FORT LAUDERDALE NEWS/SUN-SENTINEL

Published Daily

Fort Lauderdale, Broward County, Florida
Boca Raton, Palm Beach County, Florida

STATE OF FLORIDA
COUNTY OF BROWARD/PALM BEACH

Before the undersigned authority personally appeared Molly Curry who on oath says that he is Classified Supervisor of the Fort Lauderdale News/Sun-Sentinel, Daily newspapers published in Broward/Palm Beach County, Florida that the attached copy of advertisement, being a Notice of Certification in the matter of To Construct and Operate an Electrical Power Plant

_______________ in the _______________ Court,

was published in said newspaper in the issues of Oct. 11, 1985

Affiant further says that the said Fort Lauderdale News/Sun-Sentinel are newspapers published in said Broward/Palm Beach County, Florida, and that the said newspapers have heretofore been continuously published in said Broward/Palm Beach County, Florida, each day, and have been entered as second class matter at the post office in Fort Lauderdale, in said Broward County, Florida, for a period of one year next preceding the first publication of the attached copy of advertisement; and affiant says that he has neither paid nor promised any person, firm or corporation any discount, rebate, commission or refund for the purpose of securing this advertisement for publication in said newspapers.

Molly Curry

Sworn to and subscribed before me

this 11th day of October

A.D. 19 85

Notary Public

(SEAL) Notary Public, State of Florida
My Commission Expires Nov. 1988
Bonded Thru Troy Fain Insurance, Inc.

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices And/Or To Other Than The Addressee	
To: Edward Svec	Loctn.: BER
To:	Loctn.:
To:	Loctn.: OCT 28 1985
From:	Date:
Reply Optional [ ] Date Due:	Reply Required [ ] Info. Only [ ] Date Due: BAQM

TO: Clair Fancy
Tom Rogers
Barry Andrews
Ed Svec
Buck Oven

FROM: Julia D. Cobb, OGC *Julie*

RE: South Broward County Resource Recovery Facility

DATE: October 25, 1985

Next Thursday, the attorneys for the applicant, Broward County, will be taking your deposition. Attached is the notice for your particular time. I'm not sure where in Twin Towers you will be deposed.

I will be at a hearing in Clearwater through Wednesday, but would like to meet with all of you on Thursday a.m. at 8:30 in my office. In the meantime, please contact Buck Oven if you have any questions.

JDC/ml

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

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For Routing To District Offices And/Or To Other Than The Addressee	
To: Clair Fancy	Loctn.: DER
To: R-100	Loctn.:
To:	Loctn.: OCT 28 1985
From:	Date:
Reply Optional [ ] Date Due	Reply Required [ ] Info. Only [ ] Date Due: BAQM

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STATE OF FLORIDA
DIVISION OF ADMINISTRATIVE HEARINGS

IN RE: SOUTH BROWARD COUNTY RESOURCE RECOVERY PROJECT, INC., POWER PLANT SITING CERTIFICATION APPLICATION P.A. 85-21	CASE NO. 85-1106 CASE NO. 85-1166 **NOTICE OF TAKING DEPOSITION**

TO: JULIA D. COBB, ESQ.
Assistant General Counsel
Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

PLEASE TAKE NOTICE that the undersigned attorneys will take the deposition of:

NAME AND ADDRESS	DATE AND TIME	PLACE
EDWARD SVEC Department of Environmental Regulation Twin Towers Office Building 2600 Blair Stone Road Tallahassee, Florida 32301	Thursday, October 31st at ~~10:30~~ a.m. 11:00	Department of Environmental Regulation Twin Towers Office Building 2600 Blair Stone Road Tallahassee, Florida 32301

upon oral examination before Sue S. Habershaw, Court Reporter, or any other officer appointed by law to take depositions in the State of Florida. The oral examination will continue until completed. The deposition is being taken for the purpose of discovery, for use at trial, and for such other purposes as are permitted under the rules of civil procedure and the rules of the Florida Administrative Code. Please bring with you at the time of deposition any and all files, reports, letters, and any other documentation relating to Broward County's application for power plant siting certification (No. P.A. 85-21) in the possession of the Department of Environmental Regulation, including those related to the Department's justification for requiring scrubbers and fabric filter systems for this project. Broward County makes this request for production under the rules of civil procedure and the Public Records Act, chapter 119 of the Florida Statues.

10/10/85

E.6. Air Quality Impacts

Broward County proposes to construct a resource recovery facility near Fort Lauderdale, Florida. The facility will be a major source of the air pollutants particulate matter, sulfur dioxide, nitrogen oxides, and carbon monoxide from the combustion of municipal solid waste in three incinerators. Thermal energy from the combustion will be used to produce steam for electric power generation.

a. Construction

The primary sources of air pollutants during construction of the facility will originate from vehicular and heavy equipment exhaust emissions and fugitive dust from wind and the movement of equipment and vehicles over unpaved areas.

The acts of stripping and filling of the construction site will produce some dust clouds. Estimates by the EPA indicate that suspended dust levels from heavy construction activities approximate 1.2 tons per acre per month of construction activity. The applicant indicates that water sprays and other dust suppression measures will be applied on problem sites as necessary.

b. Operation

(i) Emissions

During operation of the facility, expected stack emissions will be particulates, SO_2, fluorides, lead, carbon monoxide, hydrocarbons, mercury, beryllium, chlorides and oxides of nitrogen. Other site emissions will arise from landfilling and truck movement around the site causing fugitive dust. Odor is not expected to be a problem because plant air will be drawn towards the boiler, where odor-causing chemicals in the air stream will be combusted.

The emission of particulate matter from the boilers has been proposed to be controlled by an electrostatic precipitator (ESP). Such emissions are limited by subsection 17-2, FAC, to 0.08 grains per standard cubic foot corrected to 50% excess air and by subsection 17-2.600(1), FAC, to 20% opacity of visible emissions.

The applicant has proposed to meet an emission limit of 0.03 grains per dry standard cubic foot at 12% CO_2.

(ii) Rule Applicability

The applicable air quality related rules are contained in Chapter 17-2 of the Florida Administrative Code (FAC) and Chapter 40 of the Code of Federal Regulation. Two broad categories can be distinguished; nonattainment rules, or rules governing pollutants emitted in areas with measured concentrations of these pollutants exceeding the air quality standards, and attainment rules, or rules governing pollutants emitted within areas not exceeding an air quality standard for that pollutant. Broward County is designated a nonattainment area for the pollutant ozone (40 CFR 81.310 and Rule 17-2.410, FAC). For all other pollutants for which an air quality standard exists (criteria pollutants), the county is designated as attainment (40 CFR 81.310 and Rule 17-2.420, FAC).

The applicant is proposing initially to construct three 750 TPD municipal solid waste (MSW) incinerators. An ultimate maximum capacity of 3,300 TPD is anticipated in the future which will require a fourth unit. The maximum annual emissions for all regulated pollutants have been estimated by the applicant based on operation of the boilers at 115% of their rated capacity. These emissions are compared to the significant emission rates used to determine the Prevention of Significant Deterioration (PSD) review applicability (i.e. the attainment rules) (40 CFR 52.21(b)(23) and Rule 17-2.500, Table 500-2) and nonattainment review applicability (Rule 17-2510(2)). Table 1-1 lists the proposed emissions along with the applicable significant emissions rates. The proposed facility has the potential to emit more than 100 tons per year of one or more regulated pollutants and is, therefore, subject to review for Prevention of Significant Deterioration (40 CFR 52.21 and Rule 17-2.500(5)(c), FAC). PSD review includes a determination of Best Available Control Technology (BACT) and an air quality analysis for each attainment or noncriteria pollutant that would be emitted in a significant amount as listed in Table 6-1. For the proposed facility, the applicant has addressed PSD review for 10 pollutants: PM, SO_2, NO_x, CO, Pb, fluorides, sulfuric acid mist, Be, Hg, and As.

Nonattainment review (Rule 17-2.510(4), FAC) is required for all nonattainment pollutants which have the potential to emit 100 tons per year or more of the affected pollutant. Nonattainment review includes a determination of Lowest Achievable Emission Rate (LAER) and the obtaining of emission offsets. The regulated pollutant for ozone is volatile organic compounds (VOC). The controlled emission rate of VOC is less than 100 tons per year and is, thus, not subject to nonattainment review.

The proposed facility is also subject to the provisions of the federal New Source Performance Standards, 40 CFR 60 Subpart E, for incinerators. Rules require that any standard established by BACT shall be, at a minimum, as stringent as an applicable New Source Performance Standard.

The source is also subject to the provisions of Rule 17-2.620(2), which states that no person shall cause, suffer, allow or permit the discharge of air pollutants which cause or contribute to an objectionable odor.

c. Best Available Control Technology

The emission limits determined to be Best Available Control Technology are based on the use of a baghouse collector for particulate matter and heavy metals and a scrubber to control fluorides and acid gases. Using a maximum charging rate of 2,558 tons per day and continuous operation, emissions from the three proposed incinerators are as follows:

POLLUTANT	EMISSION LIMIT	POUNDS/HR	TONS/YR
Particulate Matter	0.015 gr/dscf corrected to 12% CO_2	37.5	164.3
Sulfur Dioxide	2.8 lb/ton (30 day average) 5.6 lb/ton (maximum)	~~301.8~~ 603.9	1322.1
Nitrogen Oxides	3.0 lb/ton	323.4	1416.5
Carbon Monoxide	0.8 lb/ton	86.2	377.7
Lead	0.014 lb/ton	1.5	6.4

POLLUTANT	EMISSION LIMIT	POUNDS/HR	TONS/YR
Fluorides	0.02 lb/ton	2.5	10.9
Beryllium	8.4 E-6 lb/ton	9.1 E-4	4.0 E-3
VOC	0.12 lb/ton	12.9	56.7
Sulfuric Acid Mist	---	4.6	20.0

The emission rates of fluorides and sulfuric acid mist assumes 90% removal by the scrubber.

In addition, hydrogen chloride will be emitted at an uncontrolled rate of 4.0 pounds per ton of waste burned (431.2 pounds per hour, 1888.7 tons per year). A scrubber should reduce emissions of hydrogen chloride by 90%. Mercury emissions are limited to 3200 grams per day. Lead emissions are projected to be 29.1 pounds per hour (127.5 tons per year) based on an emission factor of 0.27 pounds per ton of waste burned. Actual lead emissions should be much lower because a baghouse collector can control the fine particulate matter on which lead tends to sorb. Visible emissions from the incinerators are limited to 15% opacity.

Compliance with the limitations for particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, lead, fluoride, mercury and visible emissions shall be determined in accordance with Florida Administrative Code Rule 17-2.700, DER Methods 1, 2, 3, 5, 6 and 9; 40 CFR 60 Appendix A, Methods 7, 10, 12 and 13; and 40 CFR 61, Appendix B, Method 101.

Best Available Control Technology (BACT) Determination
South Broward County Resource Recovery, Inc.
Broward County

The applicant plans to eventually construct a 3300 ton per day (TPD) municipal solid waste (MSW) incinerator facility to be located at 4400 South, State Road 7, Fort Lauderdale, Florida. The thermal energy from combustion of the MSW will be used to produce steam for electric power generation.

The present plans are to install three 750 TPD mass burn incinerators that will process a total of 2250 TPD of MSW. This BACT review will apply only to these three units. At some future date a BACT review will be made for the fourth unit as a modification to an existing facility.

Each of the three mass burn incinerators will have an approximate heat input of 313 million Btu per hour, based upon a MSW calorific content of 4500 Btu per pound. Each incinerator will be scheduled to operate 8760 hours per year, and on this basis the tons per year of the various air pollutants emitted were calculated. The applicant has projected a total annual tonnage of regulated air pollutants emitted from the three units based on operating at 115% above nameplate capacity to be as follows:

		line up	line up
Particulate	(PM)	~~315~~ 328	(25)*
Sulfur Dioxide	(SO_2)	2319	(40)*
Nitrogen Oxides	(NOx)	2361	(40)*
Carbon Monoxide	(CO)	378	(100)*
Lead	(Pb)	128	(0.6)*
Beryllium	(Be)	0.0040	(.0004)*
Mercury	(Hg)	3.9 [1]	(0.1)*
Arsenic	(As)	0.13	(0)*
Fluorides	(F)	109	(3)*
Ozone	(O_3)	57 (VOC)	(40)*
Sulfuric Acid Mist		200 [2]	(7)*

[1] Based on a potential emission factor of 0.00092 lbs/MMBTU

[2] Based on a potential emission factor of 0.047 lbs/MMBTU

* Regulated Air Pollutants-Significant Emission Rates Florida Administrative Code Rule 17-2.500, Table 500-2.

The Broward County solid waste energy recovery facility was reviewed according to Florida Adminstrative Code Chapter 17-17, Electrical Power Plant Siting and Rule 17-2.500, Prevention of Significant Deterioration (PSD). The Bureau of Air Quality Management (BAQM) performed the air quality review for the siting committee, which includes this BACT determination. The certification number assigned to the proposed facility is PA 85-21.

Rule 17-2.500(2)(f)3 requires a BACT review for all regulated pollutants emitted in an amount equal to or greater than the significant emission rates listed in Table 500-2, Regulated Air Pollutants. The facility is located in an area classified as attainment for all air pollutants, except ozone. The emission limits for the air pollutant ozone (VOC's are the controlling pollutant) ~~(VOC)~~ are determined through the application and employment of Lowest Achievable Emission Rate (LAER), Rule 17-2.640, if applicable.

BACT Determination Requested by the Applicant:

The following emission limits are based upon a unit ton~~s~~ of MSW charged.

PM	- 0.67 lbs	CO	- 0.80 lbs	Hg	- 0.0081 lbs
SO_2	- 4.91 lbs	Pb	- 0.27 lbs	F	- 0.23 lbs
NOx	- 5.00 lbs	Be	- 8.4 x E-6	VOC	- 0.12 lbs

Date of receipt of a BACT application:

June 9, 1985

Date of publication with Florida Administrative Weekly:

June 14, 1985

Review Group Members:

[redacted] - New Source Review Section

Clair Fancy - Central Air Permitting

~~Tom Rogers~~ - Air Modeling Section

Buck Oven - Power Plant Siting

BACT Determination by DER:

Pollutant	Emission Limit Per Unit ~~Source~~
Particulate Matter	0.015 grains/dscf, corrected to 12% CO
Sulfur Dioxide	2.8 lb/ton MSW charged, 30 day average, not to exceed 5.6 lb/ton
Nitrogen Oxides	3.0 lb/ton MSW charged
Carbon Monoxide	0.8 lb/ton MSW charged

Pollutant	Emission Limit Per ~~Source~~
Fluorides	90% control
Sulfuric Acid Mists	90% control
Lead	~~(1)~~ 95% control
Mercury	~~2240~~ 3200 grams/day (1)
Beryllium	8.4 x E-6 lb/ton MSW charged
VOC	0.12 lb/ton MSW charged
Visible Emission	15% opacity

~~(1) No definite emission limit set but control technology discussed in BACT Determination Rationale.~~

(1) Total emissions from the facility shall not exceed this value. Compliance with the mercury emission limit shall be demonstrated in accordance with 40 CFR 61, Method 101 Appendix B.

Compliance with limitations for sulfur oxides, particulate matter, and nitrogen oxides will be demonstrated in accordance with Florida Administrative Code Rule 17-2.700, DER Methods 1, 2, 3, 4, ~~5~~ and 6, and 40 CFR 60 Appendix A; Methods 5, 7, 10, 12, 13A or 13B. Compliance with the opacity limit shall be demonstrated in accordance with Florida Administrative Code Rule 17-2.700(6)(a)9., DER Method 9.

A continuous monitoring system to measure the opacity of emissions of each stack shall be installed, calibrated, and maintained in accordance with the provisions of Rule 17-2.710, Continuous Emission Monitoring Requirements. The CEM's must be installed and operational prior to compliance testing.

BACT Determination Rationale:

Each MSW incinerator will have a charging rate more than 50 tons per day, and therefore, is subject to the provisions of 40 CFR 60.50, Subpart E, New Source Performance Standards (NSPS). The NSPS standard regulates only particulate matter. The

particulate matter standard is 0.08 grains/dscf, corrected to 12% CO. This NSPS was promulgated in 1971 and no longer reflects state-of-the-art for control of particulate emissions. Recent stack testing data for MSW incinerators indicates that both electrostatic precipitator and fabric filter control technology are capable of controlling particulate emissions well below the applicant's proposal of 0.03 grains/dscf. Based on the control technology available, a particulate matter emission limit of 0.015 grains/dscf corrected to 12% CO_2 is judged to represent BACT. All the other requirements as set forth in the NSPS, Subpart E, will apply.

The Department has determined the emission limit for SO_2 to be 2.8 pounds per ton on MSW charged into the incinerator based on a 30 day average. MSW components that appear to be major contributors of sulfur include rubber, plastics, food wastes, yard wastes, and paper.

The SO_2 emission limit was determined to be BACT by evaluating studies of emissions test data for similar MSW incinerations. Various studies have indicated average emission levels of 2.0 to 2.8 lb SO_2/ton MSW charged with deviations of $\pm$ 1.3 to 1.6 lb/ton. The amount of SO_2 emitted would be comparable to the burning of distillate oil having less than a 0.5% sulfur content. Burning low sulfur fuel is one acceptable method of controlling SO_2 emissions. The installation of a flue gas desulfurization system to control SO_2 emissions is not warranted when burning MSW.

The mercury emission limit determined as BACT is equal to the National Emission Standard to Hazardous Air Pollutants (NESHAPs), 40 CFR 61.50, Subpart E, for municipal waste water sludge incineration plants. Although this standard does not apply to the incineration of municipal solid waste, it is an emission limit that should not be exceeded. The BACT is determined to be 3200 grams per day for the entire facility. This level of mercury emissions is not considered to have a major impact on the environment.

The uncontrolled emission of beryllium, according to the California report, when firing MSW is estimated to be 6.2 x 10^{-6} pounds per million Btu. Uncontrolled beryllium emissions would be approximately 11 grams per 24 hours or 0.01 TPY. The operating temperature of the particulate matter emission control device will be below 500°F. Operation below this temperature is necessary to force absorption/condensation of beryllium oxides, present in the flue gas stream, onto available fly ash particles subsequently removed by the particulate control device. Assuming 95% efficiency of the control device the annual beryllium emissions are estimated at 0.0007 tons per year. This amount of beryllium emitted is considered to have a negligible impact on the environment. The emission factor of 8.4 x 10^{-6} lb/ton MSW proposed by the applicant is judged to be BACT. If, however, beryllium containing waste as defined in the National Emission Standards for Hazardous Air Pollutants (NESHAPs), Subpart C, Subsection 61.31(g), is charged into the incinerator, emissions of beryllium to the atmosphere shall not exceed 10 grams per 20 hours or an ambient concentration of 0.01 ug/m^3, 30 day average. Compliance with this beryllium emission limit will be in accordance with the NESHAPs, Subpart C.

The applicant has projected unabated lead and fluoride(s) emissions to be 128 and 109 tons per year respectively. Projected sulfuric acid mist emissions are capable to being as high as 200 tons per year. These amounts are well in excess of the significant emission rates given in Florida Administrative Code Rule 17-2.500, Table 500-2.

With respect to lead emissions, two conditions are needed to achieve high removal efficiencies of metallic compounds emitted at refuse burning facilities: (1) operation of particulate matter control equipment at temperatures below 260°C (500°F), and (2) consistently efficient removal of submicron fly ash particles. The temperature of the incinerator combustion gases at the inlet to the particulate control device is estimated to be 425-475°F. At these temperatures the particulate control

equipment would be capable of removing the lead emissions from the flue gas stream.

When flue gas temperatures are lowered below 260°C (500°F), metallic compounds are removed from the vapor phase by absorption and condensation preferentially on fine particles with submicron particles receiving the highest concentrations of metals. Properly designed and operational fabric filter systems appear at this time to offer the best method for consistent and efficient removal of fine (and in particular submicron) fly ash. Removal efficiencies of fine fly ash using these systems can be in excess of 99% with respect to MSW incinerators. Studies have indicated the weight percent of submicron particles emitted from combustion is on the order of 45% which clearly indicates the need for efficient control of particles in this range.

Emissions of fluoride originate from a number of sources in the refuse. The mechanisms of governing fluoride release and formation of hydrogen fluoride at refuse-burning facilities are probably similar to those for hydrogen chloride. The control of fluorides can be reduced at refuse-burning plants by removal of selected refuse components with high fluoride contents, and the use of flue gas control equipment. In view of the fact that it is proposed to incinerate materials that contain fluoride, BACT for the control of fluorides is installation of a wet or dry flue gas scrubber system. The addition of a scrubber system would also provide control for SO_2 emissions addressed earlier in this analysis as well as other acid gases which will be addressed in other sections of the analysis.

During combustion of municipal solid waste, NOx is formed in high temperature zones in and around the furnace flame by the oxidation of atmospheric nitrogen and nitrogen in the waste. The two primary variables that affect the formation of NOx are the temperature and the concentration of oxygen. Techniques such as the method of fuel firing to provide correct distribution of combustion air between overfire and underfire air, exhaust gas recirculation, and decreased heat release rates have been used to

reduce NOx emissions. A few add-on control techniques such as catalytic reduction with ammonia and the thermal de-NOx are still experimental and are not considered to be demonstrated technology for the proposed project. State-of-the-art control of the combustion variables will be used to limit NOx emissions at 3 pounds per ton of MSW charged. This level of control is judged to represent BACT.

Carbon monoxide is a product of incomplete combustion where there is insufficient air. Incomplete combustion will also result in the emissions of solid carbon particulates in the form of smoke or soot and unburned and/or partially oxidized hydrocarbons. Incomplete combustion results in the loss of heat energy to the boiler. The department agrees with the applicant that BACT is a combustion control system that will insure sufficient mixing of the MSW and air so that the emissions of products of incomplete combustion are minimized. The proposed CO emission rate is ~~1.5~~ 0.8 pounds per ton of MSW charged. This level of control is judged to represent BACT.

Furthermore, CO has a calorific value of 4347 Btu/lb and when discharged to the atmosphere represents lost heat energy. Since heat energy is used to produce the steam which drives the generator to produce electric power, there is a strong economic incentive to minimize CO emissions.

Hydrocarbon emissions, like carbon monoxide emissions, result from incomplete oxidation of carbon compounds. Control of CO and HC emissions can be mutually supportive events. BACT for hydrocarbons is high combustion temperature, good mixing, and proper air and fuel management.

Sulfur dioxide produced by combustion of sulfur containing materials can be oxidized to SO_3 which can then combine with water vapor to produce sulfuric acid mist. The applicant has stated that sulfuric acid mist emissions could be as high as 200 tons per year for the resource recovery facility based on recent test data for a similar facility in Florida. This facility thus has the potential to be major for sulfuric acid mist and

additional control is warranted. The installation of a wet or dry scrubber would minimize sulfuric acid mist emissions and is considered to be BACT for this proposed facility.

