MIAMI-DADE WATER AND SEWER DEPARTMENT
P.O. Box 330316, Miami, Florida 33233-0316 • 3575 S. LeJeune Road • Tel: 305-665-7471

SERVE • CONSERVE

July 31, 2002

Certified Mail: 7001 0360 0001 6782 8254
Return Receipt

RECEIVED
AUG 05 2002
BUREAU OF AIR REGULATION

Mr. Syed Arif, P.E.
New Source Review Section
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Alexander Orr, Jr. Water Treatment Plant, Three Natural Gas Fueled Engine Driven Pump Sets and One Diesel Fueled Standby Generator, DEP File No. 0250314-005-AC

Dear Mr. Arif:

Enclosed please find responses to your request for information, dated June 10, 2002, regarding the referenced construction permit application. Also enclosed, please find revised air construction permit application pages and the original signature pages.

As the designated Responsible Official of this facility, I certify the responses regarding this application to be true, accurate, and complete based upon information and belief formed after reasonable inquiry. Please contact me at (786) 552-8112 or Mr. Richard M. O'Rourke, P.E. at (786) 552-8123 if there are any questions regarding this submittal.

Sincerely,

Jorge S. Rodriguez, P.E
Assistant Director - Water

JSR/BMG/RMO/ro

c: Tom Tittle, DEP Southeast District
Patrick Wong, Dade County DERM (w/o encl.)
Gregg Worley, EPA Region 4 (w/o encl.)
Charlie Neese, Poole & Kent

Enclosures: (1) Revised Air Construction Permit Application Pages
(2) Project Narrative – Application for Air Construction Permit for the Replacement of Five Existing Diesel Engine Driven Pumps and Generator, Alexander Orr, Jr., Water Treatment Plant, Miami, Florida

L0238dep.doc

bc: H. Codispoti
T. Segars
J. Epaves
B. Goldenberg
R. O'Rourke
D. Edwards
W-655

Responses to Request for Additional Information (RAI-1)
Miami-Dade Water and Sewer Department (M-DWASD)
Alexander Orr, Jr. Water Treatment Plant,
Three Natural Gas Fueled Engine Driven Pump Sets and
One Diesel Fueled Standby Generator,
DEP File No. 0250314-005-AC

Responses to Request for Additional Information (RAI-1) – Miami-Dade Water and Sewer Department (M-DWASD) Alexander Orr, Jr. Water Treatment Plant, Three Natural Gas Fueled Engine Driven Pump Sets and One Diesel Fueled Standby Generator, DEP File No. 0250314-005-AC

1. The cover page of the application refers to replacement of four existing diesel fueled engine driven pumps and generator whereas the cover letter alludes to the replacement of five existing diesel fueled engine driven pump sets. Please provide clarification.

The project physically removes a total of five existing diesel fueled engine driven units from the facility, however, pump engine no. 2 has been out of service since the early 1990's and has already been deleted from the ARMS database and is not listed under the facilities current operating permit. Therefore, five units are being removed physically, while only 4 units are being removed from the existing permit.

2. The application under II. A. 7. Facility Comment (page 7) refers to six standby generators providing standby electrical power while the facility plot plan under Attachment 2 indicates only 4 standby generators. Please provide clarification.

The four generators (emission units (EU) nos. 9, 10, 11 and 12) shown on Attachment 2 serve as the primary standby generators for the entire facility. Two other generators are pump-generator no. 1 (EU no. 1) and a unregulated backup lime kiln generator rated at 250kW (EU no.21) serve as secondary units in the event of the loss of the primary standby generators. Pump-generator no. 1 is located in the pump room and this function is being replaced as part of this project. The backup lime kiln generator is in the lime kiln operation control building next to the lime storage silos. A revised facility comment (page 7) is attached.

3. Were/are the existing pumps subject to NOx RACT? Please confirm that no pump engine set can generate electrical power other than set number 1.

The NOx RACT emission-limiting standard of not exceeding 4.75 lb/million BTU applied to any oil-fired diesel generator. Only pump-generator number one could generate electrical power. The other pumps were not subject to NOx RACT.

4. The application on page 6 under Construction/Modification Information section refers to engine driven pumps No. 3, No. 4 and No. 5 are proposed as replacements while under III. A. 9. General Emissions Unit Information (page 12) indicates pump engine nos. 2, 3 & 4 will be replaced. Please provide clarification.

Under the emission unit information section on page 12, the existing pump engine nos. 3 & 4 will be replaced with the new pump engine nos. 3 & 4. Existing pump engine no. 5 and replacement engine driven pump no. 5 covered in pages 24 through 35 of the application. A revised application page 12 is attached.

5. The application on page 20 uses 1.8 g/bhp-hr CO emission factor. Please indicate the basis for using that number.

As a result of responding to item number 9 below, emission factors were revised to reflect operational loading of the pump engines, revised permit application pages are attached. The revised emission factors (including CO) are based on manufacturer supplied emission and product literature for the Caterpillar G3512LE engine provided in Appendix 3 of the initial application.

6. The application on page 44 under section 3 shows the potential emissions for CO to be 42.924 tons/year. Please indicate how was that number arrived at.

A revised application page 44 is attached. The revised potential emissions for CO is 0.525 tons/year and is based on the synthetic limitation of 500 hours of operation per year and a 2.10 lbs/hr CO emission factor provided by the manufacturer for the Caterpillar 3508 generator set which is provided in Appendix 3 of the initial application.

7. Page 1 of Attachment 3 lists past actual emissions for all the pollutants. Please show all the calculations in arriving at tons per year numbers for NOx for pump engines 1, 3, 4 and 5.

A tabulation of past actual emissions for all pollutants with sample calculations is provided in the narrative description of the project provided as an enclosure with this response.

8. Please indicate whether the emission factors used in the calculations were based on emissions testing or manufactured supplied data. Please provide necessary documentation to verify the emission factors used in the application.

The emission factors used for the existing engine driven pumps / generator are based on the average of two NOx RACT emission tests conducted in 1997 and 1998 for NOx emissions and EPA's recommended emission factors from the Factor Information REtrieval (FIRE) Data System for the other air pollutants. Manufacturer's emission factors were used for the proposed engine driven pumps and generator when possible and emission factors from FIRE. A copy of the compendiums with the results of two NOx RACT emission tests conducted in 1997 and 1998 for NOx emissions is provided as part of the narrative description of the project provided as an enclosure with this response.

9. Please indicate the load percent at which the engines will be operating most of the time. If the engines will be operating at less than 100% load some of the time, provide the actual operating hours under those conditions.

Based on the pump test curves provided by the pump manufacturer, and pump room operating records, the pump engines will not operate at 100 per cent load. A complete analysis of the engine operating ranges and emissions are provided in the narrative description of the project provided as an enclosure with this response.

10. The Department in a telephonic conversation with Mr. Richard O'Rourke of your staff understands that the request for concurrent review of Title V air operation permit revision and air construction permit application will be withdrawn. The Department is anticipating a letter of withdrawal. The Department will proceed with the review of the air construction permit application and you will submit a separate application at a later date for Title V air operation permit revision.

A revised application page 2 is attached reflecting these changes.

11. The Department understands in conversations with Mr. Richard O'Rourke that a narrative description of the project will be submitted. This should be of the same style as one used for PSD applications.

A narrative description of the project is provided as an enclosure with this response.

Purpose of Application

Air Operation Permit Application

This Application for Air Permit is submitted to obtain: (Check one)

[ ] Initial Title V air operation permit for an existing facility which is classified as a Title V source.

[ ] Initial Title V air operation permit for a facility which, upon start up of one or more newly constructed or modified emissions units addressed in this application, would become classified as a Title V source.

Current construction permit number:________________________________

[ ] Title V air operation permit revision to address one or more newly constructed or modified emissions units addressed in this application.

Current construction permit number:________________________________

Operation permit number to be revised:________________________________

[~~X~~] Title V air operation permit revision or administrative correction to address one or more proposed new or modified emissions units and to be processed concurrently with the air construction permit application. (Also check Air Construction Permit Application below.)

Operation permit number to be revised/corrected: ~~0250314-001-AV~~

[ ] Title V air operation permit revision for reasons other than construction or modification of an emissions unit.

Operation permit number to be revised:

Reason for revision:

Air Construction Permit Application

This Application for Air Permit is submitted to obtain: (Check one)

[X] Air construction permit to construct or modify one or more emissions units.

[ ] Air construction permit to make federally enforceable an assumed restriction on the potential emissions of one or more existing, permitted emissions units.

[ ] Air construction permit for one or more existing, but unpermitted, emissions units.

July 26, 2002 Revision

Owner/Authorized Representative or Responsible Official

1.	Name and Title of Owner/Authorized Representative or Responsible Official: Jorge S. Rodriguez, P.E., Assistant Director - Water
2.	Owner/Authorized Representative or Responsible Official Mailing Address: Organization/Firm: Miami-Dade Water and Sewer Department Street Address: 3071 SW 38th Avenue City: Miami State: FL Zip Code: 33146-1520
3.	Owner/Authorized Representative or Responsible Official Telephone Numbers: Telephone: (786) 552 - 8112 Fax: (786) 552 - 8626
4.	Owner/Authorized Representative or Responsible Official Statement: *I, the undersigned, am the owner or authorized representative*(check here [X], if so) or the responsible official (check here [X], if so) of the Title V source addressed in this application, whichever is applicable. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made in this application are true, accurate and complete and that, to the best of my knowledge, any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. The air pollutant emissions units and air pollution control equipment described in this application will be operated and maintained so as to comply with all applicable standards for control of air pollutant emissions found in the statutes of the State of Florida and rules of the Department of Environmental Protection and revisions thereof. I understand that a permit, if granted by the Department, cannot be transferred without authorization from the Department, and I will promptly notify the Department upon sale or legal transfer of any permitted emissions unit.* [signature] 7/31/02 Signature Date

* Attach letter of authorization if not currently on file.

Professional Engineer Certification

1.	Professional Engineer Name: Richard M. O'Rourke, P.E. Registration Number: 42683
2.	Professional Engineer Mailing Address: Organization/Firm: Miami-Dade Water & Sewer Street Address: 3071 SW 38th Avenue City: Miami State: FL Zip Code: 33146-1520
3.	Professional Engineer Telephone Numbers: Telephone: (786) 552 - 8123 Fax: (786) 552 - 8640

July 26, 2002 Revision

4. Professional Engineer Statement:

I, the undersigned, hereby certify, except as particularly noted herein, that:*

(1) To the best of my knowledge, there is reasonable assurance that the air pollutant emissions unit(s) and the air pollution control equipment described in this Application for Air Permit, when properly operated and maintained, will comply with all applicable standards for control of air pollutant emissions found in the Florida Statutes and rules of the Department of Environmental Protection; and

(2) To the best of my knowledge, any emission estimates reported or relied on in this application are true, accurate, and complete and are either based upon reasonable techniques available for calculating emissions or, for emission estimates of hazardous air pollutants not regulated for an emissions unit addressed in this application, based solely upon the materials, information and calculations submitted with this application.

If the purpose of this application is to obtain a Title V source air operation permit (check here [ ], if so), I further certify that each emissions unit described in this Application for Air Permit, when properly operated and maintained, will comply with the applicable requirements identified in this application to which the unit is subject, except those emissions units for which a compliance schedule is submitted with this application.

If the purpose of this application is to obtain an air construction permit for one or more proposed new or modified emissions units (check here [X], if so), I further certify that the engineering features of each such emissions unit described in this application have been designed or examined by me or individuals under my direct supervision and found to be in conformity with sound engineering principles applicable to the control of emissions of the air pollutants characterized in this application.

If the purpose of this application is to obtain an initial air operation permit or operation permit revision for one or more newly constructed or modified emissions units (check here [X], if so), I further certify that, with the exception of any changes detailed as part of this application, each such emissions unit has been constructed or modified in substantial accordance with the information given in the corresponding application for air construction permit and with all provisions contained in such permit.

