PERMIT APPLICATION REVIEW
COVERED SOURCE PERMIT (CSP) NO. 0255-01-C
APPLICATION FOR MODIFICATION NO. 0255-05

Company: Covanta Honolulu Resource Recovery Venture (CHRRV)

Facility: H-POWER Municipal Waste Combustor Facility

Located at: 91-174 Hanua Street, Kapolei, Oahu
UTM – 592,618 Meters East and 2,356,415 Meters North, Zone 4 (NAD-27)

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1. <u>Background</u>.

1.1 CHRRV has applied on behalf of the City and County of Honolulu for a significant modification to CSP No. 0255-01-C for adding a 900 ton per day municipal waste combustor (MWC) boiler to the existing H-POWER facility at Campbell Industrial Park (CIP). Equipment for the existing facility includes two 854 ton per day MWC boilers that burn refuse-derived fuel (RDF). The RDF is produced by processing municipal solid waste (MSW) through shredding and size classification. The new unit proposed is a mass-burn waterwall MWC boiler with combustion controls to reduce nitrogen oxide (NO_X) emissions, feed chute, moving grate, integrated furnace/boiler, and associated ash collection systems. Shredding and size classification of MSW will not be required for the new boiler because the combustor is a mass-burn unit. Air pollution control for the new boiler will include a spray dryer absorber to minimize acid gases (sulfur dioxide (SO_2), hydrochloric acid (HCl), sulfuric acid mist (H_2SO_4), and hydrogen fluoride (HF)), baghouse to remove particulate, baghouse combined with carbon injection to control MWC metals, spray dryer absorber and baghouse combined with carbon injection and good combustion control for minimizing MWC organics, good combustion control for reducing carbon monoxide (CO) emissions, and selective non-catalytic reduction (SNCR) combined with Covanta very low-NO_X (VLN) system to minimize NO_X emissions. Another steam turbine generator, in addition to the existing 58 megawatt steam turbine generator, will be installed as part of the facility expansion. Also, the new boiler will require installation of one three-cell cooling tower. The H-POWER facility is equipped with one five-cell cooling tower for its two existing 854 ton per day MWC boilers. The Standard Industrial Classification Code for this facility is 4953 (Refuse Systems).

1.2 The new 900 ton per day MWC boiler will be equipped with two oil-fired auxiliary burners for operating the boiler during warm-ups, start-ups, and shut-downs and to maintain furnace temperatures when sustained low-Btu wastes are encountered. Each auxiliary burner is rated at 90 MMBtu/hr. Auxiliary fuels proposed for the new boiler include fuel oil No. 2 with maximum sulfur content not to exceed 0.05% by weight and used cooking oil. The applicant proposes the following auxiliary fuel limits for the new boiler:

a. Total combined auxiliary fuel firing rate not to exceed 1,200 gallons per hour;

b. Total combined auxiliary fuel consumption not to exceed 869,250 gallons per year;

c. Firing only fuel oil No. 2 auxiliary fuel during warm-up periods; and

d. Firing only fuel oil No. 2 auxiliary fuel with MSW during start-up periods.

1.3 New equipment for the proposed facility expansion is listed as follows:

NEW EQUIPMENT				
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Capacity**
mass-burn waterwall MWC boiler with VLN system	Martin	not available	not available	900 ton per day 445.3 MMBtu/hr
spray dryer absorber servicing mass-burn MWC boiler	Martin	not available	not available	3,300 lb/hr maximum $Ca(OH_2)$ injection 40 gpm reagent flow rate
baghouse servicing mass-burn MWC boiler	not available	not available	not available	8 modules and 361 bags per module with 9,073 ft^2 filter cloth area per module
SNCR System servicing mass-burn MWC boiler	not available	not available	not available	70.1 gpm aqueous ammonia (19.2% NH_3) flow rate with six (6) injection nozzles with each nozzle designed to provide 11.7 gph aqueous ammonia
carbon injection system servicing mass-burn MWC	not available	not available	not available	10 lb/hr -o 112.5 lb/hr activated carbon feed rate
3-cell cooling tower	not available	not available	not available	29,000 gpm recirculation water with 0.0005% drift rate

1.4 Pictures from October 3, 2008 and April 28, 2009 site inspections of the existing H-POWER facility are shown in Enclosures (1) and (2), respectively.

1.5 Existing equipment permitted at the H-POWER facility includes the following:

EXISTING EQUIPMENT				
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Capacity**
RDF MWC boiler (see note a)	Combustion Engineering	VU-40	28185-01	854 ton/day 370 MMBtu/hr
RDF MWC boiler (see note b)	Combustion Engineering	VU-40	28185-02	854 ton/day 370 MMBtu/hr
spray dryer absorber servicing one of two RDF combustors	Combustion Engineering	C-E ESD	85187-01	189,500 acfm
spray dryer absorber servicing one of two RDF combustors	Combustion Engineering	C-E ESD	85187-02	189,500 acfm
baghouse servicing one of two RDF combustors (see note c)	SPE-Amerex	RA-35-180-D12	1921-01	8-10 modules 175-200 bags/module
baghouse servicing one of two RDF combustors (see note c)	SPE-Amerex	RA-35-180-D13	1921-02	8-10 modules 175-200 bags/module
ESP servicing one of two RDF combustors (see note c)	Combustion Engineering	1P1C3D5F	34185-01	174,155 acfm
ESP servicing one of two RDF combustors (see note c)	Combustion Engineering	1P1C3D5F	34185-02	174,155 acfm
baghouse servicing one of two primary shredders	Ray-Jet Fabric Filter	696-8-SWIP	990467-01P	4,500 acfm
baghouse servicing two primary shredders	Ray-Jet Fabric Filter	696-8-SWIP	990467-01P	4,500 acfm
baghouse servicing two secondary shredders	Ray-Jet Fabric Filter	61214-20	990467-01S	40,000 acfm
baghouse servicing two secondary shredders	Ray-Jet Fabric Filter	61214-20	990467-01S	40,000 acfm
twelve roof vents at RDF processing building with electric fan filter	---------------	---------------	---------------	---------------
5-cell induced draft cross flow cooling tower	Lilie Hoffman	---------------	990467-01S	50,500 gpm recirculation water with 0.002% drift rate

a: National Board number is 23608
b: National Board number is 23609
c: Electrostatic precipitators (ESPs) will be replaced with baghouses pursuant to application for permit modification No. 0255-04.

1.6 The following information was disclosed by Covanta Energy personnel:

a. The H-POWER facility does not accept or burn used oil. Therefore, it was requested that used oil conditions be excluded from the permit modification.

b. A warm-up period is required for the mass-burn MWC boiler to prevent thermal shock to equipment and systems.

c. The following changes from what was proposed in the permit application are acceptable:

   1) A reduction in the maximum allowable fuel oil No. 2 auxiliary fuel sulfur content for the MWC boiler from 0.5% to 0.05% by weight;
   2) The firing of only fuel oil No. 2 auxiliary fuel during boiler warm-up periods;
   3) The firing of only fuel oil No. 2 auxiliary fuel and MSW during boiler start-up and shut-down periods; and
   4) The addition of an 80 ppmdv (30 day rolling average) CO emission limit for the BACT proposal. The addition of this emission limit is based on the most recent BACT determination for a 600 ton per day municipal solid waste facility in Hillsborough County Florida.

d. The primary function of roof vents for the existing RDF processing and storage building are to prevent the buildup of CO from motor vehicle exhaust fumes.

e. Roof vents are not required to prevent exhaust buildup for buildings where MSW is handled and stored for the new boiler. The buildings for handling MSW for the mass-burn boiler are under negative pressure and the air from these buildings will be drawn into the combustion chamber of the boiler.

f. It was requested that the total allowed dissolved solids content of the recirculating water for the five-cell cooling tower be changed from 28,600 ppm to 57,000 ppm.

g. For the new boiler's start-up periods, air pollution controls are fully functional and operational as follows:

   1) The baghouse is always in service when operating the boiler; and
   2) The carbon injection system, spray dryer absorber, and SNCR and VLN systems are in service prior to initiation of MSW combustion.

h. For the new boiler's shut-down periods, air pollution controls are fully functional and operational as follows:

   1) The baghouse is always in service when operating the boiler; and
   2) The carbon injection system, spray dryer absorber, and SNCR and VLN systems are in service until the cessation of continuous MSW combustion.

i. Attachment IIB, Special Condition Nos. B.1.c and B.1.d of the pre-draft permit are not applicable to the existing RDF MWC boilers. The existing boilers are not subject to 40 Code of Federal Regulations (CFR), Part 60, New Source Performance Standards (NSPS), Subpart Db pursuant to 40 CFR §60.40b(k). The existing boilers are not subject to 40 CFR, Part 60-NSPS, Subpart E pursuant to 40 CFR §60.50(e).

1.7 Pursuant to EPA comments on the pre-draft permit and permit application review:

1) The drift rate for the three-cell cooling tower was lowered from 0.001% to 0.0005%.

2) A filter analysis was provided for particulate matter (PM) emissions from baghouses servicing the waste processing facility. Based on filter analysis, particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) emissions are 70% of the particulate matter less than 10 microns in diameter (PM_{10}) emissions and PM_{10} emissions equal PM emissions.

3) Emission rate limits listed in the table below for NO_X, SO_2, and CO were proposed for boiler start-up and shut-down periods. It is noted that continuous emission monitoring systems (CEMs) for NO_X, SO_2, CO, and oxygen gas (O_2) continuously operate during start-up, shut-down, and normal operations (i.e., boiler operation other than warm-up, start-up, shut-down, and malfunction). H-POWER will install a continuous emissions rate monitoring system (CERMS) to accurately measure NO_X, SO_2, and CO emissions. It was requested that a limit on pollutant emissions in pounds of pollutant over the entire start-up and shut-down sequence be imposed instead of a lb/hr limit due to variability in the emissions during start-up and shut-down periods. Each start-up and shut-down period is limited to three (3) hours.

Pollutant	Basis[a]	Limit	
		(lb/hr)	lbs/start-up or shut-down period
SO_2	9.13 lb/hr + 39 ppmdv @7% O_2	32.5	98
CO	6.43 lb/hr + 500 ppmdv @7% O_2	137.9	414
NO_X	31 lb/hr + 375 ppmdv @7% O_2	192.9	579

a: Procedures specified in Appendix F to 40 Code of Federal Regulations (CFR), Part 75 Paragraph 3.3.4 (minimum concentration of 5.0% for CO_2 and 14% for O_2) apply to the emission limits.

4) Emission rate limits for NO_X, SO_2, and CO were proposed for boiler warm-up periods based on AP-42, Section 1.3 (9/98) emission factors and maximum boiler auxiliary fuel burning capacity. Emission rate limits for warm-up periods are listed in the table below and were lowered from those proposed by the applicant due to the proposed 1,200 gallon per year boiler auxiliary fuel limit. The SO_2 emission rate was based on a mass-balance calculation using 0.05% by weight fuel sulfur content and a 7.05 lb/gal fuel density. Each warm-up period is limited to twelve (12) hours.

Pollutant	Basis	Limit	
		(lb/hr)	lbs/warm-up period
SO_2	fuel sulfur content and mass balance	8.5	102
CO	AP-42 (9/98), Section 1.3 emission factor	6.0	72
NO_X	AP-42 (9/98), Section 1.3 emission factor	28.8	346

5) Modeling impacts were compared to worst-case significant monitoring concentrations (SMCs) and significant impact levels (SILs) for $PM_{2.5}$ among three EPA options identified in the PSD regulations that are not finalized yet. CHRRV will increase the new boiler's stack height to good engineering practice (GEP) stack height in order to stay below the worst-case SIL proposed by EPA for $PM_{2.5}$. Facilities with ambient air impacts that are below the SILs do not require a full impact analysis.

6) An additional modeling scenario (60% of MCR @ 3535 Btu/lb) was included in the dispersion modeling to demonstrate that all potential scenarios, including ones with highest impacts, are modeled.

7) Source test methods specified in the permit were revised as follows:

   i. For H_2SO_4 emissions, EPA Conditional Test Method (CTM)-013 was specified instead of EPA Method 8;
   ii. For VOC emissions, EPA Method 18 in conjunction with EPA method 25A was specified instead of EPA Methods 18 or 25; and
   iii. For $PM_{2.5}$ emissions, EPA Method 5 or EPA Other Test Method (OTM)-27 was specified for the filterable portion and EPA OTM-28 was specified for the condensable portion instead of specifying only EPA OTM-27.

8) CHRRV met with Walt Stevenson (919-541-5264) and Brian Shrager of EPA-OAQPS to discuss the BACT emission limits for NO_X. It was CHRRV's understanding that EPA finds the proposed NO_X emission limits of 110 ppmdv@7%O_2 (24-hour daily arithmetic average) and 90 ppmdv@7%O_2 (annual arithmetic average) acceptable.

2. <u>Applicable Requirements</u>.

