ atm}{lb\text{-}mole\ ^\circ R} \times 539.67^\circ R} = 1.56 \times 10^{-6}\ lb/ft^3$$

The average hourly uncontrolled emission rate was calculated by multiplying the air flow rate times the mass concentration of H_2S at the inlet of the Sulfa-Treat system.

$$\text{Uncontrolled Emssion Rate} \left(\frac{lb}{hr}\right) = C \times Q_{eff} \times 60 \frac{min}{hr}$$

$$\text{Uncontrolled Emission Rate} \left(\frac{lb}{hr}\right) = 1.90 \times 10^{-3} \frac{lb}{ft^3} \times 60 \frac{n^3}{min} \times 60 \frac{min}{hr} = 6.84 \frac{lb}{hr}$$

The uncontrolled annual average emission rate was estimated based on 8760 hours of operation per year.

$$\text{Uncontrolled Emission Rate} = 6.84 \frac{lb}{hr} \times 8760 \frac{hr}{yr} = 59{,}918 \frac{lb}{yr} = 29.96 \frac{tons}{yr}$$

Similarly, the average hourly controlled emission rate was calculated by multiplying the air flow rate times the mass concentration of H_2S at the exit of the Sulfa-Treat system.

$$\text{Emission Rate} \left(\frac{lb}{hr}\right) = C \times Q_{eff} \times 60 \frac{min}{hr}$$

$$\text{Emission Rate} \left(\frac{lb}{hr}\right) = 1.56 \times 10^{-6} \frac{lb}{ft^3} \times 60 \frac{ft^3}{min} \times 60 \frac{min}{hr}\ 0.0056 \frac{lb}{hr}$$

The annual average emission rate was estimated based on 8760 hours of operation per year.

$$\text{Controlled Emission Rate} = 0.0056 \frac{\text{lb}}{\text{hr}} \times 8760 \frac{\text{hr}}{\text{yr}} = 49.1 \frac{\text{lb}}{\text{yr}} = 0.025 \frac{\text{tons}}{\text{yr}}$$

COMPANY NAME: Puna Geothermal Venture

LOCATION: 14-3860 Kapoho-Pahoa road, Pahoa HI 96778

(Make as many copies of this page as necessary)

PAGE ___ OF

EMISSIONS UNITS TABLE

REVIEW OF APPLICATIONS AND ISSUANCE OF PERMITS WILL BE EXPEDITED BY SUPPLYING ALL NECESSARY INFORMATION ON THIS TABLE.

AIR POLLUTANT DATA: EMISSION POINTS				AIR POLLUTANT	AIR POLLUTANT EMISSION RATE		UTM COORDINATES			STACK SOURCE PARAMETERS					
STACK NO.	UNIT NO.	EQUIPMENT NAME/DESCRIPTION and SICC Code	EQUIP. DATE (1)	REGULATED/ HAZARDOUS AIR POLLUTANT NAME (CAS#)	#/ HR.	TONS/ YR.	ZONE	EAST (mtrs)	NORTH (mtrs)	HEIGHT ABOVE GROUND (mtrs)	DIRECT. (2)	INSIDE DIA. (mtrs)	VEL. (m/s)	ACTUAL FLOW RATE (m^3/s)	TEMP. (° K)
	E-1	Diesel Driven, Emergency Firewater Pump (370 HP nominal). Power Plant	1993	Combustion Products	See description in attachment 3	See description in attachment 3									
	E-2	Standby Diesel Geneerator (1400 kW nominal). Power Plant		Combustion Products	See description in attachment 3	See description in attachment 3									
	E-3	Pentane Storage Tanks (two- 10000 gallons nominal capacity tanks)		N-pentane 109-66-0	See description in attachment 3	See description in attachment 3									
	E-4	Diesel Storage Tank (less than 100 gallons nominal capacity tank)		VOCS	See description in attachment 3	See description in attachment 3									
	E-5	Diesel Storage Tank (less than 500 gallons nominal capacity tank) for Diesel driven Emergency Firewater Pump		VOCS	See description in attachment 3	See description in attachment 3									
	E-6	Diesel Storage Tank (500 gallons nominal capacity tank) for Standby Generator, Power Plant		VOCS	See description in attachment 3	See description in attachment 3									
	E-7	Diesel Storage Tank (1000 gallons nominal capacity tank) Vehicle Use		VOCS	See description in attachment 3	See description in attachment 3									
	E-8	Unleaded Gasoline Storage Tank (1000 gallons		VOCS	See description in attach	See description in attach									

		nominal capacity). Vehicle Use			ment 3	ment 3									
	E-9	Diesel Storage Tank (13000 gallon nominal capacity tank). Drill Rig & misc. engine use		VOCS	See description in attachment 3	See description in attachment 3									

(1) Date of Equipment Construction, Reconstruction, or Modification. Provide supporting documentation.
(2) Exit direction of stack emissions: up, down, or horizontal.

ATTACHMENT 1A TO FORM S-1
EMISSION UNITS TABLE – DRILL RIG

DRILL RIG SOURCES

Reference System DR-1.

Waukesha Diesel Engines (three) for Drill Rig: These engines are used to supply the power needed to run the "mechanical" components of the drill rig. Attachment 1 to Form S-12 provides the possible operating scenarios and the one requested by PGV.

Reference System DR-2.

Caterpillar Diesel Engines (two) for Drill Rig Generators: These engine/generator units are used to supply the electrical power needed to run the "house load" of the drill rig. Attachment 1 to Form S-12 describes the "house load" and provides the possible operating scenarios and the one requested by PGV.

Reference System DR-3.

Detroit Diesel Engine (one) for Drill Rig Top Drive: The engine is used to run a hydraulic pumping unit for operation of a Top Drive for the drill rig. The engine manufacturer's Specification Sheet is immediately after this page. It shows the maximum emissions. Attachment 1 to Form S-12 provides the operating scenario requested by PGV.

ADDITIONAL DRILL RIG SOURCES

Reference System DR-10

Caterpillar Diesel Engine to operate Drill Rig No. 2. This mobile rig engine will operate the work over rig that will perform maintenance on existing geothermal wells. The engine manufacturer's Specification Sheet follows this page.

Reference System DR-11

John Deere

Caterpillar Diesel Engine to operate a generator: This engine/generator unit is used to supply the electrical power needed to run the auxiliary equipment and lighting for the drill rig. The engine manufacturer's Specification Sheet follows this page.

Reference System DR-12

John Deere Diesel Engine to operate a pump engine: This pump engine will operate with work over rig that will perform maintenance on existing geothermal wells. The engine manufacturer's Specification Sheet follows this page.

COMPANY NAME: Puna Geothermal Venture

File No.: _____

LOCATION: 14-3860 Kapoho-Pahoa Road, Pahoa HI, 96778

(Make as many copies of this page as necessary)

PAGE ___ OF

EMISSIONS UNITS TABLE

REVIEW OF APPLICATIONS AND ISSUANCE OF PERMITS WILL BE EXPEDITED BY SUPPLYING ALL NECESSARY INFORMATION ON THIS TABLE.

AIR POLLUTANT DATA: EMISSION POINTS				AIR POLLUTANT	AIR POLLUTANT EMISSION RATE		UTM COORDINATES			STACK SOURCE PARAMETERS					
STACK NO.	UNIT NO.	EQUIPMENT NAME/DESCRIPTION and SICC Code	EQUIP. DATE (1)	REGULATED/ HAZARDOUS AIR POLLUTANT NAME (CAS#)	#/ HR.	TONS/ YR.	ZONE	EAST (mtrs)	NORTH (mtrs)	HEIGHT ABOVE GROUND (mtrs)	DIRECT. (2)	INSIDE DIA. (mtrs)	VEL. (m/s)	ACTUAL FLOW RATE (m^3/s)	TEMP. (° K)
	DR-1	Waukesha Diesel Engine (three) – See Description in Attachment	1975	NOx SOx	See Attachment 1A	See Attachment 1A	4	WellPad "E"&"A"	WellPad "E"&"A"	~8.10	Horizontal	0.25	Unknown	Unknown	Unknown
	DR-2	Caterpillar Diesel Engine (two) – See Description in Attachment 1A & Manufacturer Spec sheet	1975	NOx SOx	See attachment 1A	See attachment 1A	4	WellPad "E"&"A"	WellPad "E"&"A"	~3.5	Up	0.21	Unknown	Unknown	Unknown
	DR-3	Detroit Diesel Engine- See description in Attachment 1A & Manufacturer Spec Sheet	2007	NOx SOx	See attachment 1A	See attachment 1A	4	WellPad "E"&"A"	WellPad "E"&"A"	~3.5	Unknown	Unknown	Unknown	Exhaust @ 121.7 m/s	659
	DR-10	Caterpillar Diesel Engine – See description in Attachment 1A & Manufacturer Spec Sheet	2008	NOx SOx	See attachment 1A	See attachment 1A	4	WellPad "E"&"A"	WellPad "E"&"A"	~2.74	Horizontal	1.27	Unknown	Exhaust @ 1.2681 m/s	717.2
	DR-11	John Deere Diesel Engine – See Description in Attachment	2008	NOx SOx	See attachment 1A	See attachment 1A	4	WellPad "E"&"A"	WellPad "E"&"A"	~2.74	Up	0.1016	Unknown	Unknown	817.111
	DR-12	Caterpillar Diesel Engine – See Description in Attachment	2005	NOx SOx	See attachment 1A	See attachment 1A	4	WellPad "E"&"A"	WellPad "E"&"A"	~2.74	Up	0.1524	Unknown	Exhaust @ 2.03463 m/s	795.388

(1) Date of Equipment Construction, Reconstruction, or Modification. Provide supporting documentation.
(2) Exit direction of stack emissions: up, down, or horizontal.
(3) See attachment 4 for the S-1 emission rate calculations.