The type of air pollutants emitted when incinerating plastics depends on the atomic composition of the polymer. Plastics composed of only carbon and hydrogen or carbon, hydrogen and oxygen form carbon dioxide and water when completely combusted. Incomplete combustion yields carbon monoxide as the major pollutant.

Plastics containing nitrogen as a heteroatom yield molecular nitrogen, some NOx, carbon dioxide, and water when completely combusted. Incomplete combustion may yield hydrogen cyanide, cyanogen, nitrites, ammonia and hydrocarbon gases. Complete combustion of plastics containing halogen or sulfur heteroatoms form acid gases such as hydrogen chloride, hydrogen fluoride, sulfur dioxide, carbon dioxide, and water. Halogen or sulfur compounds can form ~~on~~ from incomplete combustion of the plastic. Polyvinyl chloride (PVC), one of the many polymers, has been implicated as causing the most serious disposal problem due to the release of hydrogen chloride (HCl) gas when incinerated. This problem has long been realized resulting in other polymers being used in packaging. For example, the weight percent of chlorine in polyurethane is 2.4, with only trace amounts in polyethylene and polystyrene, as compared to the weight percent of 45.3 in PVC.

A recent study of MSW incineration performed for the USEPA has indicated that the plastics content of refuse is expected to grow by from 300-400% from the year 1968 to 2000. This increase can be expected to increase uncontrolled HCl emissions from municipal waste incineration by roughly 400% from 1970 to the year 2000. Potential emissions of HCl from the MSW incinerator could be as high as 5252 tons per year assuming an emission rate of 11.12 pounds per ton of MSW incinerated.

Emissions of HCl at refuse incineration facilities can be reduced by removal of selected refuse components with high chlorine contents (source separation), combustion modification, and the use of flue gas control equipment. Although the combustor configuration may influence the amount of chlorine conversion, combustion modification is not a viable means of controlling HCl emissions.

Potential emissions of HCl can be reduced significantly by removing plastic items from the waste stream. This is particularly true when the plastics are the PVC type explained earlier. With the exception of limited recycling efforts, source separation of plastics has not been demonstrated and costs are uncertain at this time. In addition to this, the combustion of plastics may be favorable due to their relatively high heat of combustion.

Plastic materials have a high heat of combustion, for example, coated milk cartons - 11,300 Btu/lb, latex - 10,000 Btu/lb and polyethylene 20,000 Btu/lb. For comparison, newspaper and wood have a heat content of 8,000 Btu/lb, and kerosene - 18,900 Btu/lb. Here again there is economic incentive to obtain as complete combustion as possible.

At this time flue gas controls are the most conventional means of reducing HCl emissions at refuse burning facilities. Based on the estimates of HCl emissions and the trend for increases due to higher percentages of plastics in future waste streams, the installation of a wet or dry scrubber to control the acid gases would provide an added benefit of controlling HCl emissions.

Throughout this BACT determination much emphasis has been placed on the controls that are needed to satisfy the BACT requirements. Although the ~~Bureau~~ department does not have the authority to stipulate the type of control equipment that should be used on a facility (i.e., ESP vs. baghouse; dry vs. wet scrubber), a dry scrubber used in conjunction with a baghouse appears to be the best method for controlling emissions from this type of facility.

Electrostatic precipitators (ESP's) without acid gas control removes Total Suspended Particulates (TSP) only, collecting submicron particles with difficulty. It can be done, but as with any control, effectiveness and reliability are questionable in this area. The need for acid gas controls is clearly defined in this analysis and test data show fabric filters to be less sensitive to changes in flue gas volumes, inlet concentrations, and small excursions in temperature than ESP's employed at many refuse burning facilities. In addition it is well proven that baghouses are capable of meeting the grain loading limits discussed in this determination and that the scrubber-baghouse combination is relatively reasonable due to reduction in size requirements of the particulate control device.

The air quality impact of the proposed emissions has been analyzed. Atmospheric dispersion modeling has been completed and used in conjunction with an analysis of existing air quality data to determine maximum ground-level ambient concentrations of the pollutants subject to BACT. Based on these analyses, the department has reasonable assurance that the proposed solid waste recovery facility in Broward County, subject to these BACT emission limitations, will not cause or contribute to a violation of any PSD increment or ambient air quality standard.

d. Prevention of Significant Deterioration

i. Introduction

As seen in Section ~~X~~ E.6.b., Table ~~X~~b-1, the proposed resource recovery facility, located in south Broward County, will emit in PSD-significant amounts 10 pollutants. These are the criteria pollutants particulate matter (PM), sulfur dioxide (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), and lead (Pb), and the non-criteria pollutants fluorides, sulfuric acid mist, beryllium (Be), mercury (Hg), and arsenic (As). The emission increase for volatile organic compound (VOC) is addressed in the nonattainment review section. The pollutant hydrogen chloride (HCl) is not a regulated pollutant but will be discussed within this section.

Revised 10/10/85

E.6. Air Quality Impacts

Broward County proposes to construct a resource recovery facility near Fort Lauderdale, Florida. The facility will be a major source of the air pollutants particulate matter, sulfur dioxide, nitrogen oxides, and carbon monoxide from the combustion of municipal solid waste in three incinerators. Thermal energy from the combustion will be used to produce steam for electric power generation.

a. Construction

The primary sources of air pollutants during construction of the facility will originate from vehicular and heavy equipment exhaust emissions and fugitive dust from wind and the movement of equipment and vehicles over unpaved areas.

The acts of stripping and filling of the construction site will produce some dust clouds. Estimates by the EPA indicate that suspended dust levels from heavy construction activities approximate 1.2 tons per acre per month of construction activity. The applicant indicates that water sprays and other dust suppression measures will be applied on problem sites as necessary.

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The applicant has proposed to meet an emission limit of 0.03 grains per dry standard cubic foot at 12% CO_2.

(ii) Rule Applicability

The applicable air quality related rules are contained in Chapter 17-2 of the Florida Administrative Code (FAC) and Chapter 40 of the Code of Federal Regulation. Two broad categories can be distinguished; nonattainment rules, or rules governing pollutants emitted in areas with measured concentrations of these pollutants exceeding the air quality standards, and attainment rules, or rules governing pollutants emitted within areas not exceeding an air quality standard for that pollutant. Broward County is designated a nonattainment area for the pollutant ozone (40 CFR 81.310 and Rule 17-2.410, FAC). For all other pollutants for which an air quality standard exists (criteria pollutants), the county is designated as attainment (40 CFR 81.310 and Rule 17-2.420, FAC).

The applicant is proposing initially to construct three 750 TPD municipal solid waste (MSW) incinerators. An ultimate maximum capacity of 3,300 TPD is anticipated in the future which will require a fourth unit. The maximum annual emissions for all regulated pollutants have been estimated by the applicant based on operation of the boilers at 115% of their rated capacity. These emissions are compared to the significant emission rates used to determine the Prevention of Significant Deterioration (PSD) review applicability (i.e. the attainment rules) (40 CFR 52.21(b)(23) and Rule 17-2.500, Table 500-2) and nonattainment review applicability (Rule 17-2510(2)). Table b-1 lists the proposed emissions along with the applicable significant emissions rates. The proposed facility has the potential to emit more than 100 tons per year of one or more regulated pollutants and is, therefore, subject to review for Prevention of Significant Deterioration (40 CFR 52.21 and Rule 17-2.500(5)(c), FAC). PSD review includes a determination of Best Available Control Technology (BACT) and an air quality analysis for each attainment or noncriteria pollutant that would be emitted in a significant amount as listed in Table b-1. For the proposed facility, the applicant has addressed PSD review for 10 pollutants: PM, SO_2, NO_x, CO, Pb, fluorides, sulfuric acid mist, Be, Hg, and As.

Nonattainment review (Rule 17-2.510(4), FAC) is required for all nonattainment pollutants which have the potential to emit 100 tons per year or more of the affected pollutant. Nonattainment review includes a determination of Lowest Achievable Emission Rate (LAER) and the obtaining of emission offsets. The regulated pollutant for ozone is volatile organic compounds (VOC). The controlled emission rate of VOC is less than 100 tons per year and is, thus, not subject to nonattainment review.

The proposed facility is also subject to the provisions of the federal New Source Performance Standards, 40 CFR 60 Subpart E, for incinerators. Rules require that any standard established by BACT shall be, at a minimum, as stringent as an applicable New Source Performance Standard.

The source is also subject to the provisions of Rule 17-2.620(2), which states that no person shall cause, suffer, allow or permit the discharge of air pollutants which cause or contribute to an objectionable odor.

c. Best Available Control Technology

The emission limits determined to be Best Available Control Technology are based on the use of a baghouse collector for particulate matter and heavy metals and a scrubber to control fluorides and acid gases. Using a maximum charging rate of 2,558 tons per day and continuous operation, emissions from the three proposed incinerators are as follows:

POLLUTANT	EMISSION LIMIT	POUNDS/HR	TONS/YR
Particulate Matter	0.015 gr/dscf corrected to 12% CO_2	37.5	164.3
Sulfur Dioxide	2.8 lb/ton (30 day average) 5.6 lb/ton (maximum)	603.9	1322.1
Nitrogen Oxides	3.0 lb/ton	323.4	1416.5

POLLUTANT	EMISSION LIMIT	POUNDS/HR	TONS/YR
Carbon Monoxide	0.8 lb/ton	86.2	377.7
Lead	0.014 lb/ton	1.5	6.4
Fluorides	0.02 lb/ton	2.5	10.9
Beryllium	8.4 E-6 lb/ton	9.1 E-4	4.0 E-3
VOC	0.12 lb/ton	12.9	56.7
Sulfuric Acid Mist	---	4.6	20.0

The emission rates of fluorides and sulfuric acid mist assumes 90% removal by the scrubber.

In addition, hydrogen chloride is estimated to be emitted at a maximum uncontrolled rate of 11.12 pounds per ton of waste burned (1199.1 pounds per hour, 5252 tons per year). A scrubber should reduce emissions of hydrogen chloride by 90%. Mercury emissions are limited to 3200 grams per day. Uncontrolled lead emissions are projected to be 29.1 pounds per hour (127.5 tons per year) based on an emission factor of 0.27 pounds per ton of waste burned. Actual lead emissions should be much lower because a baghouse collector can control the fine particulate matter on which lead tends to sorb. Visible emissions from the incinerators are limited to 15% opacity.

Compliance with the limitations for particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, lead, fluoride, mercury and visible emissions shall be determined in accordance with Florida Administrative Code Rule 17-2.700, DER Methods 1, 2, 3, 6 and 9; 40 CFR 60 Appendix A, Methods 5, 7, 10, 12 and 13A or 13B and 40 CFR 61, Appendix B, Method 101.

The applicant plans to eventually construct a 3300 ton per day (TPD) municipal solid waste (MSW) incinerator facility to be located at 4400 South, State Road 7, Fort Lauderdale, Florida. The thermal energy from combustion of the MSW will be used to produce steam for electric power generation.

The present plans are to install three 750 TPD mass burn incinerators that will process a total of 2250 TPD of MSW. This

BACT review will apply only to these three units. At some future date a BACT review will be made for the fourth unit as a modification to an existing facility.

Each of the three mass burn incinerators will have an approximate heat input of 313 million Btu per hour, based upon a MSW calorific content of 4500 Btu per pound. Each incinerator will be scheduled to operate 8760 hours per year, and on this basis the tons per year of the various air pollutants emitted were calculated. The applicant has projected a total annual tonnage of regulated air pollutants emitted from the three units based on operating at 115% above nameplate capacity to be as follows:

Particulate	(PM)	315	(25)*
Sulfur Dioxide	(SO_2)	2319	(40)*
Nitrogen Oxides	(NOx)	2361	(40)*
Carbon Monoxide	(CO)	378	(100)*
Lead	(Pb)	128	(0.6)*
Beryllium	(Be)	0.0040	(.0004)*
Mercury	(Hg)	3.9 [1]	(0.1)*
Arsenic	(As)	0.13	(0)*
Fluorides	(F)	109	(3)*
Ozone	(O_3)	57 (VOC)	(40)*
Sulfuric Acid Mist		200 [2]	(7)*

[1] Based on a potential emission factor of 0.00092 lbs/MMBTU

[2] Based on a potential emission factor of 0.047 lbs/MMBTU

* Regulated Air Pollutants-Significant Emission Rates Florida Administrative Code Rule 17-2.500, Table 500-2.

The Broward County solid waste energy recovery facility was reviewed according to Florida Adminstrative Code Chapter 17-17, Electrical Power Plant Siting and Rule 17-2.500, Prevention of Significant Deterioration (PSD). The Bureau of Air Quality Management (BAQM) performed the air quality review for the siting committee, which includes this BACT determination. The certification number assigned to the proposed facility is PA 85-21.

Rule 17-2.500(2)(f)3 requires a BACT review for all regulated pollutants emitted in an amount equal to or greater than the significant emission rates listed in Table 500-2, Regulated Air Pollutants. The facility is located in an area classified as attainment for all air pollutants, except ozone. The emission limits for the air pollutant ozone (VOC's are the controlling pollutant) are determined through the application and employment of Lowest Achievable Emission Rate (LAER), Rule 17-2.640, if applicable.

BACT Determination Requested by the Applicant:

The following emission limits are based upon a unit ton of MSW charged.

PM	-	0.67 lbs	CO	-	0.80 lbs	Hg	-	0.0081 lbs
SO_2	-	4.91 lbs	Pb	-	0.27 lbs	F	-	0.23 lbs
NOx	-	5.00 lbs	Be	-	8.4 x E-6	VOC	-	0.12 lbs

Date of receipt of a BACT application:

June 9, 1985

Date of publication with Florida Administrative Weekly:

June 14, 1985

BACT Determination by DER:

Pollutant	Emission Limit Per Unit
Particulate Matter	0.015 grains/dscf, corrected to 12% CO
Sulfur Dioxide	2.8 lb/ton MSW charged, 30 day average, not to exceed 5.6 lb/ton
Nitrogen Oxides	3.0 lb/ton MSW charged
Carbon Monoxide	0.8 lb/ton MSW charged
Fluorides	90% control

Pollutant	Emission Limit Per Unit
Sulfuric Acid Mists	90% control
Lead	95% control
Mercury	3200 grams/day (1)
Beryllium	8.4 x E-6 lb/ton MSW charged
VOC	0.12 lb/ton MSW charged
Visible Emission	15% opacity

(1) Total emissions from the facility shall not exceed this value. Compliance with the mercury emission limit shall be demonstrated in accordance with 40 CFR 61, Method 101 Appendix B.

Compliance with limitations for sulfur oxides, particulate matter, and nitrogen oxides will be demonstrated in accordance with Florida Administrative Code Rule 17-2.700, DER Methods 1, 2, 3, 4, and 6, and 40 CFR 60 Appendix A; Method 5, 7, 10, 12, 13A or 13B. Compliance with the opacity limit shall be demonstrated in accordance with Florida Administrative Code Rule 17-2.700(6)(a)9., DER Method 9.

A continuous monitoring system to measure the opacity of emissions of each stack shall be installed, calibrated, and maintained in accordance with the provisions of Rule 17-2.710, Continuous Emission Monitoring Requirements. The CEM's must be installed and operational prior to compliance testing.

BACT Determination Rationale:

Each MSW incinerator will have a charging rate more than 50 tons per day, and therefore, is subject to the provisions of 40 CFR 60.50, Subpart E, New Source Performance Standards (NSPS). The NSPS standard regulates only particulate matter. The particulate matter standard is 0.08 grains/dscf, corrected to 12%

CO. This NSPS was promulgated in 1971 and no longer reflects state-of-the-art for control of particulate emissions. Recent stack testing data for MSW incinerators indicates that both electrostatic precipitator and fabric filter control technology are capable of controlling particulate emissions well below the applicant's proposal of 0.03 grains/dscf. Based on the control technology available, a particulate matter emission limit of 0.015 grains/dscf corrected to 12% CO_2 is judged to represent BACT. All the other requirements as set forth in the NSPS, Subpart E, will apply.

The Department has determined the emission limit for SO_2 to be 2.8 pounds per ton on MSW charged into the incinerator based on a 30 day average. MSW components that appear to be major contributors of sulfur include rubber, plastics, food wastes, yard wastes, and paper.

The SO_2 emission limit was determined to be BACT by evaluating studies of emissions test data for similar MSW incinerations. Various studies have indicated average emission levels of 2.0 to 2.8 lb SO_2/ton MSW charged with deviations of $\pm$ 1.3 to 1.6 lb/ton. The amount of SO_2 emitted would be comparable to the burning of distillate oil having less than a 0.5% sulfur content. Burning low sulfur fuel is one acceptable method of controlling SO_2 emissions. The installation of a flue gas desulfurization system to control SO_2 emissions is not warranted when burning MSW.

The mercury emission limit determined as BACT is equal to the National Emission Standard to Hazardous Air Pollutants (NESHAPs), 40 CFR 61.50, Subpart E, for municipal waste water sludge incineration plants. Although this standard does not apply to the incineration of municipal solid waste, it is an emission limit that should not be exceeded. The BACT is determined to be 3200 grams per day for the entire facility. This level of mercury emissions is not considered to have a major impact on the environment.

The uncontrolled emission of beryllium, according to the California report, when firing MSW is estimated to be 6.2 x 10^{-6} pounds per million Btu. Uncontrolled beryllium emissions would be approximately 11 grams per 24 hours or 0.01 TPY. The operating temperature of the particulate matter emission control device will be below 500°F. Operation below this temperature is necessary to force absorption/condensation of beryllium oxides, present in the flue gas stream, onto available fly ash particles subsequently removed by the particulate control device. Assuming 95% efficiency of the control device the annual beryllium emissions are estimated at 0.0007 tons per year. This amount of beryllium emitted is considered to have a negligible impact on the environment. The emission factor of 8.4 x 10^{-6} lb/ton MSW proposed by the applicant is judged to be BACT. If, however, beryllium containing waste as defined in the National Emission Standards for Hazardous Air Pollutants (NESHAPs), Subpart C, Subsection 61.31(g), is charged into the incinerator, emissions of beryllium to the atmosphere shall not exceed 10 grams per 24 hours or an ambient concentration of 0.01 ug/m^3, 30 day average. Compliance with this beryllium emission limit will be in accordance with the NESHAPs, Subpart C.

The applicant has projected unabated lead and fluoride(s) emissions to be 128 and 109 tons per year respectively. Projected sulfuric acid mist emissions are capable of being as high as 200 tons per year. These amounts are well in excess of the significant emission rates given in Florida Administrative Code Rule 17-2.500, Table 500-2.

With respect to lead emissions, two conditions are needed to achieve high removal efficiencies of metallic compounds emitted at refuse burning facilities: (1) operation of particulate matter control equipment at temperatures below 260°C (500°F), and (2) consistently efficient removal of submicron fly ash particles. The temperature of the incinerator combustion gases at the inlet to the particulate control device is estimated to be 425-475°F. At these temperatures the particulate control

equipment would be capable of removing the lead emissions from the flue gas stream.

When flue gas temperatures are lowered below 260°C (500°F), metallic compounds are removed from the vapor phase by absorption and condensation preferentially on fine particles with submicron particles receiving the highest concentrations of metals. Properly designed and operational fabric filter systems appear at this time to offer the best method for consistent and efficient removal of fine (and in particular submicron) fly ash. Removal efficiencies of fine fly ash using these systems can be in excess of 99% with respect to MSW incinerators. Studies have indicated the weight percent of submicron particles emitted from combustion is on the order of 45% which clearly indicates the need for efficient control of particles in this range.

Emissions of fluoride originate from a number of sources in the refuse. The mechanisms of governing fluoride release and formation of hydrogen fluoride at refuse-burning facilities are probably similar to those for hydrogen chloride. The control of fluorides can be reduced at refuse-burning plants by removal of selected refuse components with high fluoride contents, and the use of flue gas control equipment. In view of the fact that it is proposed to incinerate materials that contain fluoride, BACT for the control of fluorides is installation of a wet or dry flue gas scrubber system. The addition of a scrubber system would also provide control for SO_2 emissions addressed earlier in this analysis as well as other acid gases which will be addressed in other sections of the analysis.

During combustion of municipal solid waste, NOx is formed in high temperature zones in and around the furnace flame by the oxidation of atmospheric nitrogen and nitrogen in the waste. The two primary variables that affect the formation of NOx are the temperature and the concentration of oxygen. Techniques such as the method of fuel firing to provide correct distribution of combustion air between overfire and underfire air, exhaust gas recirculation, and decreased heat release rates have been used to

reduce NOx emissions. A few add-on control techniques such as catalytic reduction with ammonia and the thermal de-NOx are still experimental and are not considered to be demonstrated technology for the proposed project. State-of-the-art control of the combustion variables will be used to limit NOx emissions at 3 pounds per ton of MSW charged. This level of control is judged to represent BACT.

Carbon monoxide is a product of incomplete combustion where there is insufficient air. Incomplete combustion will also result in the emissions of solid carbon particulates in the form of smoke or soot and unburned and/or partially oxidized hydrocarbons. Incomplete combustion results in the loss of heat energy to the boiler. The department agrees with the applicant that BACT is a combustion control system that will insure sufficient mixing of the MSW and air so that the emissions of products of incomplete combustion are minimized. The proposed CO emission rate is 0.8 pounds per ton of MSW charged. This level of control is judged to represent BACT.

Furthermore, CO has a calorific value of 4347 Btu/lb and when discharged to the atmosphere represents lost heat energy. Since heat energy is used to produce the steam which drives the generator to produce electric power, there is a strong economic incentive to minimize CO emissions.

Hydrocarbon emissions, like carbon monoxide emissions, result from incomplete oxidation of carbon compounds. Control of CO and HC emissions can be mutually supportive events. BACT for hydrocarbons is high combustion temperature, good mixing, and proper air and fuel management.

Sulfur dioxide produced by combustion of sulfur containing materials can be oxidized to SO_3 which can then combine with water vapor to produce sulfuric acid mist. The applicant has stated that sulfuric acid mist emissions could be as high as 200 tons per year for the resource recovery facility based on recent test data for a similar facility in Florida. This facility thus has the potential to be major for sulfuric acid mist and

additional control is warranted. The installation of a wet or dry scrubber would minimize sulfuric acid mist emissions and is considered to be BACT for this proposed facility.

The type of air pollutants emitted when incinerating plastics depends on the atomic composition of the polymer. Plastics composed of only carbon and hydrogen or carbon, hydrogen and oxygen form carbon dioxide and water when completely combusted. Incomplete combustion yields carbon monoxide as the major pollutant.

Plastics containing nitrogen as a heteroatom yield molecular nitrogen, some NOx, carbon dioxide, and water when completely combusted. Incomplete combustion may yield hydrogen cyanide, cyanogen, nitrites, ammonia and hydrocarbon gases. Complete combustion of plastics containing halogen or sulfur heteroatoms form acid gases such as hydrogen chloride, hydrogen fluoride, sulfur dioxide, carbon dioxide, and water. Halogen or sulfur compounds can form from incomplete combustion of the plastic. Polyvinyl chloride (PVC), one of the many polymers, has been implicated as causing the most serious disposal problem due to the release of hydrogen chloride (HCl) gas when incinerated. This problem has long been realized resulting in other polymers being used in packaging. For example, the weight percent of chlorine in polyurethane is 2.4, with only trace amounts in polyethylene and polystyrene, as compared to the weight percent of 45.3 in PVC.