2.1 Hawaii Administrative Rules (HAR)
- Chapter 11-59, Ambient Air Quality Standards
- Chapter 11-60.1, Subchapter 1, General Requirements
- Chapter 11-60.1, Subchapter 2, General Prohibitions
  - 11-60.1-31, Applicability
  - 11-60.1-32, Visible emissions
  - 11-60.1-38, Sulfur Oxides from Fuel Combustion
  - 11-60.1-39, Storage of Volatile Organic Compounds
- Chapter 11-60.1, Subchapter 5, Covered Sources
- Chapter 11-60.1, Subchapter 6, Fees for Covered Sources, Noncovered Sources, and Agricultural Burning
  - 11-60.1-111, Definitions
  - 11-60.1-112, General fee Provisions for Covered Sources
  - 11-60.1-113, Application Fees for Covered Sources
  - 11-60.1-114, Annual fees for Covered Sources
- Chapter 11-60.1, Subchapter 7, Prevention of Significant Deterioration Review
- Chapter 11-60.1, Subchapter 8, Standards of Performance for Stationary Sources
  - 11-60.1-161, New Source Performance Standards
- Chapter 11-60.1, Subchapter 9, Hazardous Air Pollutant Sources
  Subchapter 10 – Field Citations

2.2 40 CFR Part 60 - NSPS, Subpart Eb, Standards of Performance for Large Municipal Waste Combustors for Which Construction is Commenced After September 20, 1994 or for Which Modification or Reconstruction is Commenced After June 19, 1996 is applicable to the new MWC boiler because the combustor's capacity is greater than 250 tons per day municipal solid waste. Subpart Eb emission limits for affected facilities constructed after December 19, 2005 will apply to the new 900 ton per day MWC boiler. Emissions limits for the MWC boiler, as specified in 40 CFR Part 60, Subpart Eb, are listed as follows:

Mass Burn MWC Boiler 40 CFR Part 60, Subpart Eb Limits	
Pollutant/Parameter	Flue Gas Concentration @ 7% O_2 dry gas basis, except for opacity
CO	100 ppmdv (4-hr block arithmetic average)
NO_X	180 ppmdv for first year of operation (24-hr daily arithmetic average) 150 ppmdv after the first year of operation (24-hr daily arithmetic average)
SO_2	30 ppmdv or at least 80% reduction (24-hr daily arithmetic average)
PM	20 mg/dscm
Lead (elemental)	140 ug/dscm
Cadmium	10 ug/dscm
Mercury	50 ug/dscm or at least 85% reduction
Hydrogen Chloride	25 ppmdv or at least 95% reduction
Dioxin/Furans	13 ng/dscm
Opacity	10%

2.3 40 CFR Part 60, NSPS, Subpart E, Standards of Performance for Incinerators is not applicable to the new MWC boiler because the combustor is subject to 40 CFR Part 60, Subpart Eb. Pursuant to 40 CFR §60.50(c), any facility covered by 40 CFR Part 60, Subparts Cb, Eb, AAAA, or BBBB is not covered by 40 CFR Part 60, Subpart E.

2.4 40 CFR Part 60, NSPS, Subpart Db, Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units is not applicable to the new MWC boiler because the combustor is subject to 40 CFR Part 60, Subpart Eb. Pursuant to 40 CFR §60.40b(h), any facility that meets the requirements of 40 CFR Part 60, Subparts Ea, Eb, or AAAA is not covered by 40 CFR Part 60, Subpart Db.

2.5 40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants (NESHAP), Subpart C - National Emission Standards for Beryllium is not applicable to the new MWC boiler because, as indicated in the application, the combustor will not burn beryllium-containing wastes as defined in 40 CFR, Part 61, Subpart C.

2.6 40 CFR Part 61 - (NESHAP), Subpart E - National Emission Standards for Mercury is not applicable because the existing facility and the new MWC boiler are not permitted to combust sewage sludge wastes.

2.7.1 Prevention of Significant Deterioration (PSD) review applies to the facility modification pursuant to HAR, Chapter 11-60.1, Subchapter 7 and 40 CFR §52.21 because the facility meets the following three criteria:

a. The facility is a major stationary source that has the potential to emit 250 TPY or more of a pollutant regulated under the Clean Air Act (CAA).

b. The facility is located in an attainment area. The facility is located at CIP which is an attainment area for all pollutants for which a national ambient air quality standard exists.

c. The proposed modification emits CO, NO_X, SO_2, PM, PM_{10}, $PM_{2.5}$, fluorides, sulfuric acid mist (H_2SO_4), MWC acid gases (measured as SO_2 and hydrogen chloride (HCl)), MWC metals (measured as PM), and MWC organics (dioxins and furans) in significant amounts as defined in HAR, §11-60.1-1. As such, these pollutants are subject to PSD review. See Paragraph 2.7.2 (a).

2.7.2 Pollutants subject to PSD review require the following evaluations pursuant to HAR, §11-60.1-140 - §11-60.1-148 and 40 CFR §52.21:

a. Best available control technology (BACT) is required for each pollutant exceeding significant emission levels as shown in the table below. See paragraphs 2.8.1 through 2.8.5 for BACT analysis.

Pollutant	**Potential Emissions (TPY)**[c]		**Total Emissions (TPY)**	**Significant Emission Level (TPY)**
	New Mass-Burn MWC Boiler	New 3-Cell Cooling Tower		
CO	212.7	-------------	212.7	100
NO_X	314.4	-------------	314.6	40
SO_2	126.5	-------------	126.5	40
PM	21.9	5.7	27.6	25
PM_{10}	58.5	0.4	58.8	15
$PM_{2.5}$	54.8	0.004	54.8	10
Fluorides	5.3	-------------	5.3	3
H_2SO_4	37.2	-------------	37.2	7
MWC acid gases[a]	195.8	-------------	195.8	40
MWC metals[b]	21.9	-------------	21.9	15
MWC organics[c]	2.37×10^{-5}	-------------	2.37×10^{-5}	3.50×10^{-6}

a: Measured as HCL and SO_2.
b: Measured as filterable PM.
c: Dioxins and furans.

b. A preliminary air dispersion modeling analysis is required to determine applicability to preconstruction monitoring and full air dispersion modeling for Class II Areas. All of Hawaii is designated as a Class II Area, except for Haleakala and Volcanoes National Parks which are designated Class I Areas. See air quality assessment in Paragraph 7.1 and Paragraphs 7.2.1 through 7.2.5 for the preliminary air dispersion modeling analysis.

c. A full air dispersion modeling analysis is required for ambient air impacts that exceed significant impact thresholds as determined from the preliminary modeling analysis. The preliminary modeling analysis indicated that a full air dispersion modeling analysis is not required. See Paragraph 7.2.5.

d. An analysis is required to evaluate sources that would have an adverse impact on the air quality and/or visibility in a Class I area. See Section 8 for applicability to Class I area impact analysis.

e. An analysis is required to evaluate the emissions impact on soils and vegetation and to address the emissions impact due to economic growth associated with the project. See Section 10 for additional impact analysis.

2.8.1 Based on the BACT "top-down" analysis, CHRRV proposes the following control technologies as BACT for the 900 ton per day mass-burn MWC boiler:

a. Good combustion control and furnace operating practices to minimize CO emissions and dioxin/furan formation.

b. Covanta VLN system and SNCR for controlling NO_X emissions.

c. Powdered activated carbon injection for controlling mercury and MWC organics.

d. Spray dryer absorber with lime injection to control SO_2, H_2SO_4, fluorides, MWC acid gases, and MWC organics.

e. Baghouse to remove particulate matter (PM, PM_{10}, and $PM_{2.5}$), particulate bound-SO_2, metals, H_2SO_4, fluorides, MWC acid gases, and MWC organics.

2.8.2 Pursuant to EPA guidance, the five key steps in the "top-down" BACT process are listed as follows:

Step 1: Identify all control technologies
Step 2: Eliminate technically infeasible options
Step 3: Rank remaining control technology by control effectiveness
Step 4: Evaluate energy, environmental, and economic impacts of viable control methods
Step 5: Select BACT

2.8.2.1 Control Technology Review - SO_2, H_2SO_4, MWC acid gases, and fluorides

a. Step 1 – Identify all control technologies: CHRRV evaluated the control technology options for reducing SO_2, H_2SO_4, MWC acid gases, and fluorides. Emissions of SO_2 will result from the oxidation of sulfur in the waste stream and from the combustion of auxiliary fuel. During combustion of the waste, some of the SO_2 formed will be converted to SO_3. The SO_3 is then converted to H_2SO_4 by reacting with water vapor in the flue gas. Chlorine and fluorine are also present in waste combusted. Chlorine and fluorine released from combustion will react with water vapor in the flue gas to form HCL and hydrofluoric acid/hydrogen fluoride (HF). The applicant identified the following control options for minimizing SO_2, H_2SO_4, MWC acid gases, and fluoride emissions:

Option 1: Spray Dryer Absorber
Option 2: Wet Scrubber
Option 3: Dry Sorbent Injection

b. Step 2 – Eliminate technically infeasible options: The following control options were eliminated as BACT among the three options proposed for reducing SO_2, H_2SO_4, MWC acid gases, and fluoride emissions:

1) Option 2 (Wet Scrubber): Wet scrubbers for controlling acid gases typically use either caustic soda solution or lime slurry to scrub the flue gas. Lime slurry systems react with SO_2 and other acid gases to form calcium based salts which require clarifying, thickening, and vacuum filtering to avoid a concentration build-up of precipitated salts in the system. Sodium-based systems produce a liquid waste with highly soluble sodium-based salts which may require the use of large, carefully contained, holding pond(s) or waste water treatment plants. Although wet scrubbers provide effective acid gas control, the

technology has disadvantages which discourage its use for solid waste combustion facilities as follows:

a) An extensive liquid effluent is generated which requires treatment (H-POWER does not have a wastewater treatment plant);
b) A saturated gas stream is produced which increases the potential corrosion of wet scrubber internals and downstream equipment and has the potential to create an aesthetically displeasing visible water vapor plume;
c) The saturated gas would have different, and typically worse dispersion characteristics, with ambient impacts being higher than that associated with a dry scrubber;
d) If flue gas reheating was employed to improve the dispersion characteristics, there would be a substantial added economic, energy, and environmental penalty;
e) Fabric filters are not typically used with wet scrubbers due to the detrimental effect of saturated moisture on the filter bags;
f) Wet scrubbers typically require two particulate control devices, one upstream to prevent particulate from entering the scrubber and another downstream to remove solid carryover and condensable particulate, which adds to the capital cost and operating cost without a discernable benefit; and
g) Wet scrubbers are generally not as effective in controlling submicron aerosol mists which would include sulfuric acid mist.

Based on the aforementioned information, wet scrubbers are not a technically viable BACT option for the H-POWER facility and are eliminated from further consideration.

2) Option 3 (Dry Sorbent Injection): The technology uses dry sorbent that is injected into the system to react with acid gases in the flue gas. Reacted calcium salts and unused dry sorbent is then captured downstream by a particulate control device. Dry sorbents used are typically limestone or hydrated lime. The applicant disclosed the following disadvantages of the dry injection scrubber system for use on the new MWC boiler:

a) Dry injection scrubbers require the use of large quantities of hydrated lime which is more expensive than the lime used for dry scrubbers, resulting in higher operating costs;
b) More scrubber waste is produced because of the large quantities of sorbent;
c) Residual alkalinity of the waste may require special handling;
d) More frequent fabric filter cleaning is required because of the large quantity of sorbent, which accelerates wear on the filter bags;
e) The increased solids loading and altered properties of the particulate matter may result in decreased particulate control efficiency;
f) Sorbent injected into the economizer may result in fouling of the convective heat transfer surfaces;
g) Dry injection does not decrease the flue gas temperature as much as wet scrubbers and dry scrubbers; therefore, while enhanced plume dispersion is maintained, the secondary benefit of removing condensable trace metals or organic emissions is reduced; and
h) Dry injection provides lower removal efficiency than wet and dry scrubbers.
Based on the information listed above, dry injection scrubbers are not technically feasible and are eliminated from further consideration.

c. Step 3 – Rank remaining control technologies by control effectiveness: The following table provides the control technology effectiveness for the remaining option to control SO_2, H_2SO_4, MWC acid gas, and fluoride emissions :

Control Technology Ranking	Control Technology	BACT Emission Limits
1	Spray Dryer Absorber	SO_2 – 26 ppmdv (24-hour average); 26 ppmdv (annual average; 44 ppmdv (3-hour average) or at least 80% reduction @ 7% O_2 HCl – 25 ppmdv or at least 95% reduction @ 7% O_2 Fluorides – 3.5 ppmdv @ 7% O_2

d. Step 4 - Evaluate most effective controls and document: Because there is only one control option remaining, the use of spray dry absorbers will be the only option evaluated. Spray dryer absorbers are very effective at controlling acid gas emissions from solid waste combustion facilities. This technology has been applied to the majority of MWC units in the U.S. in the last ten years and has been the technology of choice for retrofit to existing municipal waste combustors to meet the emission limits for acid gases. The spray dryer absorber control technology is described in Paragraph 5.3.

e. Step 5 – Select BACT: The new mass-burn MWC boiler will use a spray dryer absorber to minimize SO_2, H_2SO_4, MWC acid gases, and fluorides. The Department has determined that the applicant's proposal to use a spray dryer absorber constitutes BACT for the aforementioned pollutants. The applicant's BACT proposal for controlling acid gases is consistent with recent control technology decisions listed in EPA's NSR/RACT/BACT/LEAR clearing house for municipal waste combustors. The proposed BACT emission limits for acid gases (measured as SO_2 and HCl) meet the requirements specified in the 40 CFR Part 60, Subpart Eb that applies to the new MWC boiler. The Subpart Eb NSPS, developed under Section 129 of the CAA, reflect maximum achievable control technology (MACT) for large municipal waste combustors. Also, note that the emission limits proposed for SO_2 are more stringent than those specified in the Subpart Eb MACT standard.

