DRAFT

PERMIT APPLICATION REVIEW
GREENHOUSE GAS (GHG) EMISSIONS REDUCTION PLAN
Covered Source Permit (CSP) No. 0724-01-C
Application for Significant Modification No. 0724-03

Applicant:	Hu Honua Bioenergy, LLC
Facility:	Hu Honua Bioenergy Facility Located At: 28-283 Sugar Mill Road, Pepeekeo, Hawaii UTM Coordinates: 281,250 m E and 2,195,900 m N, NAD-27
Mailing Address:	Hu Honua Bioenergy, LLC Administration Office P.O. Box 8, Pepeekeo, Hawaii 96786
Responsible Official:	Mr. Warren Lee President Hu Honua Bioenergy, LLC 120 Pauahi Street Hilo, Hawaii 96720 Phone: (808) 896-8102
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Proposed Project and Background

The Standard Industrial Classification (SIC) Code is 4911 under Electric Services.

Hu Honua Bioenergy, LLC (Hu Honua) submitted an application for significant modification to CSP No. 0724-01-C on January 24, 2017, for the Hu Honua Bioenergy Facility to incorporate a GHG emission cap established by Hu Honua in its GHG emissions reduction plan (ERP). In summary, the Hu Honua GHG ERP is proposing to establish:

1. An individual facility-wide cap of 3,979 metric tons (4,386 short tons) per calendar year (CY) pursuant to Hawaii Administrative Rules (HAR) §11-60.1-204(b) and (c); and
2. A facility-wide carbon dioxide equivalent (CO_2e) emissions total baseline rate of 3,979 metric tons (4,386 short tons) per CY for a newly permitted covered source, excluding biogenic carbon dioxide (CO_2) emissions pursuant to HAR §11-60.1-204(d)(1)(B). Where total baseline CO_2e emissions equal baseline (biogenic plus non-biogenic) minus baseline biogenic CO_2 emissions as follows:

Total baseline CO_2e = baseline CO_2e (biogenic plus non-biogenic) – baseline CO_2e (biogenic)

Total baseline CO_2e = 293,306 short tons – 288,920 short tons = 4,386 short tons

In a letter dated August 14, 2018, Hu Honua also requested that a 132,676 gallon biodiesel stainless steel tank (with an internal floating roof) be considered an insignificant activity. This tank is intended to replace both the 10,000 gallon polyethylene and 250 gallon day tanks.

On August 19, 2019, Hu Honua submitted a revised GHG ERP to include the use of invasive species, calculated emissions from sorbent, and prospective sources of sustainable forestry. Hu Honua Bioenergy Facility is a biomass electricity generating facility in Pepeekeo, that is still under construction and is expected to provide electricity by a power purchase agreement (PPA) with Hawaii Electric Light Company, Inc. (HELCO). The facility is restricted to a combined wood and biodiesel fuel usage limit of 2,800,000 MMBtu per rolling twelve (12) month period to preclude the applicability of prevention of significant deterioration (PSD) controls.

The Babcock and Wilcox Boiler at Hu Honua Facility is designed and engineered to burn solid fuel with moisture content typically ranging between forty (40) to fifty (50) percent. To generate sufficient heat for the unit to remain operational at the mid to high loads, the fuel must meet this specification. Biodiesel does not meet this specification and therefore it's consumption rate is not expected to exceed 11,880 gallons per year and its use is limited to:

1. Initial stages of startups until solid fuel consumption is entirely phased-in;
2. Supplemental fuel during low-load operation of the boiler when necessary to achieve flame stabilization; or
3. Upset conditions (e.g. conveyor malfunction or quick response to load demand).

Refer to Enclosure 1 for the estimated breakdown of annual heat input expected.

Hu Honua is proposing to use commercially grown eucalyptus trees, as well as other non-native, invasive species of trees and plants (such as the moluccan albizia trees and gorse plants). The feedstock of wood will consist of primarily eucalyptus trees (typically ninety (90) percent of the feedstock) but may contain as much as fifty (50) percent of other clean wood sources at times, including invasive species. The benefits to the local community in using this feedstock include use of local managed forests that establishes ecological balance; crop rotation, and replanting; reduction of invasive species; and a reduction of imported oil to the State of Hawai'i.

Hu Honua Bioenergy Facility will be utilizing established eucalyptus biomass feedstock from managed forests, comprising of lands that are currently managed to ensure the use of biomass for energy does not result in the conversion of forested lands to non-forest or non-agricultural use. There are over 40,000 acres of commercial forest trees available for harvest on the island of Hawai'i. The most recent study produced by the Hawai'i County Department of Research and Development shows that private lands make up the majority of commercial forestry on the island of Hawai'i, allowing for locally sourced biomass. The largest stands of timber are located in the Hilo area and Hamakua Coast near the Hu Honua Bioenergy Facility. Smaller stands also exist in the Waimea and Pahala areas. There are additional forest reserves managed for timber in Waiakea, as well as state-owned lands on the Hamakua coast that account for additional sources of eucalyptus wood.

Approximately 2,000 acres of trees will be harvested from managed forests on leased land. Trees would be cut at approximately seven (7) years of growth and replanted. Hu Honua may also be involved in developing additional biogenic managed forests for future use. A variety of activities can be implemented to manage forests, including their regeneration, tending, utilization and conservation to maintain their productivity. A combination of activities is typically employed.

Plants absorb CO_2 from the air during the process of photosynthesis. During the life of a plant, CO_2 is absorbed and stored within the plant's leaves, branches, stem and roots acting as a carbon sink. Once the tree is burned, the carbon stored within is released. Thus, Hu Honua's biogenic CO_2 emissions resulting from the combustion of biomass from managed forests at a stationary source for energy production is essentially carbon neutral. As trees continue to be planted on the island of Hawai'i for the purpose of generating electricity, this cycle continues. Hu Honua's proposal to generate electricity from locally sourced trees reduces the State's dependence on imported oil and aligns to the State of Hawaii's goal of using one hundred (100) percent renewable energy in the electricity generating sector. It also promotes energy diversification that reduces dependence on any one particular form of fuel source and stabilizes both prices and power to the grid.

The 23.8 MW gross (21.5 MW net) steam powered turbine generator converts energy from steam produced by the boiler to electricity. This is an unfired generator (i.e. not directly powered by fuel combustion) and therefore is not listed as permitted equipment.

An 836 kW electrical biodiesel engine generator will be operated only during emergencies such as when the HELCO transmission system is not available and will only combust one hundred (100) percent biodiesel fuel.

The wood and biodiesel fuels will be stored on-site. The wood will be brought on site as logs or chips. If brought on as logs, it will be chipped by an electric chipper within an enclosed chipper building, and then conveyed to an on-site chip storage facility. It is expected that twenty-five (25) to thirty (30) percent of the wood will be chipped on-site. Wood transported to the site as chips will be conveyed directly to the on-site chip storage facility. Ash, a by-product of burning wood, will be shipped off-site for beneficial/soil amendment or returned to the forest to enhance the soil.

Hu Honua Bioenergy Facility will be installing a 132,676 gallon internal floating roof biodiesel tank in place of a 10,000 gallon polyethylene tank and a 250 gallon day tank that was proposed in the Revised CSP Application No. 0724-02 delivered on December 27, 2010. The increased size of the biodiesel tank is designed to ensure that:

1. The Hu Honua Bioenergy Facility has adequate capacity to fulfill the PPA's capacity obligation (including start-up) without a risk of interruption to biodiesel supply due to uncontrollable factors; and
2. Maintain flame stabilization in the plant to accommodate the fluctuations in electricity production arising from utility dispatch, in accordance with the conditions of Hu Honua Bioenergy Facility's permit.

Department of Health's (DOH) Approval

The DOH's approval is required for the following:

1. Hu Honua's basis is adequately substantiated as to why a minimum sixteen (16) percent reduction in CO_2e emissions by 2020 is unattainable, pursuant to HAR, Subsection 11-60.1-204(c) and §11-60.1-204(d)(2);
2. Hu Honua's proposed alternate "facility-wide GHG emissions cap" and associated provisions pursuant to HAR §11-60.1-204(b) and §11-60.1-204(d)(2)(B); and
3. Hu Honua's proposed alternate facility-wide total baseline GHG emissions rate for a newly permitted covered source without a 2010 operating history pursuant to HAR §11-60.1-204(c) and §11-60.1-204(d)(1).

Permitted Equipment Subject to GHG Emissions Cap

The following equipment and associated appurtenances are subject to GHG emission reductions specified in Subchapter 11 of the HAR:

Unit No.	Equipment Description
1	Babcock and Wilcox Boiler with Sodium Bicarbonate Injection System or equivalent.

Air Pollution Controls

1. Electrostatic Precipitator and Baghouse (B & W Pulse Jet Fabric Filter or equivalent);
2. Overfire Air System with CO Catalyst or equivalent;
3. Aqueous Ammonia Injection System with Selective Catalytic Reduction System (SCR) or equivalent; and
4. Trona or limestone injection system or equivalent (e.g. Sodium Bicarbonate Dry Sorbent Injection System). This controls hydrogen chloride (HCl) and sulfur dioxide (SO_2) emissions, however, CO_2 is a by-product of dry sorbent injection of trona, limestone, or sodium bicarbonate. The gas to solid reactions between acid gases (HCl and SO_2) form NaCl and Na_2SO_4 salts which are collected by the electrostatic precipitator and baghouse.