Motor Values Geodrill Rig 4

Engine Description:	(1)Rig Drive Engine
Manufacture:	Caterpillar
Manufacture Date:	2008
Model:	C-13
Serial Number:	LEE19127
EPA Family Group Number	8CPXH0763E1B
Design Capacity:	430 hp
Fuel Type:	Diesel #2
Max Fuel Consumption:	24.91 GPH
Exhaust Diameter:	5”
Exhaust Direction:	Horizontal
Exhaust Height:	9’
Exhaust Temperature:	831.56*F
Exhaust Flow:	2698.04cfm

Engine Description:	(2)185KW Generator Engine
Manufacture:	John Deere
Manufacture Date:	2008
Model:	6068HF485
Serial Number:	PE6068L039306
EPA Family Group Number:	8JDXL06.8101
Design Capacity:	284 hp
Fuel Type:	Diesel #2
Max Fuel Consumption:	11.8 GPH
Exhaust Diameter:	4”
Exhaust Direction:	UP
Exhaust Height:	9’
Exhaust Temperature:	1015*F
Exhaust Flow:	

Engine Description:	(3) Mud Pump Engine
Manufacture:	Caterpillar
Manufacture Date:	2005
Model:	C-18 DITA
Serial Number:	WJH00848
EPA Family Group Number:	5CPXL18.1ESK
Design Capacity:	630 HP
Fuel Type:	Diesel #2
Max Fuel Consumption:	34.6
Exhaust Diameter:	6"
Exhaust Direction:	UP
Exhaust Height:	9'
Exhaust Temperature:	972.3*F
Exhaust Flow:	4,329 CFM

TRUCK ENGINE PERFORMANCE DATA [LEE19127]

MARCH 16, 2010

For Help Desk Phone Numbers Click here

Performance Number: DM9716

Change Level: 02

Sales Model: C13 DITA
Engine Power: 430 HP
Manifold Type:
Turbo Quantity:
Application Type: TRUCK-ONHWY
Rating Type: HEAVY DUTY ON-HWY / ELEC

Combustion: DI
Speed: 2,100 RPM
Governor Type: ELEC
Engine App: TR
Engine Rating: TR
Certification: EPA - 2009 - 2009
CARB - 2009 - 2009

Aspr: TA
After Cooler: ATAAC
After Cooler Temp(F): 120
Turbo Arrangement:
Strategy:

General Performance Data 1

ENGINE SPEED RPM	ENGINE POWER BHP	ENGINE TORQUE LB.FT	ENGINE BMEP PSI	FUEL BSFC LB/BHP-HR	FUEL RATE GPH	INTAKE MFLD TEMP DEG F	INTAKE MFLD P IN-HG	INTAKE AIR FLOW CFM	EXH MFLD TEMP DEG F	EXH STACK TEMP DEG F	EXH GAS FLOW CFM
2,100	430	1,076.84	212.77	0.41	24.91	129.38	63.82	1,108.88	1,091.48	831.56	2,698.04
2,000	437	1,147.64	226.84	0.39	24.62	128.84	65.62	1,087.69	1,073.48	832.28	2,645.07
1,900	443	1,223.61	241.78	0.38	23.93	120.38	70.42	1,045.32	1,067	828.14	2,532.06
1,800	445	1,298.84	256.72	0.37	23.41	118.58	70.92	1,010	1,059.8	823.1	2,436.71
1,700	445	1,375.55	271.8	0.36	22.64	117.86	71.87	957.03	1,047.56	820.04	2,306.05
1,600	445	1,461.11	288.77	0.34	21.77	118.76	74.45	914.65	1,020.38	810.32	2,185.98
1,500	445	1,559.2	308.06	0.34	21.42	117.32	74.95	872.27	1,010.84	801.32	2,069.44
1,400	440	1,649.92	326.19	0.33	21.03	114.26	76.49	861.68	1,013	794.66	2,030.6
1,300	409	1,652.13	326.63	0.34	19.79	116.24	74.66	812.24	994.28	791.42	1,910.53
1,200	377	1,649.18	325.9	0.35	18.65	114.44	70.57	769.86	969.08	785.48	1,801.05

The powers listed above and all the Powers displayed are Corrected Powers

Identification Reference and Notes

Engine Arrangement:	3021542	**Lube Oil Press @ Rated Spd(PSI):**	55.1
Effective Serial No:	LEE24058	**Piston Speed @ Rated Eng SPD(FT/Min):**	--
Primary Engine Test Spec:	0K8712	**Max Operating Altitude(FT):**	10,000.0
Performance Parm Ref:	TM5740	**PEEC Elect Control Module Ref**	
Performance Data Ref:	DM9716	**PEEC Personality Cont Mod Ref**	
Aux Coolant Pump Perf Ref:			
Cooling System Perf Ref:		**Turbocharger Model**	GTA3782R
Certification Ref:	EPA CARB	**Fuel Injector**	
Certification Year:	2009	**Timing-Static (DEG):**	--
Compression Ratio:	17.1	**Timing-Static Advance (DEG):**	--
Combustion System:	DI	**Timing-Static (MM):**	--
Aftercooler Temperature (F):	120	**Unit Injector Timing (MM):**	--
Crankcase Blowby Rate(CFH):	--	**Torque Rise (percent)**	53.5
Fuel Rate (Rated RPM) No Load(Gal/HR):	--	**Peak Torque Speed RPM**	1200
Lube Oil Press @ Low Idle Spd(PSI):	21.8	**Peak Torque (LB/FT):**	1,649.9

Reference Number: DM9716

********** EPA/CARB COMPLIANCE NOTICE: **********
THIS ENGINE REQUIRES AFTERTREATMENT TO COMPLY WITH APPLICABLE EMISSIONS REGULATIONS. ENGINE IS INCOMPLETE WITHOUT INSTALLATION OF THE AFTERTREATMENT SPECIFIED FOR THIS ENGINE. FOR FURTHER INFORMATION CONSULT: CATERPILLAR APPLICATION AND INSTALLATION GUIDE OR EMAIL: enginecertification@cat.com

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THIS ENGINE PERFORMANCE DATA IS TYPICAL OF THE ENGINES APPROVED BY THE U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) AND THE CALIFORNIA AIR RESOURCES BOARD (CARB) FOR THE CALENDAR YEAR 2009. THIS ENGINE IS APPROVED FOR USE IN CANADA. THIS DATA MAY CHANGE SUBJECT TO EPA AND CARB APPROVED ENGINEERING CHANGES.
EPA - 20092009 CARB - 20092009

Parameters Reference: TM5740

TRUCK - ON HIGHWAY
TOLERANCES:
AMBIENT AIR CONDITIONS AND FUEL USED WILL AFFECT THESE VALUES. EACH OF THE VALUES MAY VARY IN ACCORDANCE WITH THE FOLLOWING TOLERANCES.

POWER	+/-	3%
EXHAUST STACK TEMPERATURE	+/-	8%
INLET AIR FLOW	+/-	5%
INTAKE MANIFOLD PRESSURE - GAGE	+/-	10%
EXHAUST FLOW	+/-	6%
SPECIFIC FUEL CONSUMPTION	+/-	3%
FUEL RATE	+/-	5%
HEAT REJECTION	+/-	5%
HEAT REJECTION EXHAUST ONLY	+/-	10%

CONDITIONS:
ENGINE PERFORMANCE IS CORRECTED TO INLET AIR STANDARD CONDITIONS OF 99 KPA (29.31 IN HG) AND 25 DEG C (77 DEG F).

THESE VALUES CORRESPOND TO STANDARD ATMOSPHERIC PRESSURE AND TEMPERATURE IN ACCORDANCE WITH SAE J1995. ALSO INCLUDED IS A CORRECTION TO STANDARD FUEL GRAVITY OF 35 DEGREES API HAVING A LOWER HEATING VALUE OF 42,780 KJ/KG (18,390 BTU/LB) WHEN USED AT 29 DEG C (84.2 DEG F) WHERE THE DENSITY IS 838.9 G/L (7.002 LB/GAL).