2.8.2.2 Control Technology Review - PM, PM_{10}, and $PM_{2.5}$

a. Step 1 – Identify all control technologies: CHRRV evaluated the control technology options for minimizing PM, PM_{10}, and $PM_{2.5}$ emissions. Sources of particulate matter include dust generated in the tipping hall, combustion of MSW in the furnace, and particulate loadings after the spray dryer absorber and carbon injection systems. The particulate matter generated in the tipping hall/pit area will be entrained in the combustion air for the furnace because the air intake for the furnace is located in the tipping hall to provide control of odors, exhaust from vehicles, and particulate matter (see Paragraph 1.6.e). The applicant identified the following control options for minimizing PM, PM_{10}, and $PM_{2.5}$ emissions:

Option 1: Fabric Filters (baghouses)
Option 2: Electrostatic Precipitators (ESPs)
Option 3: Cyclones
Option 4: Wet Scrubbers

b. Step 2 – Eliminate technically infeasible options: There were no control technologies identified by the applicant as being technically infeasible among the control options proposed for minimizing PM, PM_{10}, and $PM_{2.5}$ emissions from the new MWC boiler.

c. Step 3 – Rank remaining control technologies by control effectiveness: The following table provides the control technology effectiveness for the baghouse selected by the applicant to be the most effective option among those proposed for controlling PM, PM_{10}, and $PM_{2.5}$ emissions:

Control Technology Ranking	Control Technology	BACT Emission Limits
1	Fabric Filters (baghouses)	PM – 12 mg/dscm @ 7% O_2 PM_{10} – 32 mg/dscm @ 7% O_2 $PM_{2.5}$ – 30 mg/dscm @ 7% O_2

d. Step 4 - Evaluate most effective controls and document: As indicated by the applicant, fabric filter baghouses have surpassed ESPs as the preferred particulate control device because baghouses provide better control for finer particulate, including heavy metal and organic emissions. Maintenance for the baghouse can be performed without shutting down the boiler. Also, when combined with a spray dryer absorber, there is a secondary reaction capability associated with formation of a porous filter cake on the filter bags which contains both spent an unspent lime reagent that increases effectiveness of removing acid gases with the baghouse/spray dryer absorber control technology combination. The control technology is described for the baghouse in Paragraph 5.5, respectively.

e. Step 5 – Select BACT: The new mass-burn MWC boiler will use a fabric filter baghouse to minimize particulate emissions. The Department has determined that the applicant's proposal to use a baghouse constitutes BACT for controlling PM, PM_{10}, and $PM_{2.5}$. The applicant's BACT proposal for controlling particulate is consistent with the most recent control technology decisions listed in EPA's NSR/RACT/BACT/LEAR clearing house for municipal waste combustors. There are no specific emission limits specified for PM_{10} and $PM_{2.5}$ in 40 CFR Part 60, Subpart Eb; however, the proposed BACT emission limit for PM is more stringent than that specified in the Subpart Eb MACT standard.

2.8.2.3 Control Technology Review - MWC Metals

a. Step 1 – Identify all control technologies: The combustion of municipal solid waste results in the emissions of heavy metals. Under 40 CFR Part 60, Subpart Eb, emission limits for MWC metals are those for cadmium, lead, and mercury. Cadmium and lead will be emitted as particulate matter. As per Paragraph 2.8.2.2, a baghouse is BACT for minimizing particulate matter. Mercury is typically emitted in the gas phase and will not be completely controlled by the fabric filters. The applicant proposes the following control options to minimize emissions of MWC metals:

Option 1: Fabric Filter (baghouse) Combined with Carbon Injection System

b. Step 2 – Eliminate technically infeasible options: The proposed control technology combination is technically feasible for reducing MWC metal emissions.

c. Step 3 – Rank remaining control technologies by control effectiveness: The following table provides the control technology effectiveness of the option selected to minimize MWC metal emissions:

Control Technology Ranking	Control Technology	Emission Limits
1	Fabric Filter (baghouse) Combined with Carbon Injection	MWC Metal (as PM) – 12 mg/dscm @ 7% O_2 Cadmium – 10 ug/dscm @ 7% O_2 Lead – 140 ug/dscm @ 7% O_2 Mercury – 28 ug/dscm @ 7% O_2

d. Step 4 – Evaluate most effective controls and document: A fabric filter baghouse combined with carbon injection system was selected as BACT for controlling MWC metal emissions because: (1) MWC metals will be emitted as particulate and a baghouse represents BACT for particulate control (see Paragraph 2.8.2.2 of this review) and (2) powdered activated carbon injection provides a means to adsorb mercury in the vapor phase with activated carbon powder that is subsequently removed by the baghouse. However, as indicated by the applicant, the amount of extra reduction in mercury using activated carbon injection is speculative due to the high carbon content of fly ash in the boiler exhaust stream. Carbon in fly ash of the exhaust stream can also promote reduction of mercury emissions. The carbon injection and baghouse control technologies are described in Paragraphs 5.4 and 5.5.

e. Step 5 – Select BACT: The new mass burn boiler will be equipped with a baghouse and carbon injection system to remove MWC metal emissions. The Department has determined that a baghouse operating in conjunction with an activate carbon injection system constitutes BACT for MWC metals. The control technology combination is consistent with recent determinations listed in EPA's NSR/RACT/BACT/LEAR clearing house for municipal waste combustors. Also, proposed emission limits are the same for lead and cadmium and more stringent for mercury when comparing limits specified for these metals in 40 CFR Part 60, Subpart Eb. Although the significant emission level, as defined in HAR Section 11-60.1, is exceeded for MWC Metals (measured as PM), it should be noted that specific emission rates for cadmium, lead, and mercury are below the significant emission thresholds requiring a BACT analysis for these metals.

2.8.2.4 Control Technology Review – Dioxin/Furans

a. Step 1 – Identify all control technologies: Based on information from the application, dioxins and furans are present in MSW or can be formed during the combustion and post-combustion processes. These organics can exist in the flue gas in the vapor phase or be condensed and adsorbed on fine particulates. The applicant identified the following control options for minimizing dioxin and furan emissions:

Option 1: Good Combustion Practices
Option 2: Carbon Injection
Option 3: Dry Scrubber and Baghouse Combined with Carbon Injection

b. Step 2 – Eliminate technically infeasible options: Because all three of the control technology options listed in 2.8.2.4.a will be applied in combination for operating the new MWC boiler, an evaluation of alternate control technologies is not required.

c. Step 3 – Rank remaining control technologies by control effectiveness: The following table provides the control technology effectiveness for controlling MWC organics:

Control Technology Ranking	Control Technology	Emission Limits
1	Spray Dryer Absorber (semi-dry scrubber) and Baghouse Combined with Carbon Injection and good Combustion Control	Dioxin/Furans – 13 ng/dscm @ 7% O_2

d. Step 4 – Evaluate most effective controls and document: As indicated by the applicant, no other combination or air pollution control equipment that has been demonstrated in practice would provide superior performance on a continuous basis than that proposed for the new boiler for minimizing dioxin/furan emissions. Spray dryer absorber, carbon injection, and baghouse control technologies are described in Paragraphs 5.3, 5.4 and 5.5, respectively. Good combustion practices that will be incorporated into conditions of the permit include the following:

1) Pursuant to the Subpart Eb MACT standard, the boiler load over a four-hour block arithmetic average cannot exceed 110% of the maximum load level measured during the most recent dioxin/furan performance test showing compliance with the emission limit for MWC organics.

2) As specified by the Subpart Eb MACT standard, the flue gas temperature in any 4-hour block arithmetic average at the inlet of the baghouse servicing the mass-burn boiler cannot exceed 30.6 ^{O}F above the highest 4-hour arithmetic average temperature measured during the most recent-dioxin/furan performance test demonstrating compliance with the emissions limit for MWC organics.

3) Pursuant to the Subpart Eb MACT standard, CO emissions will be limited to 100 ppmdv at 7% O_2 over a 4-hour block arithmetic average. The permit will also specifies a CO emission limit of 80 ppmdv over a 30 day rolling average to be consistent with recent control technology determinations for other facilities that combust MSW.

4) The boiler combustion temperature must be at least 1800 ^{O}F in any 4-hour block arithmetic average during normal operation (i.e., operation of the boiler, except for warm-up, start-up, shut-down, and malfunction).

e. Step 5 – Select BACT: Application of good combustion practice, spray dryer absorber (a semi- dry scrubber), baghouse, and carbon injection will be used for the new MWC boiler to minimize dioxin and furan emissions. The Department has determined that the proposed control combination constitutes BACT for minimizing dioxin/furan emissions from the new boiler. The emission limit proposed as BACT is the same as that specified in the Subpart Eb MACT standard. The proposed emission limit for dioxin/furans is consistent with recent emission limits listed in EPA's NSR/RACT/BACT/LEAR clearing house.

<u>2.8.2.5 Control Technology Review – CO</u>

a. Step 1 – Identify all control technologies: CHRRV evaluated the control technology options for reducing CO emissions. Emissions of CO are produced by the incomplete oxidation of carbon containing compounds in the MSW fuel. The following control options were identified by the applicant for controlling CO emissions:

Option 1: Good Combustion Control
Option 2: Thermal Oxidizers
Option 3: Oxidation Catalyst Systems

b. Step 2 – Eliminate technically infeasible options: The following control options were eliminated as BACT among the three options proposed for reducing CO emissions:

1) Option 2 (Thermal Oxidizers): As indicated by the applicant, thermal oxidizers have not been successfully applied to control CO emissions from MWCs. The thermal oxidizer would require additional fuel for its operation resulting in secondary emissions. Thermal oxidizers are not technically feasible for controlling CO emissions, produce secondary emissions, and are not considered further in the analysis.

2) Option 3 (Oxidation Catalysts): Oxidation catalysts have not been applied to MWCs to control CO emissions. In addition, oxidation catalysts are made from precious or semi-precious metals that are easily poisoned by contaminants (e.g., sulfur, phosphorous, and trace metals in the flue gas). For these reasons, oxidation catalyst systems are not considered technically feasible for the project and are not considered further in the analysis.

c. Step 3 – Rank remaining control technologies by control effectiveness: The following table provides the control technology effectiveness of the remaining option to control CO:

Control Technology Ranking	Control Technology	Emission Limits
1	Good Combustion Control	CO – 100 ppmdv (4-hour average) @ 7% O_2 CO – 80 ppmdv (30-day average) @ 7% O_2

d. Step 4 – Evaluate most effective controls and document: Because formation of CO is due to the combustion process itself, the predominant CO control method for MWCs has been good combustion practice. Good combustion practices that will be required by the permit are described in Paragraph 2.8.2.4.d. The 80 ppmdv (30 day rolling average) CO emission limit is more stringent than that specified for CO in the Subpart Eb MACT standard.

e. Step 5 – Select BACT: Good combustion practice will be applied for the new MWC boiler to minimize CO emissions. Based on the information provided, the Department concurs with the applicant's proposal that good combustion practice represents BACT for minimizing CO emissions. The BACT proposal for minimizing CO emissions meets the MACT requirements of Subpart Eb. The proposed CO emission limits are consistent with recent emission limits listed in EPA's NSR/RACT/BACT/LEAR clearing house for minimizing CO emissions.

2.8.2.6 Control Technology Review – NO_X

a. Step 1 – Identify all control technologies: Nitrogen oxides are formed as a result of the combustion process through either the oxidation of nitrogen in the waste (fuel NO_X) or high-temperature reactions with atmospheric nitrogen and oxygen in the combustion air (thermal NO_X). Reduction of NO_X by material separation processes is not effective or practical. Therefore, NO_X control is primarily accomplished through either the combustion process or post combustion process. The following control technology options were proposed to control NO_X emissions:

Combustion Control and Inherent Equipment Design

Option 1: Covanta VLN System
Option 2: Staged Combustion/Low Excess Air (LEA)
Option 3: Natural Gas Reburning
Option 4: Ecotube
Option 5: Prism
Option 6: Water Cooled (WC) Grates

Post Combustion Control

Option 7: Selective Non-catalytic Reduction (SNCR)
Option 8: Selective Catalytic Reduction (SCR)
Option 9: Regenerative Selective Catalytic Reduction (RSCR)
Option 10: Wet Flue Gas Denitrification (FGDn)
Option 11: Electron Beam
Option 12: Catalytic Absorption System for CO and NO_X ($SCONO_X$)

b. Step 2 – Eliminate technically infeasible options: The following control options were eliminated as BACT among the options proposed for reducing NO_X emissions:

1) Option 4 (Ecotube): As indicated by the applicant, Ecotube is a recently developed staged combustion process offered by Synterprise. Ecotube consists of one or more 3 to 7 meter long lances located above the primary combustion zone. Available data from the Ecotube manufacture indicates an average NO_X emission rate of 210 ppmdv at 7% O_2 that is high for a controlled NO_X emission level. It was also indicated that frequent spikes in CO emission rates occur that are as high as 400 ppmdv at 7% O_2. There is an additional concern with the service live of the rotating lances in the combustion zone of the furnace due to metal fatigue, corrosion, plugging, and slag formation. Due to limited data and operating experience with Ecotube, the control technology is not considered further in the BACT analysis.

2) Option 5 (Prism): The applicant described Prism as a combustion process modification offered by Seghers which consists of a prism shaped, water-cooled structure located just above the gate of the MWC. The flue gas flow of the grate is divided into two streams which flow on either side of the prism structure. Secondary air is injected into the two gas streams from the four corners of the combustor. The benefit of Prism is to provide better mixing of the secondary air. Another benefit of Prism is to lower ammonia consumption when the technology is combined with SNCR. As noted by the applicant, Prism is a substantial configuration change to the standard grate technology and there is a relatively small (if any) improvement in reducing NO_X. Due to the limited operating data and experience with Prism, the technology is not considered a feasible NO_X control option.

3) Option 6 (WC Grates): Use of WC grates was indicated in the application to reduce NO_X by reducing combustion zone temperatures. The disadvantage of using WC grates is a lowering of the combustion efficiency and an increase in capital costs and system complexity. The use of WC grates reportedly reduces baseline NO_X emissions and ammonia usage for enhancing SNCR, but does not appear to offer any improvement over flue gas recirculation (FGR). As such, WC grates are not considered further as a NO_X control technology.