Signature: [signature] # 42683 — Date: 26 JULY 2002

(seal)

* Attach any exception to certification statement.

July 26, 2002 Revision

Construction/Modification Information

1. Description of Proposed Project or Alterations:

This application replaces the proposed construction previously permitted under DEP File No. 0250314-003-AC. This application is for a new construction permit to remove and replace existing diesel fueled engine driven pumps and generator nos. 1, 2, 3, 4, & 5.

Natural gas fueled engine driven pumps No.3 (810 bhp), No.4 (810 bhp) & No. 5 (2225 bhp) are proposed as replacements. The two (2) 810 bhp engines are proposed as a single, collectively regulated emissions unit. The 2225 bhp engine is proposed in this application as a single regulated emissions unit.

A 1332 bhp (1220 bhp continuous) diesel fueled engine driven 900 KW (810KW continuous) generator set is proposed to replace the 750 KW emergency generator that engine no. 1 also drove.

2. Projected or Actual Date of Commencement of Construction: 3/1/2000

3. Projected Date of Completion of Construction: 12/31/2004

Application Comment

This application replaces the proposed construction previously permitted under DEP File No. 0250314-003-AC. The purpose of this application is to obtain construction permits to remove existing pumps & engines no. 1 and 2, replacing the (pump/generator) capacity of engine no. 1 with a diesel fueled engine driven emergency generator set and to replace existing diesel fueled engine driven pump nos. 3, 4 & 5 with three natural gas fueled engine driven pumps.

The existing units operate without restrictions. A two-year period from April 1998 to March 2000 was used to calculate the existing emissions because it was the last period in which all units (except no. 2 out of service) were operated.

The replacement emergency generator has the potential to emit over 160 tons of NOx annually when operated continuously, however this application proposes to restrict operation to only 500 hours or 33,250 gallons of fuel annually.

A comparison of past actual emissions to proposed emissions with the proposed operational restrictions result in a net annual increase of 20.27 ton of NOx, 45.13 tons of CO, 0.14 tons of PM10, 0.12 tons of SOx and 9.96 tons of VOC and a net decrease of 0.06 tons of PM.

Information included in this construction permit application should be assimilated into the existing Title V operating permit

July 26, 2002 Revision

II. FACILITY INFORMATION

A. GENERAL FACILITY INFORMATION

Facility Location and Type

1. Facility UTM Coordinates: Zone: 17	East (km): 566.60	North (km): 2843.50	
2. Facility Latitude/Longitude: Latitude (DD/MM/SS): 25 / 42 / 30		Longitude (DD/MM/SS): 80 / 20 / 10	
3. Governmental Facility Code: 3	4. Facility Status Code: A	5. Facility Major Group SIC Code: 49	6. Facility SIC(s): 4941
7. Facility Comment (limit to 500 characters): Facility treats up to 241.7 million gallons a day & up to 74,136 MG annually of raw water using a lime softening, filtration, recarbonation & disinfection for public water supply. ~~Six~~ Four standby generators provide standby electrical power required by the FDOH, for continuous plant operations. Engines driven pump sets are used to maintain pressure & convey water. A rotary kiln recovers the water softening process solids for conversion back in to quick lime for process reuse on site.			

Facility Contact

1. Name and Title of Facility Contact: Tom Segars, Superintendent of Water Production		
2. Facility Contact Mailing Address: Organization/Firm: Miami-Dade Water and Sewer Department Street Address: 700 W. Second Ave. City: Hialeah	State: FL	Zip Code: 33010-0006
3. Facility Contact Telephone Numbers: Telephone: (305) 888 - 2522	Fax: (305) 889 - 0156	

July 26, 2002 Revision

III. EMISSIONS UNIT INFORMATION

A separate Emissions Unit Information Section (including subsections A through J as required) must be completed for each emissions unit addressed in this Application for Air Permit. If submitting the application form in hard copy, indicate, in the space provided at the top of each page, the number of this Emissions Unit Information Section and the total number of Emissions Unit Information Sections submitted as part of this application.

A. GENERAL EMISSIONS UNIT INFORMATION
(All Emissions Units)

Emissions Unit Description and Status

1. Type of Emissions Unit Addressed in This Section: (Check one)

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, a single process or production unit, or activity, which produces one or more air pollutants and which has at least one definable emission point (stack or vent).

[X] This Emissions Unit Information Section addresses, as a single emissions unit, a group of process or production units and activities which has at least one definable emission point (stack or vent) but may also produce fugitive emissions.

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, one or more process or production units and activities which produce fugitive emissions only.

2. Regulated or Unregulated Emissions Unit? (Check one)

[ ] The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit.

[X] The emissions unit addressed in this Emissions Unit Information Section is an unregulated emissions unit.

3. Description of Emissions Unit Addressed in This Section (limit to 60 characters):
Pump Engine Nos. 3, 4 (Natural Gas)

4. Emissions Unit Identification Number: [X] No ID
ID: [ ] ID Unknown

5. Emissions Unit Status Code:	6. Initial Startup Date:	7. Emissions Unit Major Group SIC Code:	8. Acid Rain Unit?
C		49	[N]

9. Emissions Unit Comment: (Limit to 500 Characters)
Pump engine nos. 3 & 4 (E.U. ID Nos. 003-004) began service in August 1951 will be replaced by these new units. Permit 0250314-003-AC authorized replacement of these units with 738 bhp natural gas fired Waukesau Model 3521GL engines with a maximum heat input rate of 5.44 mmBtu/hr. This is to replace units with 810 bhp natural gas fired Caterpillar Model G3512 engines with a maximum potential heat input rate of 5.67 mmBtu/hr.

July 26, 2002 Revision

B. EMISSIONS UNIT CAPACITY INFORMATION
(Regulated Emissions Units Only)

Emissions Unit Operating Capacity and Schedule

1. Maximum Heat Input Rate:			92,127 mmBtu/yr	
2. Maximum Incineration Rate:		lb/hr		tons/day
3. Maximum Process or Throughput Rate: Not Applicable				
4. Maximum Production Rate: Not Applicable				
5. Requested Maximum Operating Schedule:	24	hours/day	7	days/week
	52	weeks/year	8760	hours/year
6. Operating Capacity/Schedule Comment (limit to 200 characters): Maximum Annual Heat Input Rate is based on unrestricted operations for both units (17,520 hrs/yr) at a maximum 30 day rolling average of the hourly average load (based on pressure) over a period of normal operations 7512 Btu/bhp-hr x 700 bhp x 1 mmBtu/100000 Btus x 2 (engines) x 8760 hrs/yr =92,127 mmBtu/yr. The maximum potential heat input occurs at the maximum pump load of 760 bhp or 93.8% of rated engine load, which is 7455 Btu/bhp-hr x 760 bhp x 1 mmBtu/100000 Btus = 5.67 mmBtu/hr				

July 26, 2002 Revision

D. EMISSION POINT (STACK/VENT) INFORMATION
(Regulated Emissions Units Only)

Emission Point Description and Type

1. Identification of Point on Plot Plan or Flow Diagram? #3, #4 (G3512)	2. Emission Point Type Code: 3

3. Descriptions of Emission Points Comprising this Emissions Unit for VE Tracking (limit to 100 characters per point):
3 CC, Pump Engine No. 3 (4th from north end): vertical stack outside building with silencer.
4 CC, Pump Engine No. 4 (3rd from north end): vertical stack outside building with silencer.

4. ID Numbers or Descriptions of Emission Units with this Emission Point in Common:
003, 018, Unk – Pump Engine 3
004, 019, Unk – Pump Engine 4

5. Discharge Type Code: V	6. Stack Height: 32 feet	7. Exit Diameter: 1 feet
8. Exit Temperature: 793 °F	9. Actual Volumetric Flow Rate: 3610 acfm	10. Water Vapor: %

11. Maximum Dry Standard Flow Rate: dscfm	12. Nonstack Emission Point Height: feet

13. Emission Point UTM Coordinates:
Zone: 17 East (km): 566.6 North (km): 2,843.5

14. Emission Point Comment (limit to 200 characters):

Emission point is representative point of the two similar units. Exit Temperatures and Volumetric Flow interpolated values for 700 bhp or 86.4% of engine rated load.

July 26, 2002 Revision

E. SEGMENT (PROCESS/FUEL) INFORMATION
(All Emissions Units)

Segment Description and Rate: Segment 1 of 1

1. Segment Description (Process/Fuel Type) (limit to 500 characters): Natural gas powered internal combustion engines (emissions related to thousand Cubic feet burned) Maximum hourly is based on brake specific fuel consumption of 7455 BTU/bhp-hr at 760 bhp and Annual fuel rate for both units is based on 7512 BTU/bhp-hr at 700 bhp.		
2. Source Classification Code (SCC): 1-02-006-02	3. SCC Units: Million Cubic Feet Burned (all gaseous fuels)	
4. Maximum Hourly Rate: 0.01079	5. Maximum Annual Rate: 87.78	6. Estimated Annual Activity Factor: 1.00
7. Maximum % Sulfur: 0.00	8. Maximum % Ash: 0.00	9. Million Btu per SCC Unit: 1,050
10. Segment Comment (limit to 200 characters): Maximum hourly rate of the two engines is 0.01079 MMscf/hr. The Maximum annual rate of two engines is based the hourly rate of 0.01002 MMscf/hr for 8760 hours or 87.78 MMscf/yr.		

Segment Description and Rate: Segment ___ of ___

1. Segment Description (Process/Fuel Type) (limit to 500 characters):		
2. Source Classification Code (SCC):	3. SCC Units:	
4. Maximum Hourly Rate:	5. Maximum Annual Rate:	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit:
10. Segment Comment (limit to 200 characters):		

July 26, 2002 Revision

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: NOX	2. Total Percent Efficiency of Control: 0.0
3. Potential Emissions: 8.82 lb/hour 38.3 tons/year	4. Synthetically Limited? [N]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: 3.3 and 3.1 g/bhp-hr Reference: Manufacturer and Interpolated	7. Emissions Method Code: 5
8. Calculation of Emissions (limit to 600 characters): Manufacturer Supplied and Interpolated NOx emissions factors: Hourly Emissions: (2 engine) x (607 bhp) x (3.3 g/bhp-hr NOx) x (1 lb/454 g) = 8.82 lbs/hr. Annual Emissions: (2 engines) x (640 bhp) x (3.1 g/bhp-hr NOx) x (1 lb/454 g) x (8,760 hr/yr) x (ton/2,000 lb) = 38.3 tpy	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Hourly and Annual emissions are for both units 3 and 4. The hourly NOx emissions based on worst case engine loading of 75% and Annual emissions on worst average loading of 79.0%	

Allowable Emissions Allowable Emissions 1 of 2

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance (limit to 60 characters):	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters): The emission unit is not subject to any unit specific emission limiting standard and considered "unregulated" for the purposes of Title V permitting.	

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units -
Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: CO	2. Total Percent Efficiency of Control: 0.0
3. Potential Emissions: 5.42 lb/hour 22.29 tons/year	4. Synthetically Limited? [N]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: 1.62 and 1.65 g/bhp-hr Reference: Manufacturer	7. Emissions Method Code: 5
8. Calculation of Emissions (limit to 600 characters): Interpolation of Manufacturer Supplied CO emission factors: Hourly Emissions: (2 engine) x (760 bhp) x (1.62 g/bhp-hr) x (1 lb/454 g) = 5.42 lbs/hr. Annual Emissions: (2 engines) x (700 bhp) x (1.65 g/bhp-hr) x (1 lb/454 g) x (8,760 hr/yr) x (ton/2,000 lb) = 22.29 tpy	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Hourly and Annual emissions are for both units 3 and 4. The hourly CO emissions based on worst case engine loading of 93.8% and Annual emissions on worst average loading of 86.4%	

Allowable Emissions Allowable Emissions 2 of 2

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance (limit to 60 characters):	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters): The emission unit is not subject to any unit specific emission limiting standard and considered "unregulated" for the purposes of Title V permitting.	