THE CORRECTED PERFORMANCE VALUES SHOWN FOR CATERPILLAR ENGINES WILL APPROXIMATE THE VALUES OBTAINED WHEN THE OBSERVED PERFORMANCE DATA IS CORRECTED TO SAE J1995, ISO 3046-2 & 8665 & 2288 & 9249 & 1585, EEC 80/1269 AND DIN 70020 STANDARD REFERENCE CONDITIONS.

ENGINES ARE EQUIPPED WITH STANDARD ACCESSORIES; LUBE OIL, FUEL PUMP AND JACKET WATER PUMP. THE POWER REQUIRED TO DRIVE AUXILIARIES MUST BE DEDUCTED FROM THE GROSS OUTPUT TO ARRIVE AT THE NET POWER AVAILABLE FOR THE EXTERNAL (FLYWHEEL) LOAD. TYPICAL AUXILIARIES INCLUDE COOLING FANS, AIR COMPRESSORS, AND CHARGING ALTERNATORS.

RATINGS MUST BE REDUCED TO COMPENSATE FOR ALTITUDE AND/OR AMBIENT TEMPERATURE CONDITIONS ACCORDING TO THE APPLICABLE DATA SHOWN ON THE PERFORMANCE DATA SET.

ALTITUDE:
ALTITUDE CAPABILITY - THE RECOMMENDED REDUCED POWER VALUES FOR SUSTAINED ENGINE OPERATION AT SPECIFIC ALTITUDE LEVELS AND AMBIENT TEMPERATURES.

COLUMN "N" DATA - THE FLYWHEEL POWER OUTPUT AT NORMAL AMBIENT TEMPERATURE.

AMBIENT TEMPERATURE - TO BE MEASURED AT THE AIR CLEANER AIR INLET DURING NORMAL ENGINE OPERATION.

NORMAL TEMPERATURE - THE NORMAL TEMPERATURE AT VARIOUS SPECIFIC ALTITUDE LEVELS IS FOUND ON TM2001.

RATINGS MUST BE REDUCED TO COMPENSATE FOR ALTITUDE AND/OR AMBIENT TEMPERATURE CONDITIONS ACCORDING TO THE APPLICABLE DATA SHOWN ON THE PERFORMANCE DATA SET.

DEFINITIONS:
MEDIUM DUTY - OUTPUT THAT SHOULD BE UTILIZED IN TRUCK TYPE VEHICLES PERFORMING SHORT HAUL PICK-UP AND DELIVERY OR OTHER URBAN TYPE SERVICES.

HEAVY-DUTY - OUTPUT THAT SHOULD BE UTILIZED IN TRUCK TYPE VEHICLES PERFORMING INTERCITY AND LONG HAUL SERVICES.

Industrial Engine Performance Data
[WJH00848]

June 12, 2008

C-18
Fig 4 Pump motor.

For Help Desk Phone Numbers
Click here

Performance Number: DM7699

Change Level:

( )	Current
( )	00
(*)	01

Sales Model: C18 DITA	Combustion: DI	Aspr: TA
Engine Power: 630 HP	Speed: 2,100 RPM	After Cooler: ATAAC
Manifold Type: DRY	Governor Type: ELEC	After Cooler Temp(F): 120
Turbo Quantity: 1	Engine App: IN	Turbo Arrangement:
	Engine Rating: IN	Strategy:
Rating Type: IND-C (INT)	Certification: EPA TIER-3 2005 - ----- EU STAGE -IIIA 2006 - 2010	

General Performance Data 1

ENGINE SPEED RPM	ENGINE POWER BHP	ENGINE TORQUE LB.FT	ENGINE BMEP PSI	FUEL RATE LB/BHP-HR	FUEL RATE GPH	INTAKE MFLD TEMP DEG F	INTAKE MFLD P IN-HG	INTAKE AIR FLOW CFM	EXH MFLD TEMP DEG F	EXH STACK TEMP DEG F	EXH GAS FLOW CFM
2100	630	1,576	215	0.384	34.6	120.2	52.3	1,546.8	1,235.3	972.3	4,329.6
2000	630	1,655	226	0.378	34.0	122.5	53.7	1,504.4	1,229.7	966.0	4,191.9
1900	630	1,742	237	0.369	33.2	122.2	54.2	1,447.9	1,219.1	957.6	4,015.3
1800	630	1,839	251	0.360	32.4	120.0	54.2	1,384.3	1,207.4	946.2	3,814.0
1700	623	1,926	263	0.353	31.4	117.7	54.2	1,324.3	1,198.6	934.3	3,612.7
1600	610	2,002	273	0.349	30.4	115.7	54.3	1,260.7	1,199.3	925.7	3,422.0
1500	591	2,070	282	0.348	29.3	113.5	54.3	1,190.1	1,206.9	933.6	3,231.3
1400	566	2,123	289	0.346	28.0	110.3	52.6	1,098.3	1,216.9	954.0	3,019.4
1300	519	2,096	286	0.346	25.6	103.8	47.1	964.1	1,229.2	975.7	2,698.0
1200	414	1,812	247	0.347	20.6	97.0	38.5	801.6	1,246.8	996.4	2,270.7
1100	347	1,654	226	0.352	17.4	90.3	27.3	614.5	1,273.3	1,013.4	1,765.7

General Performance Data 2

ENGINE SPEED RPM	ENGINE POWER BHP	COMPRESS OUT PRESS KPA	COMPRESS OUT TEMP DEG F
2100	630	193	353.5
2000	630	196	352.0
1900	630	197	348.8
1800	630	196	345.0
1700	623	196	341.8

1600	610	195	340.5
1500	591	194	339.4
1400	566	186	334.4
1300	519	165	316.0
1200	414	134	283.3
1100	347	96	238.6

Heat Rejection Data

ENGINE SPEED RPM	ENGINE POWER BHP	REJ TO JW BTU/MN	REJ TO ATMOS BTU/MN	REJ TO EXHAUST BTU/MN	EXH RCOV TO 350F BTU/MN	FROM OIL CLR BTU/MN	FROM AFT CLR BTU/MN	WORK ENERGY BTU/MN	LHV ENERGY BTU/MN	HHV ENERGY BTU/MN
2100	630	9,099.0	7,052.0	30,312.0	17,857.0	3,964.0	6,085.0	26,729.0	74,443.0	79,277.0
2000	630	8,872.0	7,166.0	29,402.0	17,232.0	3,901.0	5,801.0	26,729.0	73,192.0	77,969.0
1900	630	8,644.0	6,995.0	28,151.0	16,379.0	3,805.0	5,516.0	26,729.0	71,429.0	76,092.0
1800	630	8,474.0	6,768.0	26,729.0	15,355.0	3,697.0	5,289.0	26,729.0	69,381.0	73,931.0
1700	623	8,246.0	6,711.0	25,307.0	14,388.0	3,588.0	5,005.0	26,444.0	67,334.0	71,770.0
1600	610	8,076.0	6,881.0	23,999.0	13,535.0	3,480.0	4,777.0	25,876.0	65,287.0	69,552.0
1500	591	7,905.0	6,597.0	22,975.0	12,966.0	3,355.0	4,550.0	25,080.0	63,012.0	67,106.0
1400	566	7,564.0	5,801.0	21,781.0	12,398.0	3,162.0	4,152.0	23,999.0	59,372.0	63,296.0
1300	519	6,938.0	5,061.0	19,677.0	11,374.0	2,855.0	3,469.0	22,009.0	53,628.0	57,097.0
1200	414	6,028.0	6,313.0	16,833.0	9,782.0	2,462.0	2,502.0	17,573.0	46,235.0	49,249.0
1100	347	5,005.0	5,630.0	13,308.0	7,791.0	2,008.0	1,535.0	14,672.0	37,762.0	40,207.0

EMISSIONS DATA

EPA TIER-3 2005 - ----
********** G5 Gaseous emissions data measurement are consistent with those described in

in 40 CFR, EU 97/68/EC, ECE Regulation No. 96 and ISO 8178 for measuring

HC, CO, PM and NOx.

Gaseous emissions values are WEIGHTED CYCLE AVERAGES and are in compliance

with the following non-road regulations:

LOCALITY	AGENCY/LEVEL	MAX LIMITS - g/kw-hr		
U. S. (incl Calif)	EPA/Tier 3	CO:3.5	NOx + HC:4.0	PM:0.2
Europe	EU/Stage-IIIA	CO:3.5	NOx + HC:4.0	PM:0.2

EU STAGE -IIIA 2006 - 2010
********** G5 Gaseous emissions data measurement are consistent with those described in

in 40 CFR, EU 97/68/EC, ECE Regulation No. 96 and ISO 8178 for measuring

HC, CO, PM and NOx.