Applicable Requirements

HAR

Title 11, Chapter 60.1	Air Pollution Control
Subchapter 1	General Requirements
HAR 11-60.1-1	Definitions
Subchapter 2	General Prohibitions
HAR 11-60.1-31	Applicability
HAR 11-60.1-32	Visible Emissions
HAR 11-60.1-33	Fugitive Dust
HAR 11-60.1-36	Biomass Fuel Burning Boilers
HAR 11-60.1-38	Sulfur Oxides from Fuel Combustion
HAR 11-60.1-39	Storage of Volatile Organic Compounds (VOC)
Subchapter 5	Covered Sources
HAR 11-60.1-81	Definitions
HAR 11-60.1-104	Applications for Significant Modification
Subchapter 6	Fees for Covered Sources, Noncovered Sources, and Agricultural Burning
HAR 11-60.1-111	Definitions
HAR 11-60.1-112	General Fee Provisions for Covered Sources
HAR 11-60.1-113	Application Fees for Covered Sources
HAR 11-60.1-114	Annual Fees for Covered Sources
HAR 11-60.1-115	Basis of Annual Fees for Covered Sources
Subchapter 8	Standards of Performance for Stationary Sources (NSPS)
Subchapter 9	Hazardous Air Pollutant Sources
HAR 11-60.1-174	Maximum Achievable Control Technology (MACT) Emission Standards
Subchapter 11	Greenhouse Gas Emissions

HAR Chapter 11-60.1, Subchapter 11, §11-60.1-36 Biomass Fuel Burning Boilers

HAR §11-60.1-36 is applicable to Hu Honua Bioenergy Facility because the 407 MMBtu/hr Babcock and Wilcox Boiler is designed to be fired entirely on biomass fuel. Hu Honua provides the following calculations to demonstrate compliance with the particulate matter (PM) limitation of 0.40 lbs per one hundred (100) lbs of biomass burned:

$$\text{Feed Rate}_{\text{Biomass}} = \text{Firing Rate}_{\text{Biomass}} / \text{HHV}_{\text{Biomass}}$$
$$= 407 \text{ MMBtu/hr} \times 1{,}000{,}000 \text{ Btu//1 MMBtu} \times 1 \text{ lb} /4{,}474 \text{ Btu}$$
$$= 90{,}970 \text{ lbs/hr}$$

$$\text{PM/100 lb}_{\text{Biomass}} = \text{PM lbs/MMBtu} \times \text{Firing Rate MMBtu/hr} \times 1/\text{Feed Rate} \times 100$$
$$= 0.024 \text{ lb/MMBtu} \times 407 \text{ MMBtu/hr} \times 1 \text{ hr}/90{,}970 \text{ lbs} \times 100$$
$$= 0.01 \text{ lb/100 lbs}_{\text{Biomass}}$$

The calculated PM emission rate per one hundred (100) lb of biomass burned is below the limitation of 0.40 lb PM per one hundred (100) lbs of biomass burned.

<u>HAR Chapter 11-60.1, Subchapter 11, §11-60.1-204 Greenhouse Gas ERP</u>

1. Applicability of Subchapter 11 pursuant to HAR §11-60.1-204(a)

   HAR §11-60.1-204 is applicable to Hu Honua Bioenergy Facility because it is a permitted covered source with the potential GHG emissions (biogenic plus non-biogenic) equal to or greater than 100,000 short tons per year (tpy).

2. Baseline Emission Rate and Cap

   a. Hu Honua Bioenergy Facility has not yet begun operations and so it has no operating history. HAR §11-60.1-204(d)(1)(B) allows the owner or operator of newly permitted covered sources without 2010 data to make the best estimate of normal operations based on contract agreements, available operational records, required scheduled maintenance, market forecast, or any other information for projecting the affected source emissions.

      Therefore, Hu Honua proposes to use baseline emissions based on operating levels expected to fulfill market needs and future contractual agreements. In particular, the facility will be operated under an economic dispatch arrangement with HELCO, and subject to the limitations of the facility's operations. As a base load dispatchable plant, it is anticipated that the facility will be operated to stabilize the electrical grid with respect to intermittent electricity supply from wind and solar generators. For planning purposes, the facility assumes an operation of fourteen (14) hours during peak periods and ten (10) hours during off peak periods. These factors along with the existing limits imposed by special permit conditions serves as the basis for a combined maximum allowed heat input of 2,800,000 MMBtu per rolling twelve (12) month period.

      Hu Honua proposes to use a heat input of 2,800,000 MMBtu/yr to make a best estimate of their normal operation. A breakdown of expected fuel consumption and mass-based emissions by fuel type and emission units are shown in Table 1-1 of Enclosure 1 (*Source: Table 1 of Hu Honua's GHG ERP*). In Table 1-2 of Enclosure 1, Global Warming Potentials are applied to show the CO_2e emissions. Since Hu Honua Bioenergy Facility plans to operate entirely on biofuels, Table 1-2, further shows a breakdown between biogenic and non-biogenic CO_2e emissions. As required by HAR §11-60.1-204(c) biogenic CO_2 emissions are excluded from the cap, except CO_2e emissions of methane (CH_4) and nitrous oxides (N_2O) are included, whether these emissions are biogenic or not. Pursuant to HAR §11-60.1-204(d)(1), Hu Honua is proposing a total baseline CO_2e emissions of 293,306 short tons per year, of which 288,920 and 4,386 short tons are from biogenic CO_2, and non-biogenic CO_2 plus CH_4 and N_2O emissions respectively. Non-biogenic CO_2 emissions are released when HCl and SO_2 acid gases reacts with the injected and thermally decomposed sodium bicarbonate. The breakdown of these GHG emissions are reported pursuant to Code of Federal Regulations (CFR) Subpart C §98.36 and are used to establish Hu Honua's proposed CO_2e baseline emission and cap.

b. Section 1 of Hu Honua's GHG ERP states that a sixteen (16) percent reduction in GHG emissions is not attainable. HAR §11-60.1-204(d)(2) requires the facility to include the following as part of the GHG ERP when a sixteen (16) percent emissions reduction from the baseline year is deemed unattainable:

   i. The justification and supporting documentation of why the required emissions cap cannot be met;
   ii. A proposal, for approval, of an alternate emissions cap resulting in the maximum achievable GHG reductions; and
   iii. Conduct a GHG control assessment as described in HAR §11-60.1-204(d) paragraphs (3) through (5).

   Hu Honua's basis for why a sixteen (16) percent reduction is unattainable are as follows:

   i. Hu Honua Bioenergy Facility plans to operate entirely on biofuels, however, approximately 1.50% of total CO_2e emissions are determined to be attributed to biogenic emissions of CH_4 and N_2O and non-biogenic emissions of CO_2 from the reaction of injected sodium bicarbonate. The remaining 98.50% of total CO_2e emissions are biogenic CO_2 emissions, which are excluded from the GHG cap determination in accordance with HAR §11-60.1-204(c). There are no available capture and control mechanisms for eliminating emissions of CH_4 and N_2O and curtailment by restricting operations would not yield a significant reduction since only a small portion of total emissions are determined to be attributed to these pollutants.
   ii. The facility has already applied the best available control technology (BACT) for GHG at the initial start-up of the facility's construction; and
   iii. Hu Honua was originally designed for optimum performance using wood that contains mid-forty (40) percent moisture content as a primary fuel source and any proposed design changes, at this stage, will redefine the original purpose or objective of the facility, which is not the intent of Environmental Protection Agency's (EPA) "PSD and Title V Permitting Guidance for Greenhouse Gases", dated March 2011.

   Pursuant to HAR §11-60.1-204(d)(2), **Hu Honua proposes an alternate GHG emissions cap of 4,386 short tons** based on a facility total baseline CO_2e emissions rate of 293,306 tpy. As summarized in Table 1, the Hu Honua facility's total baseline CO_2e emissions rate and alternate emissions cap is adjusted to include 558 short tons of non-biogenic CO_2 emissions from the reaction of injected sodium bicarbonate.

Table 1
CO_2e Emission Cap

Hū Honua Bioenergy Facility Emissions (Short Tons of CO_2e)				Total CO_2e GHG Cap (Excluding Biogenic CO_2)	
CO_2		CH_4	N_2O	Short Tons	Metric Tons
Biogenic[1, 2]	Non-biogenic[3]				
288,920	558	551	3,277	4,386	3,979

[1]Biogenic CO_2 emissions as defined in HAR §11-60.1-1.
[2]Biogenic emissions are emissions that occur as a result of combustion or decomposition of biological based materials.
[3]Non-Biogenic are anthropogenic/human made emissions (e.g., HFC, PFC, and SF_6 and emissions from burning fossil fuels, and mineral sources of CO_2 from sorbent).

A review of Hu Honua's GHG control assessment is included in the following Sections 3 through 5:

3. Available Control Measures

Hu Honua's GHG ERP included reviews of the following available control measures:

a. *Available technologies for direct GHG capture and control.* Only through capture and control of CH_4 and N_2O emissions, which represents approximately 1.31% of the total baseline CO_2e emissions, would Hu Honua be able to reduce their total GHG emissions as required by HAR §11-60.1-204(c). Since Hū Honua's feedstock will be limited to the combustion of biomass fuel, approximately 98.50% of total emissions will be biogenic CO_2, which are not included when determining compliance with the facility-wide GHG emissions cap. Therefore, a capture and control mechanism will be limited to reducing CH_4 and N_2O emissions. Section 4.1.1 of Hu Honua's GHG ERP states that there are no capture and control mechanisms for CH_4 and N_2O.
b. *Fuel switching or co-fired fuels.* Hu Honua's boiler is being refurbished and converted from a fossil fueled coal boiler to a bio-fueled boiler that principally burns wood. CO_2e emissions from CH_4 and N_2O per MMBtu of fuel combusted are provided below for various fuels. As shown, the liquid biofuel has the lowest CO_2e emissions of CH_4 and N_2O on a per heat input basis. However, a fuel cost analysis conducted in early 2015 showed that the cost of biodiesel was approximately four (4) to five (5) times higher than the proposed solid biomass fuel. In addition, Hu Honua states that an increase in maintenance cost is expected if biodiesel fuel is used since the facility will need to sustain enough heat at mid to high loads.