III. EMISSIONS UNIT INFORMATION

A separate Emissions Unit Information Section (including subsections A through J as required) must be completed for each emissions unit addressed in this Application for Air Permit. If submitting the application form in hard copy, indicate, in the space provided at the top of each page, the number of this Emissions Unit Information Section and the total number of Emissions Unit Information Sections submitted as part of this application.

A. GENERAL EMISSIONS UNIT INFORMATION
(All Emissions Units)

Emissions Unit Description and Status

1. Type of Emissions Unit Addressed in This Section: (Check one)

[X] This Emissions Unit Information Section addresses, as a single emissions unit, a single process or production unit, or activity, which produces one or more air pollutants and which has at least one definable emission point (stack or vent).

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, a group of process or production units and activities which has at least one definable emission point (stack or vent) but may also produce fugitive emissions.

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, one or more process or production units and activities which produce fugitive emissions only.

2. Regulated or Unregulated Emissions Unit? (Check one)

[X] The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit.

[ ] The emissions unit addressed in this Emissions Unit Information Section is an unregulated emissions unit.

3. Description of Emissions Unit Addressed in This Section (limit to 60 characters):
Pump Engine No. 5 (Natural Gas)

4. Emissions Unit Identification Number:
ID:

[ ] No ID
[X] ID Unknown

5. Emissions Unit Status Code:	6. Initial Startup Date:	7. Emissions Unit Major Group SIC Code:	8. Acid Rain Unit?
C		49	[ ]

9. Emissions Unit Comment: (Limit to 500 Characters)
Pump engine no. 5 (E.U. ID 005) began service in August 1951 will be replaced by this new unit. Permit 0250314-003-AC authorized the replacement with a 2090 bhp natural gas fired Waukesau Model 8L-AT27GL engine with a maximum heat input rate of 13.70 mmBtu/hr as (E.U. ID No. 020). This is to replace unit with 2225 bhp natural gas fired Caterpillar Model G3808LE engine with a maximum potential heat input rate of 14.05 mmBtu/hr.

B. EMISSIONS UNIT CAPACITY INFORMATION
(Regulated Emissions Units Only)

Emissions Unit Operating Capacity and Schedule

1. Maximum Heat Input Rate:			116,608	mmBtu/yr
2. Maximum Incineration Rate:		lb/hr		tons/day
3. Maximum Process or Throughput Rate:				
4. Maximum Production Rate:				
5. Requested Maximum Operating Schedule:				
	24	hours/day	7	days/week
	52	weeks/year	8760	hours/year

6. Operating Capacity/Schedule Comment (limit to 200 characters):

Maximum Annual Heat Input Rate is based on unrestricted operations (8760 hrs/yr) at a maximum 30 day rolling average of the hourly average load (based on pressure) over a period of normal operations
6933 Btu/bhp-hr x 1920 bhp x 1 mmBtu/100000 Btus x 8760 hrs/yr = 116,608 mmBtu/yr.

The maximum potential heat input occurs at the maximum pump load of 2040 bhp or 91.7% of rated engine load, which is
6885 Btu/bhp-hr x 2040 bhp x 1 mmBtu/100000 Btus = 14.05 mmBtu/hr

July 26, 2002 Revision

D. EMISSION POINT (STACK/VENT) INFORMATION
(Regulated Emissions Units Only)

Emission Point Description and Type

1. Identification of Point on Plot Plan or Flow Diagram? # 5 SDR (G3608)

2. Emission Point Type Code: 3

3. Descriptions of Emission Points Comprising this Emissions Unit for VE Tracking (limit to 100 characters per point):
5 SDR, Pump Engine No. 5 (2nd from north end): vertical stack outside building with silencer.

4. ID Numbers or Descriptions of Emission Units with this Emission Point in Common:

5. Discharge Type Code: V	6. Stack Height: 32 feet	7. Exit Diameter: 1.5 feet
8. Exit Temperature: 857 °F	9. Actual Volumetric Flow Rate: 13080 acfm	10. Water Vapor: %

11. Maximum Dry Standard Flow Rate: dscfm

12. Nonstack Emission Point Height: feet

13. Emission Point UTM Coordinates:
Zone: 17 East (km): 566.6 North (km): 2,843.5

14. Emission Point Comment (limit to 200 characters):

Exit Temperatures and Volumetric Flow interpolated values for 1920 bhp or 86.3% of engine rated load.

July 26, 2002 Revision

E. SEGMENT (PROCESS/FUEL) INFORMATION
(All Emissions Units)

Segment Description and Rate: Segment 1 of 1

1. Segment Description (Process/Fuel Type) (limit to 500 characters): Natural gas powered internal combustion engines (emissions related to thousand Cubic feet burned) Maximum hourly rate is based on brake specific fuel consumption of 6885 BTU/bhp-hr at 2040 bhp and Annual fuel rate is based on 6933 BTU/bhp-hr at 1920 bhp at 1050 MMBtu/MMScf.		
2. Source Classification Code (SCC): 1-02-006-02	3. SCC Units: Million Cubic Feet Burned (all gaseous fuels)	
4. Maximum Hourly Rate: 0.0134	5. Maximum Annual Rate: 111.05	6. Estimated Annual Activity Factor: 1.00
7. Maximum % Sulfur: 0.00	8. Maximum % Ash: 0.00	9. Million Btu per SCC Unit: 1,050
10. Segment Comment (limit to 200 characters): Maximum hourly rate of the engine is 0.0134 MMscf/hr. The Maximum annual rate is based the nominal capacity of 0.0127 MMscf/hr and 8760 hrs/yr or 111.05 MMscf/yr		

Segment Description and Rate: Segment ___ of ___

1. Segment Description (Process/Fuel Type) (limit to 500 characters):		
2. Source Classification Code (SCC):	3. SCC Units:	
4. Maximum Hourly Rate:	5. Maximum Annual Rate:	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit:
10. Segment Comment (limit to 200 characters):		

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: NOX	2. Total Percent Efficiency of Control: 0.0
3. Potential Emissions: 3.15 lb/hour 12.95 tons/year	4. Synthetically Limited? [N]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: 0.7 g/bhp-hr Reference: Manufacturer	7. Emissions Method Code: 5
8. Calculation of Emissions (limit to 600 characters): Interpolation of Manufacturer Supplied NOx emission factors: Hourly Emissions: (2040 bhp) x (0.7 g/bhp-hr NOx) x (1 lb/454 g) = 3.15 lbs/hr. Annual Emissions: (1920 bhp) x (0.7 g/bhp-hr NOx) x (1 lb/454 g) x (8,760 hr/yr) x (ton/2,000 lb) = 12.95 tpy	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): The hourly NOx emissions based on worst case engine loading of 91.7% and Annual emissions on worst average loading of 86.3%	

Allowable Emissions Allowable Emissions 1 of 2

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance (limit to 60 characters):	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters): The emission unit is not subject to any unit specific emission limiting standard and considered "unregulated" for the purposes of Title V permitting.	

July 26, 2002 Revision

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: CO	2. Total Percent Efficiency of Control: 0.0
3. Potential Emissions: 8.54 lb/hour 35.19 tons/year	4. Synthetically Limited? [N]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: 1.90 g/bhp-hr Reference: Manufacturer	7. Emissions Method Code: 5
8. Calculation of Emissions (limit to 600 characters): Interpolation of Manufacturer Supplied CO emissions: 1.90 g/bhp-hr CO Hourly Emissions: (2040 bhp) x (1.90 g/bhp-hr) x (1 lb/454 g) = 8.54 lbs/hr. Annual Emissions: (1920 bhp) x (1.90 g/bhp-hr) x (1 lb/454 g) x (8,760 hr/yr) x (ton/2,000 lb) = 35.19 tpy	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): The hourly CO emissions based on worst case engine loading of 91.7% and Annual emissions on worst average loading of 86.3%	

Allowable Emissions Allowable Emissions 2 of 2

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance (limit to 60 characters): Initial air compliance testing	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters): The emission unit is not subject to any unit specific emission limiting standard and considered "unregulated" for the purposes of Title V permitting.	

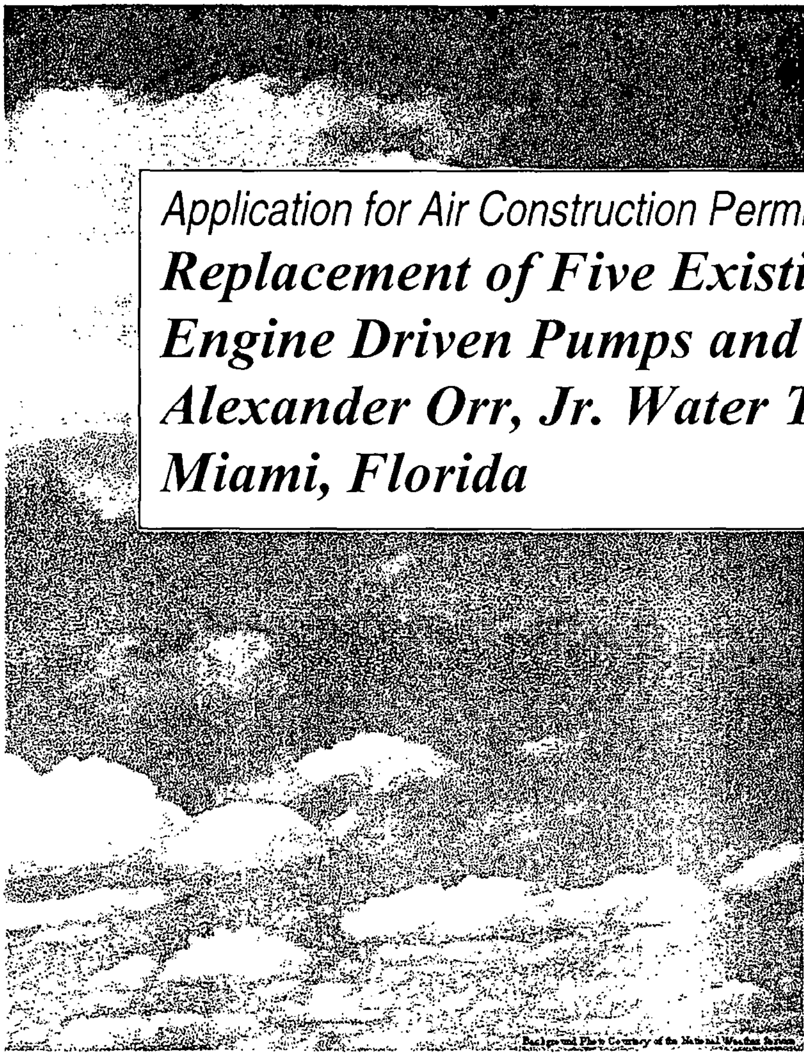
G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units -
Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: CO	2. Total Percent Efficiency of Control:
3. Potential Emissions: 2.10 lb/hour 0.525 tons/year	4. Synthetically Limited? [Y]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: 2.10 lb/hr Reference: Manufacturer	7. Emissions Method Code: 5
8. Calculation of Emissions (limit to 600 characters): Manufacturer Supplied CO emissions: 2.10 lb/hr CO Hourly Emissions: 2.10 lb/hr Annual Emissions: (2.10lb/hr CO) x (500 hr/yr) x (ton/2,000 lb) = 0.525 tpy	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):	

Allowable Emissions Allowable Emissions ___2___ of ___2___

1. Basis for Allowable Emissions Code: OTHER	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance (limit to 60 characters):	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):	



Application for Air Construction Permit for the

Replacement of Five Existing Diesel Fueled Engine Driven Pumps and Generator Alexander Orr, Jr. Water Treatment Plant Miami, Florida

SERVE • CONSERVE

Miami-Dade Water and Sewer Department
July 2002

Contents

Contents, cont.