Gaseous emissions values are WEIGHTED CYCLE AVERAGES and are in compliance

with the following non-road regulations:

LOCALITY	AGENCY/LEVEL	MAX LIMITS - g/kw-hr		
U. S. (incl Calif)	EPA/Tier 3	CO:3.5	NOx + HC:4.0	PM:0.2
Europe	EU/Stage-IIIA	CO:3.5	NOx + HC:4.0	PM:0.2

EXHAUST STACK DIAMETER	--
WET EXHAUST MASS	7,079.0 LB/HR
WET EXHAUST FLOW (971.60 F STACK TEMP)	4,333.11 CFM
WET EXHAUST FLOW RATE (32 DEG F AND 29.98 IN HG)	1,469.00 STD CFM
DRY EXHAUST FLOW RATE (32 DEG F AND 29.98 IN HG)	1,345.84 STD CFM
FUEL FLOW RATE	34 GAL/HR

RATED SPEED "Not to exceed data"

ENGINE SPEED RPM	PERCENT LOAD	ENGINE POWER BHP	TOTAL NOX (AS NO2) LB/HR	TOTAL CO LB/HR	TOTAL HC LB/HR	PART MATTER LB/HR	OXYGEN IN EXHAUST PERCENT
2100	100	630	4.3600	1.1600	.1100	.1900	10.5000
2100	75	473	2.4700	.9400	.1600	.2000	12.0000
2100	50	315	1.4700	.7900	.1800	.2200	14.0000
2100	25	158	1.5400	1.1600	.1100	.2600	15.2000
2100	10	63	1.1200	1.3000	.1500	.1600	16.9000

RATED SPEED "Nominal Data"

ENGINE SPEED RPM	PERCENT LOAD	ENGINE POWER BHP	TOTAL NOX (AS NO2) LB/HR	TOTAL CO LB/HR	TOTAL HC LB/HR	TOTAL CO2 LB/HR	PART MATTER LB/HR	OXYGEN IN EXHAUST PERCENT
2100	100	630	4.0400	.6200	.0600	767.7	.1000	10.5000
2100	75	473	2.2900	.5000	.0800	634.1	.1000	12.0000
2100	50	315	1.3600	.4200	.1000	455.7	.1100	14.0000
2100	25	158	1.4200	.6200	.0600	221.0	.1300	15.2000
2100	10	63	1.0400	.7000	.0800	132.8	.0800	16.9000

Engine Serial Number: PE6068L039306

Base Code:	268JF	**Rating:**	6068HF48
Model No:	6068HF485	**EPA Family:**	8JDXL06.8
Manufactured Date:	Apr 15,2008	**EUR Family:**	8JDXL06.8
Emission Label Part No:	R527144	**EPA Certificate:**	JDX-NRCI
Parts Catalog No:	PC9436	**CARB Certificate:**	U-R-004-0

Option Name	Ordered	Production
Rocker Arm Cover, Front Fill, w/ J.D. Embossed Logo	1145	1145
Oil Filler, RH	1201	1201
Crankshaft Pulley, 188mm (7.47"), Heavy Duty Damper	1320	1320
Flywheel Housing, SAE #2, LH, 3 Bolt Type 1 Starter Mount, Magnetic PU	1420	1420
Flywheel for SAE #3, 10" or 11.5" OCC, 129 Tooth 8/10 Pitch Ring Gear	1509	1509
INJECTION PUMP,6 CYL, 4V, DENSO HP3, L1	16C7	16C7
Air Intake, Vertical Air Inlet	17BL	17BL
Oil Pan, Sheet Metal, Shallow Sump, 35° Int & 25° Cont. Off-Level, 32.5L	1961	1961
93mm Diameter Pulley	2001	2001
Thermostat Cover, Hor, Three Thermostats, Three Sensor Ports, for use w/EGR Components	2154	2154
Three (3) Thermostats	2255	2255
Fan Housing, Nodular Iron, Heavy Duty Bearing, Fan Height less than 15.8"/402mm, Max 12KG Fan	2342	2342
338mm (13.3") Fan Height @ 1.02:1 Fan Drive Ratio	24GH	24GH
NO FAN	2599	-
No Engine Cylinder Block Heater	2699	-
Exhaust Manifold, High Mount Turbo, Front Exhaust, w/ Exhaust Elbow Pad	2873	2873
Vent System, 90° Elbow w/o clamp, 1100mm Vent Hose	2917	2917
12V Denso, 6.4 HP, LH, 3-Bolt, Type 1 Mount, Gear Reduction	3006	3006
12V, Small Frame, 75 Amp Iskra, w/ Wiring Harness	3138	3138
6.0", 2 Micron Final Fuel Filter, RH Side Mount	35DZ	35DZ
Front Plate, Auxiliary Drive	3614	3614
Mechanical Fuel Transfer Pump, w/o Inlet Fitting (for use without fuel cooler)	3713	3713
Three Thermostats, Four Sensor Ports	3917	3917

Dipstick, RH Side Service	4002	4002
No Auxiliary Front Drive Pulley	4199	-
Glowplugs, 12V	4327	4327
Timing Gear Cover, Aux-Drive, High Flow Iron Water Pump, Fan Mount	4435	4435
Non-Structural	4633	4633
Crankshaft, Taper Nose	4712	4712
CONNECTING RODS AND PISTONS	4834	4834
VALVE ACTUATING MECHANISM,Valve actuati	4905	4905
PUMP, OIL	5024	5024
HEAD, CYLINDER WITH VALVES	5120	5120
Gear Driven Auxiliary Drive w/Shipping Cover	5204	5204
No Fuel Heater	5399	-
Straight Inlet Hose, for use w/ Front Exhaust, w/ sensor jumper harness	5401	5401
Shipping Stand, Metal, without adapter, for shipment of two (2) engines	5580	5580
Agricultural Green	5602	-
Water Pump Inlet, Downward Orientation w/ M18 O-Ring Port	5722	5722
Oil Cooler, 9 Plate	5945	5945
No Auxiliary Fan Drive Pulley	6099	-
Alternator Mounting, Bosch, 45-120 Amp, Auto Tensioner, for Aux-Drive	6271	6271
RH, Engine Mounted Primary Filter, High RH Rear Engine Mounted Final Filte - AC Compatible	6360	6360
Exhanust Elbow, Front or Rear Exhaust Turbochargers	6435	6435
12V, High Mount, Front Exhaust, Genset	65PE	65PE
NO TEMPERATURE SWITCH	6698	6698
Base Engine Sensors	6717	6717
Single Damper, Standard Duty or Heavy Duty, Compatible w/ Single or Dual Auxiliary Belt Drive	6895	-
ENGINE SERIAL NUMBER PLATE	6901	6901
12V, 234kW (314HP) @ 1800 RPM - (Standby Rating 200kWe)	72JL	72JL
No Air Conditioning Compressor or Mounting Bracket	7499	-
Oil Pressure Switch	7699	-
No Air Compressor	7899	-
RH Side, Engine Mounted, High RH Side, 6.0", 30 Micron Primary Fuel Filter w/ Water Separator and W.I.F Sensor	8169	8169
ECU Software, John Deere Custom Performance - High Power Genset Application (314hp/234kW) (500 Hour Oil Change Interval)	83CT	-
Engine Mounted ECU, Rear of Head, w/ Wiring Harness Between Engine Sensors & ECU and hardware, Factory Installed	8426	8426
184mm (7.24") Diameter, 338mm (13.3") Fan Height	8655	8655
Belt Tensioner, Auto for use w/ Aux-Drive	8718	8718

Oil Filter, RH Low Forward	8842	8842
EGR System, Long Cooler, for use w/ Sheet Metal Oil Pan, Industrial Applications	8901	8901
Customer/Panel Interface Harness, Engine Mounted ECU (Rear of Head) to Instr. Panel, pckged & shipped w/engine (contains 21 & 23 pin connectors, starter relay leads, power/ground leads, TVP, Aux Power, CAN Terminator, Remote On/Off, Fuse)(DHL180204)	9112	9112
Engine Accessories	9299	
EMISSION LABEL	9398	
No Software Trim	9499	
ENGINE HANGER STRAPS	9801	9801

The information may not reflect running change options. Due to possible supplier changes, the description under the option name may not be representative of the actual option.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF TRANSPORTATION AND AIR QUALITY
WASHINGTON, DC 20460

CERTIFICATE OF CONFORMITY
2008 MODEL YEAR

Manufacturer:	**JOHN DEERE POWER SYSTEMS**
Engine Family:	**8JDXL06.8101**
Certificate Number:	**JDX-NRCI-08-08**
Intended Service Class:	**NR5 (75-130) NR6 (130-225) NR7 (225-450)**
Fuel Type:	**DIESEL**
FELs: g/kW-hr	NMHC+NOx: **N/A** NOx: **N/A** PM: **N/A**
Effective Date:	**12/10/2007**
Date Issued:	**12/10/2007**

Karl J. Simon, Director
Compliance and Innovative Strategies Division
Office of Transportation and Air Quality

Pursuant to Section 213 of the Clean Air Act (42 U.S.C. section 7547) and 40 CFR Part 89, and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engines which have been found to conform to applicable requirements and which represent the following nonroad engines, by engine family, more fully described in the documentation required by 40 CFR 89 and produced in the stated model year.