Types of Biofuels	Other Solids	Wood	Gas	Liquids
CO_2e emissions from CH_4+N_2O (Kg/MMBtu)	2.052	1.253	0.268	0.060

Biogas has the second lowest CO_2e emission per MMBtu of fuel combusted however, biogas is normally combusted onsite at landfills and wastewater treatment plants and is not readily available for distribution because biogas capture in Hawaii has never been economically justified. *(Source: New Source for Renewable Energy" dated June 2015 by Hawaii Business*). Also, Hu Honua's facility is not designed nor capable of accommodating the combustion of biogas.

Wood can be managed to be readily and continuously available as an economical feedstock by tree farming. The wide adaptability, extremely fast growth rate, and energy-rich cellulosic biomass makes eucalyptus trees a prime choice of fuel source. (*Source: Eucalyptus – A Global Tree for Fuel and Fiber dated June 11, 2014 from the – A Department of Energy Joint Genome Institute at https://jgi.doe.gov/just-food-koalas-eucalyptus-global-tree-fuel-fiber/*).

The facility is engineered with a stoker boiler which is designed for solid fuel and cannot perform to its full capability burning a liquid fuel. The refurbished boiler is designed to combust wood with mid forty (40) percent moisture content for optimum performance.

The "PSD and Title V Permitting Guidance for Greenhouse Gases" (March 2011 Edition) states that a BACT analysis need not necessarily include inherently lower polluting processes that would fundamentally redefine the nature of the source proposed by the permit applicant. The EPA guidance further states that a BACT analysis should generally not be applied to regulate the applicant's purpose or objective for the proposed facility and any decision to exclude an option on "redefining the source" grounds must be explained and documented in the permit record, especially where such an option has been identified as significant in public comments.

In assessing whether fuel switching primary fuels would fundamentally redefine a proposed source, the goals, objectives, and basic design for Hu Honua's facility in its application were considered. The Hu Honua's facility is expected to:

1. Provide base loads under an economic dispatch arrangement by combusting wood with mid forty (40) percent moisture content for optimum performance and overall cost;
2. Help stabilize the electrical grid relative to other renewable sources;
3. Continuously have readily available feedstock through an economically managed tree farm that maintains carbon neutral ecological balance, and
4. Align with the state's goal of transitioning the electric power sector towards using renewable sources and to mitigate the risk of dependency on imported fossil fuel by delinking from the use of fossil fuel. Based on the plant design for optimum performance, fuel availability, and overall economic and ecological considerations, fuel switching will fundamentally redefine the proposed source.

Therefore, fuel switching to either biomass liquid or gas as a primary fuel is not considered to be a technically feasible control measure.

c. *Energy Efficiency Upgrades*

Section 4.1.3 of the GHG ERP states that the coal fired boiler was retrofitted and upgraded to a biomass boiler using applicable energy efficiency improvements from the U.S. EPA 2010 guidance document titled, "Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from Industrial, Commercial, and Institutional Boilers" (U.S. EPA 2010 Guidance). The plan further states, the baseline emission already includes the BACT from the boiler improvements and provides a list of boiler efficiency improvement measures that were implemented during retrofitting and upgrading the boiler from bituminous coal to biomass fired.

d. *Combustion or Operational Improvements*

U.S. EPA 2010 Guidance categorizes combustion improvements into tuning, optimization, and instrumentation and controls (I&C).

Tuning – Hu Honua Bioenergy Facility's boiler is subject to the biennial boiler tune-up requirements of 40 CFR Part 63, Subpart JJJJJJ, National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Industrial, Commercial, and Institutional Boilers. Because this boiler commenced reconstruction after June 4, 2010, to be fueled only with biofuel, a one-time energy assessment of the boiler is not required. Section 4.1.6 of the GHG ERP, however, states that a thermal tune-up will be conducted annually, which includes inspection of the burner, flame pattern, and air/fuel ratio.

Optimization, Monitoring, and Instrumentation - Section 4.1.4 of the GHG ERP states that fuel consumption is reduced and combustion efficiency is maximized when optimum fuel mix is achieved by use of a software based system that monitors certain parameters, such as O_2 levels, to effectively control other parameters such as the residence time.

e. *Restrictive Operations*

Hu Honua anticipates the operation of Hu Honua Bioenergy Facility will eliminate the need for approximately 250,000 barrels of oil imported into Hawaii each year. 250,000 barrels of oil is equivalent to combusting 1,575,000 MMBtu of fuel, which is within the facility's annual capacity of 2,800,000 MMBtu. This estimate is based on using a high heat value of 0.150 MMBtu per gallon for fuel oil No. 6 with an equivalent conversion factor of forty-two (42) gallons per barrel. Since Hu Honua Bioenergy Facility will operate entirely on biofuel, approximately 98.50% of the GHG emissions are expected to be biogenic CO_2. HAR §11-60.1-204(d)(6)(B) states that biogenic CO_2 emissions are not included when determining compliance with the facility-wide GHG emissions cap.

Therefore, restricting operations of Hu Honua Bioenergy Facility potentially could increase non-biogenic GHG emissions from burning fossil fuels to meet electricity demands, unless another renewable energy source is used to make up power due to any imposed curtailment.

f. *Planned Upgrades, Overhaul, or Retirement of Equipment*

Hu Honua Bioenergy Facility's boiler is currently undergoing major retrofits and upgrades on site as summarized in Table 2 in Section 4 of the GHG ERP.

g. *Outstanding Regulatory Mandates Emission Standards, and Binding Agreements*

None

h. *Other GHG Reduction Initiatives That May Affect the Facility's GHG Emissions*

None

4. Technical Feasible Measures

The following summarizes documented discussion of control measures for this facility:

Table 2
Technically Feasible Control Measures

Available Control Measure	Technically Feasible	Notes
Direct GHG capture and control	No	There are no available capture and control devices for CH_4 and N_2O
Fuel switching or co-fired fuels.	No	The boiler is being refurbished from a coal to a wood fired boiler. The refurbished boiler is designed for optimum performance and cost using wood that contains mid-40% moisture content. "PSD and Title V Permitting Guidance for Greenhouse Gases" states that a BACT analysis should generally not be applied to regulate and redefine the applicant's purpose or objective for the proposed facility.
Energy efficiency upgrades.	Yes	The boiler is being upgraded to the applicable energy efficiency improvements based on the U.S. EPA 2010 guidance document. The boiler is designed to operate at optimum heat load and with an excess air system that maximizes thermal efficiency. Also, modification in metallurgy and configuration (such as finned tubes) to increase heat transfer characteristics are part of the design to improve thermal efficiency.
Combustion or operational improvements.	Yes	The boiler is subject to regular tuning pursuant to 40 CFR Part 63, Subpart JJJJJJ and being retrofitted with software and control devices that optimizes fuel mixes and allows for adequate combustive residence time. Also, maintenance techniques are being implemented to reduce fouling of heat exchanger components.
Restrictive operations.	Yes	Fuel usage is restricted to biofuel and therefore restrictive operations is not regarded as an effective control measure.
Planned upgrades, overhaul, or retirement of equipment	Yes	Planned boiler and steam turbine upgrades for fuel switching from coal to biomass and improved efficiency are in progress.

5. Effectiveness of Control Measures and Cost Evaluation

A control effectiveness and cost evaluation is not applicable since all effective available control measures that have been determined to be technically feasible were already implemented and a zero reduction in CO_2e emissions from the established baseline level is being proposed. HAR §11-60.1-204(d)(5) requires identification of the following for each control measure as applicable:

a. Control effectiveness (percent pollutant removed): NA;
b. Expected emission rate (tons per year (tpy) CO_2e, lbs CO_2e/kilowatt-hr): 293,306 tpy total baseline and 4,386 tpy non-biogenic CO_2 and biogenic CH_4 and N_2O;
c. Expected emission reduction (tpy): None;
d. Energy impacts (BTU, Kilowatt-hour): 2,800,000 MMBtu;
e. Environmental impacts (other media and the emissions of other regulated air pollutants): None;
f. Any secondary emissions or impacts resulting from the production or acquisition of the control measure: None; and
g. Economic impact (cost effectiveness: annualized control cost, dollar/megawatt-hr, dollar/ton CO_2e removed, and incremental cost effectiveness between the control and status quo). The Public Utility Commission (PUC) approved HELCO's PPA with Hū Honua Bioenergy Facility and determined the non-fossil fuel energy pricing of $0.219 per KWH (or $219 per MWH) pursuant to HRS §269-27.2 over the next thirty (30) years as just and reasonable [*Source: PUC Docket 2017-0122 Decision and Order dated July 28, 2017, pending PUC proceedings to resolve the State of Hawai'i Supreme Court ruling as codified in SCOT-17-0000630 dated May 10, 2019*].