Acronyms

acfm	actual cubic feet per minute
ARC	ambient reference concentration
BACT	Best Achievable Control Technology
bhp	brake horsepower
bhp-hr	brake horsepower-hour
BSFC	brake-specific fuel consumption
CAA	Clean Air Act
CO_2	carbon dioxide
CO	carbon monoxide
EPA	Environmental Protection Agency
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FLM	Federal Land Manager
FP&L	Florida Power & Light Company
fps	feet per second
ft	foot (or feet)
g/bhp-hr	gram(s) per brake horsepower-hour
g/s	gram(s) per second
GEP	good engineering practice
H_2SO_4	sulfuric acid
HAP	hazardous air pollutant
HC	hydrocarbon
HNO_3	nitric acid
IC	internal combustion
IR	fuel injection timing retard
ISC	Industrial Source Complex
°K	degrees Kelvin
km	kilometer (s)
kW	kilowatt
kW-hr	kilowatt-hour
$\mu g/m^3$	microgram(s) per cubic meter
m	meter
m^3/s	cubic meter(s) per second
MIA	Miami International Airport
m/s	meter(s) per second

Acronyms, cont.

NAAQS	National Ambient Air Quality Standards
NH_3	ammonia
NO	nitric oxide
NOx	nitrogen oxides
NO_2	nitrogen dioxide
PAH	polycyclic aromatic hydrocarbon
PEC	purchased equipment cost
PM-10	particulate matter less than 10 microns in diameter
ppm	parts per million
PSD	Prevention of Significant Deterioration
RACT	Reasonably Available Control Technology
RBLC	RACT/BACT/LAER Clearinghouse
rpm	revolutions per minute
scfm	standard cubic feet per minute
SCR	selective catalytic reduction
SO_2	sulfur dioxide
SO_3	sulfite
SO_4	sulfate
UTM	Universal Transverse Mercator
VOC	volatile organic compound
WASD	Water and Sewer Department (Miami-Dade)
WTP	water treatment plant
WWTP	wastewater treatment plant

SECTION 1
Introduction

The Miami-Dade Water and Sewer Department (WASD) proposed to remove five existing diesel fueled engine driven pumps numbers 1, 2, 3, 4 and 5 and to install new three new pumps with natural gas fired engines numbers 3, 4 and 5 at its Alexander Orr, Jr. Water Treatment Plant (WTP) in Miami, Florida with an initial Air Construction Permit Application submitted for review on October 29, 1998. The existing pumps numbers 1, 2, 3 and 4, are driven by similar 825 brake horsepower (bhp) Worthington diesel fueled engines. Existing pump number 1 is coupled to a 750 kilowatt (KW) generator, serving as the emergency generator for the pump room when the generator is excited and the pump drive is not clutched in. Pump engine number 2 was removed from service in the early 1990's and cannibalized for parts to maintain the three similar units remaining. A 1,500 bhp Worthington diesel fueled engine drives existing pump number 5.

Air Construction Permit No. 0250314-003-AC was issued on March 5, 1999 to remove existing pumps and engines numbers 1, 2, 3, 4 and 5 and to install new pumps with natural gas fired engines numbers 3, 4 and 5 at the Alexander Orr, Jr. WTP. The units proposed in this previous permit were not installed; the emission increment was not consumed and this project replacing the previous. Replacement of the existing five diesel fueled engine driven pumps will ensure uninterrupted Miami water supply and pressure to the South Dade County population. The existing engines burn transportation grade diesel fuel, which has a sulfur content of 0.05 weight percent.

An air quality impact analysis was not conducted in support of this application, as the units being replaced are baseline units and the replacement unit operations as proposed do not exceed Prevention of Significant Deterioration (PSD) increments. Questions regarding the application can be addressed to the individual listed below at Miami-Dade Water and Sewer Department in Miami, Florida:

Mr. Richard M. O'Rourke, P.E.
Miami-Dade Water and Sewer Department
P.O. Box 330316
Miami, Florida 33233-0316
Telephone: (786) 552-8123
FAX: (786) 552-8640

Facility Information

2.1 Facility Location

The facility is located at the Alexander Orr, Jr. Water Treatment Plant, 6800 SW 87 Avenue, Miami, Miami-Dade County. UTM coordinates are: Zone 17; 566.6 km E and 2843.5 km N.

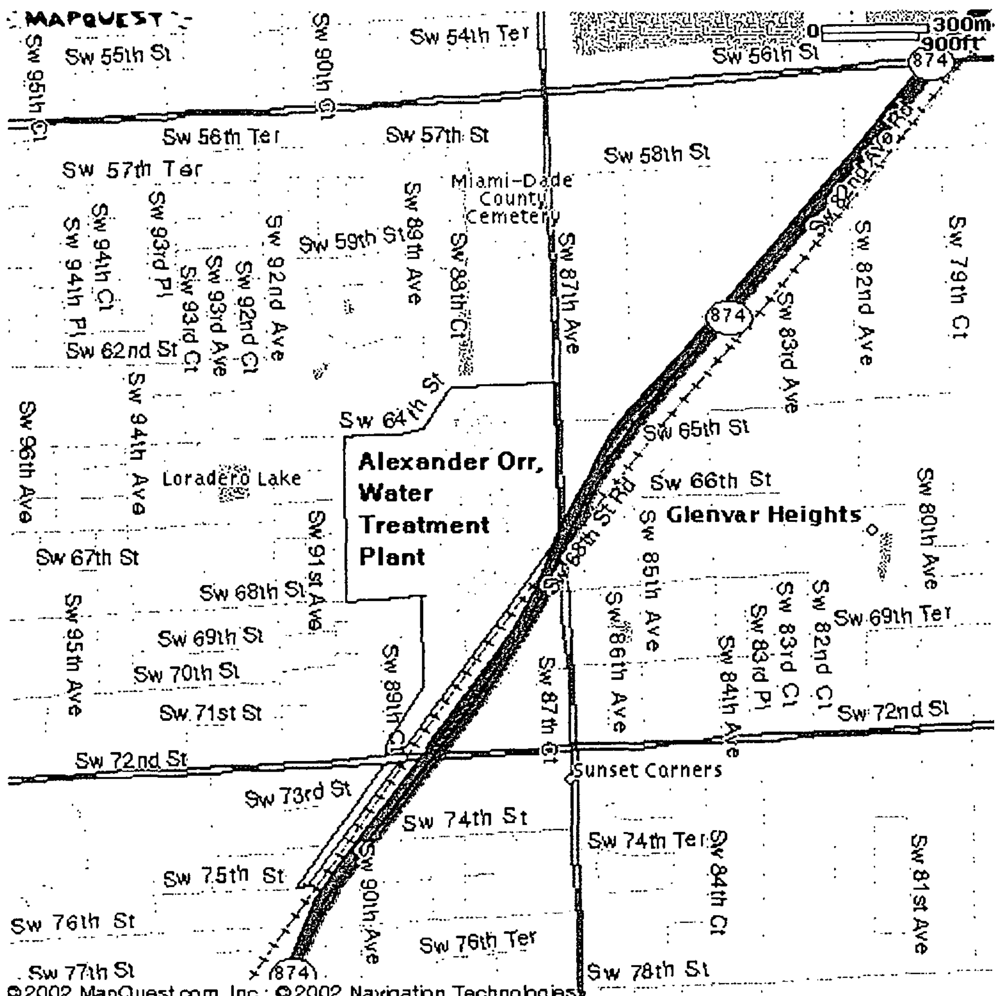


Figure 1 - Alexander Orr Water Treatment Plant Location[1]

2.2 Standard Industrial Classification Codes (SIC)

Industry Group No.	49	Electric, Gas, and Sanitary Services
Industry No.	4941	Water Supply

2.3 Facility Category

[1] Base map available at http://www.mapquest.com.

The facility, the Alexander Orr, Jr. Water Treatment Plant, is a municipally owned water treatment plant providing potable water to the public. The Miami-Dade Water and Sewer Department (WASD) is the sixth largest public utility in the United States, providing direct services to approximately 356,000 retail customers. Wholesale water service is provided to 14 municipalities and wholesale sewer service to 12 of the County's 29 municipalities. Miami-Dade County's current population of 2 million is expected to reach the 3 million mark by the year 2015.[2] The Alexander Orr, Jr. WTP produces approximately half of the water supply of the WASD system.[3]

This facility is classified as a Major or Title V Source of air pollution because emissions of at least one regulated air pollutant, such as particulate matter (PM/PM_{10}), sulfur dioxide (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), or volatile organic compounds (VOC) exceeds 100 tons per year (TPY).

This facility is not within an industry included in the list of the 28 Major Facility Categories per Table 62-212.400-1, F.A.C. However, because overall facility emissions are greater than 250 TPY for at least one criteria pollutant, it is a Major Facility with respect to Rule 62-212.400, Prevention of Significant Deterioration (PSD).

This replacement project is exempt from the requirements of Rule 62-212.400, F.A.C., Prevention of Significant Deterioration (PSD) as discussed in this Report. The emissions units included in this project are not subject to any unit-specific emission limiting standard (considered "unregulated" for purposes of Title V permitting) as described below.

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[2] Provided by WASD at http://www.co.miami-dade.fl.us/wasd/about.htm.

[3] Application, April 2002.

SECTION 3
Project Information

3.1 Project Scope

The scope of this project is to remove existing engines and pumps numbers 1, 2, 3, 4 and 5 and to install new pumps with natural gas fired engines numbers 3, 4 and 5. Existing engine and pump number 1 also served as a prime mover for a 750 KW generator set. Emissions units that will be removed are 001 (engine and pump #1), 002 (engine and pump #2 which were previously taken out of service), 003 (engine and pump #3), 004 (engine and pump #4), and 005 (engine and pump #5).

Emissions units proposed by this permit application are:

Table 1 - Proposed Emission Units

Emissions Unit No.	Emissions Unit Description
	1332 brake hp diesel fired Caterpillar Model 3508 TA-130, a 4-cycle turbocharged diesel internal combustion (IC) engine driving an electric generator prime rating 900 kW. Maximum heat input rate is 6.00 mmBtu/hr.
	810 brake hp natural gas fired Caterpillar Model G3512 LE-130 engine for pump 3. Maximum heat input rate is 6.00 mmBtu/hr. Pump has a designed 20 million gallons per day (MGD) water pumping capacity.
	810 brake hp natural gas fired Caterpillar Model G3512 LE-130 engine for pump 4. Maximum heat input rate is 6.00 mmBtu/hr. Pump has a designed 20 MGD water pumping capacity.
	2090 brake hp natural gas fired Caterpillar Model G3608 LE engine for pump 5. Maximum heat input rate is 13.70 mmBtu/hr. Pump has a designed 40 MGD water pumping capacity.

3.2 Replacement Emission Units

3.2.1 Replacement of Pump / Generator Engine 1

Pump engine number one (Emission unit ID No. 001) began service in August 1951 and was coupled to a 750 KW generator and could also be clutched in to drive a pump rated at 20 million gallons per day (MGD). Since this unit served two purposes, the primary of which was to provide the emergency power backup for the pump room, it was normally set up to generate emergency power and only occasionally used. This unit is to be removed and replaced by a Caterpillar Model 3508 TA-130 Series Engine and Generator.

The Model 3508 TA-130 is in Caterpillar's 3500 engine series that, according to Caterpillar are designed to operate reliably at 1800 rpm continuously. The Model 3508 TA-130 engine is a V 8 cylinder engine with a Bore & Stroke of 6.7 x 7.5 in. (170 x 190 mm) and displacement of 2105 cu. in. (34.5 liters). This is a turbocharged engine, and power output at the design aftercooler operating temperature of 130° F ranges from 379 to 1332 bhp at 1800 rpm. Following is a figure of a typical Model 3508 series engine generator package.[4]

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[4] Information and photo from Caterpillar's promotional and technical information found at www.cat.com.