A recent study of MSW incineration performed for the USEPA has indicated that the plastics content of refuse is expected to grow by from 300-400% from the year 1968 to 2000. This increase can be expected to increase uncontrolled HCl emissions from municipal waste incineration by roughly 400% from 1970 to the year 2000. Potential emissions of HCl from the MSW incinerator could be as high as 5252 tons per year assuming an emission rate of 11.12 pounds per ton of MSW incinerated.

Emissions of HCl at refuse incineration facilities can be reduced by removal of selected refuse components with high chlorine contents (source separation), combustion modification, and the use of flue gas control equipment. Although the combustor configuration may influence the amount of chlorine conversion, combustion modification is not a viable means of controlling HCl emissions.

Potential emissions of HCl can be reduced significantly by removing plastic items from the waste stream. This is particularly true when the plastics are the PVC type explained earlier. With the exception of limited recycling efforts, source separation of plastics has not been demonstrated and costs are uncertain at this time. In addition to this, the combustion of plastics may be favorable due to their relatively high heat of combustion.

Plastic materials have a high heat of combustion, for example, coated milk cartons - 11,300 Btu/lb, latex - 10,000 Btu/lb and polyethylene 20,000 Btu/lb. For comparison, newspaper and wood have a heat content of 8,000 Btu/lb, and kerosene - 18,900 Btu/lb. Here again there is economic incentive to obtain as complete combustion as possible.

At this time flue gas controls are the most conventional means of reducing HCl emissions at refuse burning facilities. Based on the estimates of HCl emissions and the trend for increases due to higher percentages of plastics in future waste streams, the installation of a wet or dry scrubber to control the acid gases would provide an added benefit of controlling HCl emissions.

Throughout this BACT determination much emphasis has been placed on the controls that are needed to satisfy the BACT requirements. Although the department does not have the authority to stipulate the type of control equipment that should be used on a facility (i.e., ESP vs. baghouse; dry vs. wet scrubber), a dry scrubber used in conjunction with a baghouse appears to be the best method for controlling emissions from this type of facility.

Electrostatic precipitators (ESP's) without acid gas control removes Total Suspended Particulates (TSP) only, collecting submicron particles with difficulty. It can be done, but as with any control, effectiveness and reliability are questionable in this area. The need for acid gas controls is clearly defined in this analysis and test data show fabric filters to be less sensitive to changes in flue gas volumes, inlet concentrations, and small excursions in temperature than ESP's employed at many refuse burning facilities. In addition it is well proven that baghouses are capable of meeting the grain loading limits discussed in this determination and that the scrubber-baghouse combination is relatively reasonable due to reduction in size requirements of the particulate contol device.

The air quality impact of the proposed emissions has been analyzed. Atmospheric dispersion modeling has been completed and used in conjunction with an analysis of existing air quality data to determine maximum ground-level ambient concentrations of the pollutants subject to BACT. Based on these analyses, the department has reasonable assurance that the proposed solid waste recovery facility in Broward County, subject to these BACT emission limitations, will not cause or contribute to a violation of any PSD increment or ambient air quality standard.

d. Prevention of Significant Deterioration

i. Introduction

As seen in Section E.6.b., Table b-1, the proposed resource recovery facility, located in south Broward County, will emit in PSD-significant amounts 10 pollutants. These are the criteria pollutants particulate matter (PM), sulfur dioxide (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), and lead (Pb), and the non-criteria pollutants fluorides, sulfuric acid mist, beryllium (Be), mercury (Hg), and arsenic (As). The emission increase for volatile organic compound (VOC) is addressed in the nonattainment review section. The pollutant hydrogen chloride (HCl) is not a regulated pollutant but will be discussed within this section.

Buck, Air Quality Portion of the Broward County RRF. Tables are inserted into the appropriate places. Tom Rogers

E.6. Air Quality Impacts

Broward County proposes to construct a resource recovery facility near Fort Lauderdale, Florida. The facility will be a major source of the air pollutants particulate matter, sulfur dioxide, nitrogen oxides, and carbon monoxide from the combustion of municipal solid waste in three incinerators. Thermal energy from the combustion will be used to produce steam for electric power generation.

a. Construction

The primary sources of air pollutants during construction of the facility will originate from vehicular and heavy equipment exhaust emissions and fugitive dust from wind and the movement of equipment and vehicles over unpaved areas.

The acts of stripping and filling of the construction site will produce some dust clouds. Estimates by the EPA indicate that suspended dust levels from heavy construction activities approximate 1.2 tons per acre per month of construction activity. The applicant indicates that water sprays and other dust suppression measures will be applied on problem sites as necessary.

b. Operation

(i) Emissions

During operation of the facility, expected stack emissions will be particulates, SO_2, fluorides, lead, carbon monoxide, hydrocarbons, mercury, beryllium, chlorides and oxides of nitrogen. Other site emissions will arise from landfilling and truck movement around the site causing fugitive dust. Odor is not expected to be a problem because plant air will be drawn towards the boiler, where odor-causing chemicals in the air stream will be combusted.

The emission of particulate matter from the boilers has been proposed to be controlled by an electrostatic precipitator (ESP). Such emissions are limited by subsection 17-2, FAC, to 0.08 grains per standard cubic foot corrected to 50% excess air and by subsection 17-2.600(1), FAC, to 20% opacity of visible emissions.

The applicant has proposed to meet an emission limit of 0.03 grains per dry standard cubic foot at 12% CO_2.

(ii) Rule Applicability

The applicable air quality related rules are contained in Chapter 17-2 of the Florida Administrative Code (FAC) and Chapter 40 of the Code of Federal Regulation. Two broad categories can be distinguished; nonattainment rules, or rules governing pollutants emitted in areas with measured concentrations of these pollutants exceeding the air quality standards, and attainment rules, or rules governing pollutants emitted within areas not exceeding an air quality standard for that pollutant. Broward County is designated a nonattainment area for the pollutant ozone (40 CFR 81.310 and Rule 17-2.410, FAC). For all other pollutants for which an air quality standard exists (criteria pollutants), the county is designated as attainment (40 CFR 81.310 and Rule 17-2.420, FAC).

The applicant is proposing initially to construct three 750 TPD municipal solid waste (MSW) incinerators. An ultimate maximum capacity of 3,300 TPD is anticipated in the future which will require a fourth unit. The maximum annual emissions for all regulated pollutants have been estimated by the applicant based on operation of the boilers at 115% of their rated capacity. These emissions are compared to the significant emission rates used to determine the Prevention of Significant Deterioration (PSD) review applicability (i.e. the attainment rules) (40 CFR 52.21(b)(23) and Rule 17-2.500, Table 500-2) and nonattainment review applicability (Rule 17-2510(2)). Table b-1 lists the proposed emissions along with the applicable significant emissions rates. The proposed facility has the potential to emit more than 100 tons per year of one or more regulated pollutants and is, therefore, subject to review for Prevention of Significant Deterioration (40 CFR 52.21 and Rule 17-2.500(5)(c), FAC). PSD review includes a determination of Best Available Control Technology (BACT) and an air quality analysis for each attainment or noncriteria pollutant that would be emitted in a significant amount as listed in Table ~~I~~6-1. For the proposed facility, the applicant has addressed PSD review for 10 pollutants: PM, SO_2, NO_x, CO, Pb, fluorides, sulfuric acid mist, Be, Hg, and As.

Nonattainment review (Rule 17-2.510(4), FAC) is required for all nonattainment pollutants which have the potential to emit 100 tons per year or more of the affected pollutant. Nonattainment review includes a determination of Lowest Achievable Emission Rate (LAER) and the obtaining of emission offsets. The regulated pollutant for ozone is volatile organic compounds (VOC). The controlled emission rate of VOC is less than 100 tons per year and is, thus, not subject to nonattainment review.

The proposed facility is also subject to the provisions of the federal New Source Performance Standards, 40 CFR 60 Subpart E, for incinerators. Rules require that any standard established by BACT shall be, at a minimum, as stringent as an applicable New Source Performance Standard.

The source is also subject to the provisions of Rule 17-2.620(2), which states that no person shall cause, suffer, allow or permit the discharge of air pollutants which cause or contribute to an objectionable odor.

c. Best Available Control Technology

The emission limits determined to be Best Available Control Technology are based on the use of a baghouse collector for particulate matter and heavy metals and a scrubber to control fluorides and acid gases. Using a maximum charging rate of 2,558 tons per day and continuous operation, emissions from the three proposed incinerators are as follows:

POLLUTANT	EMISSION LIMIT	POUNDS/HR	TONS/YR
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Nitrogen Oxides	3.0 lb/ton	323.4	1416.5
Carbon Monoxide	0.8 lb/ton	86.2	377.7
Lead	0.014 lb/ton	1.5	6.4

POLLUTANT	EMISSION LIMIT	POUNDS/HR	TONS/YR
Fluorides	0.02 lb/ton	2.5	10.9
Beryllium	8.4 E-6 lb/ton	9.1 E-4	4.0 E-3
VOC	0.12 lb/ton	12.9	56.7
Sulfuric Acid Mist	---	4.6	20.0

The emission rates of fluorides and sulfuric acid mist assumes 90% removal by the scrubber.

In addition, hydrogen chloride will be emitted at an uncontrolled rate of 4.0 pounds per ton of waste burned (431.2 pounds per hour, 1888.7 tons per year). A scrubber should reduce emissions of hydrogen chloride by 90%. Mercury emissions are limited to 3200 grams per day. Lead emissions are projected to be 29.1 pounds per hour (127.5 tons per year) based on an emission factor of 0.27 pounds per ton of waste burned. Actual lead emissions should be much lower because a baghouse collector can control the fine particulate matter on which lead tends to sorb. Visible emissions from the incinerators are limited to 15% opacity.

Compliance with the limitations for particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, lead, fluoride, mercury and visible emissions shall be determined in accordance with Florida Administrative Code Rule 17-2.700, DER Methods 1, 2, 3, 5, 6 and 9; 40 CFR 60 Appendix A, Methods 7, 10, 12 and 13 and 40 CFR 61, Appendix B, Method 101.

Best Available Control Technology (BACT) Determination
South Broward County Resource Recovery, Inc.
Broward County

The applicant plans to eventually construct a 3300 ton per day (TPD) municipal solid waste (MSW) incinerator facility to be located at 4400 South, State Road 7, Fort Lauderdale, Florida. The thermal energy from combustion of the MSW will be used to produce steam for electric power generation.

The present plans are to install three 750 TPD mass burn incinerators that will process a total of 2250 TPD of MSW. This BACT review will apply only to these three units. At some future date a BACT review will be made for the fourth unit as a modification to an existing facility.

Each of the three mass burn incinerators will have an approximate heat input of 313 million Btu per hour, based upon a MSW calorific content of 4500 Btu per pound. Each incinerator will be scheduled to operate 8760 hours per year, and on this basis the tons per year of the various air pollutants emitted were calculated. The applicant has projected a total annual tonnage of regulated air pollutants emitted from the three units based on operating at 115% above nameplate capacity to be as follows:

Particulate	(PM)	~~315~~ 328	(25)*
Sulfur Dioxide	(SO_2)	2319	(40)*
Nitrogen Oxides	(NOx)	2361	(40)*
Carbon Monoxide	(CO)	378	(100)*
Lead	(Pb)	128	(0.6)*
Beryllium	(Be)	0.0040	(.0004)*
Mercury	(Hg)	3.9 [1]	(0.1)*
Arsenic	(As)	0.13	(0)*
Fluorides	(F)	109	(3)*
Ozone	(O_3)	57 (VOC)	(40)*
Sulfuric Acid Mist		200 [2]	(7)*

[1] Based on a potential emission factor of 0.00092 lbs/MMBTU

[2] Based on a potential emission factor of 0.047 lbs/MMBTU

* Regulated Air Pollutants-Significant Emission Rates Florida Administrative Code Rule 17-2.500, Table 500-2.

The Broward County solid waste energy recovery facility was reviewed according to Florida Adminstrative Code Chapter 17-17, Electrical Power Plant Siting and Rule 17-2.500, Prevention of Significant Deterioration (PSD). The Bureau of Air Quality Management (BAQM) performed the air quality review for the siting committee, which includes this BACT determination. The certification number assigned to the proposed facility is PA 85-21.

Rule 17-2.500(2)(f)3 requires a BACT review for all regulated pollutants emitted in an amount equal to or greater than the significant emission rates listed in Table 500-2, Regulated Air Pollutants. The facility is located in an area classified as attainment for all air pollutants, except ozone. The emission limits for the air pollutant ozone (VOC's are the controlling pollutant) ~~(VOC)~~ are determined through the application and employment of Lowest Achievable Emission Rate (LAER), Rule 17-2.640, if applicable.

BACT Determination Requested by the Applicant:

The following emission limits are based upon a unit ~~tons~~ ton of MSW charged.

PM	- 0.67 lbs	CO	- 0.80 lbs	Hg	- 0.0081 lbs
SO_2	- 4.91 lbs	Pb	- 0.27 lbs	F	- 0.23 lbs
NOx	- 5.00 lbs	Be	- 8.4 x E-6	VOC	- 0.12 lbs

Date of receipt of a BACT application:

June 9, 1985

Date of publication with Florida Administrative Weekly:

June 14, 1985

Review Group Members:

[redacted] - New Source Review Section

Clair Fancy - Central Air Permitting

~~Tom Rogers~~ - Air Modeling Section

Buck Oven - Power Plant Siting

BACT Determination by DER:

Pollutant	Emission Limit Per ~~Source~~ Unit
Particulate Matter	0.015 grains/dscf, corrected to 12% CO
Sulfur Dioxide	2.8 lb/ton MSW charged, 30 day average, not to exceed 5.6 lb/ton
Nitrogen Oxides	3.0 lb/ton MSW charged
Carbon Monoxide	0.8 lb/ton MSW charged

Pollutant	Emission Limit Per ~~Source~~ Unit
Fluorides	90% control
Sulfuric Acid Mists	90% control
Lead	~~(1)~~ 9? % control
Mercury	3200 ~~2240~~ grams/day (1) ~~(2)~~
Beryllium	8.4 x E-6 lb/ton MSW charged
VOC	0.12 lb/ton MSW charged
Visible Emission	15% opacity

~~(1) No definite emission limit set but control technology discussed in BACT Determination Rationale.~~

(1) ~~(2)~~ Total emissions from the facility shall not exceed this value. Compliance with the mercury emission limit shall be demonstrated in accordance with 40 CFR 61, Method 101 Appendix B.

Compliance with limitations for sulfur oxides, particulate matter, and nitrogen oxides will be demonstrated in accordance with Florida Administrative Code Rule 17-2.700, DER Methods 1, 2, 3, 4, ~~5~~, and 6, and 40 CFR 60 Appendix A; Methods 5, 7, 10, 12, 13A or 13B. Compliance with the opacity limit shall be demonstrated in accordance with Florida Administrative Code Rule 17-2.700(6)(a)9., DER Method 9.

A continuous monitoring system to measure the opacity of emissions of each stack shall be installed, calibrated, and maintained in accordance with the provisions of Rule 17-2.710, Continuous Emission Monitoring Requirements. The CEM's must be installed and operational prior to compliance testing.

BACT Determination Rationale:

Each MSW incinerator will have a charging rate more than 50 tons per day, and therefore, is subject to the provisions of 40 CFR 60.50, Subpart E, New Source Performance Standards (NSPS). The NSPS standard regulates only particulate matter. The

particulate matter standard is 0.08 grains/dscf, corrected to 12% CO. This NSPS was promulgated in 1971 and no longer reflects state-of-the-art for control of particulate emissions. Recent stack testing data for MSW incinerators indicates that both electrostatic precipitator and fabric filter control technology are capable of controlling particulate emissions well below the applicant's proposal of 0.03 grains/dscf. Based on the control technology available, a particulate matter emission limit of 0.015 grains/dscf corrected to 12% CO_2 is judged to represent BACT. All the other requirements as set forth in the NSPS, Subpart E, will apply.

The Department has determined the emission limit for SO_2 to be 2.8 pounds per ton on MSW charged into the incinerator based on a 30 day average. MSW components that appear to be major contributors of sulfur include rubber, plastics, food wastes, yard wastes, and paper.

The SO_2 emission limit was determined to be BACT by evaluating studies of emissions test data for similar MSW incinerations. Various studies have indicated average emission levels of 2.0 to 2.8 lb SO_2/ton MSW charged with deviations of $\pm$ 1.3 to 1.6 lb/ton. The amount of SO_2 emitted would be comparable to the burning of distillate oil having less than a 0.5% sulfur content. Burning low sulfur fuel is one acceptable method of controlling SO_2 emissions. The installation of a flue gas desulfurization system to control SO_2 emissions is not warranted when burning MSW.

The mercury emission limit determined as BACT is equal to the National Emission Standard to Hazardous Air Pollutants (NESHAPs), 40 CFR 61.50, Subpart E, for municipal waste water sludge incineration plants. Although this standard does not apply to the incineration of municipal solid waste, it is an emission limit that should not be exceeded. The BACT is determined to be 3200 grams per day for the entire facility. This level of mercury emissions is not considered to have a major impact on the environment.

The uncontrolled emission of beryllium, according to the California report, when firing MSW is estimated to be 6.2 x 10^{-6} pounds per million Btu. Uncontrolled beryllium emissions would be approximately 11 grams per 24 hours or 0.01 TPY. The operating temperature of the particulate matter emission control device will be below 500°F. Operation below this temperature is necessary to force absorption/condensation of beryllium oxides, present in the flue gas stream, onto available fly ash particles subsequently removed by the particulate control device. Assuming 95% efficiency of the control device the annual beryllium emissions are estimated at 0.0007 tons per year. This amount of beryllium emitted is considered to have a negligible impact on the environment. The emission factor of 8.4 x 10^{-6} lb/ton MSW proposed by the applicant is judged to be BACT. If, however, beryllium containing waste as defined in the National Emission Standards for Hazardous Air Pollutants (NESHAPs), Subpart C, Subsection 61.31(g), is charged into the incinerator, emissions of beryllium to the atmosphere shall not exceed 10 grams per 24 hours or an ambient concentration of 0.01 ug/m^3, 30 day average. Compliance with this beryllium emission limit will be in accordance with the NESHAPs, Subpart C.

The applicant has projected unabated lead and fluoride(s) emissions to be 128 and 109 tons per year respectively. Projected sulfuric acid mist emissions are capable of being as high as 200 tons per year. These amounts are well in excess of the significant emission rates given in Florida Administrative Code Rule 17-2.500, Table 500-2.

With respect to lead emissions, two conditions are needed to achieve high removal efficiencies of metallic compounds emitted at refuse burning facilities: (1) operation of particulate matter control equipment at temperatures below 260°C (500°F), and (2) consistently efficient removal of submicron fly ash particles. The temperature of the incinerator combustion gases at the inlet to the particulate control device is estimated to be 425-475°F. At these temperatures the particulate control

equipment would be capable of removing the lead emissions from the flue gas stream.

When flue gas temperatures are lowered below 260°C (500°F), metallic compounds are removed from the vapor phase by absorption and condensation preferentially on fine particles with submicron particles receiving the highest concentrations of metals. Properly designed and operational fabric filter systems appear at this time to offer the best method for consistent and efficient removal of fine (and in particular submicron) fly ash. Removal efficiencies of fine fly ash using these systems can be in excess of 99% with respect to MSW incinerators. Studies have indicated the weight percent of submicron particles emitted from combustion is on the order of 45% which clearly indicates the need for efficient control of particles in this range.

Emissions of fluoride originate from a number of sources in the refuse. The mechanisms of governing fluoride release and formation of hydrogen fluoride at refuse-burning facilities are probably similar to those for hydrogen chloride. The control of fluorides can be reduced at refuse-burning plants by removal of selected refuse components with high fluoride contents, and the use of flue gas control equipment. In view of the fact that it is proposed to incinerate materials that contain fluoride, BACT for the control of fluorides is installation of a wet or dry flue gas scrubber system. The addition of a scrubber system would also provide control for SO_2 emissions addressed earlier in this analysis as well as other acid gases which will be addressed in other sections of the analysis.

During combustion of municipal solid waste, NOx is formed in high temperature zones in and around the furnace flame by the oxidation of atmospheric nitrogen and nitrogen in the waste. The two primary variables that affect the formation of NOx are the temperature and the concentration of oxygen. Techniques such as the method of fuel firing to provide correct distribution of combustion air between overfire and underfire air, exhaust gas recirculation, and decreased heat release rates have been used to

reduce NOx emissions. A few add-on control techniques such as catalytic reduction with ammonia and the thermal de-NOx are still experimental and are not considered to be demonstrated technology for the proposed project. State-of-the-art control of the combustion variables will be used to limit NOx emissions at 3 pounds per ton of MSW charged. This level of control is judged to represent BACT.

Carbon monoxide is a product of incomplete combustion where there is insufficient air. Incomplete combustion will also result in the emissions of solid carbon particulates in the form of smoke or soot and unburned and/or partially oxidized hydrocarbons. Incomplete combustion results in the loss of heat energy to the boiler. The department agrees with the applicant that BACT is a combustion control system that will insure sufficient mixing of the MSW and air so that the emissions of products of incomplete combustion are minimized. The proposed CO emission rate is ~~1.5~~ 0.8 pounds per ton of MSW charged. This level of control is judged to represent BACT.

Furthermore, CO has a calorific value of 4347 Btu/lb and when discharged to the atmosphere represents lost heat energy. Since heat energy is used to produce the steam which drives the generator to produce electric power, there is a strong economic incentive to minimize CO emissions.

Hydrocarbon emissions, like carbon monoxide emissions, result from incomplete oxidation of carbon compounds. Control of CO and HC emissions can be mutually supportive events. BACT for hydrocarbons is high combustion temperature, good mixing, and proper air and fuel management.

Sulfur dioxide produced by combustion of sulfur containing materials can be oxidized to SO_3 which can then combine with water vapor to produce sulfuric acid mist. The applicant has stated that sulfuric acid mist emissions could be as high as 200 tons per year for the resource recovery facility based on recent test data for a similar facility in Florida. This facility thus has the potential to be major for sulfuric acid mist and

additional control is warranted. The installation of a wet or dry scrubber would minimize sulfuric acid mist emissions and is considered to be BACT for this proposed facility.

The type of air pollutants emitted when incinerating plastics depends on the atomic composition of the polymer. Plastics composed of only carbon and hydrogen or carbon, hydrogen and oxygen form carbon dioxide and water when completely combusted. Incomplete combustion yields carbon monoxide as the major pollutant.