4) Option 9 (RSCR): The applicant describes an RSCR system as a combination of SCR technology and regenerative heat recovery technology utilized with regenerative thermal oxidizers. Because the RSCR system is located towards the end of the exhaust stream where exhaust temperatures are reduced after passing through duct work and spray dryer absorber, heaters would be necessary to raise the flue gas temperature to approximately 650 ^{O}F to enable proper functioning of the catalyst. As such, secondary emissions would occur from heater fuel combustion to raise exhaust temperature. It was indicated that no RSCR system has been installed and proven for application on an MSW fired boiler. Also, RSCR is an undemonstrated technology for NO_X control on a large scale and is not expected to remove NO_X more efficiently than SCR. Therefore, RSCR is not being evaluated further as a control option.

5) Option 10 (FGDn): The FGDn systems were described as being divided into four major systems that include oxidation absorption reduction, oxidation-absorption, absorption-reduction, and absorption-oxidation. The wet FGDn processes have not been commercially demonstrated and, therefore, are deemed technically infeasible.

6) Option 11 (Electron Beam): The electron beam process is a dry process using electron beam irradiation in the presence of ammonia (NH_3) to initiate chemical conversion of nitrogen oxides into an aerosol which can be collected using an ESP or baghouse. The applicant indicated that, although this technology has been installed for cleaning flue gas from fossil fuel combustion, there have been no tests or demonstrations on MWC units. Therefore, electron beam control technology is not being considered a feasible option.

7) Option 12 ($SCONO_X$): $SCONO_X$ is a catalytic control method for NO_X that does not utilize ammonia as a reagent and has been applied to combustion equipment fired on clean fuels (e.g., natural gas, synthetic natural gas, etc.) with high NO_X removal efficiencies. $SCONO_X$, however, has not been tested or applied to large-scale MWCs for NO_X control and is not currently marketed for this application. Therefore, $SCONO_X$ is deemed infeasible and not considered further in the analysis.

c. Step 3 – Rank remaining control technologies by control effectiveness: The following table provides the control technology effectiveness of the remaining options to control NO_X:

Control Technology Ranking	Control Technology	Emission Limits
1	Covanta VLN system combined with SCR	NO_X – 70 ppmdv (annual average) @ 7% O_2
2	Covanta VLN system combined with SNCR	NO_X – 90 ppmdv (annual average) @ 7% O_2 NO_X – 110 ppmdv (24-hour average) @ 7% O_2
3	staged combustion/LEA combined with or SCR or SNCR	staged combustion/LEA does not provide higher control than Covanta VLN system
4	natural gas reburning combined with or SCR or SNCR	natural gas reburning does not provide higher control than Covanta VLN system

d. Step 4 – Evaluate most effective controls and document: Combustion control/inherent equipment design and post combustion controls were evaluated for reducing NO_X

emissions from the new boiler. Of the combustion control methods, Covanta VLN, staged combustion/LEA, and natural gas reburning were deemed technically feasible. Among these combustion controls, the Covanta VLN system will provide greater NO_X reduction. Also, SCR and SNCR were the only post combustion control technologies deemed feasible for the project. Therefore evaluation of the post combustion controls considers either SCR or SNCR in conjunction with Covanta VLN system for controlling NO_X emissions. The following is further analysis comparing economic, energy, and environmental impacts from applying SCR and SNCR control technologies:

1) Economic Impacts (SCR): Information from the application shows the cost effectiveness value associated with using SCR would be as high as $34,500 per ton of NO_X removed. This high economic cost is not considered cost effective for controlling NO_X emissions. The high economic cost, therefore, eliminates application of SCR as BACT for controlling NO_X from the new boiler.

2) Economic Impacts (SNCR): Information from the application indicates the cost effectiveness value associated with using SNCR would be $4,700 per ton of NO_X removed which is a cost effective value for applying SNCR as BACT.

3) Energy Impacts (SCR): Information provided by the applicant shows the annual energy impacts from using SCR would be 200,205 MMBtu per year due to firing fuel to re-heat the flue gas and 1,082,732 kWh per year of electricity to overcome the increased pressure drop across the catalyst reactor. If fuel oil No. 2 was used for the SCR system, the fuel consumption would be 5,071 gallons and 715 MMBtu per ton of NO_X controlled. Electricity consumption would to 3,867 per ton of NO_X removed. These energy impacts eliminate SCR from further consideration as a BACT option.

4) Energy Impacts (SNCR): No fuel is used with the application of SNCR. The only energy impact would be 74,803 kWh per year of electricity or 356 kWh per ton of NO_X removed. The energy impact is acceptable for the application of SNCR as BACT.

5) Environmental Impacts (SCR/SNCR): Pollutant emissions would be significantly higher for SCR than those for SNCR based on a comparison of fuel consumption requirements for the two control technologies.

e. Step 5 – Select BACT: The new boiler will be equipped with Covanta VLN system combined with SNCR to control NO_X emissions. The BACT proposal for minimizing NO_X emissions meets the MACT requirements of Subpart Eb. The proposed NO_X emission limits are consistent with recent emission limits listed in EPA's NSR/RACT/BACT/LEAR clearing house for minimizing NO_X emissions. Also note that emission limits proposed as BACT for NO_X are more stringent than that specified 40 CFR Part 60, Subpart Eb. The SNCR and Covanta VLN systems are described in Paragraphs 5.1 and 5.2, respectively.

2.8.3 The following is a summary of the BACT emission limits proposed for the 900 ton per day MWC boiler:

Pollutant	Flue Gas Concentration @ 7% O_2 dry gas basis	Time Weighted Average	Compliance Method
CO	100 ppmdv 80 ppmdv	4-hour block average 30-day rolling average	CEMS[a]
NO_X	110 ppmdv 90 ppmdv	24-hour arithmetic average annual average	CEMS[a]
SO_2	26 ppmdv or 80% reduction 26 ppmdv or 80% reduction 44 ppmdv or 80% reduction (see note b)	24-hour daily geometric average annual average 3-hour block average	CEMS[a]
PM	12 mg/dscm (see notes b and d)	per method	CAM[c] and EPA Methods 5, 201A, and 202
PM_{10}	32 mg/dscm (see note d)	per method	CAM[c] and EPA Methods 5, OTM-27, and OTM-28
$PM_{2.5}$	30 mg/dscm (see note d)	per method	CAM[c] and EPA Methods 5 and 22
MWC Metals	10 ug/dscm cadmuim 140 ug/dscm lead 28 ug/dscm mercury (see note b)	per method	CAM[c] and EPA Methods 5, 201A, 202, and 29
Fluorides	3.5 ppmdv	per method	CAM[c] and EPA Method 13B
H_2SO_4	5 ppmdv	per method	CAM[c] and EPA Method CTM-013
MWC Acid Gases	26 ppmdv or 80% reduction 25 ppmdv or 95% reduction	SO_2 24-hour daily geometric average HCl per method	CAM[c] SO_2 – CEMS HCL -EPA Method 26A
MWC Organics	13 ng/dscm	per method	EPA Method 23

a: CEMS – Continuous Emission Monitoring System
b: Proposed BACT limits for SO_2, particulate matter, and mercury are more stringent than NSPS, Subpart Eb requirements.
c: CAM – Compliance Assurance Monitoring
d: PM includes only filterable particulate matter. PM_{10} and $PM_{2.5}$ include filterable + condensable particulate.

2.8.4 The following table summarizes Subpart Eb emission limits, BACT emission limits, identifies limits that will be specified in the permit, and provides an explanation for selecting the permit emissions limits for normal boiler operation:

Pollutant		Subpart Eb Limit[1,2]	BACT Limit[1,2]	Permit Limit[1,2]	Reason for Permit Limit
SO_2	Annual[3,9]	----------	26 ppmdv	26 ppmdv	better than proposed BACT from similar mass-burn facilities permitted recently
	24-hour[4,9]	30 ppmdv	26ppmdv	26 ppmdv	better than proposed BACT from similar mass-burn facilities permitted recently, proposed limit meets Subpart Eb also
	3-hour[5,9]	----------	44ppmdv	44 ppmdv	better than proposed BACT from similar mass-burn facilities permitted recently
PM (filterable only)		20 mg/dscm	12 mg/dscm	12 mg/dscm	better than proposed BACT from similar mass-burn facilities permitted recently, proposed limit meets Subpart Eb also
PM_{10} (filterable + condensable)		-----------	32 mg/dscm	32 mg/dscm	proposed BACT, no data from other facilities recently permitted
$PM_{2.5}$ (filterable + condensable)		-----------	30 mg/dscm	30 mg/dscm	proposed BACT, no data from other facilities recently permitted
NO_X	Annual[3]	-----------	90 ppmdv	90 ppmdv	BACT based on similar mass-burn facilities recently permitted
	24-hour[6]	180 ppmdv[12] 150 ppmdv[13]	110 ppmdv	110 ppmdv	BACT based on similar mass-burn facilities permitted, proposed limit meets Subpart Eb also
CO	4-hour[7]	100 ppmdv	100 ppmdv	100 ppmdv	BACT based on similar mass-burn facilities recently permitted, proposed limit meets Subpart Eb also
	30-day[8]	-----------	80 ppmdv	80 ppmdv	limit specified by Department to be consistent with recent BACT decision
VOC (as CH_4)		-----------	-----------	10 ppmdv	limit specified at the Department's discretion, VOC emissions were based on a 10 ppmdv concentration
Ammonia		-----------	-----------	15 ppmdv	limit specified at the Department's discretion, ammonia emissions were based on a 15 ppmdv concentration
Cadmium		10 ug/dscm	-----------	10 ug/dscm	limit specified as required by Subpart Eb
Lead		140 ug/dscm	-----------	140 ug/dscm	limit specified as required by Subpart Eb
Mercury[10]		50 ug/dscm	-----------	28 ug/dscm	limit specified as required by Subpart Eb
Fluorides (as HF)		-----------	3.5 ppmdv	3.5 ppmdv	BACT as proposed by applicant, no BACT data from other facilities recently permitted
H_2SO_4		-----------	5 ppmdv	5 ppmdv	BACT based on similar mass-burn facilities permitted
HCl[11]		25 ppmdv	25 ppmdv	25 ppmdv	BACT based on similar mass-burn facilities permitted, proposed limit also meets Subpart Eb
MWC Metals (as PM)		12 mg/dscm	12 mg/dscm	12 mg/dscm	BACT based on similar mass-burn facilities permitted, proposed limit also meets Subpart Eb
Dioxin/Furans		13 ng/dscm	13 ng/dscm	13 ng/dscm	BACT based on similar mass-burn facilities permitted, proposed limit also meets Subpart Eb

Table Notes:

1. Emission limits shall not be exceeded for the mass burn MWC boiler except for warm-up, start-up, shut-down, and malfunction.
2. All emission limits are referenced to 7% O_2, dry gas basis.
3. Annual arithmetic average emissions limit.
4. 24-hour daily geometric average emissions limit.
5. 3-hour block arithmetic average.
6. 24-hour daily arithmetic average.
7. 4-hour block arithmetic average.
8. 30-day rolling average.
9. Maximum emissions limit indicated or at least 80% reduction by weight or volume (whichever is less stringent).
10. Maximum emissions limit indicated, or at least 85% reduction by weight (whichever is less stringent).
11. Maximum emissions limit indicated or at least 95% reduction by weight or volume (whichever is less stringent).
12. For first year of operation.
13. After first year of operation.

2.9 The purpose of Compliance Assurance Monitoring (CAM) is to provide reasonable assurance that compliance is being achieved with large emission units that rely on air pollution control device equipment to meet an emissions limit or standard. A CAM applicability determination disclosed the following:

a. The CAM regulation applies to the new MWC boiler because: (1) the boiler is located at a major source; (2) the boiler is subject to BACT emission limits; (3) air pollution control devices are required for compliance with BACT emission limits; (4) potential pre-control emissions from the boiler are greater than the major source threshold, and (5) the boiler is not otherwise exempt from CAM for pollutants that require an air pollution control device for compliance with the BACT emission limits that are more stringent than the emission limits specified in 40 CFR, NSPS Subpart Eb.

b. The CAM regulation does not apply to emission limits or standards proposed after November 15, 1990. Because 40 CFR Part 60, NSPS, Subpart Eb was promulgated on December 19, 1995, the CAM regulation is not applicable to this standard.

c. Pursuant to the technical guidance document "Compliance Assurance Monitoring (Revised Draft, August 1998)", if the Boiler is subject to both Subpart Eb limits (exempt limits) and BACT emissions limits (non-exempt limits), CAM is still applicable. The Department agrees with the applicant, that CAM only applies to BACT emission limits that are more stringent than those from 40 CFR Part 60, Subpart Eb if criteria in Paragraph 2.9.a. is met.

d. The CEMS for determining compliance with NO_X and SO_2 emission limits for the MWC boiler are exempt from the CAM regulation pursuant to 40 CFR Part 64, §64.2(b)(vi). The permit will require the applicant to install, calibrate, maintain, and operate one or more CEMSs for the boiler's exhaust stream to measure and record the NO_X, SO_2, and CO emissions. The CEMSs for measuring these pollutants is a requirement from 40 CFR Part 60, Subpart Eb.

e. The following is a summary of CAM applicability:

Pollutant	Controlled Emission (TPY)	Uncontrolled Emission (TPY)	Control Device Efficiency	Applicability		Control Device Employed	CAM Applicable	Notes
				NSPS	BACT			
CO	213	213		Y	Y	N	N	Note 1
NO_X	315	940		Y	Y	Y	N	Note 2
SO_2	126	632	80%	Y	Y	Y	N	Note 3
$PM/PM_{10}/PM_{2.5}$	22/59/55	2,190	90%	Y	Y	Y	Y	Note 4
VOC	12	12		Y	Y	N	N	Note 5
Lead	0.26	26	99%	Y	N	Y	Y	Note 6
Cadmium	0.018	2	99%	Y	N	Y	N	Note 7
Mercury	0.051	5	99%	Y	N	Y	N	Note 8
Fluorides	5	106	95%	N	Y	Y	Y	Note 9
H_2SO_4	37	186	80%	N	Y	Y	Y	Note 10
MWC Organics	2.38E-05			Y	Y	N	N	Note 11
HCl	69	1,386	80%	Y	Y	Y	N	Note 12
Ammonia	19			N	N	N	N	Note 13
Acid Gases (SO_2 + HCl)	196	2,018	80%	Y	Y	Y	N	Note 14
MWC Metals (PM)	22	2,190	99%	Y	Y	Y	Y	Note 15