6. Proposed Control Strategy

Hu Honua Bioenergy Facility proposes to continue with their plant refurbishment to transition from a fossil fueled source to a renewable energy facility. The facility is currently undergoing refurbishment to upgrade the boiler based on EPA's BACT guidance for GHGs. Operationally, the facility will be consuming primarily wood that contains mid forty (40) percent moisture content for optimum performance with biodiesel as the secondary fuel. Since the Hu Honua Bioenergy Facility has no operating history, a best estimate of normal operations was based on a heat input operating limit of 2,800,000 MMBtu on a twelve (12) month rolling average. Hu Honua Bioenergy Facility is proposing to cap its facility-wide CO_2e emissions (less any biogenic CO_2 emissions). While the operation will be fueled entirely on biofuel, approximately 1.50% of the total CO_2e emissions from CO_2 generated by the sodium bicarbonate injection system, and biogenic emissions of CH_4 and N_2O that are not excluded from the cap. Hu Honua is proposing a zero percent CO_2e emissions reduction from the proposed baseline since there are no effective means of eliminating CH_4 and N_2O emissions and the sodium bicarbonate injection system is required for the control of HCl and SO_2 emissions. Finally, restricting operation potentially could increase fossil fuel emissions and is not expected to yield a significant reduction since only 1.50% of total emissions are included in the GHG emissions cap.

Federal Requirements
40 CFR Part 60 - Standards of Performance for New Stationary Sources (NSPS)

Subpart A – General Provisions
Subpart Db – Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units and the following subsections of this subpart **are applicable** to the boiler because it is undergoing reconstruction or modification after June 19, 1984, and it has a heat input capacity from fuels combusted in the boiler unit of greater than one hundred (100) MMBtu/hr.

§60.43b(f) – opacity standard – Twenty (20) percent opacity (six (6) min avg.), except for one (1) six (6) minute period per hour of not more than twenty-seven (27) percent opacity; and
§60.43b(h)(1) –PM standard – 0.030 lbs/MMBtu limit.

40 CFR Part 63 – National Emission Standards for Hazardous Air Pollutants (NESHAP) for Source Categories (Maximum Achievable Control Technologies (MACT) Standards).

Subpart A – General Provisions
Subpart JJJJJJ – NESHAP for Area Sources: Industrial, Commercial, and Institutional Boilers **is applicable** because the boiler:

1. Is an “industrial boiler” as defined in §63.11237;
2. Is located at an area source of hazardous air pollutants (HAP), as defined in §63.2; and
3. Is not excluded from Subpart JJJJJJ as specified in §63.11195.

Major Source/ Synthetic Minor Applicability
The facility is a major source as defined in HAR §11-60.1-1. The facility is not a major stationary source subject to Prevention of Significant Deterioration (PSD) as defined in HAR §11-60.1-131 since its potential to emit is less than 250 tpy of any air pollutant subject to regulation approved pursuant to the act.

AERR/In-house Reporting Applicability
40 CFR Part 51, Subpart A – Air Emissions Reporting Requirements (previously called the Consolidated Emissions, Reporting Rule (CERR)), remains unchanged from the Initial Permit Application Review No. 0724-01 and **is applicable** based on the nitrogen oxide (NOx) emission level.

Non-Applicable Requirements

No change from the previous permit application review

HAR
Title 11, Chapter 60.1 Air Pollution Control
Subchapter 7 Prevention of Significant Deterioration Review

Federal Requirements
40 CFR Part 52.21 –PSD of Air Quality. PSD **is not applicable** because this facility is not a new major stationary source nor does this application propose any major modifications to a major stationary source as defined in 40 CFR 52.21. A major modification is defined as a project at an existing major stationary source that will result in a significant and a significant net emission increase above specified emission thresholds for pollutants subject to regulation. The facility is not a major stationary source as defined in HAR §11-60.1-131.

40 CFR Part 60, Subpart Kb, Standards of Performance for Volatile Organic Liquid Storage Vessels **is not applicable** to the 132,676 gallon internal floating roof biodiesel storage tank because the maximum true vapor pressure of the volatile organic compounds (VOC) stored inside the tank is less than 15.0 kilopascals (kPa). Refer to Enclosure 2 for details.

40 CFR Part 60 Subpart IIII - NSPS for Stationary Compression Ignition Internal Combustion Engines **is not applicable** to the biodiesel engine generator since the engine generator was manufactured prior to the April 1, 2006 or model year 2007 applicability date.

40 CFR Part 61 – NESHAP. This source **is not subject** to these NESHAP because there are no standards in 40 CFR Part 61 applicable to this facility.

40 CFR Part 63 Subpart ZZZZ – NESHAP (MACT) RICE **is not applicable** to the emergency stationary RICE (or DEG), such as the diesel fire pump engine, at an area source of hazardous air pollutants that complies with §63.6585(f).

Best Available Control Technology (BACT)
A BACT analysis is required for new or modified sources that have the potential to emit or increase emissions above significant amounts as defined in HAR §11-60.1-1. Since this is not a new source nor are any modifications proposed that have the potential to cause a significant increase in air emissions, a BACT analysis **is not required**.

Compliance Assurance Monitoring (CAM), 40 CFR Part 64
The purpose of CAM is to provide a reasonable assurance that compliance is being achieved with large emissions units that rely on air pollution control device equipment to meet an emissions limit or standard.

Pursuant to 40 CFR Part 64, for CAM to be applicable, the emissions unit must:

1. Be located at a major source;
2. Be subject to an emissions limit or standard;
3. Use a control device to achieve compliance;
4. Have potential pre-control emissions that are one hundred (100) percent of the major source level; and
5. Not otherwise be exempt from CAM.

No change from the initial permit application review. CAM is only applicable for PM/PM_{10} but will not apply until permit renewal since the post-control emissions are less than the major source threshold. This facility **will be subject to CAM for PM upon permit renewal**.

Insignificant Activities

The equipment listed in Table 3 are insignificant activities.

Table 3

Unit Number	Description	Capacity (gallons)	Justification
-------	Internal floating roof tank	132,676 gal	HAR 11-60.1-82(f)(7) [1.7138 lbs/yr VOC]
3	Emergency Biodiesel Engine Generator, Detroit Diesel, 12V-2000 G60, 1,120 bhp	836 kW (54.7 gal/hr)	HAR 11-60.1-82(f)(5)

Alternate Operating Scenarios

This project did not propose any alternate operating scenarios.

Project Emissions

The modification to incorporate GHG emissions caps and install new biodiesel storage tank will not cause a significant increase in maximum potential emissions. The emission rates, equipment, and design operating parameters used in determining the maximum potential emissions have not changed significantly. Table 4-1 compares the net increase in boiler emissions with respect to the Initial CSP Application No. 0724-01 and the impact of the net increase relative to various permitting thresholds. The changes proposed by this permit modification are discussed as follows:

1. Emissions in Table 4-1 are from combustion sources only that shows net changes in emissions from the Initial Application Review No. 0724-01. Table 4-1 also shows the impact of both the net change and total emissions relative to the control thresholds. The net change in emissions from the Initial Review Application No. 0724-01 are attributable to:

a. The breakdown in the annual heat input by fuel types;
b. Using revised emission factors for calculating emissions of CH_4 and N_2O;
c. Using revised global warming potentials for calculating emissions of CH_4 and N_2O;
d. Including emissions from the existing diesel engine generator calculated in Enclosures 4 and 6; and
e. Including emissions from the reaction of injected sodium bicarbonate calculated in Enclosure 5.

2. Fugitive VOC emissions for losses expected from the new internal floating roof biodiesel tank are shown in Table 4-2 and are not included with Table 4-1 evaluation (see HAR Subchapter 7, Major Source definitions). The detailed calculations of VOC emissions attributable to losses from the tank are included in Enclosure 3, which does not exceed the thresholds in HAR 11-60.1-82(f)(7) and is deemed insignificant.

3. A breakdown in GHG emissions are shown in Table 4-3 and summarized in Table 4-1.

   Refer to Enclosure 1 for details of the breakdown and revised factors used in the computations. For fee assessments, both biogenic and non-biogenic CO_2e emissions shall be included in the determination. However, biogenic CO_2 emissions will not be included when determining compliance with the facility-wide GHG emissions cap.

   The GHG emissions were based on the expected maximum heat input specified for the boiler in the existing permit. For actual GHG emissions, heat input shall be calculated from the mass or volume of fuel combusted times the respective HHV in accordance with the Tier 2 methodology specified in 40 CFR §98.33(a)(2). Emission factors are from 40 CFR §98 Appendix, Table C-1 and C-2 and global warming potentials (GWP) are from 40 CFR §98 Appendix, Table A-1. GHG emissions from the emergency biodiesel engine generator and the new internal floating roof biodiesel tank are included in these emission estimates, however, GHG emissions from these sources are not required to be included for the mandatory GHG emissions reporting. 40 CFR Part 98, Subpart A, §98.2(a)(3) states that reporting of GHG emissions must be from stationary fuel combustion sources only. 40 CFR Part 98, Subpart C, §98.30 further defines stationary fuel combustion sources as devices that combust fuel for producing useful energy and specifically excludes emergency generators.

Table 4-1 Total Facility Emissions Relative to Control Thresholds (tpy)

Pollutant	Boiler Emissions (Application No. 0724-01)	Net Change in Emissions (Application No. 0724-03)	Total Emissions (tpy)	AERR		Major Source		DOH (In-House) Reporting	
				Thresholds (Type B Sources)	Applies	Threshold	Applies	Threshold	Applies
NO_x	210	0.8	210.8	100	Yes	100	Yes	25	Yes
SO_2	39.2	3.86E-04	39.2	100	No	100	No	25	Yes
CO	246.4	0.213	246.6	1,000	No	100	Yes	250	No
VOC	39.2	0.023	39.2	100	No	100	No	25	Yes
PM	33.6	0.250	33.9	100	No	100	No	25	Yes
PM_{10}	33.6	0.240	33.8	100	No		NA	25	Yes
$PM_{2.5}$	33.6	0.225	33.8	100	No		NA		NA
Pb (Actual)	0	0	0.0	0.5	No	100	No	5	No
HAPs (Single)[a]	6.1	1.45E-03	6.1		NA	10	No	5	Yes
HAP (Total)	23.8	3.47E-03	23.8		NA	25	No		NA
GHG (CO_2e)	301,078	-7,772	293,306		NA		NA		NA

[a]Single highest HAP is formaldehyde. Refer to Enclosure 6 for details.