Plastics containing nitrogen as a heteroatom yield molecular nitrogen, some NO_x, carbon dioxide, and water when completely combusted. Incomplete combustion may yield hydrogen cyanide, cyanogen, nitrites, ammonia and hydrocarbon gases. Complete combustion of plastics containing halogen or sulfur heteroatoms form acid gases such as hydrogen chloride, hydrogen fluoride, sulfur dioxide, carbon dioxide, and water. Halogen or sulfur compounds can form ~~on~~ from incomplete combustion of the plastic. Polyvinyl chloride (PVC), one of the many polymers, has been implicated as causing the most serious disposal problem due to the release of hydrogen chloride (HCl) gas when incinerated. This problem has long been realized resulting in other polymers being used in packaging. For example, the weight percent of chlorine in polyurethane is 2.4, with only trace amounts in polyethylene and polystyrene, as compared to the weight percent of 45.3 in PVC.

A recent study of MSW incineration performed for the USEPA has indicated that the plastics content of refuse is expected to grow by from 300-400% from the year 1968 to 2000. This increase can be expected to increase uncontrolled HCl emissions from municipal waste incineration by roughly 400% from 1970 to the year 2000. Potential emissions of HCl from the MSW incinerator could be as high as 5252 tons per year assuming an emission rate of 11.12 pounds per ton of MSW incinerated.

Emissions of HCl at refuse incineration facilities can be reduced by removal of selected refuse components with high chlorine contents (source separation), combustion modification, and the use of flue gas control equipment. Although the combustor configuration may influence the amount of chlorine conversion, combustion modification in not a viable means of controlling HCl emissions.

Potential emissions of HCl can be reduced significantly by removing plastic items from the wash stream. This is particularly true when the plastics are the PVC type explained earlier. With the exception of limited recycling efforts, source separation of plastics has not been demonstrated and costs are uncertain at this time. In addition to this, the combustion of plastics may be favorable due to their relatively high heat of combustion.

Plastic materials have a high heat of combustion, for example, coated milk cartons - 11,300 Btu/lb, latex - 10,000 Btu/lb and polyethylene 20,000 Btu/lb. For comparison, newspaper and wood have a heat content of 8,000 Btu/lb, and kerosene - 18,900 Btu/lb. Here again there is economic incentive to obtain as complete combustion as possible.

At this time flue gas controls are the most conventional means of reducing HCl emissions at refuse burning facilities. Based on the estimates of HCl emissions and the trend for increases due to higher percentages of plastics in future waste streams, the installation of a wet or dry scrubber to control the acid gases would provide an added benefit of controlling HCl emissions.

Throughout this BACT determination much emphasis has been placed on the controls that are needed to satisfy the BACT requirements. Although the Bureau does not have the authority to stipulate the type of control equipment that should be used on a facility (i.e., ESP vs. baghouse; dry vs. wet scrubber), a dry scrubber used in conjunction with a baghouse appears to be the best method for controlling emissions from this type of facility.

Electrostatic precipitators (ESP's) without acid gas control removes Total Suspended Particulates (TSP) only, collecting submicron particles with difficulty. It can be done, but as with any control, effectiveness and reliability are questionable in this area. The need for acid gas controls is clearly defined in this analysis and test data show fabric filters to be less sensitive to changes in flue gas volumes, inlet concentrations, and small excursions in temperature than ESP's employed at many refuse burning facilities. In addition it is well proven that baghouses are capable of meeting the grain loading limits discussed in this determination and that the scrubber-baghouse combination is relatively reasonable due to reduction in size requirements of the particulate control device.

The air quality impact of the proposed emissions has been analyzed. Atmospheric dispersion modeling has been completed and used in conjunction with an analysis of existing air quality data to determine maximum ground-level ambient concentrations of the pollutants subject to BACT. Based on these analyses, the department has reasonable assurance that the proposed solid waste recovery facility in Broward County, subject to these BACT emission limitations, will not cause or contribute to a violation of any PSD increment or ambient air quality standard.

d. Prevention of Significant Deterioration

i. Introduction

As seen in Section ~~X~~ E.6.b., Table ~~X~~b-1, the proposed resource recovery facility, located in south Broward County, will emit in PSD-significant amounts 10 pollutants. These are the criteria pollutants particulate matter (PM), sulfur dioxide (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), and lead (Pb), and the non-criteria pollutants fluorides, sulfuric acid mist, beryllium (Be), mercury (Hg), and arsenic (As). The emission increase for volatile organic compound (VOC) is addressed in the nonattainment review section. The pollutant hydrogen chloride (HCl) is not a regulated pollutant but will be discussed within this section.

Broward County RRF

Table I-1

Broward County Resource Recovery Facility
Proposed Annual Emissions

Pollutant	Proposed Maximum(1) by Applicant (T/Y)	Proposed Maximum(2) by Department (T/Y)	Significant Emission Rate for PSD Applicability (T/Y)	Significant Emission Rate for Nonattainment Applicability (T/Y)
Particulate Matter (PM)	328	164	25	NA
Sulfur Dioxide (SO_2)	2319	1322	40	NA
Nitrogen Oxides (NOx)	2361	1417	40	NA
Carbon Monoxide (CO)	378	378	100	NA
Hydrocarbons (VOC)	57	57	NA	100
Lead (Pb)	128	128	0.6	–
Fluorides (F^-)	109	11	3	–
Sulfuric Acid Mist (H_2SO_4)	200	20	7	–
Beryllium (Be)	0.0040	0.0040	0.00040	–
Mercury (Hg)	3.9	1.3	0.1	–
Arsenic (As)	0.13	0.13	0	–
Hydrogen Chloride (HCl)	5252	5252	–	–

(1) Based on facility capacity of 2588 TPD of MSW with emission rates as proposed by the applicant.

(2) Based on facility capacity of 2588 TPD of MSW with emission rates as proposed by the Department.

(3) NA – Not applicable in the application.

Table II-1

Broward County Resource Recovery Facility
Source Parameters

Source (1)	UTM – E (km)	UTM – N (km)	Stack Height (M)	Exit Temp. (K)	Exit Velocity (M)	Stack Diameter (M)
Unit 1	579.6	2883.3	59.4	505	26.4 (2)	2.29
Unit 2	579.6	2883.3	59.4	505	26.4 (2)	2.29
Unit 3	579.6	2883.3	59.4	505	26.4 (2)	2.29

(1) Three 750 TPD incinerators, each with a flue to a common stack. For modeling purposes the common stack was given a stack diameter of 5.03 m and an exit velocity of 14.1 m/s, providing for a minimum flow rate.

(2) Estimated by dividing flow rate (ACFM) in application by 3 and calculating with given diameters.

Table II - 2
Broward County Resource Recovery Facility
Maximum Emission Rates (1)

Polluatant	(lb/ton)	(lb/hr)	(ton/yr)
PM	0.34	37.5	164
SO_2	2.8/5.6(2)	603.9	1322
NOx	3.0	323.5	1417
CO	0.8	86.3	378
VOC	0.12	12.9	57
Pb	0.27	29.1	128
F^-	0.023	2.5	11
H_2SO_4 Mist	0.042	4.6	20
Be	$8.4x10^{-6}$	0.00091	0.0040
Hg	0.0027	0.29	1.3
As	0.00028	0.030	0.13
HCl	4.0	431.3	5252

(1) Based on facility capacity of 2588 TPD of MSW and department emission limitations.

(2) The emission limitation is 2.8 lb/ton 30 day average, not to exceed 5.6 lb/ton.

Table II - 3
Broward County Resource Recovery Facility
Maximum Air Quality Impacts of the RRF
For Comparsion to the Deminumus Ambient Levels

Polluatant and Averaging Time	Predicted Impact (ug/m^3)	Deminimus Ambient Impact Level(ug/m^3)
SO_2 (24-hour)	7.4	13
PM (24-hour)	0.5	10
NO_2 (Annual)	0.4	14
CO (8-hour)	2.1	575
Pb (24-hour)	0.36	0.1
F^- (24-hour)	0.030	0.25
Be (24-hour)	0.00001	0.0005
Hg (24-hour)	0.004	0.025

Table II - 4
Broward County Resource Recovery Facility
Monitoring Data Within 10 km of the RRF

Site	(Location with Respect to the Proposed Facility) Direction (degrees)	Distance (km)	Pollutant	Concentration 1984 Annual (ug/m^3)	24-hour (ug/m^3)	8-hour (mg/m^3)	1-hour (mg/m^3)
0420002	3°	2.0	CO			10	17
0910002	296°	3.8	PM	33	64		
			NO_2	28			
			SO_2	3	4		
1260004	55°	6.8	PM	41	72		
			NO_2	29			
			SO_2	4	28		
1840001	158°	6.9	PM	39	70		
			Pb (quarterly)	0.2			
3530001	216°	7.3	NO_2	30			
			SO_2	3	6		
1260003	27°	7.6	PM	59	93		
			NO_2	42			
			SO_2	3	4		
			CO			7	11
			Pb (quarterly)	0.9			
1840002	150°	8.6	CO			6	10
3640002	334°	9.4	PM	31	59		

Table II - 5
Broward County Resource Recovery Facility
Comparison of New Source Impacts with PSD Increments

Pollutant and Averaging Time	PSD Class II Increment (ug/m^3)	Predicted Increased Concentration (ug/m^3)	Percent Increment Consumed	PSD Class I Increment (ug/m^3)	Predicted Increased Concentration (ug/m^3)
SO_2					
3-hour	512	26	5	25	4
24-hour	91	7	8	5	1
Annual	20	<1	<5	2	<1
PM					
24-hour	37	<1	<3	10	<1
Annual	19	<<1	<<5	5	<<1

Table II - 6
Broward County Resource Recovery Facility
Comparsion of Total Impact with the AAQS

Pollutant and Averaging Time	Maximum Impact Project (ug/m^3)	Maximum Impact (1) All Sources (ug/m^3)	Existing Background (2) (ug/m^3)	Maximum Total Impact(ug/m^3)	Florida AAQS (ug/m^3)
SO_2					
3-hour	26	625	63 (3)	688	1300
24-hour	7	216	28	244	260
Annual	<1 (4)	-	4	-	60
PM					
24-hour	<1 (4)	-	93	-	150
Annual	<<1 (4)	-	59	-	60
NO_2					
Annual	<1 (4)	-	42	-	60
CO					
1-hour	4 (4)	-	17,000	-	40,000
8-hour	2 (4)	-	10,000	-	10,000
Pb					
3-months	0.1 (5)	-	0.9	1	1

(1) Maximum impact includes the FPL Port Everglades and Fort Lauderdale power plants.

(2) Existing background is estimated using the highest monitored concentrations in the area near the proposed RRF.

(3) The 3-hour background is estimated by multiplying the 24-hour background by 2.25.

(4) Less than significant, no further analysis completed.

(5) Three-month average estimated using a logrithmic average of 24-hour and annual concentration estimates.

Broward County RRF

6. Impacts on Air Quality

I. Rule Applicability

II. Prevention of Significant Deterioration
1. Introduction
2. Control Technology Review
   a. BACT Determination
3. Modeling Methodology
4. Analysis of Existing Air Quality
5. PSD Increment Analysis
   a. Class II Area
   b. Class I Area
6. AAQS Analysis
7. Additional Impacts Analysis
   a. Impacts on Soils and Vegetation
   b. Impact on Visibility
   c. Acid Rain Impact
   d. Growth-Related Air Quality Impacts
   e. GEP Stack Height Determination

III. Nonattainment Review
1. Introduction
2. Area of Influence

IV. Fog

Permitted or Proposed Emissions
(lb/ton MSW)

Facility	PM	SO_2	NO_x	CO	VOC	Pb	F	Hg	Be	H_2SO_4 Mist	HCl
Dade County											
Pinellas County Units 1+2, 3[3]	0.6	3.0	4.3	0.8	0.2	0.1	0.1	0.003	$10.\times10^{-6}$		5.3
Hillsborough County	0.38	3.2	3.0	1.8	0.20	0.048	0.06	0.0039	13.1×10^{-6}	0.0768	4.0
City of Tampa[1]	0.67	4.07	7.2	0.41	0.22	0.074	0.10	0.0096[2]	6.24×10^{-6}		4.51
Broward County[3]	0.67	4.91	5.0	0.80	0.12	0.27	0.23	0.0023	7.4×10^{-6}	0.025	
Palm Beach County[3]	0.45	6.27	2.79	7.36	0.14	0.001	0.028	0.0021	6.27×10^{-6}		2.45

(1) based on permitted maximum hourly emission rate for 1000 T/day MSW

(2) Vaporous Mercury, Particulate Hg limited to 0.0004 lb/ton

(3) Proposed by Applicant

TABLE 1

Comparison of DER and BC Proposed Emission Rates

Pollutant	DER Draft	DER lbs/MBtu	BC 6/14/85 lbs/MBtu
Particulate	0.015 gdscf	0.050	0.074
Sulfur Dixoide	2.8 lbs/T 5.6 lbs/T	0.311 0.622	---- 0.55
Nitrogen Oxides	5 ~~3~~.0 lbs/T	0056 ~~0.333~~	0.56
Carbon Monoxide	0.8 lbs/T	0.089	0.089
Lead	0.027 ~~0.27~~ lbs/T	0.0030 uncont. ~~0.0015~~	0.003
Mercury	2400 grams/D	0.00026	----
Odor	None	None	----
Opacity	15%	----	10%
Fluoride	2.5 lbs/hr	0.0022 ~~0.000013~~	----
Beryllium	8.4xE-6	9.3xE-7	----
Volatile Organic Compounds	0.12 lbs/T	0.013	----
Sulfuric Acid Mist	4.6 ~~4.8~~ lbs/hr	.0047 ~~0.000026~~	----

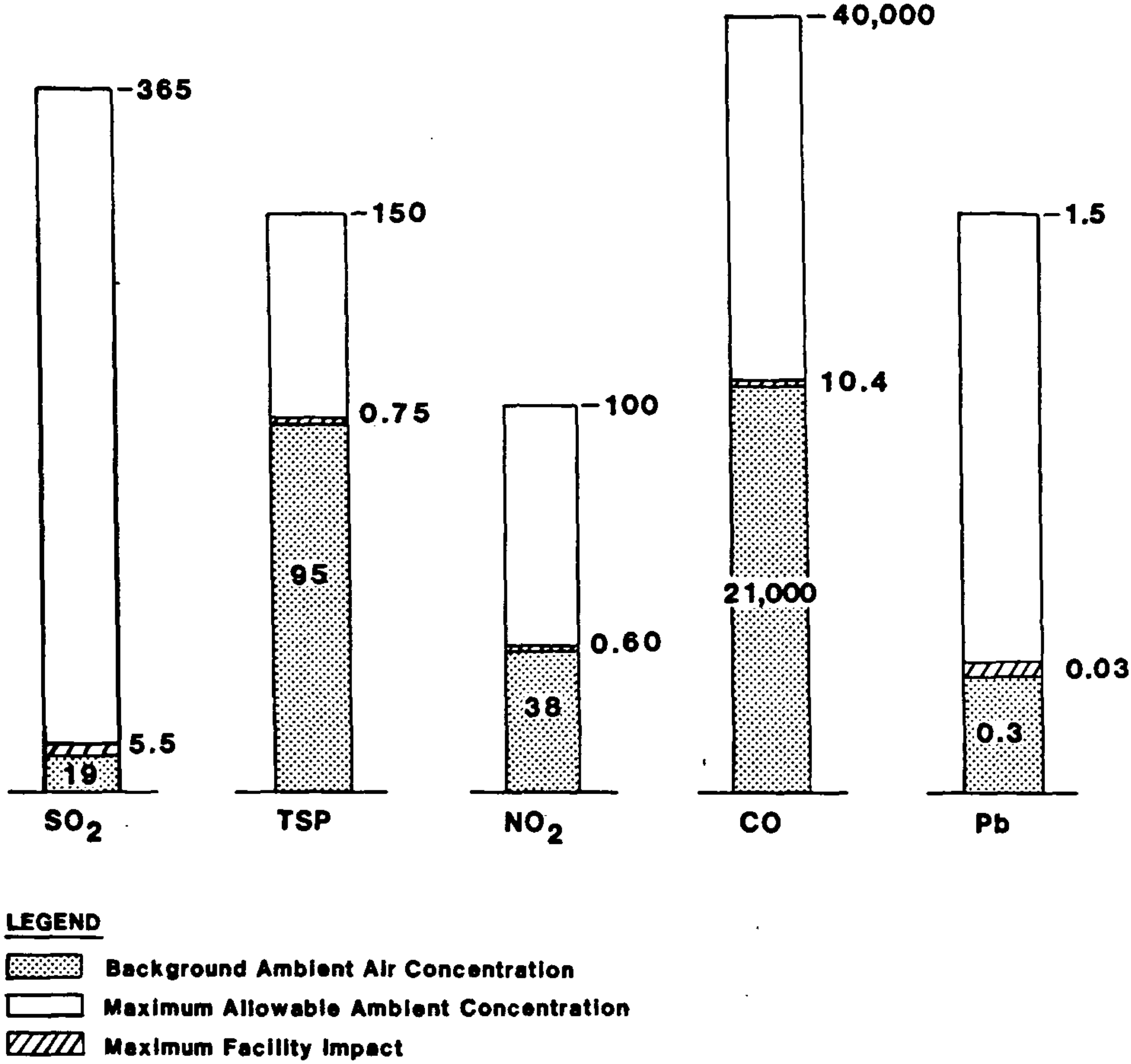
TABLE 2

Comparison of DER and BC Proposed Emission Rates

Pollutant	DER Draft	DER lbs/MBtu	BC 6/14/85 lbs/MBtu	Standard Test	
Particulate	0.015 gdscf	0.050	0.074	Method 5	
Sulfur Dixoide	2.8 lbs/T	0.311	----	Method 6 or 8	
	5.6 lbs/T	0.622	0.55		
Nitrogen Oxides	3.0 lbs/T	0.333	0.56	Method 7	
Carbon Monoxide	0.8 lbs/T	0.089	0.089	Method 10	
Lead	0.27 lbs/T	~~0.0015~~ 0.109	0.003	Method 12	
Mercury	2400 grams/D	0.00026	----		????
Odor	None	None	----	ASTM D-1391-57	???
Opacity	15%	----	10%	Method 9	
Fluoride	2.5 lbs/hr	~~0.000048~~ 0.0077	----		????
Beryllium	8.4xE-6	9.3xE-7	----		????
Volatile Organic Compounds	0.12 lbs/T	0.013	----		????
Sulfuric Acid Mist	4.8 lbs/hr	0.000026	----		????

COMPARISON OF FACILITY AIR QUALITY IMPACTS WITH SHORT-TERM AAQS* AVERAGING PERIODS
INTIAL PROJECTED CAPACITY

(Concentrations in ug/m³**)

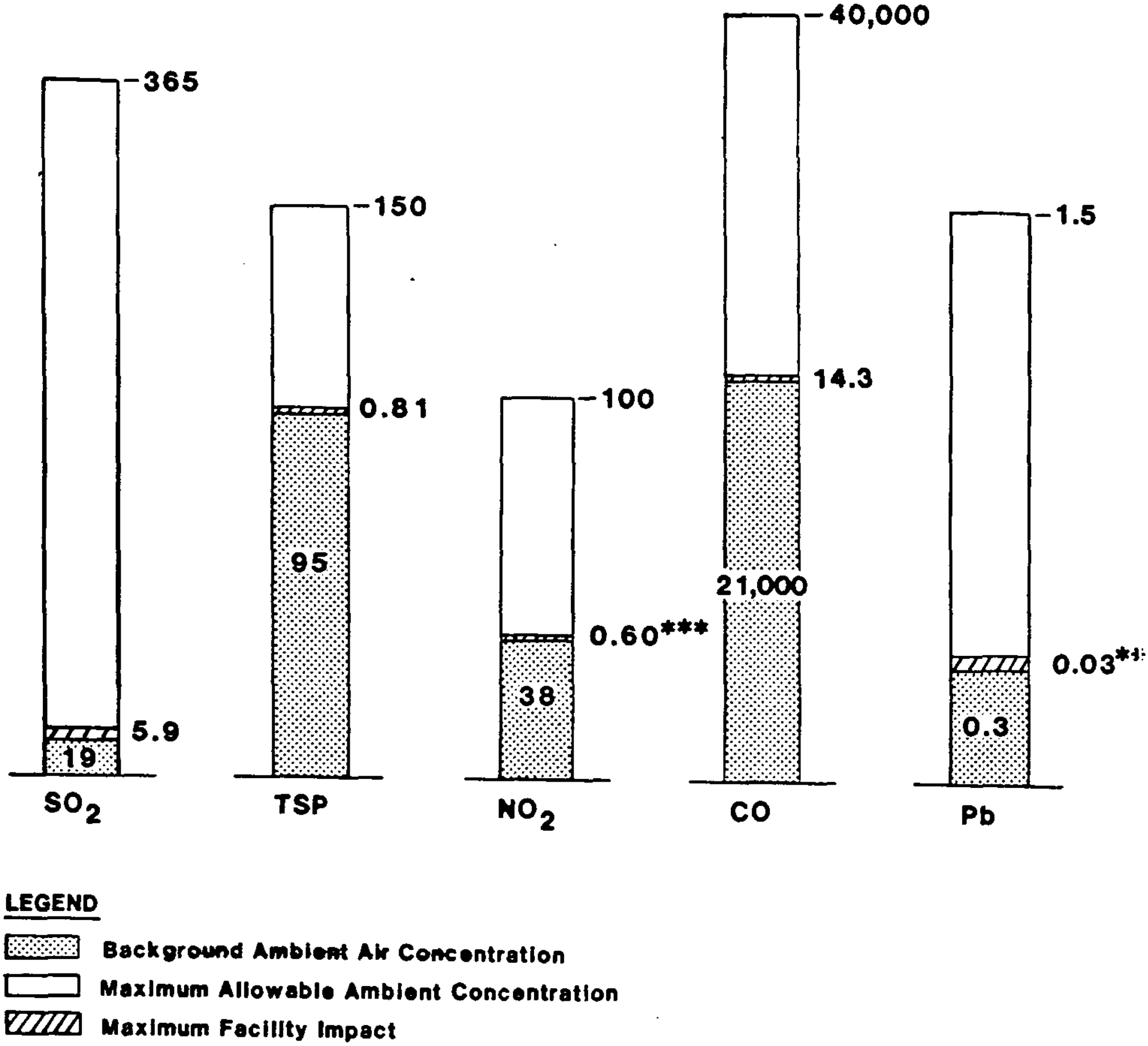


SO_2 - Sulfur Dioxide (SO_2) concentrations given for 24-hour averaging time.
TSP - Particulate Suspended Matter (TSP) concentrations given for 24-hour averaging time.
NO_2 - Nitrogen Dioxide (NO_2) concentrations given for annual averaging time.
CO - Carbon Monoxide (CO) concentrations given for 1-hour averaging time.
Pb - Lead (Pb) concentrations given for quarterly averaging time.
* - AAQS - Ambient Air Quality Standard
** - ug/m^3 - micrograms per cubic meter

COMPARISON OF FACILITY AIR QUALITY IMPACTS WITH SHORT-TERM AAQS* AVERAGING PERIODS

MAXIMUM PROJECTED CAPACITY

(Concentrations in ug/m³**)



SO_2 - Sulfur Dioxide (SO_2) concentrations given for 24-hour averaging time.
TSP - Particulate Suspended Matter (TSP) concentrations given for 24-hour averaging time.
NO_2 - Nitrogen Dioxide (NO_2) concentrations given for annual averaging time.
CO - Carbon Monoxide (CO) concentrations given for 1-hour averaging time.
Pb - Lead (Pb) concentrations given for quarterly averaging time.
* - AAQS - Ambient Air Quality Standard
** - ug/m^3 - micrograms per cubic meter
*** Actual concentrations are negligably higher (rounded to the nearest hundredth)

District Office, Post Office Box 3858, 3301 Gun Club Road, West Palm Beach, Florida, 33402-3858, by telephone during the working day that the effect or damage occurs and shall confirm this in writing within seventy-two (72) hours of becoming aware of such conditions, and shall provide in writing an analysis of the problem and a plan to eliminate or significantly reduce the harmful effects of damage.