This certificate of conformity covers only those nonroad compression-ignition engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Part 89 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Part 89.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 89.129-96 and 89.506-96 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to a revocation or suspension of this certificate for reasons specified in 40 CFR Part 89. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void ab initio for other reasons specified in 40 CFR Part 89.

This certificate does not cover nonroad engines sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.

California Environmental Protection Agency AIR RESOURCES BOARD	John Deere Power Systems	EXECUTIVE ORDER U-R-004-0311 New Off-Road Compression-Ignition Engines

Pursuant to the authority vested in the Air Resources Board by Sections 43013, 43018, 43101, 43102, 43104 and 43105 of the Health and Safety Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-02-003;

IT IS ORDERED AND RESOLVED: That the following compression-ignition engines and emission control systems produced by the manufacturer are certified as described below for use in off-road equipment. Production engines shall be in all material respects the same as those for which certification is granted.

MODEL YEAR	ENGINE FAMILY	DISPLACEMENT (liters)	FUEL TYPE	USEFUL LIFE (hours)
2008	8JDXL06.8101	4.5, 6.8	Diesel	8000

SPECIAL FEATURES & EMISSION CONTROL SYSTEMS	TYPICAL EQUIPMENT APPLICATION
Direct Diesel Injection, Turbocharger, Charge Air Cooler, Electronic Control Module, Smoke Puff Limiter, Exhaust Gas Recirculation	Loader, Tractor, Pump, Compressor, Generator Set, Other Industrial Equipment

The engine models and codes are attached.

The following are the exhaust certification standards (STD) and certification levels (CERT) for hydrocarbon (HC), oxides of nitrogen (NOx), or non-methane hydrocarbon plus oxides of nitrogen (NMHC+NOx), carbon monoxide (CO), and particulate matter (PM) in grams per kilowatt-hour (g/kw-hr), and the opacity-of-smoke certification standards and certification levels in percent (%) during acceleration (Accel), lugging (Lug), and the peak value from either mode (Peak) for this engine family (Title 13, California Code of Regulations, (13 CCR) Section 2423):

RATED POWER CLASS	EMISSION STANDARD CATEGORY		EXHAUST (g/kw-hr)					OPACITY (%)		
			HC	NOx	NMHC+NOx	CO	PM	ACCEL	LUG	PEAK
75 ≤ kW < 130	Tier 3	STD	N/A	N/A	4.0	5.0	0.30	20	15	50
130 ≤ kW < 225	Tier 3	STD	N/A	N/A	4.0	3.5	0.20	20	15	50
225 ≤ kW < 450	Tier 3	STD	N/A	N/A	4.0	3.5	0.20	20	15	50
		CERT	--	--	3.4	0.6	0.11	8	1	14

BE IT FURTHER RESOLVED: That for the listed engine models, the manufacturer has submitted the information and materials to demonstrate certification compliance with 13 CCR Section 2424 (emission control labels), and 13 CCR Sections 2425 and 2426 (emission control system warranty).

Engines certified under this Executive Order must conform to all applicable California emission regulations.

This Executive Order is only granted to the engine family and model-year listed above. Engines in this family that are produced for any other model-year are not covered by this Executive Order.

Executed at El Monte, California on this 14th day of December 2007.

Annette Hebert, Chief
Mobile Source Operations Division

File No.: _____

S-9: Application for a Noncovered Source Permit Renewal

Each application for permit renewal shall be submitted to the Director of Health (hereafter, Director) a minimum of ***sixty days*** prior to the date of permit expiration. In providing the required information, reference the corresponding letters and numbers listed below.

I. In accordance with Hawaii Administrative Rules (HAR) §11-60.1-74, the following information is required:

A. Statement certifying that no changes have been made in the design or operation of the source as proposed in the initial and any subsequent Noncovered Source Permit applications. If changes have occurred or are being proposed, the applicant shall provide a description of those changes such as work practices, operations, equipment design, and monitoring procedures.

B. Equipment Specifications:
1. Maximum design capacity.
2. Fuel type.
3. Fuel use.
4. Production capacity.
5. Production rates.
6. Raw materials.
7. Provide any manufacturer's literature.

C. Provide detailed descriptions of all processes and products. Also, provide any reasonably anticipated alternative operating scenarios, associated processes, and products.

D. Identify and describe in detail all air pollution control equipment and compliance monitoring devices or activities planned by the owner or operator, and to the extent of available information, an estimate of emissions before and after controls. Provide all calculations and assumptions.

E. Current operational limitations or work practices, or for noncovered sources that have not yet begun operation, such limitations or practices which the owner or operator of the noncovered source plans to implement that affect emissions of any regulated or hazardous air pollutants at the source.

F. Provide a detailed schedule for construction or modification of the proposed noncovered source, including any major milestones, if applicable.

G. Provide an explanation of all proposed exemptions from any applicable requirement(s).

H. A Compliance Plan, Form C-1.

II. Submit an application fee according to the Application Fee Schedule in the <u>Instructions for Applying for an Air Pollution Control Permit</u>.

III. Provide other information as follows:

A. As required by any applicable requirement or as requested and deemed necessary by the Director to make a decision on the application.

B. As may be necessary to implement and enforce other applicable requirements of the Clean Air Act or of HAR Chapter 11-60.1 or to determine the applicability of such requirements.

IV. The Director reserves the right to request the following information:

A. An assessment of the ambient air quality impact of the noncovered source or modification. The assessment shall include all supporting data, calculations and assumptions, and a comparison with the National Ambient Air Quality Standards and State Ambient Air Quality Standards.

B. A risk assessment of the air quality related impacts caused by the noncovered source or modification to the surrounding environment.

C. Results of source emissions testing, ambient air quality monitoring, or both.

D. Information on other available control technologies.

V. An application shall be determined to be complete only when all of the following have been complied with:

A. All information required or requested in numbers **I, III, and IV** has been submitted.

B. All documents requiring certification have been certified pursuant to HAR §11-60.1-4.

C. All applicable fees have been submitted.

D. The Director has certified that the application is complete.

VI. The Director shall not continue to act upon or consider any incomplete application.

A. The Director shall notify the applicant in writing whether the application is complete. Unless the Director requests additional information or notifies the applicant of incompleteness within sixty days of receipt of an application, the application shall be deemed complete.

B. During the processing of an application that has been determined or deemed complete if the Director determines that additional information is necessary to evaluate or take final action on the application, the Director may request such information in writing and set a reasonable deadline for a response. As set forth in HAR §11-60.1-62, the noncovered source ability to operate and the validity of the Noncovered Source Permit shall continue beyond the permit expiration date, until the final permit is issued or denied, provided the applicant submits all additional information within the reasonable deadline specified by the Director.