Figure 2 - Caterpillar 3508 Series Engine and Generator

3.2.2 Removal of Pump Engine 2

Pump engine two (E.U. ID No. 002) began service in August 1951, driving a 20 mgd pump. It has been out of service since early 1990s and parts removed for use to keep the remaining similar units in service. This engine and pump is to be removed and not replaced

3.2.3 Replacement of Pump Engines 3 and 4

Pump engine numbers 3 & 4 (E.U. ID Nos. 003-004) also began service in August 1951, driving 20 mgd pumps. These engines and pumps are to be removed and replaced by Caterpillar Model G3512 LE-130 engines coupled to Flowserve Model 16LNC28 high service pumps.

The Model G3512 is in Caterpillar's G3500 engine series that, according to Caterpillar are designed to operate reliably at 900 to 1400 rpm continuously. The Model G3512 LE-130 engine is a V 12 cylinder engine with a Bore & Stroke of 6.7 x 7.5 in. (170 x 190 mm) and displacement of 3158 cu. in. (51.8 liters). This is a turbocharged engine and power output at the design aftercooler operating temperature of 130° F ranges from 610 bhp to 945 bhp. Following is a figure of a typical 3500 series engine.[5]

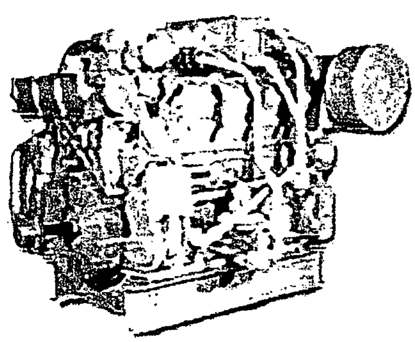

Figure 3 - Caterpillar G3500 Series Engine

[5] Information and photo from Caterpillar's promotional and technical information found at www.cat.com.

3.2.3 Replacement of Pump Engine 5

Pump engine number five (E.U. ID Nos. 005) began service in August 1951, driving a 40 mgd pump. This engines and pump is to be removed and replaced by Caterpillar Model G3608LE TA-130 engine and a Flowserve Model 600LNEC1150 high service pump rated at 40 million gallons per day.

The Model G3608LE TA-130 engine is an eight-cylinder engine in Caterpillar's G3600 series natural gas fueled engines. Caterpillar characterizes this series as high horsepower, high torque engines that are designed for reliable operation, fuel economy and low emissions. The Model G3608LE TA-130 has an in-line cylinder arrangement, with a bore and stroke of 11.81 x 11.81 in. (300 x 300 mm) and displacement of 10,350 cu. in (143 liters). This is a turbocharged engine, and power output at the design aftercooler operating temperature of 130° F ranges from 1555 bhp to 2225 bhp at 700 rpm to 1000 rpm. Following is a figure of a typical ATGL series engine.[6]

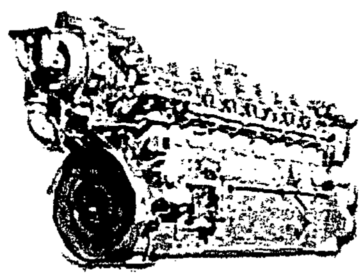

Figure 4 - Typical Caterpillar G3600 Series Engine

[6] Information and photo from Caterpillar's promotional and technical information found at www.cat.com.

4. Project Emissions

The emissions associated with this project are the typical pollutants from combustion of natural gas in internal combustion reciprocating engines. The primary pollutants associated with this project are NOx and CO. Because this project essentially consists of replacing existing engines with new engines, a comparison of past actual to future potential emissions for the pollutants expected to be emitted from these engines was performed. The existing engines are fuel oil fired internal combustion reciprocating engines. With the exception of the pump/generator which will be replaced with a fuel oil fired standby generator, units will be replaced with natural gas fired internal combustion reciprocating engines, that are expected to emit much less NOx and CO on a lb/hr basis than the existing engines. This is confirmed by the past actual to future potential analysis, which also demonstrates that the project is not subject to the requirements of PSD.

4.1 Actual Emissions for Existing Units

A two-year period from April 1998 to March 2000 was used for the estimate of past actual emissions. This was the last period that all engines were operational, and is most reflective of operations prior to modifications to the east pump room. The existing engines operated far less than 8760 hours per year, average, in this period. As noted previously, engine and pump #2 were previously removed from service but are still on-site; for the period chosen this engine and pump set did not operate, so no emissions were estimated from engine #2. In the period chosen, pump engine #1 operated an average of 142.5 hours per year, pump engine #2 was zero, pump engine #3 was 1,306.3 hours per year, pump engine #4 was 1,543.0 hours per year, and pump engine #5 was 2,513.8 hours per year. Actual past emissions were estimated from fuel consumption, operating hours and past emission test results for these units.

4.1.1 Most Recent Emissions Testing for Existing Units

Emissions tests of the existing units were conducted in 1997 and 1998 for the determination of visible and nitrous oxides emissions. The compendium of these tests is included as an attachment. A summary of the nitrous oxides (NOx) emission results is included in the tabulation below:

Table 2 - Summary of Past Emissions Test Results
NOx Testing 1997 & 1998, Emissions in Lbs/MMBtu.

Pump Engine	No. 1	No. 3	No.4	No. 5
1997	2.12	1.83	2.95	2.60
1998	2.26	2.36	2.57	2.29
Average	2.19	2.10	2.76	2.45

The average value of test results for the two tests conducted will be used for the purpose of determining the annual NOx emissions of the existing units over the two year period being evaluated, as tests were also taken over a two year period, and more representative of operations than just one test result.

4.1.2 Existing Unit Operations

Monthly operations of the existing units over a two-year period from April 1998 to March 2000 were selected for the estimate of past actual emissions. This was the last period that all engines were operational, and is most reflective of operations prior to modifications to the east pump room. A tabulation of the monthly fuel consumptions over this period used in the 1998, 1999 and 2000 Annual Operating Reports for Air Pollutant Emitting Facility, Alexander Orr, Jr. Water Treatment Plant is presented Table 3 below:

Table 3 - Fuel Consumption (10^3 gallons Diesel)
Pump Room Engines 1 through 5

Month	Pump Engine #1	Pump Engine #3	Pump Engine #4	Monthly Total Engines 3&4	Pump Engine #5
Apr-98	0.543	2.806	4.449	7.255	3.480
May-98	-	0.992	5.921	6.913	4.620
Jun-98	-	0.589	5.301	5.890	8.280
Jul-98	0.233	0.605	4.464	5.069	3.900
Aug-98	0.837	3.999	5.580	9.579	21.360
Sep-98	1.891	5.332	8.773	14.105	41.580
Oct-98	0.217	5.503	8.091	13.594	43.980
Nov-98	-	6.851	4.666	11.517	42.570
Dec-98	-	6.696	2.201	8.897	8.220
Jan-99	-	7.316	2.325	9.641	32.280
Feb-99	0.093	2.356	4.185	6.541	6.000
Mar-99	-	7.239	2.294	9.533	3.840
Apr-99	0.155	7.130	0.744	7.874	3.720
May-99	0.806	9.486	-	9.486	6.540
Jun-99	1.240	3.162	-	3.162	8.940
Jul-99	0.744	1.674	1.395	3.069	4.500
Aug-99	0.093	3.147	2.697	5.844	9.540
Sep-99	0.372	3.751	0.279	4.030	7.380
Oct-99	-	2.356	-	2.356	8.460
Nov-99	-	-	4.836	4.836	11.940
Dec-99	0.434	-	7.006	7.006	6.840
Jan-00	0.168	-	6.024	6.024	4.200
Feb-00	0.576	-	6.096	6.096	3.864
Mar-00	0.168	-	3.720	3.720	1.512
Annual Average Apr 98 - Mar 00	4.285	40.495	45.524	86.019	148.773

These annual average fuel consumptions for the two year period will be used with the average emission test results of each engine for NOx emissions and using emission factors obtained from the EPA Factor Inventory REtrieval (FIRE[7])

4.1.3 Annual Emissions for Existing Units

[7] Factor Information REtrieval (FIRE) Data System is a database containing EPA's recommended emission estimation factors for criteria and hazardous air pollutants.

The annual emissions for the existing units based average operations, emission tests and emission factors from the EPA FIRE database is provided in Table 4 below:

Table 4 - Existing Annual Pump Engine Emissions

				Average Annual Operations April 1998 - March 2000					
				Pump / Gen Engine 1	Pump Engine 3	Pump Engine 4	Sum Pump Engines 3 & 4	Pump Engine 5	Total Units 1, 3, 4 & 5
Average Annual Fuel consumption (1000) gallons				4.285	40.495	45.524	86.019	148.773	234.8
MMbtus based on 138 / SCC Unit (1000 gallons)				591	5,588	6,282	11,870.6	20,531	32,401
Average Nitrogen Oxides (NOx) Emissions Test Results (Lbs/mmBTU)				2.19	2.10	2.76		2.45	
	Emission Factor	Units	Source or SCC[8]	Annual Emissions in Tons					
Nitrogen Oxides (NOx)	-	-	Test Results	0.65	5.87	8.67	14.54	25.15	40.33
Carbon Monoxide (CO)	1.11E+02	Lbs/1000gals	20200401	0.24	2.25	2.53	4.77	8.26	13.27
PM, Total	9.55E+00	Lbs/1000gals	20200401	0.02	0.19	0.22	0.41	0.71	1.14
PM_{10}, Total	7.85E+00	Lbs/1000gals	20200401	0.02	0.16	0.18	0.34	0.58	0.94
Sulfur Oxides (SOx)	6.90E+00	Lbs/1000gals	20200401	0.00	0.01	0.01	0.01	0.03	0.04
VOC, Total	1.37E+01	Lbs/1000gals	20200401	0.03	0.28	0.31	0.59	1.02	1.64

Notes:
Emissions Factors based on Emissions Testing. EPA FIRE database Source Classification Codes
Emissions (tons/yr) = (emission factor [lbs/unit]) x (units) / 2000 lbs/ton

4.2 Potential Emissions of Replacement Units

Future potential emissions were estimated for the replacement engines based on operating at maximum capacity for 8760 hours per year, except for the emergency generator, which was limited to a maximum operation of 500 hours. Emissions were estimated using emission factors obtained from the EPA FIRE database and by interpolating manufacturer supplied factors for NOx and CO for the anticipated operating loads.

4.2.1 Operational Considerations of Replacement Unit Loading

Due to the nature of emergency generator operations and the minimum number of hours of operation proposed a detailed analysis to determine potential operations at less than full load was not done. However, review of manufacturer supplied emission rates indicate that hourly emissions of the critical pollutants of concern decrease under lower loads.