C. Reporting

1. Starting three (3) months after certification, a quarterly construction status report shall be submitted to the Southeast Florida District Office of the Department of Environmental Regulation. The report shall be a short narrative describing the progress of construction.

2. Upon completion of construction the DER Southeast Florida District Office will be notified in order that a pre-operational inspection can be performed.

XIV. OPERATION

A. Air

The operation of the Resource Recovery Facility shall be in accordance with all applicable provisions of Chapter 17-2, 17-5, and 17-7, Florida Administrative Code. In addition to the foregoing, the permittee shall comply with the following specific conditions of certification:

1. Emission Limitations upon Operation of Unit 3 ?

a. Stack emissions from each unit shall not exceed the following:

(1) Particulate matter: ~~0.03~~ 0.015 grains per standard cubic foot dry gas corrected to 12% CO_2

(2) SO_2: 2.8 lbs/ton 30 day rolling average
Not to Exceed 5.6 lbs/ton.

(3) Nitrogen Oxides: 3 lbs/ton

(4) Carbon Monoxide: 0.8 lbs/ton

(5) Lead: 0.27 lbs/ton

This 3,200 gms/day is for the entire facility

(6) Mercury: ~~2240~~ 3,200 grams/day ~~when more than 2205 lbs/day of municipal sludge is fired~~. Compliance shall be determined in accordance with 40 CFR 61, Method 101, Appendix B.

(7) Odor: there shall be no objectionable odor.

(8) Visible emissions: opacity shall be no greater than ~~10%~~ 15 except that visible emissions with no more than 20% opacity may be allowed for up to three minutes in any one hour except during start up or upsets when the provisions of 17-2.250, FAC shall apply. Opacity compliance shall be demonstrated in accordance with Florida Administrative Code Rule 17-2, 700(6)(2)9;, DER Method 9.

(9) Fluoride: 2.5 lbs/hour.

b. The height of the boiler exhaust stack shall not be less than 195 feet above grade.

c. The incinerator boilers shall not be loaded in excess of 115% of their rated capacity, ~~or~~ 71,875 pounds per hour each.

115%

Name plate: 62,500 lbs/hr.

d. The incinerator boilers shall have a metal name plate affixed in a conspicuous place on the shell showing manufacturer, model number, type waste, rated capacity and certification number.

e. Compliance with the limitations for particulates, sulfur oxides, nitrogen oxides, carbon monoxide and lead shall be determined in accordance with Florida Administrative Code Rule 17-2.700, DER Methods 1,2, 3, 5, 6, and 40 CFR 60, Appendix A, Method 7. The stack test for each unit shall be performed at ± 10% of the maximum steam rate of 71,875 pounds per hour.

2. Electrostatic Precipitators

The four-field electrostatic precipitator shall be designed and constructed to achieve a maximum emission rate of 0.03 grains per dscf.

3. Air Monitoring Program

a. The permittee shall install and operate continuously monitoring devices for stack oxygen and opacity. The monitoring devices shall meet the applicable requirements of Chapter 17-2, Section 17-2.710, FAC, and 40 CFR 60.45, and 40 CFR 60.13, including certification of each device. Data on monitoring equipment specifications, manufacturer, type, calibration and maintenance needs, and location on the stack shall be provided to the department for approval prior to installation.

b. The permittee shall provide sampling ports into the stack and shall provide access to the sampling ports in accordance with Section 17-2.700(4), FAC. Drawings of stack testing facilities as required by Section 17-2.700(4) shall be submitted to the department for approval at least 120 days prior to construction of the stack.

E.6. Air Quality Impacts

Broward County proposes to construct a resource recovery facility near Fort Lauderdale, Florida. The facility will be a major source of the air pollutants particulate matters, sulfur dioxide, nitrogen oxides, and carbon monoxide from the combustion of municipal solid waste in three incinerators. Thermal energy from the combustion will be used to produce steam for electric power generation.

a. Construction

The primary sources of air pollutants during construction of the facility will originate from vehicular and heavy equipment exhaust emissions and fugitive dust from wind and the movement of equipment and vehicles over unpaved areas.

The acts of stripping and filling of the construction site will produce some dust clouds. Estimates by the EPA indicate that suspended dust levels from heavy construction activities approximate 1.2 tons per acre per month of construction activity. The applicant indicates that water sprays and other dust suppression measures will be applied on problem sites as necessary.

b. Operation

(i) Emissions

During operation of the facility, expected stack emissions will be particulates, SO_2, fluorides, lead, carbon monoxide, hydrocarbons, mercury, beryllium, chlorides and oxides of nitrogen. Other site emissions will arise from landfilling and truck movement around the site causing fugitive dust. Odor is not expected to be a problem because plant air will be drawn towards the boiler, where odor-causing chemicals in the air stream will be combusted.

The emission of particulate matter from the boilers has been proposed to be controlled by an electrostatic precipitator (ESP). Such emissions are limited by subsection 17-2, FAC, to 0.08 grains per standard cubic foot corrected to 50% excess air and by subsection 17-2.600(1), FAC, to 20% opacity of visible emissions.

The applicant has proposed to meet an emission limit of 0.03 grains per dry standard cubic foot at 12% CO_2.

(ii) Rule Applicability

The applicable air quality related rules are contained in Chapter 17-2 of the Florida Administrative Code (FAC) and Chapter 40 of the Code of Federal Regulation. Two broad categories can be distinguished; nonattainment rules, or rules governing pollutants emitted in areas with measured concentrations of these pollutants exceeding the air quality standards, and attainment rules, or rules governing pollutants emitted within areas not exceeding an air quality standard for that pollutant. Broward County is designated a nonattainment area for the pollutant ozone (40 CFR 81.310 and Rule 17-2.410, FAC). For all other pollutants for which an air quality standard exists (criteria pollutants), the county is designated as attainment (40 CFR 81.310 and Rule 17-2.420, FAC).

The applicant is proposing initially to construct three 750 TPD municipal solid waste (MSW) incinerators. An ultimate maximum capacity of 3,300 TPD is anticipated in the future which will require a fourth unit. The maximum annual emissions for all regulated pollutants have been estimated by the applicant based on operation of the boilers at 115% of their rated capacity. These emissions are compared to the significant emission rates used to determine the Prevention of Significant Deterioration (PSD) review applicability (i.e. the attainment rules) (40 CFR 52.21(b)(23) and Rule 17-2.500, Table 500-2) and nonattainment review applicability (Rule 17-2510(2)). Table I-1 lists the proposed emissions along with the applicable significant emissions rates. The proposed facility has the potential to emit more than 100 tons per year of one or more regulated pollutants and is, therefore, subject to review for Prevention of Significant Deterioration (40 CFR 52.21 and Rule 17-2.500(5)(c), FAC). PSD review includes a determination of Best Available Control Technology (BACT) and an air quality analysis for each attainment or noncriteria pollutant that would be emitted in a significant amount as listed in Table I-1. For the proposed facility, the applicant has addressed PSD review for 10 pollutants: PM, SO_2, NO_x, CO, Pb, fluorides, sulfuric acid mist, Be, Hg, and As.

Nonattainment review (Rule 17-2.510(4), FAC) is required for all nonattainment pollutants which have the potential to emit 100 tons per year or more of the affected pollutant. Nonattainment review includes a determination of Lowest Achievable Emission Rate (LAER) and the obtaining of emission offsets. The regulated pollutant for ozone is VOC. The controlled emissions rate of VOC is less than 100 tons per year and is, thus, not subject to nonattainment review.

The proposed facility is also subject to the provisions of the federal New Source Performance Standards, 40 CFR 60 Subpart E, for incinerators. Rules require that any standard established by BACT shall be, at a minimum, as stringent as an applicable New Source Performance Standard.

The source is also subject to the provisions of Rule 17-2.620(2), which states that no person shall cause, suffer, allow or permit the discharge of air pollutants which cause or contribute to an objectionable odor.

~~c. Best Available Control Technology~~

The emission limits determined to be Best Available Control Technology are based on the use of an electrostatic precipitator ~~a baghouse collector~~ for particulate matter and heavy metals ~~and a scrubber to control fluorides and acid gases.~~ Using a maximum charging rate of 2,558 tons per day and continuous operation, emissions from the three proposed incinerators are as follows:

POLLUTANT	EMISSION LIMIT	POUNDS/HR	TONS/YR
Particulate Matter	0.03 ~~0.015~~ gr/dscf corrected to 12% CO_2	~~37.5~~	~~164.3~~
Sulfur Dioxide	~~2.8 lb/ton~~	301.8	1322.1
Nitrogen Oxides	~~3.0 lb/ton~~	323.4	1416.5
Carbon Monoxide	~~0.8 lb/ton~~	86.2	377.7

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POLLUTANT	EMISSION LIMIT	POUNDS/HR	TONS/YR
Fluorides	~~0.02 lb/ton~~	2.5	10.9
Beryllium	~~8.4 E-6 lb/ton~~	9.1 E-4	4.0 E-3
VOC	~~0.12 lb/ton~~	12.9	56.7
Sulfuric Acid Mist	---	4.6	20.0

~~The emission rates of fluorides and sulfuric acid mist assumes 90% removal by the scrubber.~~

In addition, hydrogen chloride will be emitted at an uncontrolled rate of 4.0 to 10.0 ~~4.0~~ pounds per ton of waste burned. ~~(431.2 pounds per hour, 1888.7 tons per year). A scrubber should reduce emissions of hydrogen chloride by 90%.~~ Mercury emissions are limited to 3200 grams per day during periods when sewage sludge is charged. Lead emissions are projected to be 0.003 lb/mmBTU. ~~29.1 pounds per hour (127.5 tons per year) based on an emission factor of 0.27 pounds per ton of waste burned. Actual lead emissions should be much lower because a baghouse collector can control the fine particulate matter on which lead tends to sorb.~~ Visible emissions from the incinerators are limited to 15% opacity.

Compliance with the limitations for particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, lead, fluoride, mercury and visible emissions shall be determined in accordance with Florida Administrative Code Rule 17-2.700, DER Methods 1, 2, 3, ~~4~~, 6 and 9; 40 CFR 60 Appendix A, Methods 7, 10, 12 and 13; and 40 CFR 61, Appendix B, Method 101.

Best Available Control Technology (BACT) Determination
South Broward County Resource Recovery, Inc.
Broward County

The applicant plans to eventually construct a 3300 ton per day (TPD) municipal solid waste (MSW) incinerator facility to be located at 4400 South, State Road 7, Fort Lauderdale, Florida. The thermal energy from combustion of the MSW will be used to produce steam for electric power generation.

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The present plans are to install three 750 TPD mass burn incinerators that will process a total of 2250 TPD of MSW. This BACT review will apply only to these three units. At some future date a BACT review will be made for the fourth unit as a modification to an existing facility.

Each of the three mass burn incinerators will have an approximate heat input of 313 million Btu per hour, based upon a MSW calorific content of 4500 Btu per pound. Each incinerator will be scheduled to operate 8760 hours per year, and on this basis the tons per year of the various air pollutants emitted were calculated. The applicant has projected a total annual tonnage of regulated air pollutants emitted from the three units based on operating at 115% above nameplate capacity to be as follows:

Particulate	(PM)	315	(25)*
Sulfur Dioxide	(SO_2)	2319	(40)*
Nitrogen Oxides	(NOx)	2361	(40)*
Carbon Monoxide	(CO)	378	(100)*
Lead	(Pb)	128	(0.6)*
Beryllium	(Be)	0.0040	(.0004)*
Mercury	(Hg)	3.9 [1]	(0.1)*
Arsenic	(As)	0.13	(0)*
Fluorides	(F)	109	(3)*
Ozone	(O_3)	57 (VOC)	(40)*
Sulfuric Acid Mist		200 [2]	(7)*

[1] Based on a potential emission factor of 0.00092 lbs/MMBTU

[2] Based on a potential emission factor of 0.047 lbs/MMBTU

* Regulated Air Pollutants-Significant Emission Rates Florida Administrative Code Rule 17-2.500, Table 500-2.

The Broward County solid waste energy recovery facility was reviewed according to Florida Adminstrative Code Chapter 17-17, Electrical Power Plant Siting and Rule 17-2.500, Prevention of Significant Deterioration (PSD). The Bureau of Air Quality Management (BAQM) performed the air quality review for the siting committee, which includes this BACT determination. The certification number assigned to the proposed facility is PA 85-21.

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Rule 17-2.500(2)(f)3 requires a BACT review for all regulated pollutants emitted in an amount equal to or greater than the significant emission rates listed in Table 500-2, Regulated Air Pollutants. The facility is located in an area classified as attainment for all air pollutants, except ozone. The emission limits for the air pollutant ozone (VOC) are determined through the application and employment of Lowest Achievable Emission Rate (LAER), Rule 17-2.640, if applicable.

BACT Determination Requested by the Applicant in pounds per mBTU:

~~The following emission limits are based upon tons of MSW charged~~.

PM	-	~~0.67 lbs~~ 0.074	CO	-	~~0.80 lbs~~ 0.089	Hg	-	~~0.0081 lbs~~ 0.00026
SO_2	-	~~4.91 lbs~~ 0.55	Pb	-	~~0.27 lbs~~ 0.003	F	-	~~0.23 lbs~~ 0.025
NOx	-	~~5.00 lbs~~ 0.56	BE	-	~~8.4 x E-6~~ 9.3 x E-7	VOC	-	~~0.12 lbs~~ 0.013

Date of receipt of a BACT application:

June 9, 1985

Date of publication with Florida Administrative Weekly:

June 14, 1985

Review Group Members:

Ed Svec - New Source Review Section

Clair Fancy - Central Air Permitting

Tom Rogers - Air Modeling Section

Buck Oven - Power Plant Siting

See Certification Conditions for Emission Rates

BACT Determination by DER:

Pollutant	Emission Limit Per Source
Particulate Matter	0.015 grains/dscf, corrected to 12% CO
Sulfur Dioxide	2.8 lb/ton MSW charged, 30 day average, not to exceed 5.6 lb/ton
Nitrogen Oxides	3.0 lb/ton MSW charged
Carbon Monoxide	0.8 lb/ton MSW charged

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Pollutant	Emission Limit Per Source
Fluorides	90% control
Sulfuric Acid Mists	90% control
Lead	~~(1)~~
Mercury	2240 grams/day ~~(2)~~ (1)
Beryllium	8.4 x E-6 lb/ton MSW charged
VOC	0.12 lb/ton MSW charged
Visible Emission	15% opacity

See Certification Conditions

~~(1) No definite emission limit set but control technology discussed in BACT Determination Rationale.~~

(1) ~~(2)~~ Compliance ~~with the mercury emission limit shall be~~ demonstrated in accordance with 40 CFR 61, Method 101 Appendix B.

Compliance with limitations for sulfur oxides, particulate matter, and nitrogen oxides will be demonstrated in accordance with Florida Administrative Code Rule 17-2.700, DER Methods 1, 2, 3, 4, 5, and 6, and 40 CFR 60 Appendix A; Method 7. Compliance with the opacity limit shall be demonstrated in accordance with Florida Administrative Code Rule 17-2.700(6)(a)9., DER Method 9.

A continuous monitoring system to measure the opacity of emissions of each stack shall be installed, calibrated, and maintained in accordance with the provisions of Rule 17-2.710, Continuous Emission Monitoring Requirements. The CEM's must be installed and operational prior to compliance testing.

BACT Determination Rationale:

Each MSW incinerator will have a charging rate more than 50 tons per day, and therefore, is subject to the provisions of 40 CFR 60.50, Subpart E, New Source Performance Standards (NSPS). The NSPS standard regulates only particulate matter. The

particulate matter standard is 0.08 grains/dscf, corrected to 12% CO. This NSPS was promulgated in 1971 and no longer reflects state-of-the-art for control of particulate emissions. ~~Recent stack testing data for MSW incinerators indicates that both electrostatic precipitator and fabric filter control technology~~ is potentially ~~are capable of controlling particulate emissions, well below the applicant's proposal of 0.03 grains/dscf.~~ Based on the control technology available, a particulate matter emission limit of ~~0.015~~ 0.03 grains/dscf corrected to 12% CO_2 is judged to represent BACT. All the other requirements as set forth in the NSPS, Subpart E, will apply.

The Department has determined the emission limit for SO_2 to be 2.8 pounds per ton on MSW charged into the incinerator based on a 30 day average. MSW components that appear to be major contributors of sulfur include rubber, plastics, food wastes, yard wastes, and paper.

The SO_2 emission limit was determined to be BACT by evaluating studies of emissions test data for similar MSW incinerations. Various studies have indicated average emission levels of 2.0 to 2.8 lb SO_2/ton MSW charged with deviations of $\pm$ 1.3 to 1.6 lb/ton. The amount of SO_2 emitted would be comparable to the burning of distillate oil having less than a 0.5% sulfur content. Burning low sulfur fuel is one acceptable method of controlling SO_2 emissions. The installation of a flue gas desulfurization system to control SO_2 emissions is not warranted when burning MSW.

The mercury emission limit determined as BACT is equal to the National Emission Standard to Hazardous Air Pollutants (NESHAPs), 40 CFR 61.50, Subpart E, for municipal waste water sludge incineration plants. Although this standard does not apply to the incineration of municipal solid waste, it is an emission limit that should not be exceeded. The BACT is determined to be 3200 grams per day. This level of mercury emissions is not considered to have a major impact on the environment.

The uncontrolled emission of beryllium, according to the California report, when firing MSW is estimated to be 6.2 x 10^{-6} pounds per million Btu. Uncontrolled beryllium emissions would be approximately 11 grams per 24 hours or 0.01 TPY. The operating temperature of the particulate matter emission control device will be below 500°F. Operation below this temperature is necessary to force absorption/condensation of beryllium oxides, present in the flue gas stream, onto available fly ash particles subsequently removed by the particulate control device. Assuming 95% efficiency of the control device the annual beryllium emissions are estimated at 0.0007 tons per year. This amount of beryllium emitted is considered to have a negligible impact on the environment. The emission factor of 8.4 x 10^{-6} lb/ton MSW proposed by the applicant is judged to be BACT. If, however, beryllium containing waste as defined in the National Emission Standards for Hazardous Air Pollutants (NESHAPs), Subpart C, Subsection 61.31(g), is charged into the incinerator, emissions of beryllium to the atmosphere shall not exceed 10 grams per 20 hour or an ambient concentration of 0.01 ug/m^3, 30 day average. Compliance with this beryllium emission limit will be in accordance with the NESHAPs, Subpart C.

The applicant has projected unabated lead and fluoride(s) emissions to be 128 and 109 tons per year respectively. Projected sulfuric acid mist emissions are capable to being as high as 200 tons per year. These amounts are well in excess of the significant emission rates given in Florida Administrative Code Rule 17-2.500, Table 500-2.

With respect to lead emissions, two conditions are needed to achieve high removal efficiencies of metallic compounds emitted at refuse burning facilities: (1) operation of particulate matter control equipment at temperatures below 260°C (500°F), and (2) consistently efficient removal of submicron fly ash particles. The temperature of the incinerator combustion gases at the inlet to the particulate control device is estimated to be 425-475°F. At these temperatures the particulate control

equipment would be capable of removing the lead emissions from the flue gas stream.

When flue gas temperatures are lowered below 260°C (500°F), metallic compounds are removed from the vapor phase by absorption and condensation preferentially on fine particles with submicron particles receiving the highest concentrations of metals. Properly designed and operational fabric filter systems appear at this time to offer the best method for consistent and efficient removal of fine (and in particular submicron) fly ash. Removal efficiencies of fine fly ash using these systems can be in excess of 99% with respect to MSW incinerators. Studies have indicated the weight percent of submicron particles emitted from combustion is on the order of 45% which clearly indicates the need for efficient control of particles in this range.

Emissions of fluoride originate from a number of sources in the refuse. The mechanisms of governing fluoride release and formation of hydrogen fluoride at refuse-burning facilities are probably similar to those for hydrogen chloride. The control of fluorides can be reduced at refuse-burning plants by removal of selected refuse components with high fluoride contents, and the use of flue gas control equipment. In view of the fact that it is proposed to incinerate materials that contain fluoride, BACT for the control of fluorides is installation of a wet or dry flue gas scrubber system. The addition of a scrubber system would also provide control for SO_2 emissions addressed earlier in this analysis as well as other acid gases which will be addressed in other sections of the analysis.

During combustion of municipal solid waste, NOx is formed in high temperature zones in and around the furnace flame by the oxidation of atmospheric nitrogen and nitrogen in the waste. The two primary variables that affect the formation of NOx are the temperature and the concentration of oxygen. Techniques such as the method of fuel firing to provide correct distribution of combustion air between overfire and underfire air, exhaust gas recirculation, and decreased heat release rates have been used to

reduce NOx emissions. A few add-on control techniques such as catalytic reduction with ammonia and the thermal de-NOx are still experimental and are not considered to be demonstrated technology for the proposed project. State-of-the-art control of the combustion variables will be used to limit NOx emissions at 3 pounds per ton of MSW charged. This level of control is judged to represent BACT.

Carbon monoxide is a product of incomplete combustion where there is insufficient air. Incomplete combustion will also result in the emissions of solid carbon particulates in the form of smoke or soot and unburned and/or partially oxidized hydrocarbons. Incomplete combustion results in the loss of heat energy to the boiler. The department agrees with the applicant that BACT is a combustion control system that will insure sufficient mixing of the MSW and air so that the emissions of products of incomplete combustion are minimized. The proposed CO emission rate is 1.5 pounds per ton of MSW charged. This level of control is judged to represent BACT.

Furthermore, CO has a calorific value of 4347 Btu/lb and when discharged to the atmosphere represents lost heat energy. Since heat energy is used to produce the steam which drives the generator to produce electric power, there is a strong economic incentive to minimize CO emissions.

Hydrocarbon emissions, like carbon monoxide emissions, result from incomplete oxidation of carbon compounds. Control of CO and HC emissions can be mutually supportive events. BACT for hydrocarbons is high combustion temperature, good mixing, and proper air and fuel management.