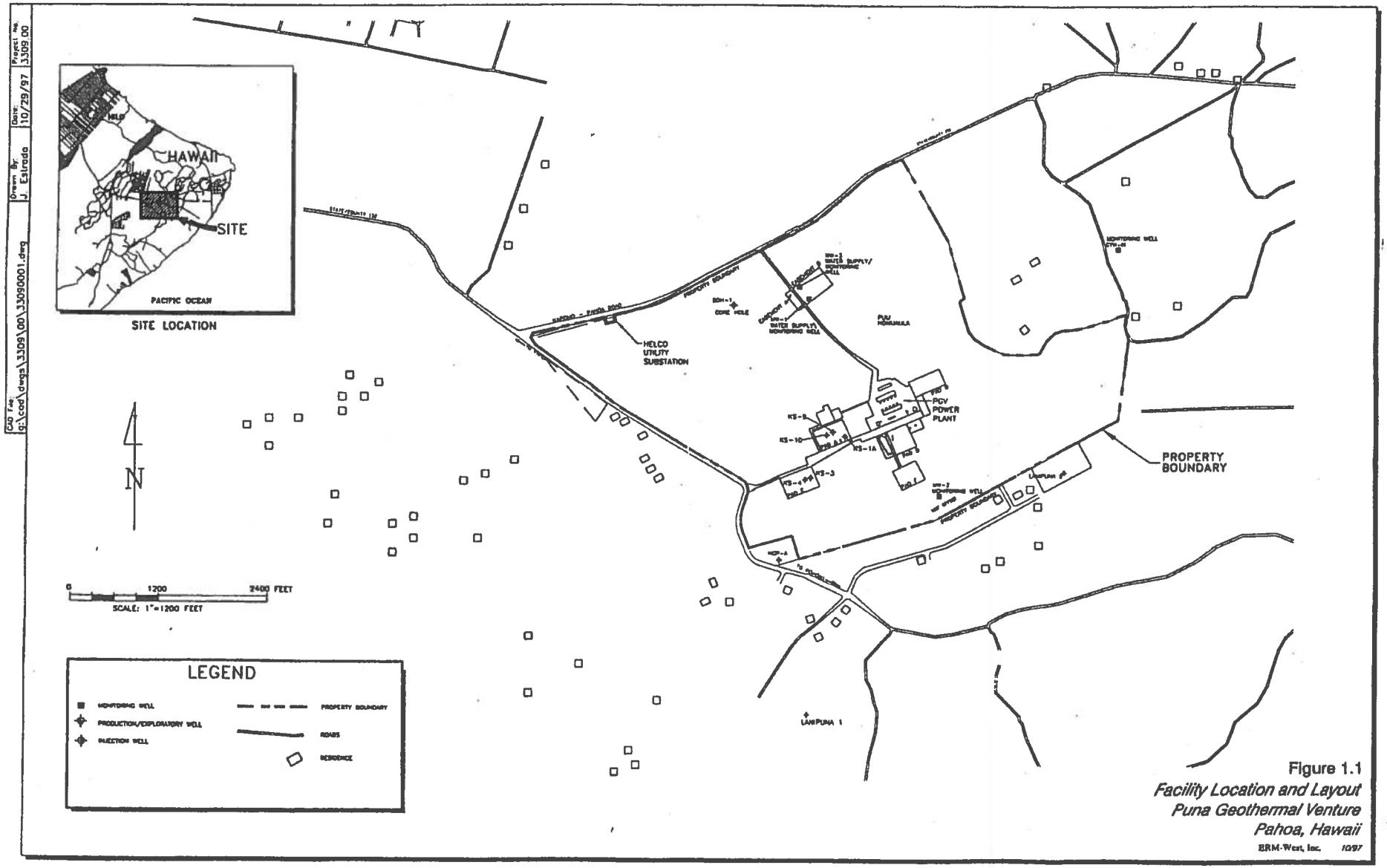
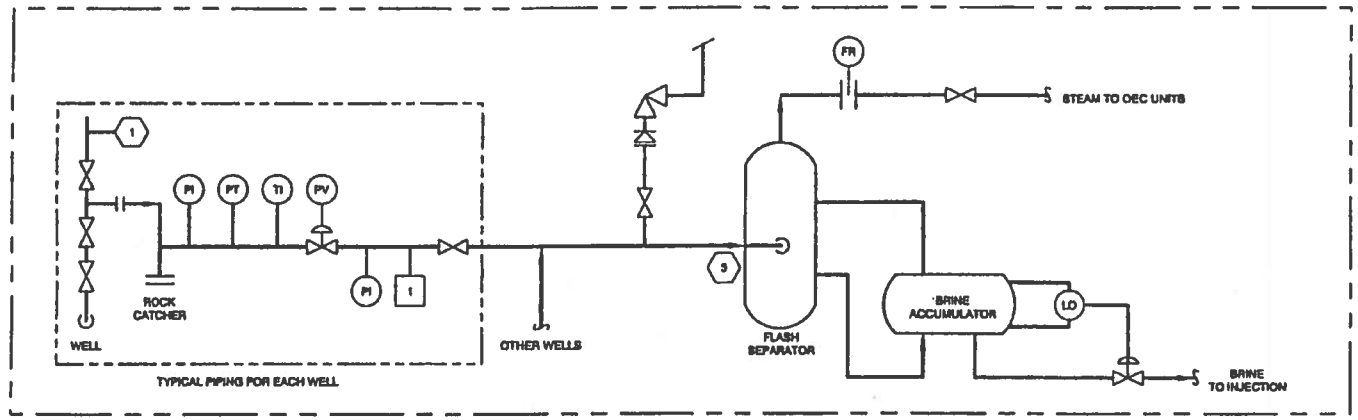


Figure 1.1
Facility Location and Layout
Puna Geothermal Venture
Pahoa, Hawaii
ERM-West, Inc. 10/97

CAD file: g:\cad\dwgs\3309\00\33090002.dwg | Drawn By: J. Estrada | Date: 10/28/97 | Project No. 3309.00



TYPICAL ARRANGEMENT FOR WELLPAD A

LEGEND

- EMMISION POINTS
  - 1 WELLHEAD
  - 2 WELLPAD ROOM MUFFLER
  - 3 WELLPAD PIPING FUGITIVE EMMISSIONS
- RAW MATERIALS AND CHEMICALS ADDITION POINTS
  - 1 GEOTHERMAL FLUID

MATERIAL BALANCE BASIC ASSUMPTIONS:

1. Flow rates shown are for 25 MW net power production.
2. Basis is 505,000 #/Hr of steam to turbines.
3. Solid geothermal fluid based on KS-1A well is:
   - 80% W steam
   - 20% W brine
4. Noncondensible gases concentration in the vapor phase, based on composite data from wells KS-1;KS-1A;KS-2 & HGP-A is:
   - H_2O – 1300 ppm
   - CO_2 – 840 ppm
   - H_2 – 390 ppm
5. Amount of H_2S & CO dissolved in the brine & condensate is negligible.

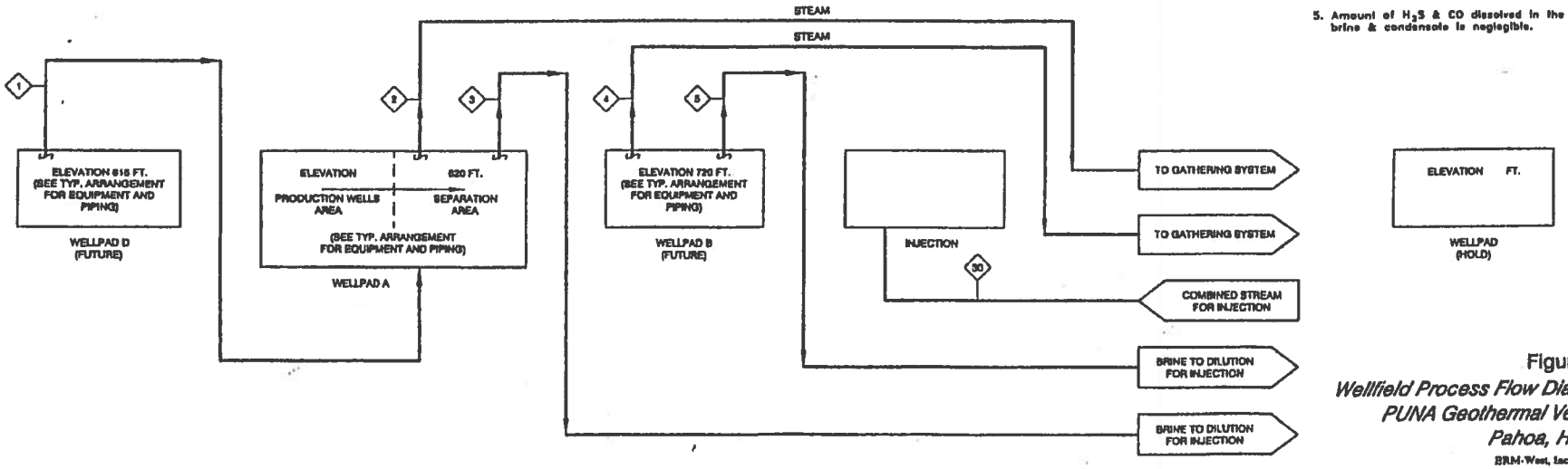
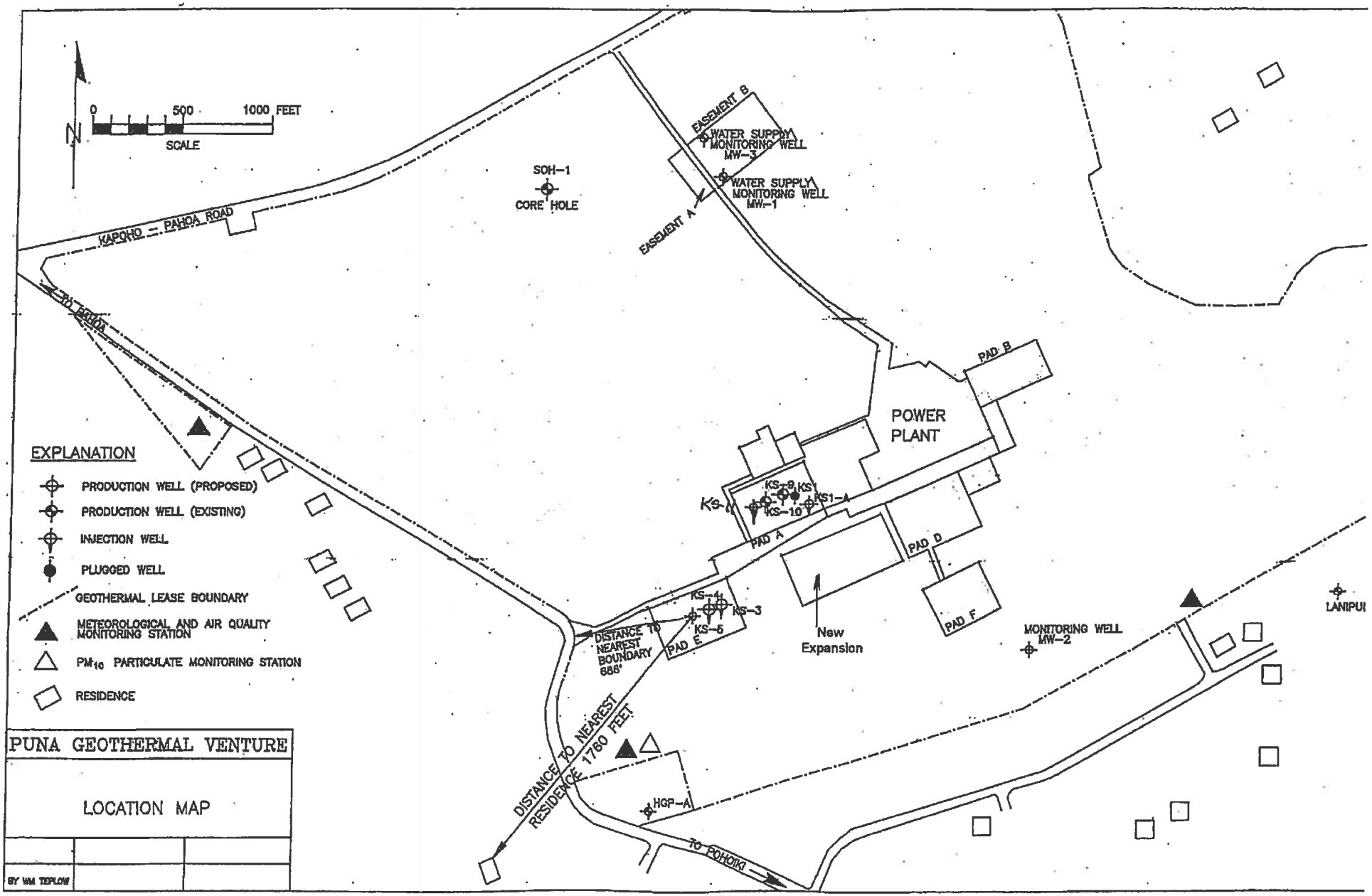