Note 1: CAM not applicable for CO; does not use a control device to achieve compliance.
Note 2: CAM not applicable for NO_X; exempt due to CEMS requirement (40 CFR §64.3 (d)(1)).
Note 3: CAM not applicable for SO_2; exempt due to CEMS requirement (40 CFR §64.3 (d)(1)).
Note 4: CAM applicable for $PM/PM_{10}/PM_{2.5}$ BACT limit because it is more stringent than Subpart Eb limit; compliance demonstrated using presumptive CAM.
Note 5: CAM not applicable for VOC; does not use a control device to achieve compliance.
Note 6: CAM not applicable for lead because BACT does not apply to lead emissions.
Note 7: CAM not applicable for cadmium because BACT does not apply to cadmium emissions.
Note 8: CAM not applicable for mercury because BACT does not apply to mercury emissions.
Note 9 CAM applicable for fluorides; compliance demonstrated using lime slurry feed rate and SO_2 CEMS.
Note 10: CAM applicable for H_2SO_4; compliance demonstrated using lime slurry feed rate and SO_2 CEMS.
Note 11: CAM not applicable for MWC organics; pre-control MWC organic emissions are below major source level.
Note 12: CAM not applicable for HCl; both BACT and Subpart Eb limits are the same.
Note 13: CAM not applicable for ammonia; does not use a control device to achieve compliance.
Note 14: CAM not applicable for acid gases; see Notes 3 and 12.
Note 15: CAM applicable for MWC metals (measured as PM); compliance demonstrated using presumptive CAM.

g. The rational for selecting presumptively acceptable monitoring to meet CAM requirements for fluorides and H_2SO_4 emission limits is based on utilizing a spray dryer absorber and baghouse to control acid gases from the boiler exhaust. The control technology removes multiple gases that include SO_2, H_2SO_4, HF, and HCl. It was concluded that the lime slurry feed rate monitoring system used in conjunction with SO_2 monitoring by the CEMS, as required by the NSPS, satisfies the presumptive acceptable monitoring pursuant to 40 CFR §64.4(b)(2). Acid gases are removed by the spray dryer absorber and baghouse by order of acid reactivity (HF-then-H_2SO_4/HCl-then-SO_2). The lime slurry feed rate can be set during annual performance testing for determining compliance with the HF, H_2SO_4, and HCl emission limits to allow continuing compliance. Based on source test data, continuous compliance with acid gas emission limits can be achieved by associating the CEM SO_2 measurement with a lime slurry injection rate that returns the SO_2 emission to the CAM set point which ensures compliance with the applicable emissions limit for acid gases. The applicant proposed the following indicators of an excursion for the applicable acid gas emissions limit:

1) A lime slurry feed rate in gallon per minute that is less than the minimum lime slurry feed rate established during the most recent boiler performance test that shows compliance with the applicable emissions limit for fluorides and sulfuric acid mist.

2) An SO_2 emission that is greater than 26 ppmdv or less than 80% reduction @ 7% O_2 over a 24-hour daily geometric average during normal operation (i.e., boiler operation, except for warm-up, start-up, shut-down, and malfunction).

h. The CAM regulation applies to PM, PM_{10}, $PM_{2.5}$, and MWC metal emission limits. Excursions for these pollutants are incidences when the opacity, as measured by the COMS, exceeds 7% on a one hour average basis for three consecutive hours.

2.10 The Consolidated Emissions Reporting Rule (CERR) is applicable because potential emissions from the H-POWER facility exceed reporting levels pursuant to 40 CFR 51, Subpart A for Type B sources (see table below for applicability).

Pollutant	Potential Emissions (TPY)[a]	CERR Triggering Levels (TPY)	
		1 year cycle (Type A sources)	3 year cycle (Type B sources)
PM-10	173.4	≥250	≥100
PM-2.5	149.5	≥250	≥100
SO_2	350.6	≥2,500	≥100
NO_x	1,720	≥2,500	≥100
VOC	52.9	≥250	≥100
CO	888.5	≥2,500	≥1,000
Pb	1.2	--------	≥5
NH_3	19.3	≥250	≥100

a: See Paragraph 6.5 for the emission rates.

2.11 Annual emissions reporting is required because this facility is a covered source.

3. Insignificant Activities and Exemptions

3.1 The following is a list of insignificant activities identified by the applicant that meet the exemption criteria specified in HAR §11-60.1-82:

a. Two (2) 25,000 gallon diesel storage tanks are exempt pursuant to HAR §11-60.1-82(f)(1).

b. A 120 gallon gasoline storage tank is exempt pursuant to HAR §11-60.1-82(f)(1).

c. An 80 hp Caterpillar emergency diesel engine generator, model no. 3304B, is exempt in accordance with HAR §11-60.1-82(f)(5).

d. A 121 hp Caterpillar emergency fire pump diesel engine, model no. 3208-175, is exempt pursuant to HAR §11-60.1-82(f)(5).

e. An 11 hp engine for power-washing is exempt in accordance with HAR §11-60.1-82(f)(2).

f. A 10.1 hp engine for an air compressor is exempt pursuant to HAR §11-60.1-82(f)(2).

g. An 11.1 hp diesel engine powered welder is exempt pursuant to HAR §11-60.1-82(f)(2).
h. A 30 gallon mineral spirits tank for metal parts cleaning is considered an insignificant activity pursuant to HAR §11-60.1-82(f)(7).

i. A Lime silo with baghouse servicing the spray dryer absorbers for the two 854 ton per day RDF MWC boilers is considered an insignificant activity pursuant to HAR §11-60.1-82(f)(7).

j. A Lime silo with baghouse servicing the spray dryer absorber for the 900 ton per day mass-burn MWC boiler is considered an insignificant activity pursuant to HAR §11-60.1-82(f)(7).

k. An activated carbon silo with baghouse servicing the activated carbon injection system for the 900 ton per day mass-burn MWC boiler is considered an insignificant activity pursuant to HAR §11-60.1-82(f)(7).

l. Roof vents, primarily to prevent the buildup of CO inside the RDF processing and storage building, are considered insignificant activities pursuant to HAR §11-60.1-82(f)(7).

4. Alternate Operating Scenario

4.1 The applicant proposed to burn the following supplemental wastes, defined on Pages 15 and 16 of the permit application, as an alternate operating scenario for the facility:

a. Commodity wastes;
b. Pharmaceutical wastes;
c. Manufacturing wastes;
d. Oily wastes;
e. Used cooking oil;
f. Triple rinsed containers;
g. Shredded tires and automobile shredded residue;
h. Treated medical wastes; and
i. Treated foreign wastes.

5. Air Pollution Controls

5.1 The MWC boiler will be equipped with Covanta VLN system to control NO_X. The system will be an integral part of the boiler that changes the combustion process. The Covanta VLN system reduces NO_X and increases boiler efficiency by:

1) Reducing the overall excess air rate from approximately 90% to 100% excess air to between 50% and 55% excess air;
2) Reducing the amount of secondary air and adding a tertiary gas stream at a higher elevation in the furnace; and
3) Including an internal recirculated gas system.

5.2 An SNCR system will be installed to control NO_X emissions from the flue gas downstream of the boiler's combustion zone. The post combustion control technology utilizes injection of either ammonia NH_3 or urea ($NH_2C(O)H_2$) into the flue gas that acts as a reducing agent for NO_X. The reducing agent is injected into the exhaust stream at a temperature between 1,600 ^{O}F and 2,100 ^{O}F. The high temperatures support high chemical reaction rates within the exhaust stream so that a catalyst is not required for the NO_X reduction reaction. The reagent reduces NO_X to nitrogen and water. It was indicated that placement of the injection probes for the SNCR system is important. If reagent is injected at a point where the temperature is greater than 2,100 ^{O}F, ammonia or urea will react with oxygen to form additional NO_X. Injection of the reagent at a point where temperatures are below 1,600 ^{O}F will promote excessive/unreacted ammonia that passes through the duct work and out the stack ("ammonia slip"). Increasing levels of ammonia slip promotes ammonium bisulfate formation that can plug and corrode the air preheater. Also, ammonia slip can contribute to formation of ammonium chloride that may cause a visible white plume. It is expected that the total combined NO_X removal efficiency for using the Covanta VLN and SNCR systems will be 74%.

5.3 A spray dryer absorber (semi-dry scrubber) will control acid gases. For this technology, hot untreated boiler flue gases are introduced into an absorbing chamber where the flue gases are contacted by a fine spray of lime slurry. To form the reagent lime slurry, lime is slaked with water to form calcium hydroxide that is pumped to nozzles or rotary atomizers inside the scrubber's absorbing chamber. Acid gases are absorbed by the slurry mixture and the alkaline component reacts with the flue gases to form salts. Evaporation of water from the slurry forms a finely divided particle of mixed salt and unreacted alkali and lowers the flue gas temperature. A portion of the dry powder drops to the bottom of the spray dryer absorber scrubber vessel. Flue gases containing the remaining powder with reacted acid gas salts and particulates generated from combustion flow downstream for removal by the baghouse. Removal efficiency for the spray dryer absorber with baghouse is anticipated to be 80% for SO_2, H_2SO_4, and fluorides, and greater than 95% for MWC acid gases (as HCl and SO_2)

5.4 An activated carbon injection system will be installed to control mercury and dioxin/furan emissions. The activated carbon will be injected into the flue gas upstream of the baghouse. The baghouse will collect the activated carbon that adsorbs mercury and dioxin/furan pollutants within the exhaust stream. It is anticipated that the removal efficiency for mercury and dioxin/furan emissions will be greater than 85% and 95%, respectively.

5.5 A baghouse will be installed to collect particulate generated from MSW combustion and other particulate generated after control of pollutants by the spray dryer absorber and activated carbon injection system. Expected particulate removal efficiency for the baghouse is 99%. The filter bags can be replaced during boiler operation by removing the affected filter bag module from the baghouse for bag replacement. Specific filter bag modules can be turned off during boiler operation to determine which module contains a leaking bag. A decrease in the boiler opacity after switching off the module may indicate a bag leak for that module.

6. Project Emissions

6.1 Emissions from the new 900 ton per day MWC boiler were based on emission limits specified in 40 CFR, Part 60, Subpart Eb, other emission limits established pursuant to the BACT analysis, and AP-42 emission factors. Maximum potential emissions were based on operating 8,760 hours per year at the 110% MCR- 6,400 Btu/lb operating scenario with a 3,157 dry standard cubic meter per minute stack flue gas flow rate. The ppm pollutant emission limits were multiplied by M/24.04 to convert ppm to mg/m^3, where M is the molecular weight of the air pollutant. Arsenic, chromium, and nickel emissions were determined using emission factors from AP-42, Section 2.1 (10/96), Refuse Combustion. The VOC emissions were based on a molecular weight for methane of 16.05 grams per mole. A 900 ton per day boiler capacity was used to determine the ton per year emissions. Emissions are shown in Enclosure (3) and summarized below.

900 TON PER DAY MASS-BURN MWC BOILER (Normal Operation with Controls)			
Pollutant	Emission Rate		Emission TPY
	lb/hr	g/s	No Limits at 8,760 hr/yr
CO	48.6	6.131	212.7
NO_X	71.8	9.063	314.4
SO_2	28.9	3.646	126.5
PM (see note a)	5.0	0.631	21.9
PM_{10} (see note a)	13.3	1.684	58.4
$PM_{2.5}$ (see note a)	12.5	1.579	54.8
VOC as CH_4	2.8	0.350	12.2
Arsenic	3.0×10^{-4}	3.79×10^{-5}	0.001
Cadmium	0.004	0.0005	0.020
Chromium	3.49×10^{-3}	4.41×10^{-4}	0.015
Lead	0.016	0.002	0.300
Mercury	0.012	0.0015	0.050
Nickel	6.75×10^{-3}	8.52×10^{-4}	0.030
Fluorides as HF	1.2	0.153	5.3
H_2SO_4	8.5	1.073	37.2
Dioxin/Furans	5.42×10^{-6}	6.84×10^{-7}	2.37×10^{-5}
HCl	15.8	1.996	69.2
MWC Acid Gases as SO_2 and HCl	44.7	5.642	195.8
MWC Metals	5.0	0.631	21.9
Ammonia	4.4	0.556	12.9
Total HAPs	-----------	-----------	74.9

a: PM includes only filterable particulate matter. PM_{10} and $PM_{2.5}$ include filterable + condensable particulate.