Sulfur dioxide produced by combustion of sulfur containing materials can be oxidized to SO_3 which can then combine with water vapor to produce sulfuric acid mist. The applicant has stated that sulfuric acid mist emissions could be as high as 200 tons per year for the resource recovery facility based on recent test data for a similar facility in Florida. ~~This facility thus has the potential to be major for sulfuric acid mist and~~

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~~additional control is warranted. The installation of a wet or dry scrubber would minimize sulfuric acid mist emissions and is considered to be BACT for this proposed facility.~~

~~The~~ type of air pollutants emitted ~~when incinerating~~ plastics depends on the atomic composition of the polymer. Plastics composed of only carbon and hydrogen or carbon, hydrogen and oxygen form carbon dioxide and water when completely combusted. Incomplete combustion yields carbon monoxide as the major pollutant.

Plastics containing nitrogen as a heteroatom yield molecular nitrogen, some NOx, carbon dioxide, and water when completely combusted. Incomplete combustion may yield hydrogen cyanide, cyanogen, nitrites, ammonia and hydrocarbon gases. Complete combustion of plastics containing halogen or sulfur heteroatoms form acid gases such as hydrogen chloride, hydrogen fluoride, sulfur dioxide, carbon dioxide, and water. Halogen or sulfur compounds can form on incomplete combustion of the plastic. Polyvinyl chloride (PVC), one of the many polymers, has been implicated as causing the most serious disposal problem due to the release of hydrogen chloride (HCl) gas when incinerated. This problem has long been realized resulting in other polymers being used in packaging. For example, the weight percent of chlorine in polyurethane is 2.4, with only trace amounts in polyethylene and polystyrene, as compared to the weight percent of 45.3 in PVC.

A recent study of MSW incineration performed for the USEPA has indicated that the plastics content of refuse is expected to grow by from 300-400% from the year 1968 to 2000. This increase can be expected to increase uncontrolled HCl emissions from municipal waste incineration by roughly 400% from 1970 to the year 2000. Potential emissions of HCl from the MSW incinerator could be as high as 5252 tons per year assuming an emission rate of 11.12 pounds per ton of MSW incinerated.

Emissions of HCl at refuse incineration facilities can be reduced by removal of selected refuse components with high chlorine contents (source separation), combustion modification, and the use of flue gas control equipment. Although the combustor configuration may influence the amount of chlorine conversion, combustion modification in not a viable means of controlling HCl emissions.

Potential emissions of HCl can be reduced significantly by removing plastic items from the wash stream. This is particularly true when the plastics are the PVC type explained earlier. With the exception of limited recycling efforts, source separation of plastics has not been demonstrated and costs are uncertain at this time. In addition to this, the combustion of plastics may be favorable due to their relatively high heat of combustion.

Plastic materials have a high heat of combustion, for example, coated milk cartons - 11,300 Btu/lb, latex - 10,000 Btu/lb and polyethylene 20,000 Btu/lb. For comparison, newspaper and wood have a heat content of 8,000 Btu/lb, and kerosene - 18,900 Btu/lb. Here again there is economic incentive to obtain as complete combustion as possible.

At this time flue gas controls are the most conventional means of reducing HCl emissions at refuse burning facilities. Based on the estimates of HCl emissions and the trend for increases due to higher percentages of plastics in future waste streams, the installation of a wet or dry scrubber to control the acid gases would provide an added benefit of controlling HCl emissions.

~~Throughout this BACT determination much emphasis has been placed on the controls that are needed to satisfy the BACT requirements. Although the Bureau does not have the authority to stipulate the type of control equipment that should be used on a facility (i.e., ESP vs. baghouse; dry vs. wet scrubber), a dry scrubber used in conjunction with a baghouse appears to be the best method for controlling emisions from this type of facility.~~

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Electrostatic precipitators (ESP's) without acid gas control removes Total Suspended Particulates (TSP) only, collecting submicron particles with difficulty. It can be done, but as with any control, effectiveness and reliability are questionable in this area. The need for acid gas controls is clearly defined in this analysis and test data show fabric filters to be less sensitive to changes in flue gas volumes, inlet concentrations, and small excursions in temperature than ESP's employed at many refuse burning facilities. In addition it is well proven that baghouses are capable of meeting the grain loading limits discussed in this determination and that the scrubber-baghouse combination is relatively reasonable due to reduction in size requirements.

The air quality impact of the proposed emissions has been analyzed. Atmospheric dispersion modeling has been completed and used in conjunction with an analysis of existing air quality data to determine maximum ground-level ambient concentrations of the pollutants subject to BACT. Based on these analyses, the department has reasonable assurance that the proposed solid waste recovery facility in Broward County, subject to these BACT emission limitations, will not cause or contribute to a violation of any PSD increment or ambient air quality standard.

d. Prevention of Significant Deterioration

i. Introduction

As seen in Section I, Table I-1, the proposed resource recovery facility, located in south Broward County, will emit in PSD-significant amounts 10 pollutants. These are the criteria pollutants particulate matter (PM), sulfur dioxide (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), and lead (Pb), and the non-criteria pollutants fluorides, sulfuric acid mist, beryllium (Be), mercury (Hg), and arsenic (As). The emission increase for volatile organic compound (VOC) is addressed in the nonattainment review section. The pollutant hydrogen chloride (HCl) is not a regulated pollutant but will be discussed within this section.

ii. The air quality impact analysis required by the PSD regulations for these pollutants includes:

An analysis of existing air quality;

A PSD increment analysis (for SO_2 and PM only);

An Ambient Air Quality Standards (AAQS) analysis;

An analysis of impacts on soils, vegetation, acid rain, and growth-related air quality impacts; and

A "Good Engineering Practice" (GEP) stack height determination.

The analysis of existing air quality generally relies on preconstruction monitoring data collected in accordance with EPA-approved methods. The PSD increment and AAQS analysis depend on air quality dispersion modeling carried out in accordance with EPA guidelines.

Based on these required analyses, the department has reasonable assurance that the proposed source at the south Broward County RRF, as described in this report and subject to the conditions of approval proposed herein, will not cause or contribute to a violation of any PSD increment or ambient air quality standard. A discussion of the modeling methodology and required analysis follows.

iii. Modeling Methodology

The EPA-approved Industrial Source Complex Short-Term (ISCST) dispersion model was used in the air quality impact analysis. This model determines ground-level concentrations of inert gases or small particles emitted into the atmosphere by point, area, and volume sources. The model incorporates elements for plume rise, transport by the mean wind, gaussian dispersion, and pollutant removal mechanisms such as deposition or transformation. The ISCST model also allows for the separation of sources, building wake downwash, and various other input and output features. Both screening and refined analyses were completed using this model.

The applicant completed the dispersion modeling for two scenarios. The first scenario dealt with the initial capacity of the proposed facility and the second scenario with a predicted ultimate capacity. The initial capacity of the facility was estimated at 2705 tons per day (TPD) of municipal solid waste (MSW). This capacity was estimated because the actual incinerator size had not been determined. The ultimate capacity of the facility was estimated at 3795 TPD of MSW; however, there are currently no plans for the construction of additional incinerators to bring the capacity up to this level. Since the submission of the modeling results, the applicant has decided to initially construct three 750 TPD incinerators. Allowing for these units to run at up to 15% above the nameplate capacity (this same allowance was made in the original estimate of 2705 TPD), the initial capacity is now estimated as 2588 TPD.

In addition to estimating the capacity of the facility, the applicant also estimated the emission rates of the regulated pollutants. These estimates were based on test results from other facilities and from their proposed best available control technology (BACT) analysis. The department has reviewed the applicant's BACT analysis and has in some cases determined a different emission limitation for a pollutant. For the purpose of this review te initial capacity, as currently anticipated (2588 TPD), and the emission limitations as determined by the department will be used to develop the ambient impacts. It is assumed that the emission characteristics, i.e. the stack height, stack gas temperature, exit velocity, and stack diameter, are the same for the new capacity and BACT emission rates, although these could change if a different control device is required to meet these limitations.

Five years of sequential hourly meteorological data were used in the modeling analyses. Both the surface and the upper air data used were Nationa Weather Service data collected at Miami, Florida, during the period 1970-1974. Since five years of data were used, the highest, second-high, short-term predicted concentrations are compared with the appropriate ambient standard or PSD increment.

The initial set of screening model runs determined the highest, second-high concentrations over a polar coordinate receptor grid with 36 radials, 10 degrees apart, and 10 downwind distances from 0.3 km to 4.3 km. Concentrations were predicted for the initial capacity of the facility. Additional refined modeling was completed for those days having the highest, second-high concentrations using a refined receptor grid of seven radials, 2 degrees apart and seven distances, 100 m apart, centered on the location of the previously determined high, second-high value. In all of these runs only the proposed RRF was modeled. Other major sources in the area, namely Florida Power and Light's Port Everglades and Fort Lauderdale facilities, were additionally modeled by the applicant.

The impact of the proposed facility on the Everglades National Park Class I area was also evaluated. Modeling was completed placing receptors along the edge of the Class I area using five years of meteorological data. The 17 receptor locations were spaced two kilometers apart along the northeast boundary of the park.

All of the modeling was completed using the SO_2 emissions rate of the proposed facility. The impacts of the other emitted pollutants were determined by ratioing the emission rates to the SO_2 emission rate and multiplying by the SO_2 impact. Total ambient air quality impacts were based on the modeled impacts plus the monitored "background" concentrations.

The stack parameters and emission rates used in evaluating the ambient impacts are listed in Table II-1 and Table II-2, respectively.

iv. Analysis of Existing Air Quality

Preconstruction ambient air quality monitoring is required for all pollutants subject to PSD review. In general, one year of quality assured data using an EPA reference, or the equivalent, monitor must be submitted. Sometimes less than one year of data, but no less than four months, may be accepted when department approval is given.

An exemption to the monitoring requirement can be obtained if the maximum air quality impact, as determined through air quality monitoring, is less than a pollutant-specific deminimus concentration. In addition, if current monitoring data already exist and these data are representative of the proposed source area, then at the discretion of the department these data may be used.

The predicted maximum air quality impacts of the proposed RRF for those pollutants subject to PSD review are given in Table III-3. The monitoring deminimus level for each of these pollutants is also listed. Sulfuric acid mist and arsenic are not listed because there is no deminimus level for either of these pollutants.

Lead is the only pollutant which exceeds its monitoring deminimus level. Two existing lead monitors are located within 7.6 km of the proposed facility, therefore, the department did not require any additional monitoring for lead. Table II-4 lists the measured ambient concentrations of lead and other pollutants at all monitors within 10 km of the proposed facility.

v. PSD Increment Analysis

a. Class II Area

The proposed Broward County RRF is to be located in a Class II area. This area is also designated as attainment area for both SO_2 and PM. A PSD increment analysis is therefore required to show compliance with the Class II increments.

The PSD increments represent the amount that new sources in the area may increase ambient ground-level concentrations of SO_2 and PM. At no time, however, can the increased loading of these pollutants cause or contribute to a violation of the ambient air quality standards.

All SO_2 and PM emission increases from sources constructed or modified after the baseline data (December 1977) will consume PSD increment. In addition, all SO_2 and PM emission increases associated with construction or modification of major sources which occurred after January 6, 1975, will consume increment. The proposed Broward County RRF is the only signficant source in the area which will consume PSD increment for either SO_2 or PM.

Atmospheric dispersion modeling, as previously described, was performed to quantify the amount of PSD increment consumed. The results of this modeling are summarized in Table II-5. The results indicate that the concentration increases are within the allowable amounts.

b. Class I area

A Class I area increment analysis is required because the proposed facility is located within 100 kilometers (57 km) of the Everglades National Park, a designated Class I area. Although the distance to the Class I area is greater than 50 kilometers (the distance to which the models are generally considered valid), the applicant used the model to estimate the impact on this area. The results indicated a less than significant impact.

vi. AAQS Analysis

Given existing air quality in the area of the proposed Broward County RRF, emissions from the new facility are not expected to cause or contribute to a violation of an AAQS. The results of the AAQS analysis are contained in Table II-6.

Of the pollutants subject to review, only the criteria pollutants PM, SO_2, CO, NOx, and Pb have an AAQS to compare with. Dispersion modeling was performed, as detailed in section 3, Modeling Methodology, for the proposed facility. The results showed that, with the exeption of SO_2 and lead, the maximum impacts of the other criteria pollutants were less than the signficant impact levels defined in Rule 17-2.100(150), FAC. As such, no further modeling analysis was completed for PM, NOx, and CO. For SO_2, additional modeling was performed which included the interaction of surrounding sources of SO_2. For lead, there is no significant impact level defined in the Rule. No further modeling of lead was completed because the predominate source of ambient lead in the area is mobile sources.

The total impact on ambient air is obtained by adding a "background" concentration to the maximum modeled concentration. This "background" concentration takes in to account all sources of the particular pollutant in question that were not explicitly modeled. A conservative estimate of these "background" concentrations is given by the second highest monitored concentration for each pollutant as listed in Table II-4. This is a conservative estimate because sources used in the modeling may have contributed to the monitored value and contribute doubly to the total impact.

None of these criteria pollutants are expected to cause or contribute to an exceedance of an AAQS. However, the increased lead emissions could increase ambient concentrations up to the lead standard. In this area, lead is introduced into the atmosphere principally by motor vehicles. As leaded gasoline is gradually faded out of the market, ambient lead levels will decrease in the area.

vii. Additional Impacts Analysis

a. Impacts on Soils and Vegetation

The maximum ground-level concentrations predicted to occur for the criteria pollutants as a result of the proposed project, in conjunction with other sources, including a background concentration, will be at or below all applicable AAQS including the secondary standards designed to protect public welfare-related values. As such, these pollutants are not expected to have a harmful impact on soils and vegetation.

A summary of the types and quantities of soils and vegetation in and around the proposed RRF site area and in the Everglades National Park can be found in the Site Certification Application. The applicant has also compared predicted maximum impacts with known adverse impact levels for both criteria and noncriteria pollutants. No adverse impacts are expected.

b. Impact of Visibility

A level-1 visibility screening analysis was performed to determine any impact on the Everglades National Park Class I area. The analysis showed that there was no potential for adverse impact on visibility in this area due to emissions from the proposed RRF.

c. Acid Rain Impact

The increased emissions of SO_2 and NOx, identified percursors to possible acid formation and subsequent acidic rain, from the proposed facility are relatively small in comparison with emissions of these pollutants from nearby power plants. Thus no significant additional impact on the acidity of rainfall is expected as a result of these emissions. Hydrogen chloride, also emitted from the facility in similar quantities as SO_2 and NOx, may also increase acidity in rain.

d. Growth-Related Air Quality Impacts

The proposed facility is not expected to significantly change employment, population, housing, or commercial/industrial development in the area to the extent that an air quality impact will result.

e. GEP Stack Height Determination

Good Engineering Practice (GEP) stack height means the greater of: (1) 65 meters or (2) the maximum nearby building height plus 1.5 times the building height or width, which ever is less. For the proposed project, a single common stack, housing the individual flues of the three incinerators, will be 59.4 meters in height. This is below the allowed GEP stack height of 65 meters.

f. Noncriteria Pollutants

The proposed facility emits in significant amounts (as defined in the PSD regulations): fluorides, sulfuric acid mist, beryllium, mercury, and arsenic. All of these pollutants are regulated, but, there is no ambient air quality standards or PSD increments set for any of them. For three of these pollutants, fluorides, beryllium, and mercury, a deminimus ambient impact level has been defined. Exceedance of these levels, usually determined by dispersion modeling, is used to determine if ambient monitoring is necessary. The results of this modeling for these pollutants is listed in Table II-3. For each of these three pollutants, the predicted impact is less than the respective deminimus impact level.

Hydrogen chloride is not a regulated pollutant. However, because emissions of this pollutant are known to be relatively high, the applicant was asked to estimate these emissions. Uncontrolled, the emissions of hydrogen chlorides are on the same order as sulfur dioxide and nitrogen oxides. Emissions will likely be reduced due to controls being required for fluorides and sulfuric acid mist.

e. Nonattainment Review

1. Introduction

The nonattainment review procedures require that a new or modified facility, which increases emissions by 100 tons (or more) per year of the pollutant for which the are is designated nonattainment, complete the following preconstruction review requirements.

* Meet the Lowest Achievable Emission Rate (LAER) for the affected pollutants;
* Demonstrate that all major facilities owned or operated by the applicant are in compliance with all applicable emission limitations;
* Obtain necessary emission offsets; and,
* Demonstrate a net air quality improvement.

The proposed RRF is to be located in an area designated as nonattainment for ozone. The regulated pollutant for ozong is hydrocarbons. Hydrocarbons (measured as volatile organic compounds) will increase by 57 tons per year. Therefore, nonattainment review is not required.

A demonstration that the increased emissions of VOC would not hinder reasonable further progress was made by the applicant.

The new facility's VOC emissions are less than one percent of the total for the county. In addition, minor source growth was accounted for in the development of the reasonable further progress projections. The department is satisfied that this new facility will not interfere with reasonable further progress for this area attaining the ozone air quality standard.

E.7. Noise

a. Construction

During construction of the plant, noises will be those associated with earth moving, foundation work, erection of steel, pouring of concrete, and driving piling. The nearest residential area subject to potential impact from construction noise is approximately 300-400 feet away. Construction equipment is expected to increase noise levels noticeably above that of traffic and existing noises. The predicted noise levels are not predicted to violate Broward County noise ordinances, however, the residents may be annoyed by the increased duration of the noise during the daylight hours.

b. Operation

The addition of the power plant/energy recovery facility itself should not result in a significant increase in noise levels present in the nearest residential areas. Activities associated with the operation of the plant such as the induced draft fans and the truck traffic bringing in refuse to the plant will likely be the significant sources of noise. Truck traffic into the plant will be for the most part through industrial areas, removing it from residential roadways. Noise levels from the mobile sources will depend on types of equipment utilized over the years and the degree of maintenance given. Concentration of vehicular noise at the plant should be buffered by the plant's enclosed tipping area and landscaping.

Although the state does not currently have noise limitations, Broward County has noise limits of 55 dBA at all times in residential areas but which may rise to 65 dBA from 7 a.m. to 10 p.m. The resource recovery facility will be expected to comply with these limits during construction and operation.

APPENDIX A

PROJECT DESCRIPTION

The southern Broward County Resource Recovery Facility (RRF) and residue/unprocessable waste landfill will be located on 228 acres of land in unincorporated Broward County (Figure 1). The site is bounded by Route 441 on the west, the South Fork New River Canal on the south and east and the proposed I-595 right-of-way in the north. A portion of the site including a 300 foot wide strip along the South Fork New River Canal has been designated by Broward County as a Local Area of Particular Concern (LAPC) and an Urban Wilderness area. The resource recovery facility and the residue/unprocessable waste landfill sites will be divided by the Central Broward Wastewater Region sludge composting plant. The resource recovery facility (RRF) will be located on the southern portion of the project site (57 acres). The residue/unprocessable waste landfill will be constructed on 171 acres north of the sludge composting facilities. Development of the 228 acre site will include a significant mitigation effort which will consist of the preservation and enhancement of 50 acres of land adjacent to South Fork New River Canal and Anne Kolb Park (Figure 2).

The RRF is a mass burn system which will receive and process a minimum of 1,600 tpd of solid waste from southern Broward County with capability for future expansion of up to 2,200 tpd. Approximately 60 percent of the processable solid waste generated in Broward County is expected to be received by this resource recovery facility. Most of the solid waste coming to the RRF will be burned to reduce the original volume by 90 percent. Heat energy from the burning process will be recovered to generate electricity which will be sold to FP&L. Ash residue from the incineration process, consisting of less than 4.0 and 0.3 percent by weight of combustible and putrescrible matter, respectively, will be landfilled. Unprocessable wastes such as construction materials will also be landfilled directly. Ferrous metals may be salvaged and stored on site until they are sold by the operator.

The main features of the RRF will consist of material receiving and handling areas, storage pits, incinerators, boilers, turbine generators to produce electricity, and electrostatic precipitators for particulate removal prior to discharge through the stacks. Incinerator and fly ash residue will be cooled in the residue tank and conveyed to the residue disposal wing. Administrative and control facilities will include a scale house, offices, plant personnel facilities, and a control room for observing and controlling facility operations.

The landfill will consist of two landfill cells, attendant facilities for water management, and on-site mitigation adjacent to the South Fork New River Canal (Figure 2). The ash and unprocessable waste will be filled in a series of subcells within each landfill area. All material deposited in the fill will be placed at or above the 100-year flood elevation. Exposed (to public view) faces will be capped and landscaped as filling progresses. The final height of the landfill will be approximately 133 feet above grade, or elevation 140 feet above mean sea level (MSL).

The development plan for the landfill site initially involves material disposal in landfill cell No. 1, which is expected to occur over a period of 14 years (i.e., 1987 to 2001). After landfill cell No. 1 is completely filled and closed in accordance with federal, state, and local regulatory agency requirements, the remaining landfill cell No. 2 will become the final site for active landfilling for a period of 6 years (i.e., 2001 to 2007).

The ash residue and unprocessable solid waste are stable inorganic and nonhazardous materials. Thus, the landfill mass will be a stable, inorganic material which will not be subject to the anaerobic decomposition processes with associated noxious end products common to the landfilling of organic solid wastes (garbage). Landfills of this type do not attract insects, rodents, and birds as do sanitary (garbage) landfills.

The project site is within regulated airspace of the Fort Lauderdale-Hollywood International Airport. The FAA has been notified of the proposed project and the facility will be in compliance with FAA regulations. The FAA's main concerns are stack height and attraction of birds about landfills. The RRF stack height is below the 200 foot FAA limitation for the site. The FAA has stated that the proposed landfill operations should not promote an increase in bird population at the site due to its inorganic content.

The surface water management system for the southern site will be designed to accommodate current and future site utilization. A phased development plan is envisioned in order to address such issues as the routing and treatment of runoff from active portions of a landfill cell and concerns regarding the quality and appropriate control methods for the disposal of surface runoff during rainfall periods. Collection and disposal of leachate and stormwater from active landfill subcell areas will be entirely separate from the stormwater management facilities. To ensure that all runoff and leachate are contained on-site, each landfill cell will have an impermeable membrane and underdrain system, and the landfill cell will be surrounded by a grassed perimeter swale system and perimeter access road which will serve as a dike. All leachate and stormwater runoff will be disposed of in an environmentally acceptable manner.

APPENDIX B

TECHNICAL SPECIFICATIONS

SECTION 1 - RESOURCE RECOVERY FACILITIES

1.1 Introduction

The intent of these technical specifications is to set minimum guidelines and functional design requirements to insure comparable proposals of uniform quality and to establish specific standards for the construction and operation of the facilities. In no instance is there any intent to limit the Proposer from adding to these minimum requirements and guidelines, or to unfavorably affect the use of proprietary systems and subsystems developed by manufacturer-suppliers through their own research and development efforts.

If a Proposer desires a change in the functional design requirements described herein, the Proposer shall submit identification of the change by utilizing Form 5.3 contained in the RFP. As discussed in Section 1 of the RFP, these facilities shall include two resource recovery facilities and two final Residue/Unprocessable Waste disposal landfills. In this specification, unless the context otherwise requires, words imparting the singular include the plural and vice versa. Thus, these technical specifications will apply to each facility.