[8] Source Classification Code, 20200401 is SCC for Internal Combustion Engines, Industrial, Large Bore Engine, Diesel

Since the pump engine loads vary depending on the operational discharge pressures of the pump room and the specific test curves of the pump model being installed, historic hourly average discharge pressures for the pump room were obtained from the MDWASD Supervisory Control And Data Acquisition (SCADA) System. To better utilize this data in a manner that would provide a useful indicator of an average operating pressure (and thus engine loading) over a longer period of time, it was agreed by the FDEP that a 30 day rolling average discharge pressure could be used to determine the normal pump engine operation loads for the purpose of determining annual potential emissions. The following is a chart depicting a moving average of 720 average hourly discharge pressures from January 1, 1999 to July 7, 2002:

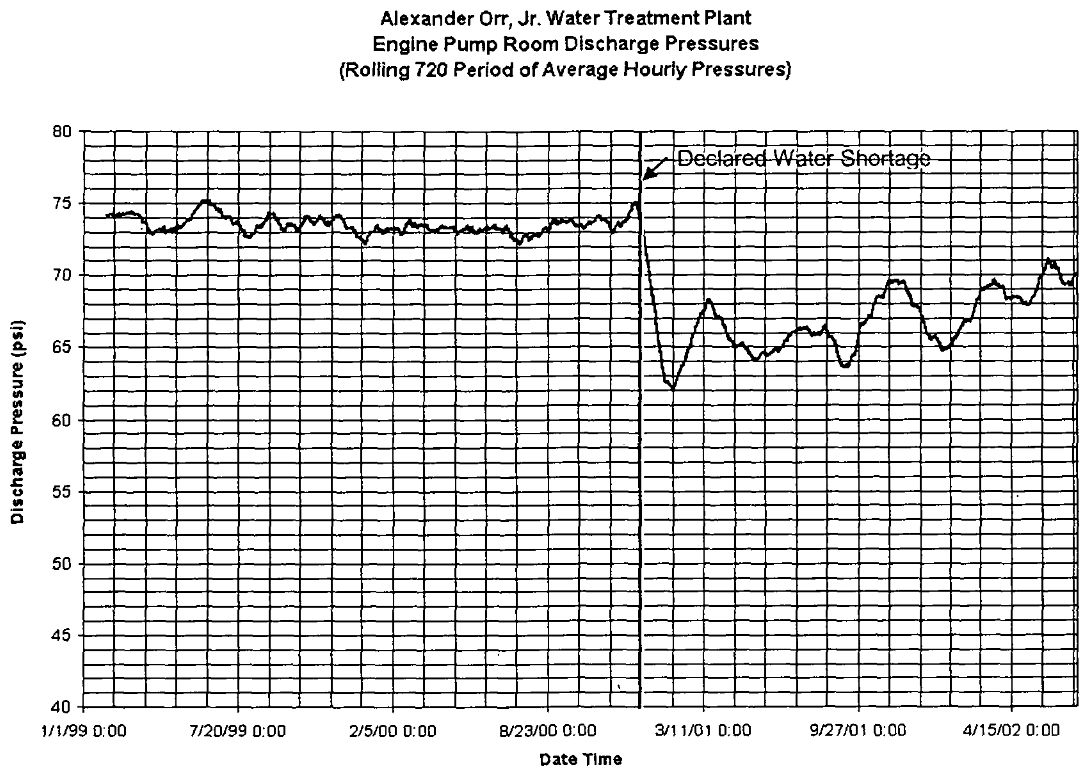

Figure 5 – Rolling Average Engine Pump Room Discharge Pressures
January 1, 1999 to July 7, 2002

From the figure above, beginning in 2001, the rolling average discharge pressures dropped dramatically and variability increased. This is attributed to two abnormalities; Phase II drought restrictions were effective January 2001 until October 2001 (pressures were decreased to reduce water consumption and loss) and beginning in March 2001 pump engines 1 through 4 were taken out of service pending replacement.

Prior to this abnormal period of operations, the rolling average discharge pressure ranges between 75.2 psi and 72 psi over the two-year period from January 1, 1999 to December 31, 2000 as shown in Figure 6:

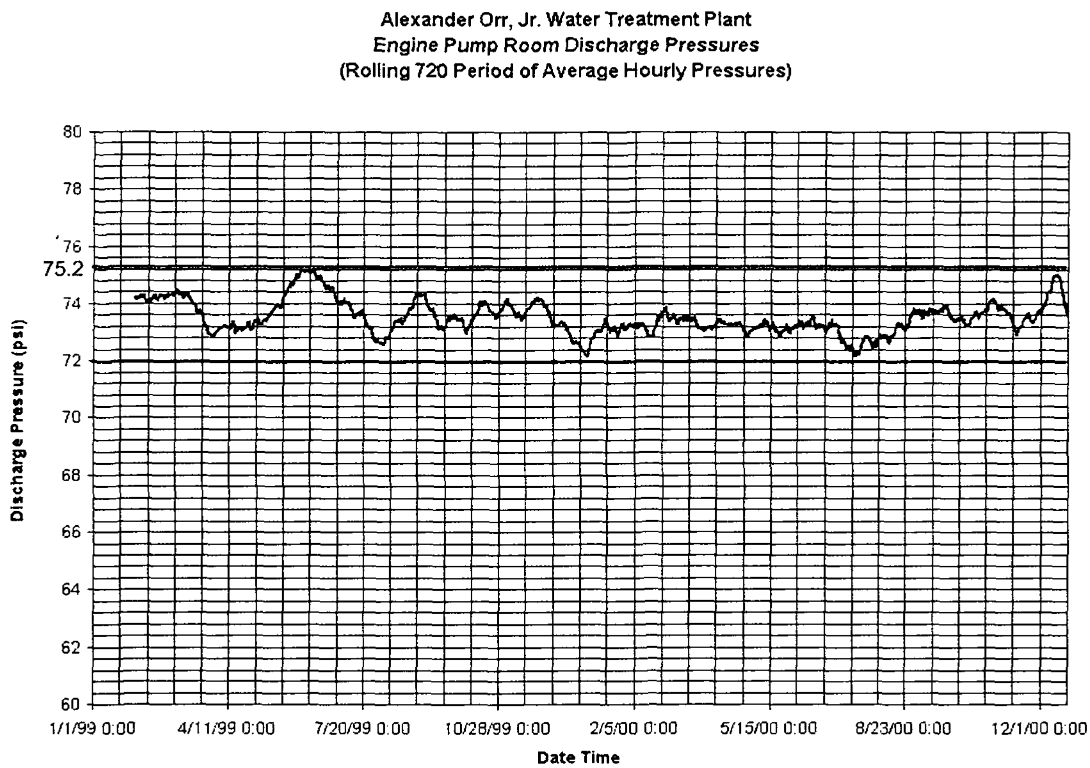

Figure 6 - Rolling Average Engine Pump Room Discharge Pressures
January 1, 1999 to December 31, 2000

4.2.2 Determination of Pump Loads

Because pump horsepower input requirements are dependent on the operational discharge pressures. The required horsepower inputs for normal operations was determined using the pump performance test curves for the pumps to be installed and the high and low rolling average discharge pressures of 75.2 and 72 psi (173.8 and 166.4 TDH respectively).

4.2.2.1 Pumps 3 and 4

Pump numbers 3 and 4 are the same model, however slight differences in performance test curves required the analysis of both to obtain the horsepower input requirements.

The performance test curves for these two pumps are provided as Figures 7 and 8:

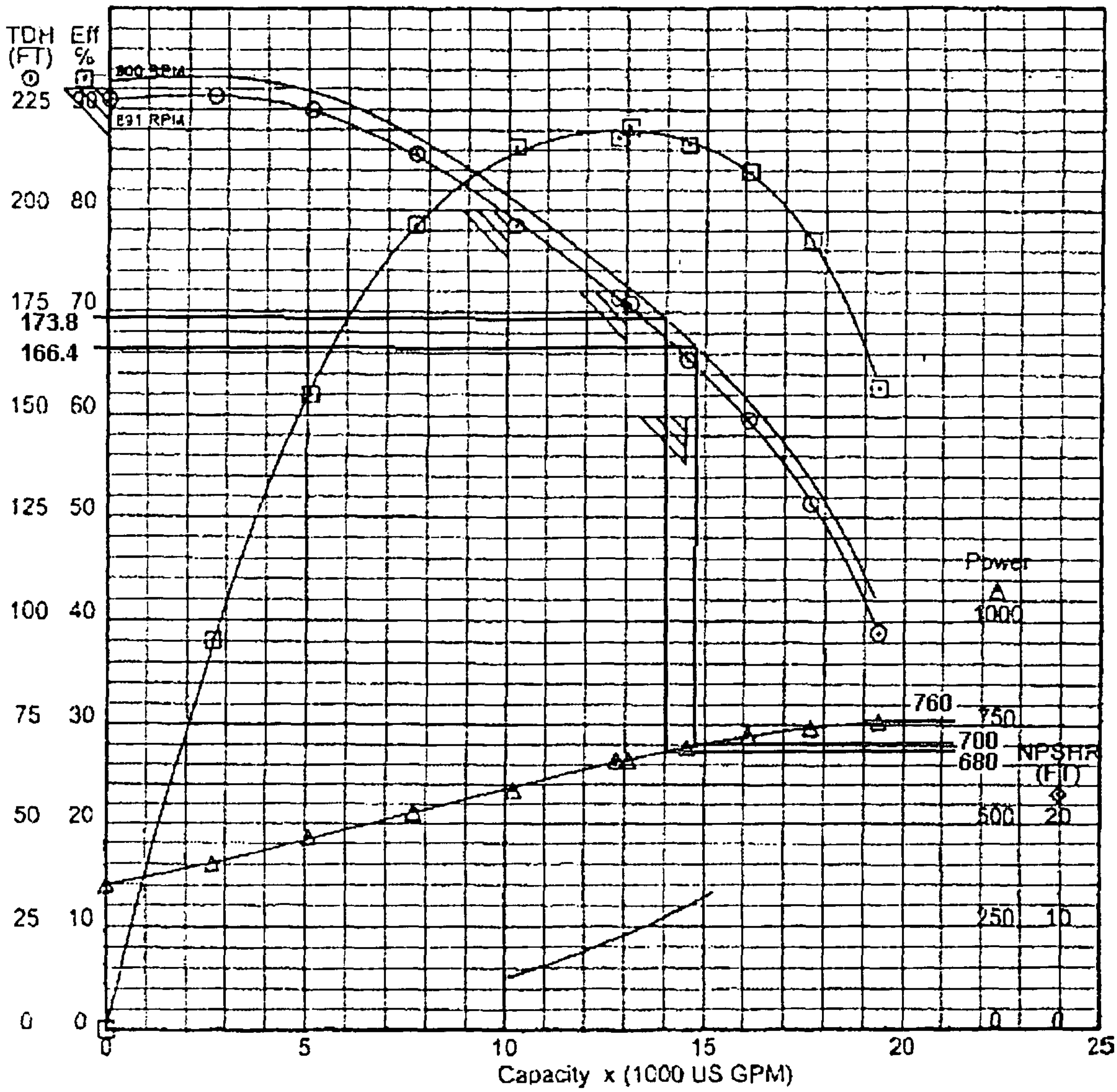

Figure 7 - Pump Curve 16LNC28 Pump Serial No. 0110MS001385-1

Based on this performance curve the maximum potential load occurring at pump run out occurs at 760 bhp. The normal operating range based on the high and low rolling average discharge pressures of 173.8 and 166.4 TDH is 700 and 680 bhp.