6.2 Based on emission limits proposed by the applicant for each boiler start-up and each boiler shut-down period, emissions are as follows (see Paragraph 1.7(3)):

Pollutant	Limit	
	(lb/hr)	lbs/each start-up and each shut-down period
SO_2	32.5	98
CO	137.9	414
NO_X	192.9	579

6.3 Based AP-42, Section 1.3 (9/98) emission factors for firing fuel oil No. 2, emissions during warm-up periods for the mass-burn boiler are less than those used from Paragraphs 6.1 and 6.2 for the air modeling assessment. Emissions for boiler warm-up are based on permit limits. The boiler is equipped with two 90 MMBtu/hr auxiliary fuel burners with a total combined firing rate of 1,285 gallons per hour. Auxiliary fuel limits for warm-up include firing only fuel oil No. 2 auxiliary fuel at a rate not to exceed 1,200 gallons per hour. The total combined auxiliary fuel consumption is limited to 869,250 gallons per year. Also, the fuel oil No. 2 sulfur content is limited to 0.05% by weight. The boiler is permitted to burn either fuel oil No. 2 or used cooking oil auxiliary fuels during normal operation. A mass balance calculation was used to determine SO_2 emissions assuming a 7.05 lb/gal fuel density. Maximum potential emissions are shown in Enclosure (4) for firing fuel oil No. 2 during warm-up periods and summarized below. Except some of the hazardous air pollutants (HAPs), predicted emissions in the table below are greater for firing MSW during normal operation than for warm-up. The HAP emissions for warm-up are accounted for in the air quality modeling assessment from Paragraphs 7.3.2 to 7.3.4.

900 TON PER DAY MASS-BURN MWC BOILER (Warm-up Periods)			
Pollutant	Emission Rate		Emission TPY
	lb/hr	g/s	
CO	6.0	0.757	2.2
NO_X	28.8	3.636	10.4
SO_2	8.5	1.073	3.1
PM	2.4	0.303	0.9
PM_{10}	1.6	0.206	0.6
$PM_{2.5}$	0.3	0.036	0.1
VOC	2.8	0.351	12.2
Lead	1.51×10^{-3}	1.91×10^{-4}	5.48×10^{-4}
Cadmium	5.04×10^{-4}	6.36×10^{-5}	1.83×10^{-4}
Mercury	5.04×10^{-4}	6.36×10^{-5}	1.83×10^{-4}
Arsenic	6.72×10^{-4}	8.48×10^{-5}	2.43×10^{-4}
Chromium	5.04×10^{-4}	6.36×10^{-5}	1.83×10^{-4}
Nickel	5.04×10^{-4}	6.36×10^{-5}	1.83×10^{-4}
Benzene	2.57×10^{-4}	3.24×10^{-5}	1.12×10^{-3}
Ethylbenzene	7.63×10^{-5}	9.64×10^{-6}	3.34×10^{-4}
Formaldehyde	7.32×10^{-2}	9.24×10^{-3}	3.21×10^{-1}
Naphthalene	1.36×10^{-3}	1.71×10^{-4}	5.94×10^{-3}
Polycyclic Organic Matter	1.56×10^{-3}	1.97×10^{-5}	6.83×10^{-3}
Toluene	7.44×10^{-3}	9.39×10^{-4}	3.26×10^{-2}
o-Xylene	1.31×10^{-4}	1.65×10^{-5}	5.73×10^{-4}
Beryllium	5.04×10^{-4}	6.36×10^{-5}	1.83×10^{-4}
Selenium	2.52×10^{-3}	3.18×10^{-4}	9.13×10^{-4}

6.4 Based on emission limits for boiler warm-up, emissions are as follows (see Paragraphs 6.3 and 1.7(4):

Pollutant	Limit	
	(lb/hr)	lbs/warm-up period
SO_2	8.5	102
CO	6.0	72
NO_X	28.8	346

6.5 Emissions from the two 854 ton per day RDF MWC boilers were based on emission limits specified in NSPS, Subpart Cb and other emission limits established pursuant to the BACT analysis. Maximum potential emissions were based on operating 8,760 hours per year with a 150,480 dry standard cubic meter per hour stack flue gas flow rate. The ppm pollutant emission limits were multiplied by M/24.04 to convert ppm to mg/m^3, where M is the molecular weight of the air pollutant. A 36 ton per hour RDF capacity for each boiler was used to determine emissions from the lb/ton RDF limits. Arsenic, chromium and nickel emissions were determined with AP-42 emission factors from Section 2.1 (10/96). Differences in the emission rates from this review and those estimated in the existing application can be attributed to differences in conversions used to estimate emissions. Maximum ton per year emission rates were determined based on a maximum 36 ton per hour MSW consumption for each boiler. Emission estimates are shown in Enclosure (3) and summarized below.

854 TON PER DAY RDF MWC BOILERS			
Pollutant	Emission Rate (two boilers)		Emission TPY (two boilers)
	lb/hr	g/s	No Limits at 8,760 hr/yr
CO	154.3	19.481	675.8
NO_X	316.8	40.000	1,387.6
SO_2	51.2	6.461	224.1
PM	17.9	2.257	78.3
PM_{10}	17.9	2.257	78.3
$PM_{2.5}$	17.9	2.257	78.3
VOC as CH_4	9.3	1.172	40.7
Arsenic	3.72×10^{-4}	4.70×10^{-5}	0.002
Beryllium	0.06	0.008	0.300
Cadmium	0.03	0.003	0.120
Chromium	3.70×10^{-4}	2.93×10^{-3}	0.033
Lead	0.02	0.025	0.900
Mercury	0.053	0.007	0.230
Nickel	5.73×10^{-4}	4.54×10^{-3}	0.020
Fluorides as HF	2.6	0.327	11.4
H_2SO_4	13.5	1.706	59.2
Dioxin/Furans	3.97×10^{-5}	5.02×10^{-6}	1.74×10^{-4}
HCl	29.6	3.731	129.4
MWC Acid Gases as SO_2 and HCl	80.8	10.192	353.9
MWC Metals	17.9	2.257	78.3
HAPs	----------	----------	142.4

6.6 Particulate emissions from the two 4,500 ft^3/min capacity baghouses servicing the primary shredders and two 40,000 ft^3/min capacity baghouses servicing the secondary shredders were estimated for the waste processing facility. Emissions were based on the rated ft^3/min baghouse capacity, 8,760 hr/yr operation, and information from the initial covered source permit application that a typical particulate outlet concentration for the baghouses is 0.01 grains/ft^3. Emission estimates were based on information that there are 64.799 mg per grain. Based on a filter analysis, it was assumed that 70% of the PM_{10} is $PM_{2.5}$ and PM_{10} equals PM. Emissions are shown in Enclosure (5) and summarized below.

WASTE PROCESSING FACILITY- BAGHOUSE EMISSIONS			
Pollutant	Emission Rate (each baghouse)		Emission TPY (all baghouses)
	(lb/hr) primary/secondary	(g/s) primary/secondary	
PM	0.385/3.421	0.049/0.432	33.4
PM_{10}	0.385/3.421	0.049/0.432	33.4
$PM_{2.5}$	0.189/1.677	0.034/0.302	16.3

6.7 Particulate emissions were determined for the existing 5-cell and new 3-cell cooling towers. The PM emission estimates for the 5-cell cooling tower were based on a maximum recirculation water flow rate of 50,500 gallons per minute, a 0.002% drift rate (water droplets carried out of the tower as drift droplets), and a total dissolved solids content for the circulating water of 57,000 ppm. The PM emissions for the 3-cell cooling tower were based on a maximum recirculation water flow rate of 29,000 gallons per minute, a 0.0005% drift rate, and total dissolved solids content for the recirculation water of 57,000 ppm. Based on information from the permit application, for every pound of PM emitted from the cooling tower, 0.073 pound of PM_{10} and 0.00105 pound of $PM_{2.5}$ are discharged from the cooling tower. Emissions are shown in Enclosure (6) and summarized below.

COOLING TOWER EMISSIONS			
Pollutant	Emission Rate		Emission TPY (both cooling tower cells)
	(lb/hr) 3-cell tower/5-cell tower	(g/s) 3-cell tower/5-cell tower	
PM	1.3/9.0	0.164/1.139	45.2
PM_{10}	0.1/0.7	0.012/0.083	3.3
$PM_{2.5}$	0.001/0.009	0.0002/0.001	0.05

6.8 Worst-case yearly emissions of criteria pollutant and HAPs from operating permitted equipment at the facility are as follows (see tables from Paragraphs 6.1, 6.5, 6.6, and 6.7 for emission rates):

FACILITY-WIDE EMISSIONS					
Pollutant	Emissions (TPY)				
	Mass-Burn Boiler	RDF MWC Boilers	Waste Processing Baghouses	Cooling Towers	Total Emissions [no limits]
CO	212.7	675.8			888.5
NO_X	314.4	1,387.6			1,702
SO_2	126.5	224.1			350.6
PM	21.9	78.3	33.4	45.2	178.8
PM_{10}	58.4	78.3	33.4	3.3	173.4
$PM_{2.5}$	54.8	78.3	16.3	0.05	149.5
VOC	12.2	40.7			52.9
Fluorides (as HF)	5.3	11.4			16.7
H_2SO_4	37.2	59.2			96.4
HCl	69.2	129.4			198.6
MWC Acid Gases	195.8	353.9			549.7
MWC Metals	21.9	78.3			100.2
Arsenic	0.001	0.002			0.003
Beryllium	----------	0.3			0.3
Cadmium	0.02	0.12			0.14
Chromium	0.015	0.033			0.048
Lead	0.3	0.9			1.2
Mercury	0.05	0.23			0.28
Nickel	0.030	0.020			0.050
NH_3	19.3	----------			19.3
Dioxin/Furans	2.37×10^{-5}	1.74×10^{-4}			1.97×10^{-4}
Total Haps	---------	---------			217.3

7. <u>Air Quality Assessment</u>

7.1 An air modeling impact analysis was performed for the facility expansion using an AERMOD model to determine air impacts. Air impacts were determined for operating the new mass-burn MWC boiler concurrently with other emission sources that include the 3-cell cooling tower, lime storage silo with baghouse, activated carbon storage silo with baghouse, and fugitive dust due to an increase in traffic on paved roads. The following apply to the AERMOD model to determine maximum ambient air impacts:

a. Modeling was conducted with one year site-specific meteorological data and five years of meteorological data from the nearest National Weather Service (NWS) station. The one year of site-specific data was obtained from the Hawaiian Electric Company, Inc. (HECO) No. 064 monitoring station at Ewa Beach. The site specific data was gathered from a meteorological tower at several levels between October 1, 1992 and September 30, 1993. The five years of NWS data was obtained from the Honolulu International Airport for years 2003, 2004, 2005, 2006, and 2007. Air modeling impact results were based on data from HECO's No. 064 monitoring station that includes 64 meter wind speed, wind direction, and ambient temperature measurements near stack top as the preferred data for demonstrating compliance. The sequential modeling runs with five years of NWS meteorological data were performed to determine impacts for information only.

b. Surface data and upper air data were processed with the AERMET meteorological processor. Surface characteristic values were determined from land around the HECO No. 064 meteorological tower. The three surface characteristics determined were noon-time albedo, Bowen ratio, and the surface roughness length. Upper air data was obtained from the NWS station at Lihue International Airport.

c. Rural dispersion coefficients were used for the model. Based on Auer's land use method (AUER 1978), it was found that more than 50% of the land within 3 kilometers of the facility is rural.

d. A total of 8,976 receptors were placed in the area surrounding the H-POWER facility. For short-term $PM_{2.5}$ and PM_{10} modeling, 9,012 receptor locations were used. Coarse grid receptors were spaced 250 meters apart, and the fine receptor grid spacing was at most 50 meters on the flat coastal plane and 25 meters in elevated terrain.

e. Receptor elevations were assigned using the AERMAP software tool that extracted elevations from the USGS digital elevation model (DEM) files. The DEM data files consist of a regular array of elevations reference horizontally in the Universe Transverse Mercator (UTM) coordinate system. The DEM, data based on the 1927 North American Datum (NAD27), was from the EWA and SCHOFIELD BARRACKS topographic quadrangles.

f. Five different operating scenarios were evaluated in the air modeling assessment to determine maximum impacts from the 900 ton per day boiler. Each operating scenario affects the flue gas velocity and pollutant emission rate. The operating scenarios evaluated are among those determined from the refuse firing diagram based on a 900 ton per day boiler design capacity. The range of heating values for refuse projected on the firing diagram are typical of heating values from garbage generated in the United States. The various scenarios chosen for the air modeling assessment are among those where worst-case impacts would be expected. The five scenarios evaluated are listed below as follows:

1) Scenario 1 – Proposed mass-burn boiler at 110% load (6,400 Btu/lb MSW)
2) Scenario 2 – Proposed mass-burn boiler at 110% load (4,420 Btu/lb MSW)
3) Scenario 3 – Proposed mass burn boiler at 60% load (4,860 Btu/lb MSW)
4) Scenario 4 – Proposed mass burn boiler at 88% load (3,535 Btu/lb MSW)
5) Scenario 5 – Proposed mass burn boiler at 60% load (3,535 Btu/lb MSW)

g. The plume volume molar ratio was used for estimating NO_2 impacts. The plume molar ratio is a modeling option within AERMOD that predicts the NO_2 to NO_X ratio at locations close to the emission source. A default NO_2/NO_X ratio of 0.1 was used for the modeling option which is consistent with data from other MSW facilities. The 2006 annual mean ozone concentration from Oahu's Sand Island location of 27 ug/m^3 was used to represent the background ozone concentration. An ambient NO_2/NO_X ratio of 0.138, representative of Hawaii, was used to define the equilibrium ratio pursuant to information from technical paper by Patrick L. Hanrathan "The Plume Volume Molar Ratio Method for Determining NO_2/NO_X Ratios in Modeling – Part II Evaluation Studies".

h. Start-up/shut-down conditions were also modeled to assess the maximum potential short-term impacts.

i. The table below presents emission rates used for the air modeling impact analysis of the mass-burn MWC boiler at the various operating scenarios for comparison of impacts to the ambient air monitoring thresholds and modeling significant levels.