The Contractor shall provide the necessary facilities to dispose fully of all the municipal solid waste (MSW) delivered to the facilities.

The Contractor shall not receive or dispose of pathogenic or hazardous industrial wastes.

Each resource recovery facility shall process all processable waste delivered to the facilities as received and shall obtain the following outputs:

- o Electrical energy
- o Recovered materials (optional)
- o Ash residue

The buildings and grounds of each facility should be designed to project a coherent image of each facility's function and value to the community. Exterior building materials and fenestration shall project an image of quality and functionalism. This architectural image should be contemporary in tone, visually low-key on the exterior, and embody current design for industrial buildings. Each facility should be perceived by the public as a resource and energy recovery industrial building and not as an incinerator or refuse dump. A good neighbor relationship is mandatory for each facility and the surrounding community.

The visual quality of each facility's stack design with regard to siting, material, and color options shall be considered.

1.2.3 System Availability

The facilities shall be designed using a modular approach with sufficient equipment redundancy to avoid shutdowns or outages. Each facility shall be designed to accept those quantities delivered by the County and the contract municipalities in accordance with their normal collection and delivery practices. The facilities shall be designed to process 765,000 tons of Processable Waste per year, 14,700 tons per week, 2,100 tpd, with allowances made for scheduled and unscheduled downtime.

The system designs shall provide for continuous performance.

Guaranteed availability shall be based on a proposed energy output for each ton of input at varying MSW heating values. The extent to which the guaranteed availability changes with changes in the heating value of the wastes shall also be guaranteed.

1.2.4 General Facility Process Design Requirements

The design of each facility shall incorporate the following requirements:

- Each facility shall be designed so that all the Processable Waste received will be processed in a highly reliable manner. The Proposer will clearly state and demonstrate the long-term reliability and availability of the systems proposed.

- Each Processable Waste storage pit shall be large enough to hold a minimum of four times the daily Nampelate Capacity of the facility.

- Each vehicle shall be weighed upon entering the site to determine the net payload of the MSW delivered.

- On-site MSW truck traffic flow shall be designed to minimize conflicts and to allow a maximum on-site time of ten minutes for any vehicle, even during peak traffic periods.

- Sufficient unloading bays shall be provided to meet the above stated time criteria in regard to the unloading of Processable Waste in a totally enclosed tipping area.

- Visitor accommodations shall be provided along with the appropriate walkways, galleries, conference rooms, and control room access.

- The Proposer shall incorporate the following check-list in the design of each facility:
  - Weighing station - automated, with one standby scale
  - No truck queuing on the ramps or public road-ways
  - Cranes - minimum of two each at one hundred percent of daily facility capacity, or three each at fifty percent capacity. The crane grapples shall have the capabilities to transfer the Processable Waste quantities at these crane capacities from the storage pit to the charging hoppers.
  - Manual overrides for all systems and equipment with automatic controls
  - Maximum furnace sizes - 750 tons/day
  - Turbine-generator units - two as a minimum or one with one spare rotor provided
  - Air Pollution Control - Electrostatic Precipitators, one per process line
  - Stack(s) height - at each facility a maximum of 200 feet above final grade elevation
  - Residue removal system - each one hundred percent nominal capacity conveyor systems

1.10 Combustion Systems

1.10.1 General Design

The combustion systems and all related equipment for each facility shall be supplied by the Contractor. The minimum combined total nameplate rated capacity of the two facilities shall be 2,600 tons of Processable Waste per day. The combustion units proposed shall be of proven design with a minimal successful operating experience of one year. Scaling up of components shall not exceed 25 percent. In view of the documented history on high temperature corrosion on superheaters, the Proposer's base proposal shall be with steam parameters of 750°F and 650 psia. Proposals based on higher quality steam parameters will be accepted, where the proposer can demonstrate, through supporting documentation, furnace/boiler on-line reliability equal to that of the base proposal.

The Contractor shall furnish and install a minimum of three combustion units at the southern facility and two combustion units at the northern facility, each with the capability of operating five percent above its rated Nameplate Capacity. The use of multiple units is intended to provide for system redundancy and the capability of selling additional energy to the utility during peak hours of operation. The Proposer shall provide a firing diagram and additional information indicating how the boilers will be capable of handling fluctuations in BTU content and moisture content as well as proximate and ultimate analysis.

The Contractor shall provide the turndown ratio such that the boiler efficiencies do not drop below 85 percent of the boiler design efficiencies.

All furnace equipment and auxiliary equipment shall be manufactured and constructed in accordance with ASME boiler and furnace construction codes except where otherwise stated, and shall be so stamped on the equipment.

The individual units shall each be designed to operate at the minimum excess air level and exhaust the combustion flue gases from the electrostatic precipitator at a minimum of 40°F above dewpoint.

The minimum combustion temperature shall be 1,500°F and temperature shall be controlled to a maximum of 1,800°F.

1.10.2 Furnace Design

General: Furnace design shall be of the mass-burn stoker-fired, or stoker/rotary kiln tandem type, capable of firing as-received Processable Waste (without auxiliary fuel burning) on a continuous feed basis.

Each combustion train shall be equipped with an individual multiple pass waterwall type boiler of a configuration which has been successfully demonstrated for a minimum of three years.

Refractory Enclosures: The refractory linings of the furnaces, where applicable, shall be of super duty quality, laid in high temperature mortar. The refractory walls (other than rotary kiln) and arches shall be of the sectionally supported type, anchored with high temperature alloy anchors and insulated with an adequate amount of insulation.

The refractory enclosure materials shall conform or be equal to the latest of the following minimum requirements and classification:

- o Super duty fire brick - ASTM C-27
- o Silicon carbide walls - ASTM C-106
- o Insulating brick (where applicable) - ASTM C-15
- o Insulating castable - ASTM C-401, Class Q
- o Expansion joint filler - Fiberfrax, Kaowool or equal
- o Sectionally supported wall and arch mortar--Super-duty Fireclay
- o Insulation - Mineral wool block

at each bend; the ductwork system shall be essentially air tight with leakage not exceeding one percent of the maximum design air flow.

The fan drives shall be selected for a minimum of 125 percent of the maximum design brake horsepower (BHP).

1.10.4 Energy Recovery Systems

The steam parameters for the boiler system shall consist of the following:

- o Stream Pressure - 650 psia ±5%
- o Steam Temperature - 750°F ±5°F

Boilers: The boiler design and manufacture shall conform to the ASME boiler code and approved quality assurance program, and, if required by applicable codes, shall bear the ASME stamp.

The boilers shall be designed with in-line tubes and drum(s) perpendicular to the gas flow. Boiler tubes shall be of an adequate tube thickness and diameter with proper spacing provided between the tubes. Adequate air circulation near the convection tubes shall be provided. Gas temperatures coming into contact with the external tubes should not exceed 1,600°F.

Single pass boilers with vertical tubes shall have an arch or stainless steel baffle to redirect the air flow and prevent excessive corrosion of the boiler side tubes. Properly sized valves with welded packing shall be provided.

The tube and drum configuration shall be the option of the Contractor, but shall conform to general requirements specified herein. The drums shall be Class 1 fusion welded construction, tested before shipment. The steam drums shall be fitted with steam separation baffles yielding dry steam with a purity of one parts per million (ppm) solids at maximum continuous steaming conditions, at the design pressure and temperatures, when the boiler water concentrations do not exceed standard ABMA limits. Each drum shall have two manhole openings fitted with hinged steel manhole covers complete with necessary bolts, grabs, and gaskets.

Proper provisions shall be made for thermal expansion of the drums so that abnormal stresses are not produced on either the pressure parts or in the supporting members. The boilers shall be designated with either a soot blowing system or tube rapping system for the cleaning of both the external and internal surfaces. An access door allowing for inspection and maintenance of the tubes and the tube rapping system shall be provided.

Superheaters: Superheaters shall be manufactured out of the alloy best suited to resist thermal corrosion as well as chlorine, fluorine and sulphur corrosion. The Contractor shall specify whether the superheater tubes will be provided with clamp protective metallic shields on the tubes at the vulnerable locations or if the tubes will use plasma-gun coating by metallic or ceramic materials.

The superheaters shall be designed with proper provisions for thermal expansion and with attemperators between the stages of the superheater. The superheater bundle shall be placed away from the primary radiant section.

Economizers: Each boiler unit shall be provided with the proper tubular economizer. The economizers shall be the bare tube type (no finned tubes).

The economizers shall be designed for forced circulation, which is provided by the boiler feed pumps, using at a minimum, a feed water temperature of 250°F. The economizer design pressure shall be at a minimum of 125 percent of the boiler design pressure. The economizers shall conform, as a minimum, in all respects to the ASME boiler codes.

1.10.5 Boiler Auxiliary Systems

Boiler Auxiliaries: The Proposer shall provide all required auxiliary systems to make the boilers complete, operable and maintainable. All boiler appurtenances shall be

Controls shall consist of systems for Remote Automatic, Local Manual, and Remote Manual modes.

1.11 Residue Handling Systems

1.11.1 General

The solid residues from each facility must be managed and disposed of according to Federal and State standards for resource recovery facilities. The Proposer shall indicate the quantity and composition of residue ash expected to be produced at each facility from the furnace/boiler and air pollution control systems. The Contractor shall be responsible for ensuring that this residue ash, will not be considered hazardous based on applicable Federal and State regulations and requirements.

The Contractor will also be responsible for residue removal, transportation and landfilling, and all testing necessary to determine whether the residue is hazardous according to the applicable Federal and State regulations.

1.11.2 Description

The purpose of the residue handling systems is to collect the post-incineration bottom ash and fly ash while separating any recyclable materials in a dust free manner. The systems shall have two, one hundred percent capacity ash conveyors to transport the ash to the handling areas at each facility.

Provisions for tractor-trailer loading in an enclosed area, with ventilation and dust control shall be incorporated into the design. A clamshell-type bucket for loading ash onto trucks from an ash storage pit may be provided.

The Proposer shall indicate the marketability of ash, if any. The residue ash shall contain less than 4.0 percent combustibles, and less than 0.2 percent putrescibles. The residue shall be such that it will not support any type of animal or vermin life and will not sustain combustion.

The fly ash handling systems include, but are not limited to, screw conveyors inside precipitator hoppers, rotary or double flap air lock valves, and dry drag type transfer conveyors.

1.12 Air Pollution Control Systems

Except as may be required under applicable law, the air pollution control systems at each facility shall consist of one electrostatic precipitator and one induced draft fan per combustion line.

1.12.1 Electrostatic Precipitators

Each combustion line shall be equipped with an electrostatic precipitator (ESP) including all appurtenances, structural supports, foundations, external and internal walkways, platforms access stairways, fly ash hoppers with discharge air lock valves, power and control wiring, and other accessories for a complete operation system.

Each ESP shall be a multi-field type with the output of each ESP's flowing into a single flue. The fields shall be sized adequately considering both the volume of gases and amount of excess air. The temperature of flue gases entering the ESP must be below 600°F and at least 40°F above the dew point temperature.

The U.S. Environmental Protection Agency's (USEPA) best available control technology (B.A.C.T.) shall define the minimum efficiency of the ESP's. The Contractor shall guarantee ESP performance. For the purpose of proposal submission, Proposers shall assume that the ESP outlet gases shall not exceed 0.03 grams per cubic foot of air. The actual required removal rate shall be determined during the permit negotiation process with the appropriate regulatory agencies.

Each ESP design submitted shall have been successfully operated in a facility firing Processable Waste for a minimum of three years. The proposed ESP shall not have been scaled up more than 25 percent over previous installation.

standby); supply and return piping; power and control wiring; hyperchlorination and straining system.

- o Modifications and/or alternations required to the wastewater treatment plant.
- o Satisfying wastewater treatment plant environmental permit conditions established by the State of Florida DER, including any ocean out-fall limitation on effluent discharge temperature.

For consideration of evaporative cooling at this site, the sources of water are limited to County water, as supplied by the County System 1-A plant, or ground water. With respect to County water, average annual water quality values are presented in Table B-3 of this Appendix. The Contractor will be responsible for determing makeup water requirements and County water availability to satisfy such requirements. With respect to utilization of groundwater, Appendix B, Environmental Specifications, of the RFP contains data regarding the underlying aquifers in this area.

Southern Facility (Route 441 Site): Steam pluming is of major concern at this site due to the proximity of Fort Lauderdale International Airport. Consequently, the consideration of evaporative cooling tower(s) at this site, such towers would be limited to a wet-dry type to eliminate visible plume formation which would occur under certain wet bulb and relative humidity conditions.

City and County water (refer to Tables B-2 and B-3) or ground water may be considered for evaporative cooling use. As in the case for the Northern Facility, the Contractor shall be responsible for determining make-up water requirements and city water availability to satisfy such requirements.

Summary: The data presented above regarding cooling systems is provided for informational purposes and for future reference only. All proposers are required to base

Modeling

1.0 INTRODUCTION

This report presents the results of a comprehensive air quality dispersion modeling analysis and study performed by Environmental Science and Engineering, Inc. (ESE) for the proposed Broward County Resource Recovery (BCRR) facilities. The proposed plants will be located in the north and south portions of Broward County and, therefore, are referred to as the north and south BCRR facility, respectively. They will be owned by Broward County and operated by a vendor selected by Broward County. Because a vendor will not be selected until March 1984, a conceptual design has been specified by Malcolm Pirnie, Inc. based on conservative, or worst-case, assumptions from a potential air quality impact viewpoint. Once a vendor is selected and the conceptual design is finalized, the predicted impacts are not expected to be significantly different (i.e., not significantly higher) than those presented in this report. Therefore, for this analysis, each facility is assumed to be capable of charging 1,500 tons per day (TPD) of municipal solid waste (MSW) at a 100-percent annual availability factor. Solid waste will fuel steam generation boilers at each facility for the purpose of reducing waste volume and generating electricity.

In accordance with the Clean Air Act (CAA) Amendments of 1977, this report addresses the requirements of the Prevention of Significant Deterioration (PSD) review which will be submitted to the Florida Department of Environmental Agency (EPA) Region IV for their approval. This review includes an emission control technology evaluation, an air quality modeling and monitoring assessment of expected air pollutant emissions and background sources, and an assessment of the impact of the proposed facilities on soils, vegetation, and visibility.

TABLE 2-2

PSD Significant Emission Rates and *De Minimis* Impact Levels

Pollutant	Regulated Under	Significant Emission Rate (TPY)	*De Minimis* Air Quality Impact (ug/m^3)
Sulfur Dioxide	NAAQS, NSPS	40	13, 24-hour
Particulate Matter	NAAQS, NSPS	25	10, 24-hour
Nitrogen Oxides	NAAQS, NSPS	40	14, Annual
Carbon Monoxide	NAAQS, NSPS	100	575, 8-hour
Volatile Organic Compounds (Ozone)	NAAQS, NSPS	40	100 TPY*
Lead	NAAQS	0.6	0.1, 24-hour
Sulfuric Acid Mist	NSPS	7	†
Total Fluorides	NSPS	3	0.25, 24-hour
Total Reduced Sulfur	NSPS	10	10, 1-hour
Reduced Sulfur Compounds	NSPS	10	10, 1-hour
Hydrogen Sulfide	NSPS	10	0.04, 1-hour
Asbestos	NESHAP	0.007	†
Beryllium	NESHAP	0.0004	0.0005, 24-hour
Mercury	NESHAP	0.1	0.25, 24-hour
Vinyl Chloride	NESHAP	1	15, 24-hour
Benzene	NESHAP	0	†
Radionuclides	NESHAP	0	†
Inorganic Arsenic	NESHAP	0	†
Any Regulated Pollutant	—	Class I Impact**	

* Increase in volatile organic compounds (VOC) emissions.
† No ambient measurement method.
** Any emission rate for a source located within 10 km of a Class I area which causes impacts of 1 ug/m^3, 24-hour average, or greater.

Notes: Ambient monitoring requirements for subject pollutants may be exempted if the impact of the increase in emissions is below air quality impact *de minimis* levels.
TPY = Tons per year
NAAQS = National Ambient Air Quality Standards.
NSPS = New Source Performance Standards.
NESHAP = National Emission Standards for Hazardous Air Pollutants.

In February 1981, the Ambient Monitoring Guidelines for PSD (EPA-450/4-80-012) were revised to reflect the following changes in the *de minimis* levels: lead--0.1 ug/m^3, calendar quarter; hydrogen sulfide--0.2 ug/m^3, 1-hour; and beryllium--0.001 ug/m^3, 24-hour. These revisions have not been published in the Federal Register or incorporated into the Code of Federal Regulations.

Sources: 40 CFR 52.21.
Lutz, 1981.

TABLE 2-3

Significant Impact Levels for Criteria Pollutants

Pollutant	Averaging Period	Concentration (ug/m3)
Sulfur Dioxide	3-Hour	25
	24-Hour	5
	Annual	1
Particulate Matter	24-Hour	5
	Annual	1
Nitrogen Dioxide	Annual	1
Carbon Monoxide	1-Hour	2,000
	8-Hour	500

Source: 40 CFR 52.

TABLE 2-4

Potential Emissions for Each Proposed BCRR Facility Compared to PSD Significant Emission Rates

Pollutant	Emission* Factor (lb/ton)	Estimated Emissions† (TPY)	PSD Significant Emission Rate (TPY)
Particulate Matter	1.14**	312	25
Sulfur Dioxide	3.0	821	40
Nitrogen Dioxide	3.0	821	40
Carbon Monoxide	0.6	164	100
Volatile Organic Compounds	0.14	38	40
Lead	0.15	41	0.6
Fluorides	0.1	27	3
Sulfuric Acid Mist	0.025	6.8	7
Hydrogen Sulfide	NA	NA	10
Total Reduced Sulfur	NA	NA	10
Reduced Sulfur Compounds	NA	NA	10
Asbestos	NA	NA	0.007
Beryllium	0.000011	0.003	0.0004
Mercury	0.0023	0.63	0.1
Vinyl Chloride	NA	NA	1
Benzene	NA	NA	0
Radionuclides	NA	NA	0
Inorganic Arsenic	0.00028	0.077	0

NA = Not applicable.

* See Table 3-3 for references for emission factors.
† Based on burning 1,500 TPD of MSW and 100-percent annual availability factor, for a total of 547,500 TPY.
** Assumes emission rate of 0.03 gr/dscf.

Source: ESE, 1983.

TABLE 2-5

Predicted Impacts for Each Proposed BCRR Facility Compared to De Minimis Air Quality Impacts

Pollutant	Averaging Period	Impacts (ug/m^3) Maximum Predicted Due to Each Facility	De Minimis Level
Particulate Matter	24-hour	0.9	10
Sulfur Dioxide	24-hour	2.4	13
Nitrogen Dioxide	Annual	0.3	14
Carbon Monoxide	8-hour	1.4	575
Lead	24-hour (Quarterly)*	0.12 (0.02)	0.1 (0.1)
Fluorides	24-hour	0.08	0.25
Beryllium	24-hour	0.000009	0.0005 (0.001)
Mercury	24-hour	0.0018	0.25

* Values in parentheses represent results associated with revised de minimis monitoring levels.

Source: ESE, 1983.

Modeling

TABLE 6-2

PREDICTED MAXIMUM CONCENTRATIONS FOR THE PROPOSED RESOURCE RECOVERY FACILITY USING REFINED MODELING METHODS

Pollutant	Averaging Time	Maximum* Concentration (ug/m^3)	Receptor Location† Direction (°)	Receptor Location† Distance (km)	Period Year	Period Julian Day	Period Hour Ending	Significant Impact Levels (ug/m^3)	*De Minimis* Monitoring Levels (ug/m^3)
SO_2	3-hour	10.3	301	2.44	1971	167	15	25	NA
			300	2.3	1971	126	12		
	24-hour	2.4	260,	2.6-3.1	1970	165	24	5	13
			270		1973	107	24		
	Annual	0.3	280	3.1-3.9	1970	-	-	1	NA
			300	2.3-3.9	1972,74	-	-		
TSP	24-hour	0.9	260,	2.6-3.1	1970	165	24	5	10
			270		1973	107	24		
	Annual	0.1	280	3.1-3.9	1970	-	-		
			300	2.3-3.9	1972,74	-	-	1	NA
NO_2	Annual	0.3	280	3.1-3.9	1970	-	-	1	14
			300	2.3-3.9	1972,74	-	-		
CO	1-hour	5.0	94	1.4	1973	189	12	2,000	NA
	8-hour	1.4	312	2.0	1972	112	16	500	575
Pb	24-hour	0.12	260,	2.6-3.1	1970	165	24	NA	0.1
			270		1973	107	24		
	(Quarterly)	(0.02)**	(280)	(3.1-3.9)	(1970)	-	-	(NA)	(0.1)
			(300)	(2.3-3.9)	(1972,74)	-	-		
F^-	24-hour	0.08	260,	2.6-3.1	1970	165	24	NA	0.25
			270		1973	107	24		
Be	24-hour	0.000009	260,	2.6-3.1	1970	165	24	NA	0.0005
			270		1973	107	24		(0.001)
Hg	24-hour	0.0018	260,	2.6-3.1	1970	165	24	NA	0.25
			270		1973	107	24		

NA - Not applicable.

* Highest, second-highest concentration for short-term period; highest concentration for annual period. Values in parentheses represent results associated with revised *de minimis* monitoring levels. See Section 2.2 for details.

† With respect to proposed facility.

** Annual average.

Source: ESE, 1983.

Table 7-1. Maximum Predicted Concentrations Due to Proposed Resource Recovery Facilities Compared to Concentrations Known to Adversely Impact Vegetation

		Concentration (ug/m^3)				
Pollutant	Average Period	Maximum Predicted Due to Facility	Background*	Total (Facility Plus Background)	Lowest Concentration Known to Impact Vegetation (ug/m^3)	Reference
SO_2	3-hour	10.3	17†	27.3	260	Tingey, 1973.
TSP	24-hour	0.9	95	95.9	1,000 g/m^2	Williams, 1971.
NO_2	Annual	0.3	47	47.3	120	Thompson, 1970.
	3-hour	10.3	89†	99.3	188	Tingey, 1971.
CO	1-hour	5.0	25,000	25,006	Vegetation not impacted by CO	—
Pb	3-month	0.02	0.8	0.82	Not known to be available to plants	Zimdahl, 1973.
F^-	24-hour	0.01	**	0.01	0.10	NAS, 1971.
Be	24-hour	0.000011	**	0.000011	Not known to be available to plants	Gough, 1979.
Hg	24-hour	0.0024	**	0.0024	10 (Duration unknown)	Stahl, 1979.

* Second highest 3- or 24-hour or highest annual average concentration measured within 10 km of either the north or south facility (see Section 5.4).

† 24-hour average concentration; shorter averaging period not available with monitoring technique.

** Ambient monitoring data not available in Broward County.

Source: ESE, 1983.