[b]Refer to Enclosure 6 for breakdown by pollutants.

Table 4-2 VOC Emissions from Tank Losses

Tank Description	Fuel Types	Total VOC Losses[a] (lbs/yr)
132,767 Gallons Internal Floating Roof Tank fabricated with 304L stainless steel	Biodiesel B100	1.7138

[a]Refer to Enclosure 3 for details.

Table 4-3 Total GHG Emissions (Biogenic and Nonbiogenic)

GHG	ΣGHG Mass-Based Emissions[a]	GWP	CO_2e Based Emissions	
	Enclosure 1	40CFRS98 Table A-1	(a)*(b)	(c)*.90718474[b]
	(tpy)	**None**	**(tpy)**	**(metric tons/yr)**
	(a)	**(b)**	**(c)**	**(d)**
$CO_{2\ \text{Biogenic}}$	288,920	1	288,920	262,104
$CO_{2\ \text{Non-Biogenic}}$	443	1	558	506
CH_4	22	25	551	500
N_2O	11	298	3,277	2,973
	Baseline CO_2e Emissions =		293,306	266083

[a]Refer to Enclosure 1 for detailed calculations and derivations.

[b]One (1) short ton is equivalent to 0.90718474 metric tons**.**

Table 4-3a Biogenic CO_2 GHG Emissions Compared to Biogenic CH_4 and N_2O and Non-Biogenic CO_2 GHG Emissions

	CO_2e Emissions		
	(%)	**(tpy)**	**(metric tons/yr)**
Biogenic CO_2 GHG Emissions	98.50%	288,920	262,104
Biogenic CH_4 and N_2O and Non-biogenic CO_2 GHG Emissions	1.50%	4,386	3,979

[a]Refer to Enclosure 1 for detailed calculations and derivations.
[b]One (1) short ton is equivalent to 0.90718474 metric tons.

Ambient Air Quality Assessment

An ambient air quality impact assessment (AAQIA) was not performed since there were no changes in assumptions and parameters from our initial modeling that would increase emissions of pollutants.

Significant Permit Conditions

1. Hu Honua Bioenergy Facility shall not emit or cause to be emitted CO_2e emissions in excess of a GHG emissions cap of 3,979 metric-tons (4,386 short tons) per calendar year.

   This total combined CO_2e emissions limit will be specified in Attachment II – GHG Special Condition No. C.1.a of CSP No. 0724-01-C for Hu Honua Bioenergy Facility.

   Reason: Required by §11-60.1-204(c), HAR.

2. For purposes of the CO_2e emission limits in Attachment II – GHG Special Condition No. C.1.a:

   a. The CO_2e emissions shall have the same meaning as that specified in HAR §11-60.1-1;
   b. In accordance with HAR §11-60.1-204(d)(6)(B), biogenic CO_2 emissions shall not be included when determining compliance with the emissions limit; and
   c. The permittee shall be in compliance with the emissions limits by the end of 2019 and each calendar year thereafter.

   This Special Condition will be specified in Attachment II – GHG Special Condition No. C.1.b of CSP No. 0724-01-C for Hu Honua Bioenergy Facility.

   Reason: Required by §11-60.1-204(c), HAR.

3. Attachment II, Special Condition No. F.4 will be amended to:

At least sixty (60) days prior to first fire of the boiler, the permittee shall submit to the Department of Health for approval, in writing, a fuel analysis plan that identifies the fuels to be burned in the boiler, a detailed description of the sample location and the analytical methods, with expected minimum detection levels, to be used for the measurement of chlorine. A minimum of three (3) composite fuel samples for each fuel type must be obtained. Also, a wood sampling and analysis protocol for determining the wood's proximate and ultimate analysis, the chlorine content, and higher heating value (HHV) of the fuel shall be submitted. Sampling frequency and analysis to determine the fuel's HHV shall be in accordance with 40 CFR §98.34(a). The protocol shall address in detail the sampling and testing methodology to ensure the samples collected are representative of the wood fired in the boiler during the sampling period. The protocol shall also identify the requirement that the collection of each sample include a recorded description of the wood samples collected (such as the tree species and tree section such as bark, leaves, branches, trunk, etc.). The permittee shall obtain approval for the sampling protocol prior to the first fire of the boiler.

Manufacturer's literature on the weigh scale required by Attachment II, Special Condition No. E.2.c.i. shall be submitted to the Department of Health along with the wood sampling and analysis protocol. The literature should include information on the accuracy, manufacturer's recommended calibration methods and frequency, and operating details of the weigh scale.

(Auth.: HAR 11-60.1-3, 11-60.1-5, 11-60.1-11, 11-60.1-90, 11-60.1-173)[1]

Reason: Required by 40 CFR §98.34(a).

4. Monitoring Reports

a. The permittee shall complete and submit **semi-annual** monitoring reports to the Department. All reports shall be submitted **within sixty (60) days after** the end of each semi-annual calendar period (January 1 – June 30 and July 1 – December 31), be signed and dated by a responsible official, and shall include the metric tons and short tons of:

i. CO_2e emissions form biogenic and non-biogenic CO_2;
ii. CO_2e emissions from total CH_4 and N_2O; and
iii. Total CO_2e emissions, excluding CO_2e emissions from biogenic CO_2.

The following enclosed **form, or equivalent form**, shall be used for reporting and shall be signed and dated by a responsible official:

Monitoring Report Form: GHG Emissions

b. For calendar year 2019, the permittee shall report the CO_2e emissions **within sixty (60) days** after the issuance of this permit or **within sixty (60) days after December 31, 2019**, whichever is later. The **Monitoring Report Form: GHG Emissions, or equivalent form,** for the 2019 calendar year shall be used for reporting and shall be signed and dated by a responsible official.

Reason: Required by HAR §11-60.1-3, §11-60.1-5, §11-60.1-11, §11-60.1-90.

5. Attachment II, Special Condition No. E.2.c.iii(1) will be amended to:

The wood shall be sampled and analyzed in accordance with the wood sampling protocol of Attachment II, Special Condition No. F.4, to determine the higher heating value of the fuel. Samples shall be collected for analysis on a weekly basis and analyzed on a monthly basis.

Reason: Required by HAR §11-60.1-3, §11-60.1-5, §11-60.1-11, §11-60.1-90, 40 CFR §98.34(a

Conclusion

Hu Honua submitted a GHG ERP that includes a control assessment in accordance with paragraphs (3) to (5) of HAR §11-60.1-204(d) to:

1. Substantiate that a minimum sixteen (16) percent reduction in CO_2e emissions by 2020 is unattainable, pursuant to HAR subsection 11-60.1-204(c);
2. Establish a facility-wide total baseline GHG emissions for a newly permitted covered source without a 2010 operating history pursuant to HAR §11-60.1-204(c) and §11-60.1-204(d)(1)(B); and
3. Establish an alternate “facility-wide GHG emissions cap” and associated provisions pursuant to HAR §11-60.1-204(b) and §11-60.1-204(d)(2).

Hu Honua, also submitted a letter to add a 132,676 gallon internal floating roof tank to replace both the 10,000 gallon polyethylene and 250 gallon day tanks and requested that this tank be considered as an insignificant activity.

Hu Honua’s GHG ERP was reviewed and determined to comply with HAR §11-60.1-204.
In addition, Hu Honua has adequately evaluated and substantiated all available control measures and the proposed conditions for implementation of their GHG ERP. The proposed 132,676 gallon replacement tank was also evaluated and determined to be an insignificant activity.

Recommend issuance of the significant modification to the CSP subject to thirty (30) day public review and comment period in accordance with HAR §11-60.1-205, a forty-five (45) day EPA review period, and incorporation of the significant permit conditions.