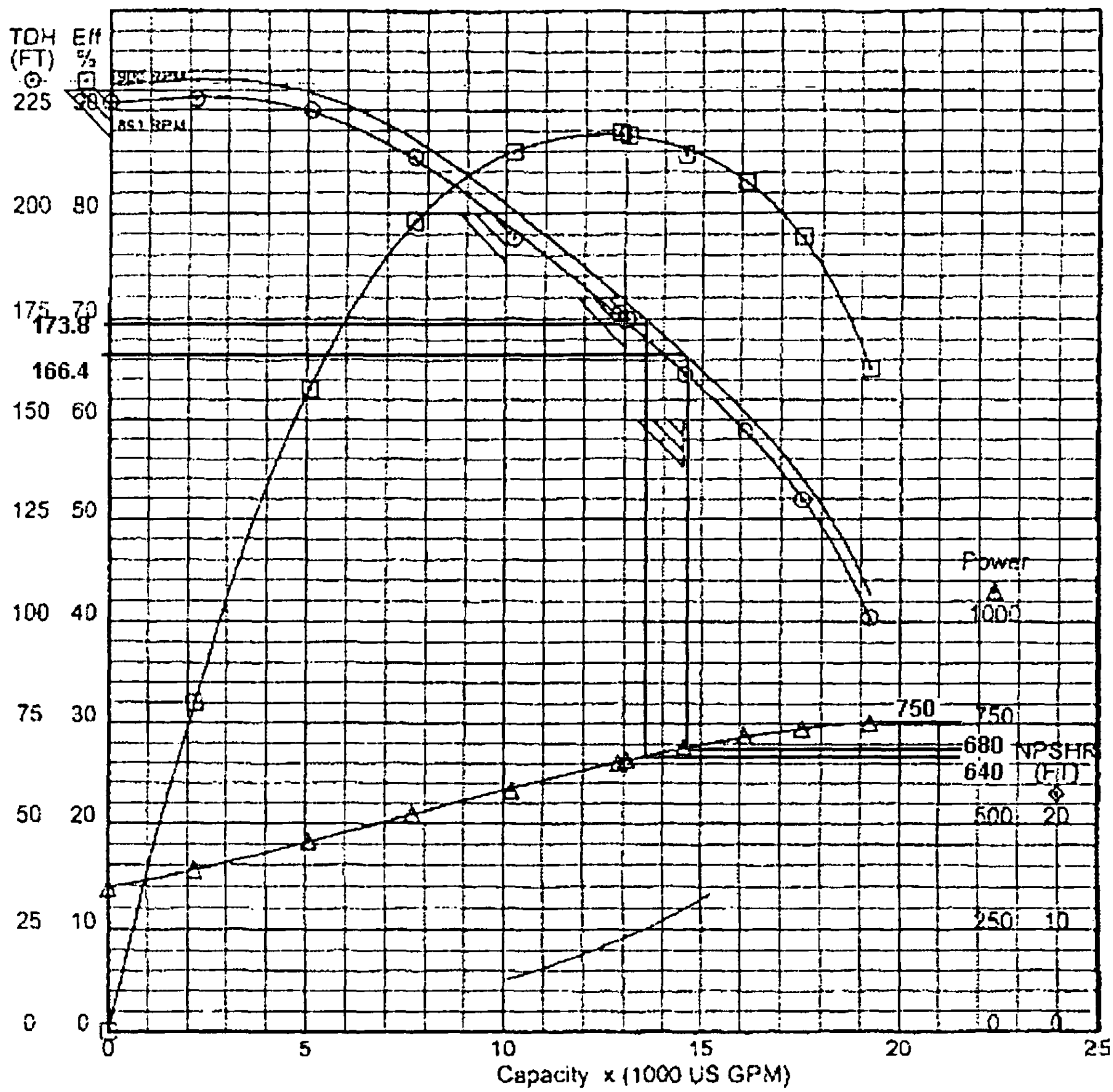

Figure 8 - Pump Curve 16LNC28 Pump Serial No. 0110MS001385-2

Based on this performance curve the maximum potential load occurring at pump run out occurs at 750 bhp. The normal operating range based on the high and low rolling average discharge pressures of 173.8 and 166.4 TDH is 680 and 640 bhp.

For the purposes of determining maximum and potential emissions, 760 bhp will be used for the maximum hourly load and the high of 700 bhp and low of 640 bhp will be used for the average loads to determine the annual potential emissions during operations.

4.2.2.2 Pump 5

The performance test curve used to obtain the horsepower input requirements for pump number 5 is provided in Figure 9 below:

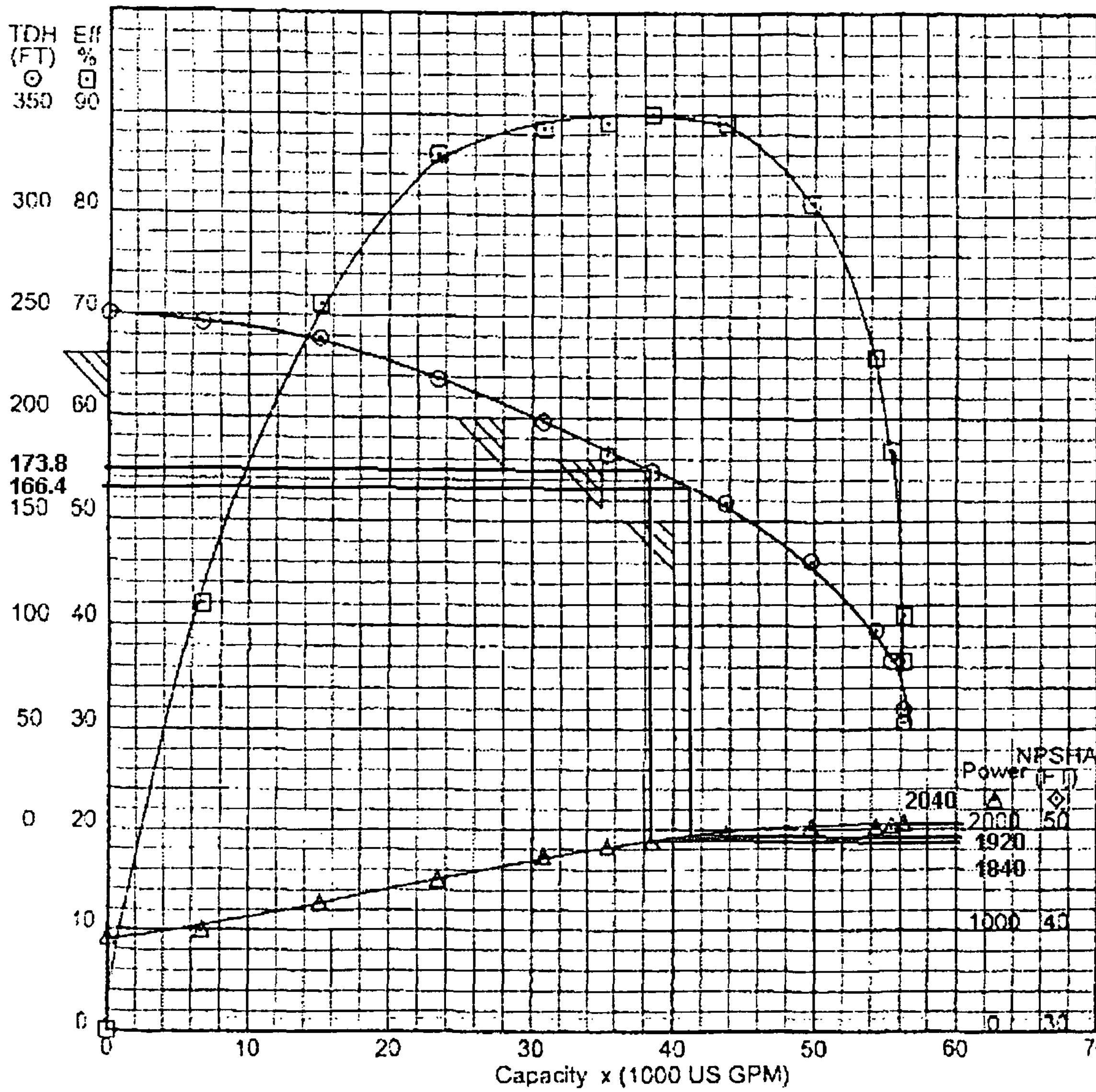

Figure 9 - Pump Curve 600LNEC1150 Pump Serial No. 0110MS001386-1

Based on this performance curve the maximum potential load occurring at pump run out at approximately 2020 bhp. The normal operating range based on the high and low rolling average discharge pressures of 173.8 and 166.4 TDH is approximately 1920 and 1840 bhp. For the purposes of determining maximum and potential emissions, 2020 bhp will be used for the maximum hourly load and the high of 1920 bhp and low of 1840 bhp will be used for the average loads to determine the annual potential emissions during operations.

4.2.3 Effects of Operating at other than Full Loads on Emissions

Caterpillar provides operating parameters and certain pollutant emissions factors for specific engine loads. To further analyze the effects of operating the engines at other than full loads on emissions and other operating parameters at loads other than specifically provided, values were interpolated for the range of loads anticipated for each of the different replacement engines.

4.2.3.1 Replacement Engine No. 1 - Caterpillar Model 3508

Table 5 summarizes the manufacturer supplied operating parameters for the Caterpillar 3508 Engine and Generator in regular text and interpolated values in italics:

Table 5
Replacement Engine No. 1 - Caterpillar Model 3508

Engine Rating Data	% load	100%	90.0%	*85.0%*	80.0%	75%	50%
Generator (w/ fan)	EKW	900	807	*761*	714	675	450
Engine Power	bhp	1332	1199	*1132*	1065	1009	691
Engine Data							
Specific Fuel Consumption (BSFC)	Gals/hr	66.5	60	*56*	53	49.8	35.2
Air Flow (Wet, @77 F, 28.8 in HG)	SCFM	2821	2662	*2583*	2503	2436	1886
Exhaust Stack Temperature	°F	884	840	*817*	795	776	723
Exhaust Gas Flow (Wet, @ stack temperature, 29.7 in Hg)	CFM	7327	6693	*6373*	6054	5787	4269
Engine Emissions Data							
Nitrous Oxides (NO2)	g/bhp-hr	12.77	13.50	*13.93*	14.42	14.88	16.87
	lb/hr	37.46	35.65	*34.74*	33.83	33.07	25.67
Carbon Monoxide (CO)	g/bhp-hr	0.72	0.66	*0.62*	0.59	0.55	0.55
	lb/hr	2.10	1.74	*1.56*	1.37	1.22	0.83
Total Hydrocarbons (THC)	g/bhp-hr	0.23	0.27	*0.30*	0.32	0.35	0.30
	lb/hr	0.68	0.72	*0.74*	0.75	0.77	0.46
Particulate Matter (PM)	g/bhp-hr	0.11	0.11	*0.11*	0.11	0.11	0.12
	lb/hr	0.31	0.29	*0.27*	0.26	0.25	0.19

The replacement generator is anticipated to operate between 100 to 75 percent load under normal conditions. Based on this range, the maximum emission rates of the pollutants provided in the table are underlined and will be used in determining the annual potential emissions for these units.

Table 6 summarizes the emissions from the Caterpillar 3508 Engine and Generator restricted to operating no more than 500 hours per year.

Table 6 – Potential Annual Emissions 900 KW GenSet

			Hours of Operation	500
			Fuel Consumption in 1000gals/hr	0.0665
			Annual Fuel consumption in 1000gals	33.25
			Annual Heat Input (mmBtus) based on or 138 /1000 gals	4,589
	Emission Factor	Units	Source, SCC[9]	Annual Emissions in Tons
Nitrogen Oxides (NOx)	37.46	Lbs/Hr	Manufacturer	9.40
Carbon Monoxide (CO)	3.10	Lbs/Hr	Manufacturer	0.80
Particulate Matter (PM)	0.310	Lbs/Hr	Manufacturer	0.08
Particulate Matter (PM_{10})	0.310	Lbs/Hr	Manufacturer	0.08
Sulfur Oxides (SOx)	6.90E+00	Lbs/1000gals	20200401	0.11
Volatile Organic Compounds (VOC)	1.37E+01	Lbs/1000gals	20200401	0.20

Notes:
Emissions Factors based on Manufacturer. EPA FIRE database Source Classification Codes
Emissions (tons/yr) = (emission factor [lbs/unit]) x (units) / 2000 lbs/ton

4.2.3.2 Replacement Pump Engines 3 and 4 - Caterpillar G3512LE

Table 7 summarizes the manufacturer supplied operating parameters for the G3512LE TA-130 in regular text, with the interpolated values provided in italics for loads of 760, 700 and 640 bhp:

Table 7 - Replacement Pump Engines Nos. 3 and 4 - Caterpillar Model G3512LE

Engine Rating Data	% load	100%	*93.8%*	*86.4%*	*79.0%*	75%	50%
Engine Power (w/o fan)	bhp	810	*760*	*700*	*640*	607	405
Specific Fuel Consumption (BSFC)	BTU/bhp-hr	7407	***7455***	***7512***	*7569*	7600	7937
Air Flow (Wet, @77 F, 28.8 in HG)	SCFM	1668	*1555*	*1419*	*1284*	1209	827
Exhaust Stack Temperature	°F	801	*797*	*793*	*788*	786	777
Exhaust Gas Flow (Wet, @ stack temperature, 29.7 in Hg)	CFM	4260	*3964*	*3610*	*3255*	3060	2080
Engine Emissions Data							
Nitrous Oxides (NO2)	g/bhp-hr	2.00	*2.32*	*2.70*	*3.09*	3.30	3.30
	lb/hr	3.57	*3.88*	*4.17*	***4.35***	**4.41**	2.94
Carbon Monoxide (CO)	g/bhp-hr	1.60	*1.62*	*1.65*	*1.68*	1.70	1.90
	lb/hr	2.85	***2.72***	***2.55***	*2.37*	2.27	1.69
Total Hydrocarbons (THC)	g/bhp-hr	3.10	*3.03*	*2.94*	*2.85*	2.80	3.20
	lb/hr	5.53	***5.07***	***4.53***	*4.02*	3.74	2.85
Non-Methane Hydrocarbons (NMHC)	g/bhp-hr	0.47	*0.46*	*0.44*	*0.43*	0.42	0.48
	lb/hr	0.84	***0.77***	***0.68***	*0.60*	0.56	0.43

The replacement engines are anticipated to operate between 86.4 to 79.0 percent load on average under normal conditions. Based on this normal operating range, the maximum emission rates of the pollutants provided in the table are underlined and will be used in determining the annual potential emissions for these units. The bold values in the table are maximum values possible during transient pumping operations and are used for a maximum hour emission rate of a pollutant.