8.0 SUMMARY AND CONCLUSIONS

The following discussions present a summary and conclusions drawn from the results of this study.

1. Each of the proposed BCRR facilities will be a major source of emissions for PM, SO_2, NO_2, and CO. Each facility will also have significant emissions for Pb, F, Be, Hg, and As. Therefore, these pollutants must undergo review under the new source review requirements of the PSD regulations. The other regulated pollutants are not emitted above the PSD significant emission rates and, therefore, do not require PSD review.

2. Emission control equipment to be used at each of the proposed facilities will be designed to remove more than 98 percent of PM. This will result in the emission of 0.03 gr/dscf of PM, which is about 60 percent better than existing EPA NSPS requirements for solid waste incinerators.

3. The proposed control systems included in the design and operational procedures for PM, SO_2, NO_2, CO and trace pollutant emissions are considered BACT. No alternative particulate and trace pollutant control device, which would be capable of a higher degree of emission reduction, is currently considered for the proposed facilities.

4. The air quality dispersion modeling results show that the proposed emissions from both facilities will comply with the national and Florida AAQS and PSD Class I and II increments. The proposed emissions from each facility produce maximum ground-level concentration that are below the established significant impact and <u>de minimis</u> air quality impact levels for all pollutants, except lead near the vicinity of each facility. For lead, the maximum predicted impact due to each facility slightly exceeds the <u>de minimis</u> air quality level (no significant impact level has been established). However, PSD monitoring is not considered necessary for any pollutants, including lead, because of the existing monitoring stations in Broward County which measure criteria pollutant concentrations and the predicted low concentrations due to each facility.

   Because the maximum predicted concentrations for pollutants emitted above the PSD significant emissions rates are below the AAQS and threshold limits that cause injury to vegetation and soils, the impacts due to each facility are not expected to have a significant impact on vegetation and soils in the PSD Class I and II areas. Also, the emissions from both proposed facilities are highly unlikely to cause adverse visibility impairment in the Everglades National Park.

3.0 FACILITY DESIGN

3.1 Process Description

The BCRR facilities will be designed such that MSW will be delivered to each facility by collection trucks that are either municipally or privately operated. MSW will be dumped from these vehicles into a totally enclosed tipping area which will be kept under negative pressure. The drawn air will be used as combustion air in the boilers. MSW will be moved from the storage pit and fed or charged into the furnaces by means of an overhead crane-and-grapple system. The cranes and grapples will also be used to mix processable waste in the pit to produce a homogeneous mass. This system will also be capable of removing large, bulky, combustible trash items from the storage pit and feeding them to the crusher and shears process. The crusher and shears, located at one end of the storage pit, will be used for size reduction of the oversized, processable trash prior to charging them into the furnaces. Provisions will also be made for removal of salvageable, oversized, noncombustible trash from the storage pit, using the overhead crane-and-grapple system.

The furnace design will be of the mass-burn stoker-fired or stoker/rotary kiln tandem type, capable of firing as-received processable waste, without auxiliary fuel burning, on a continuous-feed basis. Each combustion system will be equipped with an individual multiple-pass, waterwall-type boiler. This system will convert feed water to steam by the heat released during combustion of the solid waste. The steam will be used to drive a steam turbine which, in turn, drives an electric generator for the production of electricity.

The combustion air systems for the furnace will be designed to control automatically the furnace temperature within ±50° Fahrenheit of the set-point temperature selected by the vendor while firing processable waste with higher heating values (HHV) varying from 3,500 to 6,000 British thermal units per pound (Btu/lb). Sampling conducted on Broward County's processable waste (Malcolm Pirnie, Inc., 1983a) indicates that the minimum and maximum extremes of the range may be realized on a sustained seasonal basis (e.g., November through April at the upper range) as a result of significant variation in moisture content associated with extremes in rainfall.

The combustion air will be vented from the refuse storage area, tipping area, and/or the outside atmosphere. This procedure will maintain negative pressure in the refuse storage and tipping areas and thereby provide odor and dust control.

Gases exiting the furnaces and boilers will enter an electrostatic precipitator for removal of particulates matter prior to release of the gases to the atmosphere.

The proposed facilities will also have a residue handling system to collected the postincineration bottom ash and fly ash while separating any recyclable materials in a dust-free manner. The systems will have ash conveyors to transport the ash to the handling areas at each facility. Provisions for an enclosed tractor-trailer loading area with ventilation and dust control will be incorporated into the design. A clam-shell-type bucket for loading ash onto trucks from an ash storage pit may be provided. The residue ash will contain less than 4.0 percent combustibles and less than 0.2 percent putrescibles.

The bottom ash or residue will be water-cooled by spray or quenched in tanks or sumps before it is handled by the conveyors. The cooled bottom ash handling system will consist of drag or vibrating conveyors designed to handle the total plant load. The fly ash may be combined with the quenched bottom ash or collected separately by the vendor to market the fly ash for reuse. The fly ash handling system will include, but not be limited to, screw conveyors inside the precipitator hoppers, rotary or double-flap airlock valves, and dry drag-type transfer conveyors.

3.2 Solid Waste Composition

The proposed resource recovery facilities have been designed to process residential, commercial, institutional, and nonhazardous industrial waste. Field experience (Malcolm Pirnie, Inc., 1983a, 1983b) in Broward County has shown that the gross or HHV of municipal wastes averages 5,000 Btu/lb and ranges from 3,500 to 6,500 Btu/lb. General characteristics of the composition of the municipal waste determined from field analyses are presented in Table 3-1.

3.3 Emission and Stack Operating Parameters

The proposed project consists of two resource recovery facilities to be located in Broward County. The data presented in this report are based on preliminary or conceptual design of the proposed facilities. The design will be subject to certain refinements following selection of a full-service vendor scheduled for March 1984. However, the conceptual design is based on conservative or worst-case assumptions from a potential air quality impact viewpoint.

Each BCRR facility is assumed to be capable of burning 1,500 TPD of MSW. One of the facilities is to be located in north Broward County, approximately 22 km north-northeast of the other facility, located in south Broward County. Because the two facilities are assumed to be identical in stack and operating design, the data presented in Table 3-2 are applicable for each facility. The proposed stack heights for each facility will be at a Good Engineering Practice (GEP) height; therefore, building downwash conditions are not considered in this analysis.

TABLE 3-1

Proximate and Ultimate Analyses of MSW for BCRR Project

Component	Percent by Weight of MSW
Proximate Analysis	
Moisture	51.1
Combustibles	35.8
Ash Inert	13.1
HHV (Btu/lb)	5,000
Ultimate Analysis	
Carbon	53.4
Hydrogen	7.4
Nitrogen	0.0061
Oxygen	38.7
HHV (Btu/lb)	9,781

Source: Malcolm Pirnie, Inc., 1983b.

TABLE 3-2

Stack and Operating Parameters for North and South BCRR Facilities*

Parameter	Value
MSW charging rate (maximum)	1,500 TPD (62.5 ton/hr)
MSW heat input rate†	625 x 10^6 Btu/hr
Stack height	195 ft (59.5 m)
Stack diameter	13.8 ft (4.2 m)
Exit gas temperature	450°F (505 K)
Exit gas flow rate†	438,770 acfm (207.2 m^3/s)
	276,585 dscfm (130.6 m^3/s)
Exit gas velocity	48.9 ft/s (14.9 m/s)
Location	
North Facility	
Latitude, longitude	26.26°, 80.16°
UTM zone	17
UTM x, y coordinates	584.0 km, 2904.7 km
South Facility	
Latitude, longitude	26.07°, 80.20°
UTM zone	17
UTM x, y coordinates	579.6 km, 2883.3 km

* Stack and operation parameters are assumed to be the same for both facilities.
† Based on average heating value of MSW of 5,000 Btu/lb for wet season.

Notes: acfm = actual cubic feet per minute
dscfm = dry standard cubic feet per minute

Sources: Malcolm Pirnie, Inc., 1983b.
ESE, 1983.

It should be noted that the exit gas flow rate presented in Table 3-2 is based on wet-season conditions when moisture content in MSW is relatively high. This results in the boiler exhaust gas flow rate also being the lowest during the wet season. For air dispersion modeling purposes, the flow rate presented in Table 3-2 was used to estimate ground-level concentrations because the lower flow rate will result in a lower plume rise compared to that produced with a higher flow rate. As a result, higher ground-level concentrations are predicted with the lower exit gas flow conditions.

The emission factors and literature references for the regulated pollutants that will be emitted from the proposed BCRR facilities are presented in Table 3-3. For most of the regulated pollutants, the emission factors are based on estimates derived for resource recovery facilities similar in size to the proposed facilities. The emission factors are given as a function of the amount of MSW buried. These emission factors are based on a review of the literature, such as EPA AP-42 emission factors and A.D. Little reports, or manufacturer's design specification.

The emission factor for particulate matter is based on an emission level of 0.03 gr/dscf. This emission limit will be obtained with an electrostatic precipitator that is greater than 98-percent efficient. Based on the researched emission factors, the estimated emissions for each facility are presented in Table 3-4. The maximum hourly emission rates were used in the air dispersion modeling analysis.

TABLE 3-3

Emission Factors of Regulated Pollutants

Pollutant	Emission Factor (lb/ton)	Reference
Particulate Matter	1.14	1
Sulfur Dioxide	3.0	2
Nitrogen Dioxide	3.0	4
Carbon Monoxide	0.6	5
Volatile Organic Compounds	0.14	3
Lead	0.15	2
Fluorides	0.1	2
Sulfuric Acid Mist	0.025	6
Beryllium	0.000011	2
Mercury	0.0023	2
Arsenic	0.00028	2
Other regulated pollutants	*	*

* There is no evidence in the literature that total reduced sulfur, reduced sulfur compounds, hydrogen sulfides, asbestos, vinyl chloride, benzene, or radionuclides are emitted in measurable quantities.

References
1. PM emissions based on emission limit of 0.03 gr/dscf.
2. Little, A.D. 1981. Municipal Incinerator Emission Estimates. Report to O'Brien and Gese Engineers.
3. United States Environmental Protection Agency. 1980. Environmental Assessment of a Waste-to-Energy Process--Braintree Municipal Incinerator, Publication EPA-600/PS7-80-149.
4. United States Environmental Protection Agency. 1983. Compilation of Air Pollutant Emission Factors, Third Edition, Supplements 1-14.
5. CO emissions based on stack test results from Saugus (Mass.) municipal incinerator (Malcolm Pirnie, 1983b).
6. Battelle. 1973. Final Report on Harrisburg Municipal Incinerator, Evaluation to the Harrisburg Incinerator Authority.

TABLE 3-4

Maximum Hourly and Annual Average Emission Rates for Both North and South BCRR Facilities

Pollutant	Significant	Emission Rate* Annual (TPY)	Maximum Hourly (lb/hr)
Particulate Matter	25	312	71
Sulfur Dioxide	40	821	188
Nitrogen Dioxide	40	821	188
Carbon Monoxide	100	164	38
Volatile Organic Compounds	40	38	8.8
Lead	.6	41	9.4
Fluorides	3	27	6.3
Sulfuric Acid Mist	7	6.8	1.6
Beryllium	.0004	0.003	0.0007
Mercury	.010	0.63	0.14
Arsenic		0.077	0.02

* Hourly emission rate based on burning 62.5 ton/hr of MSW. Annual emission rate based on burning 1,500 TPD and a 100-percent annual availability factor, for a total of 547,500 TPY.

Source: Malcolm Pirnie, Inc., 1983b.

*9. The appropriate application fee in accordance with Rule 17-4.05. The check should be made payable to the Department of Environmental Regulation.

*10. With an application for operation permit, attach a Certificate of Completion of Construction indicating that the source was constructed as shown in the construction permit.

SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY

A. Are standards of performance for new stationary sources pursuant to 40 C.F.R. Part 60 applicable to the source?

[XX] Yes [ ] No (Subpart (e))

Contaminant	Rate or Concentration
1. Particulate matter	0.08 grains per standard cubic foot dry gas, corrected to 50% excess air
2. No objectionable odor	

B. Has EPA declared the best available control technology for this class of sources (If yes, attach copy)

[ ] Yes [X] No

Contaminant	Rate or Concentration
N/A	

C. What emission levels do you propose as best available control technology?

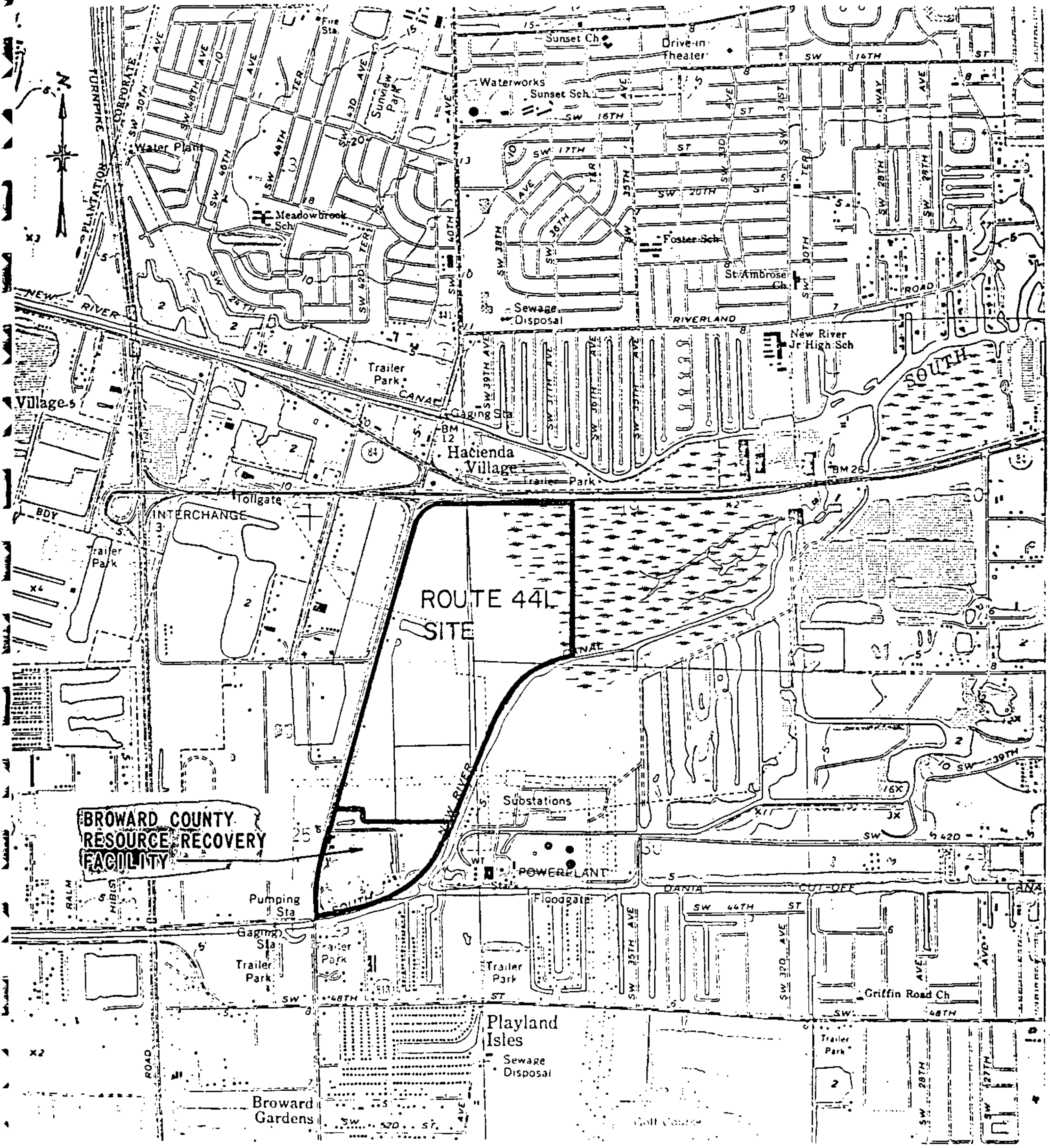
Contaminant	Rate or Concentration
1. Refer to Appendix C	
2. Particulate matter	0.03 grains per standard foot dry gas, corrected to 12% CO_2.

D. Describe the existing control and treatment technology (if any). N/A

1. Control Device/System:
2. Operating Principles:
3. Efficiency:*
4. Capital Costs:

*Explain method of determining

Note:
*Refer to attachment No. 2

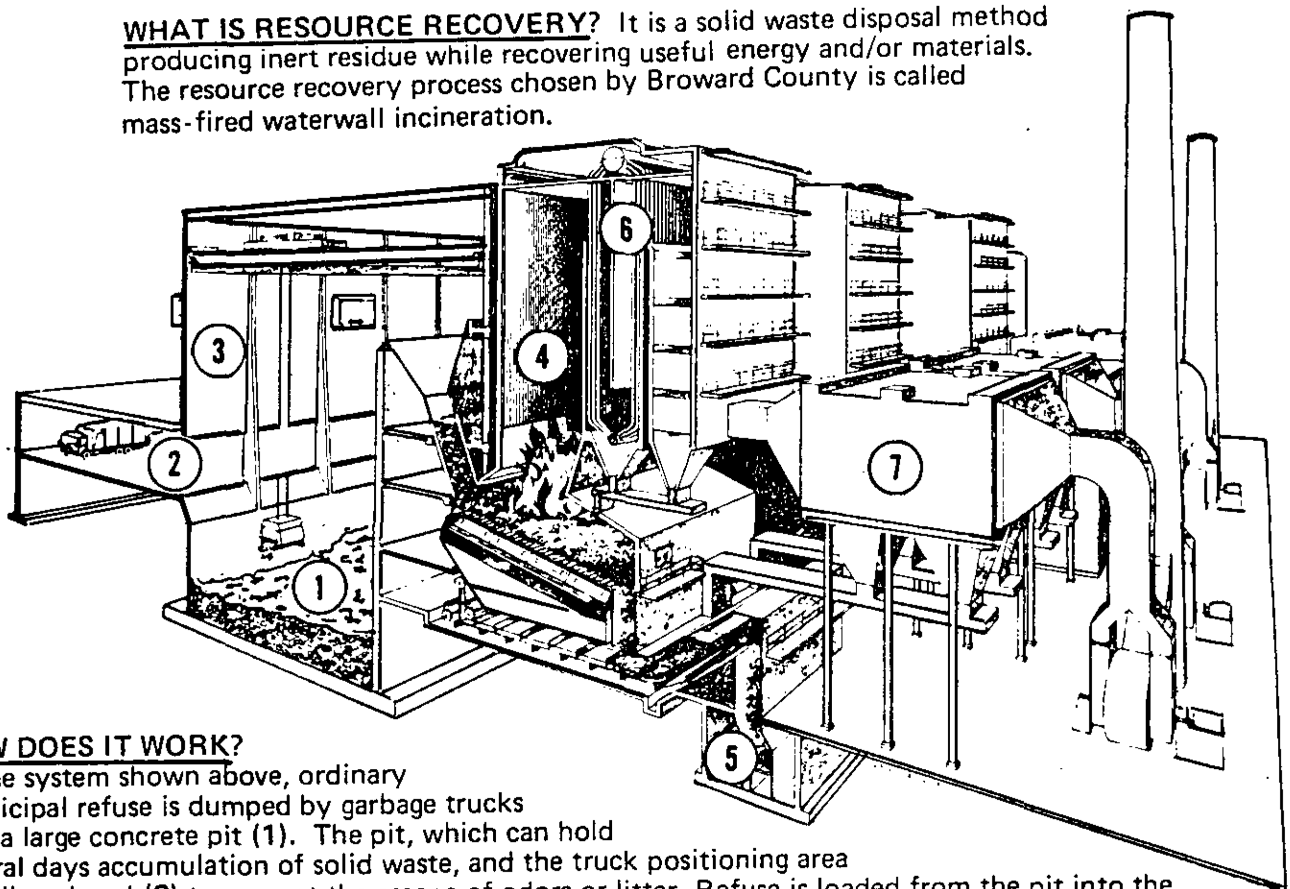


BROWARD COUNTY
RESOURCE RECOVERY

ROUTE 441 SITE

Broward County
RESOURCE RECOVERY PROGRAM
FLOW DIAGRAM

<u>WHAT IS RESOURCE RECOVERY?</u> It is a solid waste disposal method producing inert residue while recovering useful energy and/or materials. The resource recovery process chosen by Broward County is called mass-fired waterwall incineration.



<u>HOW DOES IT WORK?</u>
In the system shown above, ordinary municipal refuse is dumped by garbage trucks into a large concrete pit (1). The pit, which can hold several days accumulation of solid waste, and the truck positioning area are all enclosed (2) to prevent the escape of odors or litter. Refuse is loaded from the pit into the furnace by a large overhead bridge crane (3). Oversized or unprocessible items (engine blocks, tree stumps, concrete rubble, etc.) which accidentally get into the pit can be removed at this point and either sent directly to the landfill, or put through a shredder for size reduction prior to being sent to landfill or sold.

In the furnace (4) the refuse is burned at high temperature and under controlled conditions of air and turbulence. The result is essentially complete destruction of organic material, (paper, plastic, wood, food wastes, etc.) leaving an ash residue (5) which contains the unburnable fraction (glass, metal, ceramics, etc.). This residue has a volume of five to ten percent of the original solid waste, thus lengthening the projected landfill lifetime by a factor of ten to twenty.

Hot gases from the combustion process pass up through the boiler portion (6) of the furnace where the heat is transferred to water-filled steel tubes. This heat is used to generate steam and ultimately electricity.

After passing through the boiler the hot gases pass through electrostatic precipitators (7) which act as giant filters removing the dust particles from the gas stream. The clean gases are then discharged at the stack.

TABLE 1

ELECTROSTATIC PRECIPITATOR DESIGN CRITERIA

	Waste Management, Inc.-Bechtel Civil & Minerals, Inc.	Signal-RESCO
1) Gas Flow		
a) Volume Flow Rate (per Section) (Max), cubic meters/second	58	82
b) Velocity, meters/second	0.81	15.24
c) Temperature (per Section), °C	200	212
d) Pressure, psi	0.21	See Note 1
2) ESP Design		
a) Electrical Length per Plate, meters	0.50	3.84
b) Wire to Plate Spacing, millimeters	150	152.4
c) Wire to Wire Spacing, millimeters	180/320	304.8
d) Wire Diameter, millimeters	2.7	See Note 2
e) Wires per Section, meters	864	768
f) Wire Length per Section, meters	3,365	7.022.6
g) Number of Electrical Sections	3	3
h) Plate Area per Section, square meters	1,440	2,330.6
i) Duct Width, meters	0.30	9.75
3) Electrical Design		
a) Applied Voltage per Section, volts	60,000	See Note 1
b) Total Current in Electrical Section	0.6	See Note 1
c) Roughness of Wire	0.8	See Note 1

Notes:

1. Information not provided by vendor.
2. Field No. 1 - Isodyne wires 2.29 mm x 4.82 mm with 5.33 mm spikes every 50.9 mm perpendicular to flow.
   Field No. 2 & 3 - Star shaped wires 5.79 mm diameters.