Figure 1.2
Wellfield Process Flow Diagram
PUNA Geothermal Venture
Pahoa, Hawaii
BRM-West, Inc. 10/97


N
0
500
1000 FEET
SCALE
SOH-1
CORE HOLE
EASEMENT B
WATER SUPPLY MONITORING WELL MW-3
WATER SUPPLY MONITORING WELL MW-1
EASEMENT A
KAPOHO - PAHOA ROAD
TO HILO
PAD B
POWER PLANT
KS-9
KS-8
KS-1
KS-10
KS1-A
PAD A
PAD D
PAD F
KS-4
KS-3
KS-5
PAD E
New Expansion
MONITORING WELL MW-2
LANIPUI
DISTANCE TO NEAREST BOUNDARY 688'
DISTANCE TO NEAREST RESIDENCE 1760 FEET
HGP-A
TO POHOIKI
EXPLANATION
PRODUCTION WELL (PROPOSED)
PRODUCTION WELL (EXISTING)
INJECTION WELL
PLUGGED WELL
GEOTHERMAL LEASE BOUNDARY
METEOROLOGICAL AND AIR QUALITY MONITORING STATION
PM_{10} PARTICULATE MONITORING STATION
RESIDENCE
PUNA GEOTHERMAL VENTURE
LOCATION MAP
BY WM TEPLOW

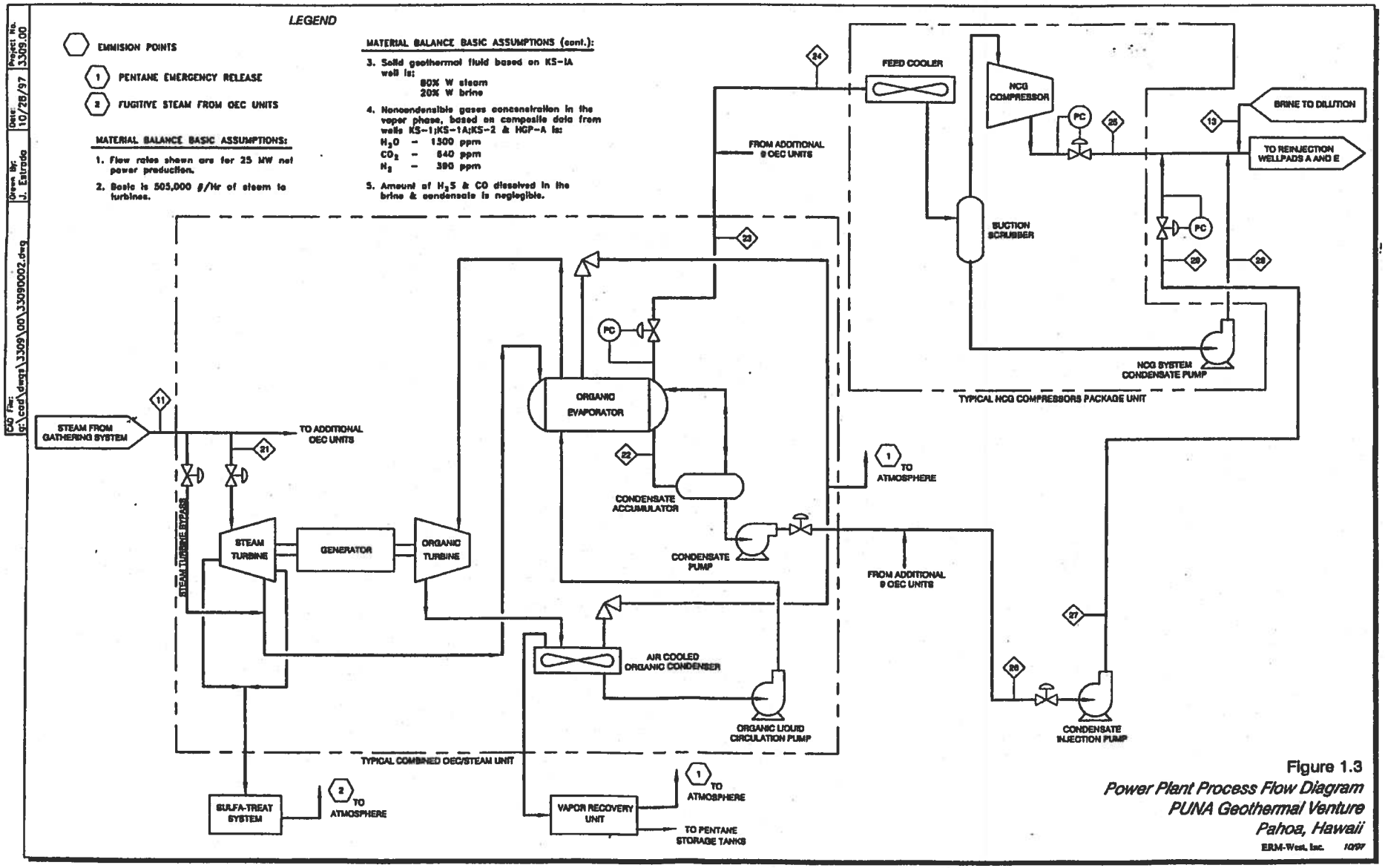


Figure 1.3
Power Plant Process Flow Diagram
PUNA Geothermal Venture
Pahoa, Hawaii
ERM-West, Inc. 10/97

VII. The Director, in writing, shall approve, conditionally approve, or deny an application for renewal of a Noncovered Source Permit, including an application for renewal requesting coverage under a noncovered source general permit, within six months after receipt of a complete application. If the application for renewal has not been approved or denied within six months after a complete application is received, the Noncovered Source Permit and all its terms and conditions shall remain in effect and not expire until the application for renewal has been approved or denied.

ATTACHMENT 1 TO FORM S-9
APPLICATION for a NONCOVERED SOURCE PERMIT RENEWAL

I. In accordance with Chapter 11-60.1, 11-60.1-74, the following information is provided:

A. Puna Geothermal Venture (PGV) certifies that no changes have been made in the design or operation of the source as proposed in the initial and any subsequent noncovered source permit applications. No changes are being proposed at this time.

B. Equipment Specifications are provided as attachments to the S-1 Form.

C. All of the air pollution control equipment is listed in the attachments to Form S-1. PGV operates and maintains three (3) Environmental Monitoring Stations as required by NSP 0008-02-N. The Hawaii Department of Health (HDOH) has access via the Internet of all data collected at these stations. An estimation of emissions before and after controls along with calculations and assumptions is also included in the attachments to Form S-1.

D. An explanation of all proposed exemptions is included in the attachments to Form S-1.

E. A Compliance Plan, Form C-1 is included.

II. Also included is an application fee in the amount of $100.00 pursuant to the Application Fee Schedule.

File No.: _____

S-12: Application for a Modification to a Noncovered Source

In providing the required information, reference the corresponding letters and numbers listed below.