Dale Hamamoto
Sept 27, 2019
(Based on Draft GHG ERP Version 5 received on August 19, 2019)

Enclosure 1 - GHG Emissions

Table 1-1 (Wood, Biodiesel, and Sorbent Emission)

	Annual Heat Input[a]	Emission Factors (kg/MMBtu)[b]			Annual GHG Mass Based Emissions (tpy)[c]			
	(MMBtu)	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	Total
Source or Derivation→	**Table 1 of Hu Honua GHG ERP**				**(a)*(b)**	**(a)*(c)**	**(a)*(d)**	**(e)+(f)+(g)**
Description ↓	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**
Boiler - Normal Operations Wood (99%)	2,770 ,495	93.8	7.20E-03	3.60E-03	286,460	21.99	10.99	286,493
Boiler - Normal Operations Biodiesel (1 %)	27,985	73.8	1.10E-03	1.10E-04	2,278	3.39E-02	3.39E-03	2,278
Boiler - Startup Biodiesel (11,880 gal/yr, 0.128 MMBtu/gal)	1,521	73.8	1.10E-03	1.10E-04	123.8	1.84E-03	1.84E-04	124
Boiler - Sodium Bicarbonate Injection (929 short tons/yr)	-	**Note[e]**	0	0	558	0	0	558
Emergency Engine Biodiesel (100 hr, 7.15 MMBtu/hr)	715	73.8	1.10E-03	1.10E-04	58.2	8.67E-04	8.67E-05	58.2
Sub-Totals					**289,478**	**22**	**11**	289,478

Enclosure 1
Table 1-2 (Wood, Biodiesel, and Sorbent Emission)

	Annual CO_2e Emissions (short tons per year)[d]						
	CO_2	CH_4	N_2O	Total	Biogenic CO_2	Non-biogenic CO_2	CH_4 + N_2O + Non-Biogenic CO_2
Source or Derivation→	(e)*1	(f)*25	(g)*298	(i)+(j)+(k)			(j)+(k)+(n)
Description ↓	(i)	(j)	(k)	(l)	(m)	(n)	(o)
Boiler - Normal Operations Wood (99%)	286,460	550	3,276	290,286	286,460	0	3,826
Boiler - Normal Operations Biodiesel (1%)	2,278	0.85	1.01	2,280	2,278	0	2
Boiler - Startup Biodiesel (11,880 gal/yr, 0.128 MMBtu/gal)	123.8	4.61E-02	5.50E-02	124	124	0	0
Boiler - Sodium Bicarbonate Injection (929 short tons/yr)	558	0	0	558	0	558	558
Emergency Engine Biodiesel (100 hr, 7.15 MMBtu/hr)	58.2	2.17E-02	2.58E-02	58	58.2	0	4.75E-02
Sub-Totals	289,478	551	3,277	**293,386**	**288,920**	**372**	**4,386**
Percentage of Total					**98.50%**		**1.50%**

Footnotes to Tables 1-1 and 1-2:

[a]**For estimating purposes, emissions are calculated based on the expected maximum heat input. For Permitting, a Tier 2 methodology will be used to calculate emissions in accordance with 40 CFR §98.33. For the combustion of wood, adjustment to the HHV to account for variation in moisture content is required per footnote 5 in 40CFR§98 Appendix, Table C-1 if a Tier 1 methodology is used. A Tier 1 methodology was used to establish the facility-wide emissions cap in the GHG ERP and this permit application review.**

[b]**Unless otherwise noted, emission factors are from 40CFR§98 Appendix, Table C-1and C-2.**

[c]**Mass based emissions are converted from kg/yr to tpy by multiplying the following factors: 10^{-3} (kg/metric-ton) * 1.10231131.**

[d]**CO_2e emissions are derived from applying the global warming potentials from 40CFR§98 Appendix, Table A-1.**

[e]**CO_2 emissions from sodium bicarbonate injection are calculated in Enclosure 5.**

Enclosure 2 - Subpart Kb Applicability of Tank
Table 2

Tank No.	Tank Description	Tank Content	Tank Capacity (gallons)	Tank Capacity[a] (m^3)	Max P_{VA}[b] of fuel (psi)	40CFR Subpart Kb, §60.110b Applicability[c]					
						≥ July 23, 1985	Capacity ≥ 75 m^3	Capacity < 151 m^3	Max P_{VA} ≥ 2.18[d] psi	Max P_{VA} ≥ 0.508[d] psi	Subpart Kb Applies
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	Internal Floating Roof Tank	Biodiesel (B100)	132,676	502	0.0004	Yes	Yes	No	NA	No	No

[a]AP-42 Appendix A (9/85 Reformatted 1/95), MISCELLANEOUS DATA AND CONVERSION FACTORS, used as reference for the following conversions:

1 gallon = 0.003785 m^3

[b]Max P_{VA} = Maximum true vapor pressure as defined in 40 CFR Kb §60.111b and provided in Attachment 3 of Hū Honua's letter dated August 14, 2018.

[c]40 CFR Subpart Kb, §60.110b Applicability:

(a) Subpart Kb applies to each storage vessel with a capacity greater than or equal to seventy-five (75) cubic meters (m^3) that is used to store volatile organic liquids (VOL) for which construction, reconstruction, or modification is commenced after July 23, 1984.
(b) Subpart Kb does not apply to storage vessels with:

(1) A capacity greater than or equal to 151 m^3 storing a liquid with a maximum true vapor pressure less than 3.5 kilopascals (kPa); or
(2) A capacity greater than or equal to 75 m^3 but less than 151 m^3 storing a liquid with a maximum true vapor pressure less than 15.0 kPa.

[d]The equivalent maximum true vapor pressures when converting the units from kPa to psi are shown below:

1 kilo Pascal (kPa) = 0.145038 (psi)

	kPa	psi
40CFR Kb, §60.110b(b)(1)	3.5	0.508
40CFR Kb, §60.110b(b)(2)	15	2.18

Enclosure 3 Tank Losses

Normal Operation (AP42 Section 7.1.3.2.1)

LT = LR + LWD + LF + LD

where:

L_T	=	1.7138	total loss, lb/yr
L_R	=	1.0324	rim seal loss, lb/yr; see Equation 2-3
L_{WD}	=	0.0935	withdrawal loss, lb/yr; see Equation 2-5
L_F	=	0.5880	deck fitting loss, lb/yr; see Equation 2-6
L_D	=	0	deck seam loss (internal floating roof tanks only), lb/yr; see Equation 2-10
	=		Functional cells - No input required

Rim Seal Loss

$L_R = (K_{Ra} + K_{Rb}\, v^n) D P^* M_V K_C$ Eq 2-2

where:

L_R	=	1.0324	rim seal loss, (lb/yr)	
K_{Ra}	=	2.2	zero wind speed rim seal loss factor, (lb-mole/ft yr); see Table 7.1-8, AP42	Vapor-mounted seal, Rim mounted secondary
K_{Rb}	=	0.003	wind speed dependent rim seal loss factor, (lb-mole/(mph)^{n}ft yr); see Table 7.1-8, AP-42	
n	=	4.3	seal-related wind speed exponent, dimensionless; see Table 7.1-8, AP-42	
v	=	7.2	average ambient wind speed at tank site, mph; see Note 1.	Table 7.1-9, AP42 for Hilo, Hawaii
D	=	31	tank diameter, (ft)	
Mv	=	292.2	average vapor molecular weight, lb/lb-mole; see Note 1 to Equation 1-21,	
Kc	=	1	product factor; Kc = 0.4 for crude oils; Kc = 1 for all other organic liquids.	
P*	=	6.79E-06	vapor pressure function, dimensionless; see Note 2	
		P* =	$\dfrac{P_{VA}/P_A}{[1+(1-P_{VA}/P_A)^{0.5}]^2}$	Eq 2-3
P_{VA}	=	0.0004	vapor pressure at daily average liquid surface temperature (psia)	
P_A	=	14.7200	atmospheric pressure, (psia) in Hilo, Hawaii	
P_{VA}/P_A	=	2.72E-05		
$(1-P_{VA}/P_A)$	=	0.999973		
$(1-P_{VA}/P_A)^{0.5}$	=	0.999986		
$1+(1-P_{VA}/P_A)^{0.5}$	=	1.999986		
$[1+(1-P_{VA}/P_A)^{0.5}]^2$	=	3.999946		

Enclosure 3

Rim Seal Loss

Notes:

1	**If the ambient wind speed at the tank site is not available, use wind speed data from the nearest local weather station or values from Table 7.1-9. If the tank is an internal or domed external floating roof tank, the value of v is zero.**
2	**P* can be calculated or read directly from Figure 7.1-19.**
3	**The API recommends using the stock liquid temperature to calculate PVA for use in Equation 2-3 in lieu of the liquid surface temperature. If the stock liquid temperature is unknown, API recommends the following equations to estimate the stock temperature:**

Note 1 to Equation 1-21	**The molecular weight of the vapor, MV, can be determined from Table 7.1-2 and 7.1-3 for selected petroleum liquids and volatile organic liquids, respectively, or by analyzing vapor samples. Where mixtures of organic liquids are stored in a tank, MV can be calculated from the liquid composition. The molecular weight of the vapor, MV, is equal to the sum of the molecular weight, Mi, multiplied by the vapor mole fraction, yi, for each component. The vapor mole fraction is equal to the partial pressure of component i divided by the total vapor pressure. The partial pressure of component i is equal to the true vapor pressure of component i (P) multiplied by the liquid mole fraction, (xi). Therefore,**	
	$\mathbf{Mv = \sum M_i y_i = \sum M_i (Px_i/Pva)}$	Eq 1-22

Withdrawal Losses

$$L_{WD} = \frac{(0.943)QC_S W_L}{D}\left[1+\frac{N_C F_C}{D}\right]$$ Eq 2-4

where:

L_{WD}	=	0.0935	withdrawal loss, lb/yr	
Q	=	282.8571	annual throughput (tank capacity [bbl] times annual turnover rate), bbl/yr	Note 4
C_S	=	0.0015	shell clingage factor, bbl/1,000 ft2; see Table 7.1-10, AP42	
W_L	=	7.09	average organic liquid density, lb/gal; see Note 1	
D	=	31	tank diameter, ft	
0.943	=	0.943	constant, 1,000 ft^3@gal/bbl^2	
N_C	=	1	number of fixed roof support columns, dimensionless; see Note 2	
F_C	=	0.67	effective column diameter, ft (column perimeter [ft]/π); see Note 3	

Enclosure 3

Withdrawal Losses

Notes:

1	**A listing of the average organic liquid density for select petrochemicals is provided in Tables 7.1-2 and 7.1-3, AP42. If WL is not known for gasoline, an average value of 6.1 lb/gal can be assumed.**
2	**For a self-supporting fixed roof or an external floating roof tank:** **NC = 0.** **For a column-supported fixed roof:** **NC = use tank-specific information or see Table 7.1-11, AP42.**
3	**Use tank-specific effective column diameter or FC = 1.1 for 9-inch by 7-inch built-up columns, 0.7 for 8-inch-diameter pipe columns, and 1.0 if column construction details are not known**
4	**Converted Annual Net Throughput from (gal/yr) to (bbl/yr) using a conversion factor of 42 gal per bbl of petroleum from AP-42 Appendix A (9/85 Reformatted 1/95)**

Deck Fitting Losses

Deck Fitting Loss - Deck fitting losses from floating roof tanks can be estimated by the following equation:

$$L_F = F_F\, P^* M_V K_C \tag{2-5}$$

where:

L_F = the deck fitting loss, lb/yr

F_F = total deck fitting loss factor, lb-mole/yr

$$F_F = [(N_{F_1} K_{F_1}) + (N_{F_2} K_{F_2}) + \ldots + (N_{F_{nf}} K_{F_{nf}})] \tag{2-6}$$

where:

L_F	=	0.5880	P*, MV, KC are as defined for Equation 2-2.
F_F	=	296.2	Refer to Table 1 of this enclosure.
N_{Fi}	=	See Table 1	number of deck fittings of a particular type (i = 0,1,2,...,n_f), dimensionless
K_{Fi}	=	K_{Fai}	deck fitting loss factor for a particular type fitting (i = 0,1,2,...,n_f), lb-mole/yr; see Equation 2-7
n_f	=		total number of different types of fittings, dimensionless

The value of F_F may be calculated by using actual tank-specific data for the number of each fitting type (N_F) and then multiplying by the fitting loss factor for each fitting (K_F).

The deck fitting loss factor, K_{F_i} for a particular type of fitting, can be estimated by the following equation:

$$K_{F_i} = K_{Fa_i} + K_{Fb_i}(K_v v)^{m_i} \tag{2-7}$$

where:

K_{Fai}	=	K_{Fi}	zero wind speed loss factor for a particular type of fitting, lb-mole/yr
K_{Fbi}	=	NA	wind speed dependent loss factor for a particular type of fitting, lb-mole/(mph)^{m}yr
m_i	=	NA	loss factor for a particular type of deck fitting, dimensionless
i	=	NA	1, 2, ..., n, dimensionless
K_v	=	NA	fitting wind speed correction factor, dimensionless; see below
v	=	0	average ambient wind speed, mph

For external floating roof tanks, the fitting wind speed correction factor, K_v, is equal to 0.7. For internal and domed external floating roof tanks, the value of v in Equation 2-7 is zero and the equation becomes:

$$K_{Fi} = K_{Fai} \tag{2-8}$$

Loss factors K_{Fa}, K_{Fb}, and m are provided in Table 7.1-12 for the most common deck fittings used on floating roof tanks. These factors apply only to typical deck fitting conditions and when the average ambient wind speed is below 15 miles per hour. Typical numbers of deck fittings for floating roof tanks are presented in Tables 7.1-11, 7.1-12, 7.1-13, 7.1-14, and 7.1-15.

Table 1

	N_{fi}	K_{Fai}		N_{fi} x K_{Fai}
Access Hatch	1	36		36
Gauge Float Well	1	14		14
Column Well	1	51		51
Ladder Well	1	98		98
Roof Leg/Hgr Well	10	7.9		79
Sample Pipe/Well	1	12		12
Vacuum Brkr	1	6.2		6.2

$F_F = \sum N_{fi} \times K_{Fai} =$ 296.2

Enclosure 3

Deck Seam Losses (Internal Floating Roof Tanks Only)

<u>Deck Seam Loss</u> - Neither welded deck internal floating roof tanks nor external floating roof tanks have deck seam losses. Internal floating roof tanks with bolted decks may have deck seam losses. Deck seam loss can be estimated by the following equation:

$$L_D = K_D S_D D^2 P^* M_V K_C \qquad (2\text{-}9)$$

where:

K_D	=	0	for welded deck

Enclosure 4
Emergency Biodiesel Engine Generator
TABLE 4-1

836 kW Detroit Diesel, 12V-2000 G60, 1,120 bhp, 54.7 gal/hr

Pollutant	Emission Factor (EF)[a]	Emission Rate (ER)[b]	Annual Emissions[c]	Annual Emissions
	(lbs/MMBtu)	**(lbs/hr)**	**(lbs/yr)**	**(tpy)**
	(a)	**(b) = (a) *7.5**	**(c)=500*(a)**	**(d)=(c)/2000**
NO_x	3.20	24.0	1600	0.800
SO_2[d]	1.54E-03	0.0	1	3.86E-04
CO	0.85	6.4	425	0.213
VOC	9.00E-02	0.7	45	0.023
PM	1.000	7.5	500	0.250
PM_{10}[e]	0.960	7.2	480	0.240
$PM_{2.5}$[e]	0.900	6.7	450	0.225
Pb	0	0	0	0
HAP (Highest)	Refer to Table 4-1.1			1.45E-03
HAP (Total)				3.47E-03

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Enclosure 4

TABLE 4-1.1

Speciated Organic Compounds of HAP

836 kW Detroit Diesel, 12V-2000 G60, 1,120 bhp, 54.7 gal/hr

Organic Compound	Emission Factor[a] (Fuel Input)	Emission Rate[b]	Annual Emissions[c]	Annual Emissions
	(lb/MMBtu)	**(lbs/hr)**	**(lbs/yr)**	**(tpy)**
	(a)	**(b)=7.5*(a)**	**(c)=500*(b)**	**(d)=(c)/2000**
Acenaphthene	4.68E-06	3.51E-05	0.018	8.77E-06
Acenaphthylene	9.23E-06	6.92E-05	0.035	1.73E-05
Acetaldehyde	2.52E-05	1.89E-04	0.094	4.72E-05
Acrolein	7.88E-06	5.91E-05	0.030	1.48E-05
Anthracene	1.23E-06	9.22E-06	0.005	2.30E-06
Benzene	7.76E-04	5.82E-03	2.908	1.45E-03
Benzo(a)anthracene	6.22E-07	4.66E-06	0.002	1.17E-06
Benzo(b)fluoranthene	1.11E-06	8.32E-06	0.004	2.08E-06
Benzo(k)fluoranthene	2.18E-07	1.63E-06	0.001	4.08E-07
Benzo(g,h,l)perylene	5.56E-07	4.17E-06	0.002	1.04E-06
Benzo(a)pyrene	2.57E-07	1.93E-06	0.001	4.81E-07
1,3 Butadiene	0.00E+00	0.00E+00	0.000	0.00E+00
Chrysene	1.53E-06	1.15E-05	0.006	2.87E-06
Dibenz(a,h)anthracene	3.46E-07	2.59E-06	0.001	6.48E-07
Fluoranthene	4.03E-06	3.02E-05	0.015	7.55E-06
Fluorene	1.28E-05	9.59E-05	0.048	2.40E-05
Formanldehyde	7.89E-05	5.91E-04	0.296	1.48E-04
Indeno(1,2,3-cd)pyrene	4.14E-07	3.10E-06	0.002	7.76E-07
Naphthalene	1.30E-04	9.74E-04	0.487	2.44E-04
Phenanthrene	4.08E-05	3.06E-04	0.153	7.64E-05
Propylene	2.79E-04	2.09E-03	1.045	5.23E-04
Pyrene	3.71E-06	2.78E-05	0.014	6.95E-06
Toluene	2.81E-04	2.11E-03	1.053	5.26E-04
Xylenes	1.93E-04	1.45E-03	0.723	3.62E-04
HAP (Single Highest)				**2.21E-03**
HAP (Total)				**7.30E-03**

Enclosure 4

Footnotes to Tables 4-1 and 4-1.1:

[a]Unless otherewise noted, emission factors are from AP-42 Section 3.4 (10/96) for diesel fuel.

[b]ER = (a) x Max Heat Input Rate = (a) x7.5

Where:

Max Heat Input Rate (MMBtu/hr) = Fuel Consumption Rate (gal/hr) x HHV (MMBtu/gal)

Where:

Fuel Consumption Rate = 54.7

HHV = 0.137

[c]The 500 maximum annual operating hours is the default assumption used in calculating the potential to emit (PTE) for emergency generators.

[Source: EPA's guidance memorandum dated September 6, 1995.]

[d]SO_2 EF based on a sulfur content of fifteen (15) ppm in the fuel for S15 biodiesel and one hundred (100) percent conversion of sulfur to SO_2. The SO_2 EF is determined as follows using data from AP42, Appendix A.

$$EF_{SO2}\ (lbs/MMBtu) = [(f)/(e)] \times [(g)/(h)] \times [(i) \times 10^{-6}] = 1.54E\text{-}03$$

Where:

(e) =	HHV of diesel =	0.137	(MMBtu/gal)	AP42, App A, Pg A-5
(f) =	Density of distillate oil =	7.05	(lbs/gal)	AP42, App A, Pg A-7
(g) =	MW [SO_2]	64	(g/mole)	
(h) =	MW [S]	32	(g/mole)	
(i) =	Sulfur content	15	(ppm)	
	Conversion Factor	10^{-6}		

[e]It is assumed that ninety-six (96) percent and ninety (90) percent of the total particulate is PM_{10} and $PM_{2.5}$ respectively, based on AP-42 Appendix B.2, Table B.2-2 (9/90 reformatted 1/95) for gasoline and diesel fired internal combustion engines.