Operating Scenario	NO_X annual (g/s)	SO_2 3-hr (g/s)	SO_2 24-hr (g/s)	SO_2 annual (g/s)	CO (g/s)	$PM_{10}/PM_{2.5}$ (g/s)	Fluorides (g/s)
110% MCR at 6,400 Btu/lb	9.1	6.2	3.6	3.6	6.1	1.7/1.6	0.15
110% MCR at 4,420 Btu/lb	9.0	6.2	3.6	3.6	6.1	1.7/1.6	0.15
60% MCR at 4,860 Btu/lb	4.9	3.3	2.0	2.0	3.3	0.9/0.9	0.08
88% MCR at 3,535 Btu/lb	7.1	4.8	2.8	2.8	4.8	1.3/1.2	0.12
60% MCR at 3,535 Btu/lb	5.9	3.3	1.9	1.9	3.3	0.9/0.8	0.08
Start-up/Shut-down		4.1	4.1		17.4		

j. The table below presents stack parameters used for the air modeling assessment of the mass-burn MWC boiler at the various operating scenarios.

Operating Scenario	Height (ft)	Base Elevation (ft)	Exit Diameter (ft)	Exhaust Flow Rate (acfm)	Exhaust Temperature (^{O}F)
110% MCR at 6,400 Btu/lb	277	12.5	7.3	179,100	270
110% MCR at 4,420 Btu/lb				182,667	
60% MCR at 4,860 Btu/lb				99,087	
88% MCR at 3,535 Btu/lb				149,379	
60% MCR at 3,535 Btu/lb				149,379	
Start-up/Shutdown				145925	

k. The table below presents the emissions from the three-cell cooling tower, activated carbon silo, and lime silo that were modeled in conjunction with the mass-burn boiler. The activated carbon and lime silos are considered insignificant activities; however, the equipment was conservatively evaluated in the air modeling assessment.

Emission Point	PM_{10} (g/s)	$PM_{2.5}$ (g/s)
Cooling Tower (cell-1)	4.0×10^{-3}	5.7×10^{-5}
Cooling Tower (cell 2)	4.0×10^{-3}	5.7×10^{-5}
Cooling Tower (cell 3)	4.0×10^{-3}	5.7×10^{-5}
Carbon Silo	3.5×10^{-5} (annual) 1.34×10^{-3} (24-hr)	3.5×10^{-5} (annual) 1.34×10^{-3} (24-hr)
Lime Silo	4.4×10^{-4} (annual) 1.34×10^{-3} (24-hr)	4.4×10^{-4} (annual) 1.34×10^{-3} (24-hr)

l. The table below presents stack parameters used for the air modeling assessment of the three-cell cooling tower, activated carbon silo, and lime silo.

Emission Point	Height (ft)	Base Elevation (ft)	Exit Diameter (ft)	Exhaust Flow Rate (acfm)	Exhaust Temperature (^{O}F)
Cooling Tower (cell-1)	55.7	14.4	31.9	1,150,000	91.2
Cooling Tower (cell 2)	55.7	16.7	31.9	1,150,000	91.2
Cooling Tower (cell 3)	55.7	18.7	31.9	1,150,000	91.2
Carbon Silo	49.9	11.1	1.5	660	78.2
Lime Silo	49.9	11.1	1.5	660	78.2

m. The table below presents area source parameters used in the modeling assessment to evaluate fugitive emissions from vehicle travel on paved roads associated with facility expansion.

AreaPoly Source	Base Elevation (ft)	Release Height (ft)	Number of Vertices	Vertical Dimension (ft)	PM_{10} (g/m^2-s)	$PM_{2.5}$ (g/m^2-s)
Road 1	12.0	0	10	4.6	3.32×10^{-7}	4.92×10^{-8}
Road 2	12.5	0	9	4.6	3.32×10^{-7}	4.92×10^{-8}
Road 3	11.4	0	22	4.6	3.32×10^{-7}	4.92×10^{-8}
Road 4	11.4	0	6	4.6	3.32×10^{-7}	4.92×10^{-8}

7.2.1 A preliminary modeling analysis was conducted for pollutants exceeding significant emission levels for which monitoring and modeling thresholds exist. Significant emission levels were exceeded for CO, NO_x, SO_2, PM, PM_{10}, $PM_{2.5}$, fluorides, H_2SO_4, MWC organics, MWC metals, and MWC acid gases. Among these pollutants, monitoring and modeling thresholds exist for CO, NO_x, SO_2, PM/PM_{10}, and fluorides. For $PM_{2.5}$, worst-case thresholds among three options proposed by EPA were used for the modeling assessment. Pollutants, such as H_2SO_4, MWC organics, and various MWC metals, for which no modeling or monitoring thresholds exist, were addressed in other air modeling assessments. See Paragraphs 7.3.1 through 7.3.5 for the other air modeling assessments. The preliminary modeling analysis was conducted to determine: (1) whether or not preconstruction monitoring is required; (2) if further modeling from a full impact analysis is applicable; and (3) to define the impact area within which a full impact analysis must be carried out if applicable. The preliminary analysis compares the maximum impacts at worst-case operating scenarios with the modeling significant impact levels and the thresholds triggering preconstruction monitoring. If the monitoring thresholds are exceeded, preconstruction monitoring is required for that pollutant and averaging period. If the modeling significant impact level is exceeded, a full impact analysis for that pollutant and averaging period is required.

7.2.2 For the preliminary analysis, worst-case operating conditions were identified by evaluating emissions from the mass-burn MWC boiler at various operating scenarios in conjunction with emissions from the 3-cell cooling tower, lime and carbon storage silos, and vehicle traffic from paved roads at the facility. Coarse grid receptors were used to roughly define the area of maximum impact. Maximum impacts determined from the fine receptor grid were compared to the modeling and monitoring thresholds.

7.2.3 Maximum project impacts from the preliminary modeling analysis are shown below for the facility expansion in comparison to the thresholds triggering preconstruction monitoring.

Worst-case impacts were determined among the various operating scenarios. Modeling impacts were compared to worst-case SMCs for $PM_{2.5}$ among three options presented by EPA that are not finalized yet. Results show that impacts are below the monitoring thresholds for SO_2, PM/PM_{10}, $PM_{2.5}$, NO_2, CO, and fluorides. As such, preconstruction monitoring is not required for these pollutants.

MAXIMUM IMPACTS AND AMBIENT AIR MONITORING THRESHOLDS				
Pollutant	Averaging Period	Maximum Impact (ug/m^3)	Monitoring Level (ug/m^3)	Percent Threshold
SO_2	24-hour	2.9	13	22
PM/PM_{10}	24-hour	2.0	10	20
$PM_{2.5}$	24-hour	1.0	2.3[a]	43
NO_2	Annual	0.22	14	2
CO	8-hour[b]	105	575	18
Fluorides	24-hour	0.13	0.25	52

a: The monitoring level is most stringent of proposed options for the $PM_{2.5}$ SMC.
b: The 8-hour impact was not determined for boiler start-up and shut-down periods. Conservatively, the 1-hour CO impact was used to represent worst-case CO impacts.

7.2.4 Maximum project impacts from the preliminary modeling assessment for the facility expansion are shown below in comparison to the modeling significant thresholds for Class II areas. Modeling impacts were compared to worst-case SILs for $PM_{2.5}$ among three options presented by EPA that are not finalized yet. Results indicate that the maximum impacts among the five operating scenarios are below the modeling significant thresholds. As per the New Source Review Workshop Manual (Page C.27), ambient air concentrations of pollutants that are below the air quality significant levels require no further modeling to determine compliance with state and federal ambient air quality standards or PSD Class II increment for that pollutant and averaging period.

MAXIMUM IMPACTS AND MODELING SIGNIFICANT LEVELS				
Pollutant	Averaging Period	Maximum Impacts (ug/m^3)	Modeling Significant Levels Class II Area (ug/m^3)	Percent Threshold
SO_2	3 hour 24 hour Annual	17 2.9 0.65	25 5 1	68 58 65
PM/PM-10	24 hour Annual	2.0 0.61	5 1	40 61
$PM_{2.5}$	24-hour Annual	1.0 0.29	1.2[a] 0.3[a]	83 97
NO_2	Annual	0.22	1	22
CO	1 hour 8 hour[b]	105 105	2,000 500	5 21

a: The modeling significant level is most stringent of proposed options for the $PM_{2.5}$ SIL.
b: The 8-hour impact was not determined for boiler start-up and shut-down periods. Conservatively, the 1-hour CO impact was used to represent worst-case CO impacts.

7.2.5 The air modeling assessment predicted a maximum $PM_{2.5}$ impact (24 hour average) approximately 600 yards from the H-POWER facility inside an area between State Highway 95 and Kuhela Street, from north to south, and between Hanua street and Kalaeloa Boulevard, from west to east. The $PM_{2.5}$ impact (annual average) was predicted about 800 yards south west of the H-POWER facility adjacent to Kaomi Loop. The SCMs and SILs used for $PM_{2.5}$ in the modeling analysis are the most stringent of those proposed by EPA for PSD evaluations. The maximum $PM_{2.5}$ impacts are only 2% of the national ambient air quality standards for this pollutant (65 ug/m^3 over 24-hour average and 15 ug/m^3 annual average). Despite the fact that EPA has not finalized the SMCs or SILs, $PM_{2.5}$ impacts as a result of the facility expansion are *de minimis* and do not significantly affect air quality in the area. Also, based on the modeling results, all other areas outside those where maximum impacts were predicted would be less than the worst-case SMC and SIL proposed for $PM_{2.5}$. Therefore, based on modeling results, the Department has determined that preconstruction monitoring and a full impact analysis are not required for the permit modification.

7.3.1 An air modeling assessment using AERMOD was conducted for the mass-burn MWC boiler to determine compliance with standards specified in HAR §11-60.1-179 for non-carcinogenic and carcinogenic HAPs.

7.3.2 The predicted concentrations in the table below show emission impacts from the mass-burn MWC boiler are below the significant ambient air concentration, for the 8-hour averaging period, for each non-carcinogenic HAP. The time limited value-time weighted average (TLV-TWA) concentration thresholds for pollutants, except for hydrogen chloride, were obtained from the “2008 Guide to Occupational Exposure Values” compiled by the ACGIH. The TLV-TWA concentration threshold for HCl was obtained from the permit application because a concentration threshold was not listed in the 2008 ACGIH publication for HCl. Maximum 8-hour model output was 0.29136 ug/m^3 per lb/hr for the 110% MCR at 6,400 Btu/lb operating scenario as worst-case.

COMPARISON OF 1/100 TLV-TWA TO 8-HOUR CONCENTRATION				
Pollutant	TLV-TWA ($\mu g/m^3$)	8-hour Impact ($\mu g/m^3$)	1/100 TLV-TWA ($\mu g/m^3$)	Percent Standard
Ethylbenzene	442	1.85×10^{-5}	4.42	<1
Fluorides	2,500	3.50×10^{-1}	25	1
Hydrogen Chloride	3,040	4.60	30.4	15
Lead	50	1.70×10^{-2}	0.5	3
Mercury	25	3.50×10^{-3}	0.25	1
Naphthalene	53	3.96×10^{-4}	0.53	<1
o-Xylene	442	3.82×10^{-5}	4.42	<1
Selenium	200	7.34×10^{-4}	2	<1
Toluene	77	2.17×10^{-3}	0.77	<1

7.3.3 The predicted concentrations in the table below show that emission impacts from the MWC boiler are below the significant annaul ambient air concentration for each non-carcinogenic HAP. Maximum model output was 0.02888 ug/m^3 per lb/hr for the 110% MCR at 6,400 Btu/lb operating scenario as worst-case.

COMPARISON OF 1/420 TLV-TWA TO ANNUAL CONCENTRATION				
Pollutant	TLV-TWA ($\mu g/m^3$)	Annual Impact ($\mu g/m^3$)	1/420 TLV-TWA ($\mu g/m^3$)	Percent Standard
Ethylbenzene[a]	442	1.82×10^{-7}	1.05	<1
Fluorides	2,500	3.47×10^{-2}	5.95	1
Hydrogen Chloride	3,040	4.56×10^{-1}	7.23	6
Lead	50	1.68×10^{-3}	0.12	1
Mercury	25	3.47×10^{-4}	0.06	1
Naphthalene[a]	53	3.25×10^{-6}	0.126	<1
o-Xylene[a]	442	3.13×10^{-7}	1.05	<1
Selenium[a]	200	6.02×10^{-6}	2	<1
Toluene[a]	77	1.78×10^{-5}	0.188	<1

a: Pollutant from combustion of fuel oil No. 2 auxiliary fuel with annual impact reduced by a factor of 869,250/10,512,000. The reduction factor is based on a total combined auxiliary fuel limit is 869,250 gallons per year. The reduction factor is also based on a 1,200 gallon per hour maximum fuel consumption or 10,512,000 gallon per year fuel rate.

7.3.4 An ambient air screening analysis in the table below shows that pollutant emissions from the mass-burn MWC boiler are below the individual lifetime cancer risk of more than ten in one million assuming continuous exposure for seventy years as defined in HAR 11-60.1, Subchapter 9 for carcinogenic hazardous air pollutants. For the analysis, the ambient annual air concentration was compared to the Preliminary Remediation Goals (PRG) concentration. The 2004 Region 9 PRG table was used for the analysis which combines EPA toxicity values with "standard" exposure factors to estimate the risk to inhalation exposure to the carcinogenic hazardous air pollutant. The toxicity values are protective of humans, including sensitive groups, over a lifetime.