I. In accordance with Hawaii Administrative Rules (HAR) §11-60.1-76, the following information is required:

A. Equipment Specifications:
   1. Maximum design capacity.
   2. Fuel type.
   3. Fuel use.
   4. Production capacity.
   5. Production rates.
   6. Raw materials.
   7. Provide any manufacturer's literature.

B. Provide a description of the modification, identifying all proposed changes, including any changes to the source operations, work practices, equipment design, source emissions, or any monitoring, recordkeeping, and reporting procedures.

C. Identify and describe in detail all air pollution control equipment and compliance monitoring devices or activities as planned by the owner or operator of the noncovered source or modification, and to the extent of available information, an estimate of emissions before and after controls. Provide all calculations and assumptions.

D. Operational limitations or work practices which the owner or operator of the noncovered source plans to implement that affect emissions of any regulated or hazardous air pollutants at the source.

E. Provide a detailed schedule for construction or modification of the proposed noncovered source, including any major milestones, if applicable.

F. Provide an explanation of all proposed exemptions from any applicable requirement(s).

G. Provide a compliance plan, Form C-1.

II. Submit an application fee according to the Application Fees Schedule in the Instructions for Applying for an Air Pollution Control Permit.

III. Provide other information as follows:

A. As required by any applicable requirement or as requested and deemed necessary by the Director of Health (hereafter, Director) to make a decision on the application.

B. As may be necessary to implement and enforce other applicable requirements of the Clean Air Act or of HAR Chapter 11-60.1 or to determine the applicability of such requirements.

IV. The Director reserves the right to request the following information:

A. An assessment of the ambient air quality impact of the noncovered source or modification. The assessment shall include all supporting data, calculations and assumptions, and a comparison with the National Ambient Air Quality Standards and State Ambient Air Quality Standards.

B. A risk assessment of the air quality related impacts caused by the noncovered source or modification to the surrounding environment.

C. Results of source emissions testing, ambient air quality monitoring, or both.

D. Information on other available control technologies.

V. An application shall be determined to be complete only when all of the following have been complied with:

A. All information required or requested in numbers **I, III, and IV** has been submitted.

B. All documents requiring certification have been certified pursuant to HAR §11-60.1-4.

C. All applicable fees have been submitted.

D. The Director has certified that the application is complete.

VI. The Director shall not continue to act upon or consider an incomplete application.

A. The Director shall notify the applicant in writing whether the application is complete. Unless the Director requests additional information or notifies the applicant of incompleteness within sixty days of receipt of an application, the application shall be deemed complete.

B. During the processing of an application that has been determined or deemed complete if the Director determines that additional information is necessary to evaluate or take final action on the application, the Director may request such information in writing and set a reasonable deadline for a response.

VII. The Director, in writing, shall approve, conditionally approve, or deny an application for modification to a noncovered source within six months after receipt of a complete application. An application for modification shall be approved only if the Director determines that the modification will be in compliance with all applicable requirements.

Attachment 1 to Form S-12

A. N/A

B. NSP No. 0008-02-N, Attachment IIB, section F.2, page 11 of 12. At the bottom of this page, last paragraph, line 3 states: ...deviates more than +10% of the INITIAL well test... We are requesting to change the word INITIAL to PREVIOUS. The language in its current state does not make sense. The resource being sampled changes over time. Because of this, we test for the H2S content in the wells in order to trend and document this data. Whenever the test results show H2S levels have increased by more than 10%, we want to retest within 6 months in order to trend and verify this increase. By making this change we will be able to compare the resources changes each year from the previous years' results and will retest if the test results from that years' testing deviate more than +10% from the previous years' testing results. This is the intention of the retest, to verify and trend the resource for increasing H2S content of more than +10% from the previous year's test, not from the initial test, as this does not provide data that is useful for either government agencies or Puna Geothermal Venture as many years of annual testing already provides data to be compared to the initial test results.

C. N/A

D. N/A

E. N/A

F. N/A

G. N/A

Included is a copy of the page from the current NSP permit we are requesting to be changed.

Steam Condensate

Benzene
Ammonium (Total)
Arsenic
Lead
Cadmium
Bicarbonate and Carbonate
Sulfates
Chlorides
Nitrates
Boron (Total)
Hydrogen Sulfide
Fluorides (Total)
Mercury (Total)
pH
Total Dissolved Solids
Total Suspended Solids
Beryllium
Asbestos
Vinyl Chloride
Radon
Radionuclides (gross Alpha and Beta)

Brine

Benzene
Ammonium (Total)
Arsenic
Lead
Cadmium
Bicarbonate and Carbonate
Sulfates
Chlorides
Nitrates
Boron (Total)
Hydrogen Sulfide
Fluorides (Total)
Mercury (Total)
pH
Total Dissolved Solids
Total Suspended Solids
Beryllium
Asbestos
Vinyl Chloride
Radon
Radionuclides (gross Alpha and Beta)

Noncondensible Gases

Benzene
Hydrogen Sulfide
Ammonia
Mercury Vapor
Methane
Non-Methane Hydrocarbons
Vinyl Chloride
Carbon Dioxide
Arsenic
Beryllium
Asbestos
Radon
Radionuclides (gross Alpha and Beta)

The sampling and testing of the resource shall be performed once upon experiencing the first steam release, and at least once during abated well cleanout and flow testing operations.

During normal operation of each well, the sampling and testing of the resource shall be performed on an **annual basis**. During the testing of the noncondensible gases, if the hydrogen sulfide concentrations deviates more than +10 percent of the initial well test measurement, the permittee shall repeat the sampling and testing of the resource for the steam condensate, brine and noncondensible gases within the next **six (6) months**. The permittee shall be required to perform a retest only **once** after performing an annual resource test.

OCT - 3 2014

File No.: _____

C-1: Compliance Plan

The Responsible Official shall submit a Compliance Plan as indicated in the Instructions for Applying for an Air Pollution Control Permit and at such other times as requested by the Director of Health (hereafter, Director).

Use separate sheets of paper if necessary.

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1. Compliance status with respect to all Applicable Requirements:

   Will your facility be in compliance, or is your facility in compliance, with all applicable requirements in effect at the time of your permit application submittal?

   ☒ YES {If YES, complete items a and c below}

   ☐ NO {If NO, complete items a, b, and c below}

   a. Identify all applicable requirement(s) for which compliance is achieved.

   We certify that all applicable requirements for which compliance is acheived have been met pursuant to HAR 11-59-1 ambient air standard, HAR 11-60-1 air pollution controls, and NSP No. 0008-02-N. We also certify that this document and all attachments are true, accurate, and complete.

   Provide a statement that the source is in compliance and will continue to comply with all such requirements.

   The Non-covered source at PGV is in compliance and will continue to comply with said HAR and permit conditions.

   b. Identify all applicable requirement(s) for which compliance is NOT achieved.

   Provide a detailed Schedule of Compliance Schedule and a description of how the source will achieve compliance with all such applicable requirements.

Description of Remedial Action	Expected Date of Completion

MD28024

c. Identify any other applicable requirement(s) with a future compliance date that your source is subject to. These applicable requirements may take effect AFTER permit issuance:

Applicable Requirement	Effective Date	Currently in Compliance?

If the source is not currently in compliance, provide a Schedule of Compliance and a description of how the source will achieve compliance with all such applicable requirements:

Description of Proposed Action/Steps to Achieve Compliance	Expected Date of Achieving Compliance

Provide a statement that the source on a timely basis will meet all these applicable requirements:

If the expected date of achieving compliance will NOT meet the applicable requirement's effective date, provide a more detailed description of each remedial action and the expected date of completion:

Description of Remedial Action and Explanation	Expected Date of Completion

2. Compliance Progress Reports:

a. If a compliance plan is being submitted to remedy a violation, complete the following information:

Frequency of Submittal: _____ Beginning Date: _____
(less than or equal to 6 months)

b. Date(s) that the Action described in (1)(b) was achieved:

Remedial Action	Date Achieved

c. Narrative description of why any date(s) in (1)(b) was not met, and any preventive or corrective measures taken in the interim:

RESPONSIBLE OFFICIAL (as defined in HAR §11-60.1-1)

Name (Last): Townsend (First): Cliff (MI): N

Title: Plant Manager Phone: 808-965-2847

Mailing Address: P.O. Box 30

City: Pahoa State: HI Zip Code: 96778

Certification by Responsible Official (pursuant to HAR §11-60.1-4)

I certify that I have knowledge of the facts herein set forth, that the same are true, accurate and complete to the best of my knowledge and belief, and that all information not identified by me as confidential in nature shall be treated by the Department of Health as public record. I further state that I will assume responsibility for the construction, modification, or operation of the source in accordance with the Hawaii Administrative Rules, Title 11, Chapter 60.1, Air Pollution Control, and any permit issued thereof.

Name (Print/Type): _____

(Signature): _____ Date: _____

Facility Name: _____

Location: _____

Permit Number: _____

FOR AGENCY USE ONLY

File/Application No.: _____

Island: _____

Date Received: _____