PM_{10} =	PM ÷ (0.96) =	0.960	(lbs/MMBtu)
$PM_{2.5}$ =	PM X (0.90) =	0.900	(lbs/MMBtu)

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Enclosure 5

40 CFR Section 98.33(d)
Calculating CO_2 Emissions from Sodium Bicarbonate Injection

$$CO_2 = 0.91 * S * R * \left(\frac{MW_{CO2}}{MW_S} \right) \quad \text{(Eq. C-11)}$$

Where:

CO_2	**=**	**508**	**CO_2 emitted from sorbent for the reporting year (metric tons)**
CO_2		**558**	**CO_2 emitted from sorbent for the reporting year (short tons)**
S	**=**	**1065**	**Limestone or other sorbent used in the reporting year, from company records (short tons).**
R^b	**=**	**1.00**	**The number of moles of CO_2 released upon capture of one mole of the acid gas species being removed (R = 1.00 when the sorbent is $CaCO_3$ and the targeted acid gas species is SO_2).**
MW_{CO2}	**=**	**44**	**Molecular weight of carbon dioxide (44).**
$MW_S{}^c$	**=**	**84.006**	**Molecular weight of sorbent (100 if calcium carbonate).**
0.91	**=**	**0.91**	**Conversion factor from short tons to metric tons.**

[a]Based on 265[1] lbs/hr estimated usage of sodium bicarbonate for 335 days/yr[2].

S = 265 (lbs/hr) x 335 (days/yr) x 24 (hrs/day) x 0.0005 short ton/lb) = 1,065 short tons

[1]*Source: ESI Boiler pdf dtd 7/26/19 submitted by email dtd 8/27/19.*
[2]*Source: Sorbent calculations provided with Hu Honua's GHG ERP Version 5 received by email on 8/19/19.*

[b]SO_2 or HCl are absorbed by injecting sodium bicarbonate ($NaHCO_3$) or trona ($Na_2CO_3 \cdot NaHCO_3 \cdot H_2O$) into the flue gas, which undergoes the following reactions:

$$NaHCO_3 + SO_2 \rightarrow NaHSO_3 + CO_2$$

$$NaHCO_3 + HCL \rightarrow NaCl + CO_2 + H_2O$$

A mole of SO_2 or HCl are captured for each mole of CO_2 release, therefore R = 1.0.

[c]Molecular weight of sodium bicarbonate ($NaHCO_3$) is determined as follows:

Element		**Molecular Weights**
Na		22.99
H		1.008
C		12.011
O_3		47.997
$MW_{sodium\ bicarbonate}$	**=**	**84.006**

Enclosure 6 HAP Emissions (tpy)

Group	Pollutants	Boiler Emissions (Application No. 0724-01)	Net Increase in Emissions (Application No. 0724-03)	Total Emissions
Speciated Organic Compounds (SOC)	Acenaphthene		8.77E-06	8.77E-06
	Acenaphthylene		1.73E-05	1.73E-05
	Acetaldehyde	1.13	4.72E-05	1.13
	Acetophenone	4.37E-06		4.37E-06
	Acrolein	1.12E-01	1.48E-05	1.12E-01
	Benzene	5.74	2.30E-06	5.74
	Benzo(a)anthracene		1.17E-06	1.17E-06
	Benzo(b)fluoranthene		2.08E-06	2.08E-06
	Benzo(k)fluoranthene		4.08E-07	4.08E-07
	Benzo(g,h,l)perylene		1.04E-06	1.04E-06
	Benzo(a)pyrene		4.81E-07	4.81E-07
	bis(2-Ethylhexyl) phthalate	6.42E-05		6.42E-05
	Bromomethane	2.05E-02		2.05E-02
	1,3 Butadiene	3.56E-06	0.00E+00	3.56E-06
	Carbon tetrachloride	6.15E-02		6.15E-02
	Chrysene		2.87E-06	2.87E-06
	Chlorine	0		0
	Chlorobenzene	4.51E-02		4.51E-02
	Chloroform	3.83E-02		3.83E-02
	Chloromethane	3.14E-02		3.14E-02
	2-Chloronaphthalene	7.71E-06		7.71E-06
	Dibenz(a,h)anthracene		6.48E-07	6.48E-07
	Dichloromethane	3.96E-01		3.96E-01
	1,2-Dichloropropane	4.51E-02		4.51E-02
	2,4-Dinitrophenol	2.46E-04		2.46E-04
	Ethylbenzene	4.27E-02		4.27E-02
	Ethylene dichloride	3.96E-02		3.96E-02
	Fluoranthene		7.55E-06	7.55E-06
	Fluorene		2.40E-05	2.40E-05
	Formaldehyde	6.1	1.48E-04	6.1
	Hexane	8.42E-07		8.42E-07
	Hydrogen chloride	5.47		5.47
	Indeno(1,2,3-cd)pyrene		7.76E-07	7.76E-07
	Naphthalene		2.44E-04	2.44E-04
	4-Nitrophenol	1.50E-04		1.50E-04
	2,4,6-Trichlorophenol	3.01E-05		3.01E-05
	Pentachlorophenol	6.97E-05		6.97E-05
	Phenanthrene		7.64E-05	7.64E-05
	Phenol	6.97E-02		6.97E-02

Enclosure 6 (Continued)

Group	Pollutants	Boiler Emissions (Application No. 0724-01)	Net Increase in Emissions (Application No. 0724-03)	Total Emissions
SOC (Continued)	Propionaldehyde	8.34E-02		8.34E-02
	Propylene		5.23E-04	5.23E-04
	Pyrene		6.95E-06	6.95E-06
	Styrene	2.6		2.60
	Toluene	1.26	5.26E-04	1.26
	Tetrachloroethane	5.19E-02		5.19E-02
	Trichloroethane	4.10E-02		4.10E-02
	Vinyl Chloride	2.46E-02		2.46E-02
	o-Xylene	3.42E-02		3.42E-02
	Xylene (total)	3.59E-04	3.62E-04	7.21E-04
Metals	Antimony	5.40E-04		5.40E-04
	Arsenic	1.51E-03		1.51E-03
	Beryllium	8.02E-05		8.02E-05
	Cadmium	2.85E-04		2.85E-04
	Chromium	1.44E-03		1.44E-03
	Chromium (VI)	2.39E-04		2.39E-04
	Lead	3.29E-03		3.29E-03
	Manganese	1.09E-01		1.09E-01
	Mercury	4.88E-03		4.88E-03
	Nickel	2.26E-03		2.26E-03
	Phosphorus	1.84E-03		1.84E-03
	Selenium	2.16E-04		2.16E-04
Polycyclic aromatic hydrocarbons	Acenaphthene	1.29E-03		1.29E-03
	Acenaphthylene	6.85E-03		6.85E-03
	Anthracene	4.10E-03		4.10E-03
	Benzo(a)anthracene	9.21E-05		9.21E-05
	Benzo(a)pyrene	3.55E-03		3.55E-03
	Benzo(b)fluoranthene	1.38E-04		1.38E-04
	Benzo(e)pyrene	6.92E-06		6.92E-06
	Benzo(g,h,i)perylene	1.29E-04		1.29E-04
	Benzo(j,k)fluoranthene	2.19E-04		2.19E-04
	Benzo(k)fluoranthene	6.92E-05		6.92E-05
	Chrysene	5.50E-05		5.50E-05
	Dibenzo(a,h)anthracene	1.40E-05		1.40E-05
	Fluoranthene	2.19E-03		2.19E-03
	Fluorene	4.67E-03		4.67E-03
	Indeno(1,2,3-cd)pyrene	1.20E-04		1.20E-04
	2-Methylnaphthalene	2.52E-04		2.52E-04
	Naphthalene	2.21E-01		2.21E-01
	Perylene	7.23E-06		7.23E-06
	Phenanthrene	9.65E-03		9.65E-03
	Pyrene	5.07E-03		5.07E-03

Enclosure 6 (Continued)

Group	Pollutants	Boiler Emissions (Application No. 0724-01)	Net Increase in Emissions (Application No. 0724-03)	Total Emissions
Dioxins/Furans	2,3,7,8 -TCDD	1.40E-08		1.40E-08
	Tetrachorodibenzo-p- dioxins	2.95E-07		2.95E-07
	Pentachlorodibenzo-p-dioxins	4.65E-07		4.65E-07
	Hexachlorodibenzo-p-dioxins	1.47E-07		1.47E-07
	Heptachlorodibenzo-p-dioxins	5.54E-07		5.54E-07
	Octachlorodibenzo-p-dioxins	9.99E-08		9.99E-08
	2,3,7,8-TCDF	2.10E-07		2.10E-07
	Tetrachlorodibenzo-p-furans	1.33E-06		1.33E-06
	Pentachlorodibenzo-p-furans	1.50E-06		1.50E-06
	Hexachlorodibenzo-p-furans	1.01E-06		1.01E-06
	Heptachlorodibenzo-p-furans	5.08E-07		5.08E-07
	Octachlorodibenzo-p-furans	2.07E-07		2.07E-07
Polychlorinated Biphenyls	Monochlorobiphenyl	3.01E-07		3.01E-07
	Dichlorobiphenyl	1.01E-06		1.01E-06
	2,4,4-Trichlorobiphenyl	3.55E-06		3.55E-06
	Tetrachlorobiphenyls, total	3.42E-06		3.42E-06
	Pentachlorobiphenyls, total	1.64E-06		1.64E-06
	Hexachlorobiphenyls, total	7.52E-07		7.52E-07
	Heptachlorobiphenyls, total	9.02E-08		9.02E-08
	Decachlorobiphenyl	3.69E-07		3.69E-07
Single Highest HAP (Formaldehyde)		**6.1**		**6.1**
Total HAPs (tpy)		**23.8**		**23.8**