Ambient Air Screening Analysis Ratio of Annual Ambient Air Concentration to PRG Concentration						
Pollutant	Annual Impact ($\mu g/m^3$)	Ambient Air PRG ($\mu g/m^3$)	Cancer Risk[a]		Risk Standard	Percent Risk Standard
Arsenic[b,c]	9.53×10^{-6}	4.5×10^{-4}	2.12×10^{-8}			
Benzene[b]	6.14×10^{-7}	2.5×10^{-1}	2.46×10^{-12}			
Beryllium[b]	1.20×10^{-6}	8.0×10^{-4}	1.50×10^{-9}			
Cadmium	1.15×10^{-4}	1.1×10^{-3}	1.05×10^{-7}		---------	---------
Chromium	1.00×10^{-4}	1.6×10^{-4}	6.25×10^{-7}			
Dioxins[d]	3.13×10^{-9}	4.5×10^{-8}	6.96×10^{-8}		---------	---------
Formaldehyde[b]	1.74×10^{-4}	1.5×10^{-1}	1.16×10^{-9}			
Nickel	1.94×10^{-4}	8.0×10^{-3}	2.43×10^{-8}			
		[a]Total----------->	8.48×10^{-7}		1×10^{-5}	8.5

a: Risk = $[(conc_X/PRG_X) + (conc_Y/PRG_Y)\ (conc_Z/PRG_Z) + \cdots] \times 10^{-6}$.

b: Pollutant from combustion of fuel oil No. 2 auxiliary fuel with annual impact reduced by a factor of 869,250/10,512,000. The reduction factor is based on the total combined auxiliary fuel limit of 869,250 gallons per year. The reduction factor is also based on a 1,200 gallon per hour maximum fuel consumption or 10,512,000 gallon per year fuel consumption rate.

c. The lb/hr emission rate is higher for burning fuel oil No. 2 auxiliary fuel than for burning MSW during normal operation. Therefore, total impact is from that for burning fuel oil No. 2 auxiliary fuel plus impact from burning MSW for remaining time. The time required for burning fuel oil No. 2 auxiliary fuel is (869,250 gallons)(hr/1,200 gallons) = 724 hours. The remaining time to burn MSW is 8,760 -724 hr/yr = 8,036 hr/hr. The time to burn the various fuels was applied to determine the emissions impact.

d: PRG based on ambient air PRG for Dioxin (2,3,7,8-TCDD).

7.3.5 Because sulfuric acid mist exceeds significant emission levels, H_2SO_4 impacts were evaluated to determine compliance with air quality thresholds. Sulfuric acid mist is not among the 188 chemicals regulated under the CAA as a HAP and no federal or Hawaii State ambient air quality standards are specified for this pollutant. There are also no monitoring, modeling, or PSD increment thresholds specified for H_2SO_4. As such, the 24-hour California Ambient Air Quality Standard (CAAQS) for sulfates of 25 ug/m^3 was used to evaluate 24-hour impacts. For evaluating annual impacts, the inhalation reference exposure level of 1 ug/m^3 for sulfuric acid, that is a "present all the time" threshold, was used. Results listed in the tables below show that 24-hour and annual impacts do not exceed air thresholds provided by the Department's toxicologist for H_2SO_4.

Pollutant	24-Hour Standard (ug/m^3)	24-Hour Impact (ug/m^3)	Percent Standard
H_2SO_4	25	1	4

Pollutant	Annual Standard (ug/m^3)	Annual Impact (ug/m^3)	Percent Standard
H_2SO_4	1	0.28	28

8. Class I Area Impact Analysis

8.1 CHRRV sent a letter to the National Park Service regarding applicability for performing a Class I Area Impact analysis for Haleakala National Park that is approximately 203 km (126 miles) from the H-POWER facility. As per the letter, the proposed facility expansion will not have an adverse impact on Haleakala National Park because the emissions will be controlled using BACT. Also the sum of the potential visibility impairing pollutants (NO_x, SO_2, PM, and H_2SO_4) in tons per year (652.6 TPY) divided by the distance from the proposed project to Haleakala National Park is 3.2. The National Park Service in response to CHRRV's letter indicated that it will screen the project from further Class I analysis based on the size of the emissions increase, relative to the distance to Haleakala National Park. The National Park Service stated that the H-POWER expansion is unlikely to result in an adverse impact on the Air Quality-Related Values (AQRV's).

9. Visibility Impairment Analysis

9.1 For information, CHHRV conducted a Class II area visibility analysis for the project expansion. The H-POWER facility is located approximately 17.9 kilometers (11 miles) west-southwest of the USS Arizona Memorial in Peal Harbor. Available data from the application indicates the wind is blowing from the Arizona Memorial towards the H-POWER facility 98% of the time. A level 2 VISCREEN modeling analysis demonstrated that visibility at the USS Arizona Memorial will not be adversely impacted by the project. The permit application presents the results from the VISCREEN modeling analysis in Tables L-3 and L-4 of Appendix K.

10. Additional Analysis

10.1 A growth analysis was provided to assess industrial, commercial, and residential growth in CIP as a result of the H-POWER facility expansion. A labor force will be required to construct the new facility expansion. Also, additional employees will be required to operate the plant after completing constructing of the plant addition. The peak in monthly employment to construct the plant is 300 additional construction workers and contractors over a 30 month period. Laborers were anticipated to be drawn predominately from the local area. The applicant stated that the temporary increase in labor force will not result in significant general commercial, residential, or industrial growth near the project. It was anticipated that additional employees to run the plant will be from the local area near the facility that already live in the area. It was concluded by the applicant that impacts on growth in the local area as a result of additional employees to run the plant will be negligible in comparison to the level of growth in population and work force in other areas of the island. Based on the information provided, the Department has determined that the proposed project will not cause a significant industrial, commercial, or residential growth in areas surrounding the H-POWER facility.

10.2 The impacts on soils and vegetation were evaluated in the permit application. Potential impacts on soils and vegetation from operating the new unit could result from wet and/or dry deposition of particulate and other pollutants such as SO_2 and NO_2. A comparison of the predicted concentrations of SO_2, NO_2, and CO with soil and vegetation screening levels in USEPA guidance (USEPA1980) demonstrated that impacts to soils and vegetation will be negligible. Table 10-1 on Page 145 of the application shows a comparison of air impacts to the soils and vegetation screening levels.

10.3 EPA sent a letter to the Pacific Islands Fish and Wildlife Office on September 2, 2009 requesting concurrence from the Fish and Wildlife Service (FWS) that the direct and indirect effects of the proposed H-POWER expansion are not likely to adversely affected listed species that included four endangered Hawaiian waterbirds and two and two endangered plants. Of the species evaluated, the FWS in response concurred that the proposed expansion project may affect, but is not likely to adversely affect the Ewa hinahina which is an endangered plant. The FWS also indicated that no further action pursuant to the Endangered Species Act is necessary unless the project changes, there is new information that listed species may be affected in a manner not considered, or a new species or critical habitat is designated that may be affected by the project.

11. Significant Permit Conditions

11.1 Significant permit conditions are listed below for the modification to add a new MWC boiler.

11.1.1 Except as provided in the permit's alternate operating scenario, the mass-burn MWC boiler shall be fired only on MSW, fuel oil No. 2, and used cooking oil.

Reason for 11.1: The applicant proposed to fire the mass-burn boiler on fuel oil No. 2, used cooking oil, and MSW. The applicant also requested, as an alternate operating scenario, to fire the mass-burn MWC boiler on supplemental waste.

11.1.2 The maximum firing rate of the mass-burn MWC boiler shall not exceed 1,200 gallons per hour for the total combined firing of fuel oil No. 2 and used cooking oil auxiliary fuels.

11.1.3 The total combined fuel oil No. 2 and used cooking oil auxiliary fuel consumption for the mass-burn MWC boiler shall not exceed 869,250 gallons in any rolling twelve-month (12-month) period.

11.1.4 The maximum sulfur content of the fuel oil No. 2 auxiliary fuel fired by the mass-burn MWC boiler shall not to exceed 0.05% by weight.

11.1.5 The mass-burn MWC boiler shall only be fired on fuel oil No. 2 auxiliary fuel during warm-up periods.

11.1.6 The mass-burn MWC boiler shall only be fired on fuel oil No. 2 auxiliary fuel and MSW during start-up and shut-down periods.

Reasons for 11.1.1 through 11.1.6: These conditions were incorporated, as proposed by the applicant for operating the mass-burn boiler. Changes to proposals in the application are listed in

Paragraph 1.6.c. The auxiliary fuel sulfur content was lowered from 0.5% by weight to 0.05% by weight to reduce SO_2 emissions. Proposing a 0.5% by weight auxiliary fuel sulfur content results in an SO_2 emission rate that is higher than that used for the ambient air quality modeling assessment. The applicant chose to reduce the auxiliary fuel sulfur content rather than re-model SO_2 with a higher emission rate. The 869,250 gallon per year auxiliary fuel limit is based on firing auxiliary fuel for 724 hours.

11.1.7 In any 4-hour block arithmetic average, except during warm-up, start-up, shutdown, or malfunction, the combustion temperature of the mass-burn MWC boiler shall be maintained at or above 1,800 ^{O}F.

Reason for 11.7: This condition is consistent with the minimum combustion temperature requirement for the existing RDF MWC boilers. Available literature indicates that combustion temperatures at or above 1000 ^{O}C (approximately 1800 ^{O}F) promote destruction of organic compounds.

11.1.8 Incorporate, BACT, CAM, and 40 CFR Part 60, Subpart Eb requirements for the new boiler and associated equipment. The following requirements specified in the permit are different than those from 40 CFR Part 60, Subpart Eb:

a. The permit specifies performance test frequency for the mass-burn MWC boiler to be no less than 9 calendar months and no more than 12 calendar months following the previous performance test; and five performance tests must be completed in each 5 year calendar period. The test frequency is worst-case among those specified in Subpart Eb for the various pollutants. In 40 CFR Part 60, Subpart Eb, for a majority of the pollutants, performance test frequency is no less than 9 calendar months and no more than 15 calendar months from the previous performance test; and five performance tests must be completed in each 5 year calendar period. The standard, though, specifies that performance tests for HCl be conducted no more than 12 calendar months following the previous performance test. The permit specifies the same test frequency for all pollutants to simplify testing procedures (e.g., scheduling, notification, and reporting).

b. The permit limits boiler warm-up periods to 12 hours at a time. No hour limit is specified in 40 CFR Part 60, Subpart Eb for boiler warm-up. The 12 hour limit for boiler warm-up is consistent with requirements for the existing RDF MWC boilers.

c. An allowance is provided in Subpart Eb to exclude continuous monitoring system data from calculations to determine compliance with requirements for start-up, shut-down, and malfunction. This provision was changed to include warm-up periods of operation where CMS data can be excluded form compliance calculations. These provisions, however, are not applicable to NO_X, SO_2, and CO emission limits specified for warm-up, start-up, and shut-down periods. These provisions are also not applicable to determine compliance with boiler opacity limits.

Reason for 11.8: The BACT, CAM, and Subpart Eb MACT standards apply to the new unit and associated equipment as determined in Paragraphs 2.2, 2.7.2, and 2.9.

11.1.9 Incorporate emission limits for boiler warm-up, start-up, and shut-down for pollutants exceeding BACT emission thresholds.

Reason for 11.1.9: Incorporate conditions pursuant to Paragraphs 1.7(3) and 1.7(4). Emission limits for these periods of operation were only applied to pollutants exceeding significant emission levels that are monitored for compliance with an applicable emissions limit using a CEMS. As per 40 CFR, Part 60, Subpart Eb, CEMS are required for NO_X, SO_2, and CO. Therefore, emission limits were only specified for NO_X, SO_2, and CO during periods of warm-up, start-up, and shut-down.

11.1.10 For emission limits specified for start-up and shut-down, a minimum concentration of 5.0% CO_2 and a maximum concentration of 14.0% O_2 may be substituted for the measured diluent gas concentration values during hours when the hourly average concentration of CO_2 is less than 5.0% CO_2 or the hourly average concentration of O_2 is greater than 14.0% O_2.

Reason for 11.1.10: This condition was incorporated to prevent inaccurate readings by the CEMS for determining compliance with the emission limits specified in Paragraph 11.1.9 for start-up and shut-down.

11.2 Significant permit conditions are listed in 11.2.1 through 11.2.2 for existing baghouses servicing the waste processing facility, the existing 5-cell cooling tower, and the new 3-cell cooling tower.

11.2.1 The pressure drop across the primary and secondary shredder baghouses shall be maintained at 1" to 7" H_2O.

Reason for 11.2.1: This condition was specified based on the pressure drop recommended by baghouse manufacturer to ensure proper control efficiency for particulate.

11.2.2 The dissolved solids content of the recirculation water from the 3-cell and 5-cell and cooling towers shall not exceed 57,000 ppm.

Reasons for 11.2.1 - 11.2.2: Maximum potential emissions were based on the maximum total dissolved solids content specified for the cooling tower recirculation water. The cooling tower recirculation water will be obtained from the aquifer below the H-POWER facility and the total dissolved solids content was based on analysis of water sampled from the aquifer.

12. <u>Conclusion and Recommendation</u>

12.1 Emissions from the mass-burn MWC boiler were based on operation at maximum rated capacity. The unit is equipped with post combustion controls and other controls inherent to the design of the boiler to minimize emissions. Air modeling assessments for the mass-burn MWC boiler operating concurrently with other emission sources (3-cell cooling tower, lime storage silo with baghouse, activated carbon storage silo with baghouse, and fugitive dust from an increase in traffic on paved roads) shows air impacts are below the PSD ambient air monitoring threshold concentrations and PSD modeling significant impact levels for air quality impacts in Class II Areas. The air modeling assessment to determine hazardous air pollutant impacts shows compliance with the significant ambient air concentration levels specified in HAR §11-60.1-179 (c). The air modeling assessment for H_2SO_4 shows compliance with the standards specified by the Department's toxicologist. The Department also concurs with the applicant's BACT proposals for CO, NO_X, SO_2, PM, PM_{10}, $PM_{2.5}$, fluorides, H_2SO_4, acid gases, MWC metals, and MWC organics. Recommend issuance of the covered source permit subject to the significant permit conditions, a public hearing, the thirty day public comment period, and forty-five day EPA review period.

Mike Madsen October 14, 2009