[9] Source Classification Code, 20200401 is SCC for Internal Combustion Engines, Industrial, Large Bore Engine, Diesel

Table 8 summarizes the emissions from the Replacement Pump Engines Nos. 3 and 4 - Caterpillar Model G3512LE TA-130 with no operating restrictions placed on the units, operating under average annual loading and pumping conditions.

Table 8 – Potential Annual Emissions Replacement Pump Engines 3 and 4

				Pump Engine 3 G3512	Pump Engine 4 G3512	Sum Pump Engines 3 & 4
Hours of Operation				8,760	8,760	17,520
Fuel Consumption in MCF/hr				5.258	5.258	
Annual Fuel consumption in MMCF				43.87	43.87	87.74
Annual Heat Input (mmBtus) based on 1050/ MMCF				46,061	46,061	92,122
	Emission Factor	Units	Source, SCC[10]	Annual Emissions in Tons		
Nitrogen Oxides (NOx)	4.35	Lbs/Hr	Manufacturer	19.10	19.10	38.20
Carbon Monoxide (CO)	2.55	Lbs/Hr	Manufacturer	11.20	11.20	22.40
PM, Filterable	1.00E+01	Lbs/MMCF	20300201	0.22	0.22	0.44
PM_{10}, Filterable	1.00E+01	Lbs/MMCF	20300201	0.22	0.22	0.44
Sulfur Oxides (SOx)	6.00E-01	Lbs/MMCF	20300201	0.01	0.01	0.02
Volatile Organic Compounds (VOC)	1.16E+02	Lbs/MMCF	20300201	2.50	2.50	5.00

Notes:
Emissions Factors based on Manufacturer. EPA FIRE database Source Classification Codes
Emissions (tons/yr) = (emission factor [lbs/unit]) x (units) / 2000 lbs/ton

4.2.3.3 Replacement Pump Engine 5 - Caterpillar G3608LE

Table 9 summarizes the manufacturer supplied operating parameters for the G3608LE TA-130 in regular text, with the interpolated values provided in italics for loads of 2020, 1920 and 1840 bhp:

Table 9 - Replacement Pump Engine No. 5 - Caterpillar Model G3608 LE

Engine Rating Data	% load	100%	*91.7%*	*86.3%*	*82.7%*	75%	50%
Engine Power (w/o fan)	bhp	2225	*2040*	*1920*	*1840*	1669	1113
BSFC	BTU/bhp-hr	6810	*6885*	*6933*	*6966*	7035	7550
Air Flow (scfm @ 77°F, 13.9 psia)		6136	*5663*	*5356*	*5152*	4715	3143
Exh Flow (cfm @ stack T, 14.5 psia)		14867	*13783*	*13080*	*12612*	11610	8048
Exhaust Stack Temp (F°)		847	*854*	*859*	*862*	868	918
Fuel Flow (scfh 4 @ 60°F, 14.7 psia)		16743	*15488*	*14674*	*14132*	12972	9281
Engine Emissions Data							
Nox (as NO_2)	g/bhp-hr	0.70	*0.70*	*0.70*	*0.70*	0.70	0.70
	lb/hr	3.43	*3.15*	*2.96*	*2.84*	2.57	1.72
CO	g/bhp-hr	1.90	*1.90*	*1.90*	*1.90*	1.90	1.90
	lb/hr	9.31	*8.54*	*8.04*	*7.70*	6.98	4.66
HC (Total)	g/bhp-hr	5.95	*6.07*	*6.14*	*6.19*	6.30	6.50
	lb/hr	29.16	*27.26*	*25.97*	*25.10*	23.16	15.94
HC(Non-Methane)	g/bhp-hr	0.89	*0.91*	*0.92*	*0.93*	0.95	0.98
	lb/hr	4.36	*4.09*	*3.90*	*3.78*	3.49	2.40

[10] Source Classification Code, 20300201is SCC for Internal Combustion Engines, Commercial/Institutional, Natural Gas, Reciprocating

The replacement engine is anticipated to operate between 86.3 to 82.7 percent load on average under normal conditions. Based on this normal operating range, the maximum emission rates of the pollutants provided in the table are underlined and will be used in determining the annual potential emissions for these units. The bold values in the table are maximum values possible during transient pumping operations and are used for a maximum hour emission rate of a pollutant.

Table 10 summarizes the emissions from the Replacement Pump Engine No. 5 - Caterpillar Model G3608 LE TA-130 with no operating restrictions placed on the unit, operating under average annual loading and pumping conditions.

Table 10 - Potential Annual Emissions Replacement Pump Engine 5

			Hours of Operation	8,760
			Fuel Consumption in MCF/hr	13.312
			Annual Fuel consumption in MMCF	111.06
Annual Heat Input (mmBtus) based on 1050/ MMCF				116,615
	Emission Factor	Units	Source, SCC[11]	Annual Emissions in Tons
Nitrogen Oxides (NOx)	2.96	Lbs/Hr	Manufacturer	13.00
Carbon Monoxide (CO)	8.04	Lbs/Hr	Manufacturer	35.20
PM, Filterable	1.00E+01	Lbs/MMCF	20300201	0.56
PM_{10}, Filterable	1.00E+01	Lbs/MMCF	20300201	0.56
Sulfur Oxides (SOx)	6.00E-01	Lbs/MMCF	20300201	0.03
Volatile Organic Compounds (VOC)	1.16E+02	Lbs/MMCF	20300201	6.40

Notes:
Emissions Factors based on Manufacturer. EPA FIRE database Source Classification Codes
Emissions (tons/yr) = (emission factor [lbs/unit]) x (units) / 2000 lbs/ton

4.2.4 Annual Potential Emissions of Replacement Units

Table 11 summarizes the annual potential emissions for all replacement units

Table 11 - Annual Potential Emissions of Replacement Units

	900 KW GenSet	Pump Engines 3 & 4	Pump Engine 5	Total 900 KW GenSet & Pump Engines 3,4 & 5
Nitrogen Oxides (NOx)	9.40	38.20	13.00	60.60
Carbon Monoxide (CO)	0.80	22.40	35.20	58.40
PM	0.08	0.44	0.56	1.08
PM_{10}	0.08	0.44	0.56	1.08
Sulfur Oxides (SOx)	0.11	0.02	0.03	0.16
Volatile Organic Compounds (VOC)	0.20	5.00	6.40	11.60

[11] Source Classification Code, 20300201is SCC for Internal Combustion Engines, Commercial/Institutional, Natural Gas, Reciprocating

4.3 Summary of Past Actual to Future Emissions

Table 12 summarizes the potential maximum emissions increases of air pollutants, comparing past actual to future potential emissions in TPY:

Table 12
Summary of Past Actual to Future Emissions in Tons per Year

Pollutant	Past Actual Existing Engines	Future Potential New Engines	Maximum Emissions Change	PSD Significance Levels[12]	Subject to PSD Review?
NOx	40.33	60.60	20.27	40	No
CO	13.27	58.40	45.13	100	No
PM	1.14	1.08	(0.06)	25	No
PM_{10}	0.94	1.08	0.14	15	No
SO_2	0.04	0.16	0.12	40	No
VOC	1.64	11.60	9.96	40	No

The proposed project results in net emissions decreases or less-than-significant increases in PSD pollutants. Emission decreases will occur for sulfur dioxide (PM). Emission increases of carbon monoxide (CO), particulate matter (PM_{10}), volatile organic compounds (VOC), and nitrogen oxides (NOx) will be less than the significant emission levels per Table 62-212.400-2, F.A.C. This project will emit negligible quantities of sulfuric acid mist (H_2SO_4 mist or SAM), fluorides, beryllium, mercury and lead. Therefore the modification is not subject to PSD.

[12] Florida Administrative Code 212.400-2

SECTION 5

Rule Applicability

5. Rule Applicability

The proposed project is subject to preconstruction review requirements under the provisions of Chapter 403, Florida Statutes, and Chapters 62-4, 62-204, 62-210, 62-212, 62-214, 62-296, and 62-297 of the Florida Administrative Code (F.A.C.).

This facility is located in an area designated, in accordance with Rule 62-204.340, F.A.C., as attainment for the criteria pollutants ozone, PM_{10}, carbon monoxide, sulfur dioxide, and nitrogen dioxide; designated as unclassifiable for lead; and also designated as a maintenance area for ozone.

The proposed project is not subject to review under Rule 62-212.400, F.A.C., Prevention of Significant Deterioration (PSD) as previously discussed in Section 4.

Rule 62-4.030, F.A.C., prohibits modification of any existing emissions unit without first receiving a permit. It further specifies that a permitted installation may only be modified in a manner that is consistent with the terms of such a permit. Rule 62-210.200, F.A.C., defines "modification" to mean generally a change that results in an increase in actual emissions of air pollutants. As discussed above, emissions will increase, although not significantly. Rules 62-210.300(1) and 62-212.300(1)(a), F.A.C., also reiterate the requirement for construction permits.

As noted, future potential emissions of the pump engines were estimated based on unrestricted operation of the new engines. Since future potential emissions were estimated with no restrictions on operating hours or fuel consumption, such limits are not required in the construction permit for this project. There is no unit-specific emission limiting standards applicable to the natural gas fired internal combustion units under Rule 62-296.570(4)(b)9, F.A.C. The NOx RACT requirement under Rule 62-296.570(4)(b)7, F.A.C. does apply to the oil-fired diesel generator unit. Therefore, a permit would authorize the installation of the new engines to replace the existing engines, but will not subject the new natural gas fuel engines to unit-specific limitations on emissions or operation. The diesel fueled generator unit will be subject to unit-specific RACT NOx emissions limitation of 4.75 lb/million BTU.

The emission units affected by this permit shall comply with all applicable provisions of the Florida Administrative Code (including applicable portions of the Code of Federal Regulations incorporated therein) and, specifically, the following Chapters and Rules.

5.1 State Regulations

Chapter 62-4	Permits.
Rule 62-204.220	Ambient Air Quality Protection
Rule 62-204.240	Ambient Air Quality Standards
Rule 62-204.800	Federal Regulations Adopted by Reference
Rule 62-210.200	Definitions
Rule 62-210.300	Permits Required
Rule 62-210.350	Public Notice and Comments
Rule 62-210.370	Reports
Rule 62-210.550	Stack Height Policy
Rule 62-210.650	Circumvention
Rule 62-210.700	Excess Emissions
Rule 62-210.900	Forms and Instructions
Rule 62-212.300	General Preconstruction Review Requirements
Rule 62-213	Operation Permits for Major Sources of Air Pollution
Rule 62-296.320	General Pollutant Emission Limiting Standards

Air Pollution Control Techniques

6. Air Pollution Control Techniques

Emissions from this project are those that typically result from combustion of natural gas and diesel fuel in four-cycle internal combustion reciprocating engines: NOx, PM/PM_{10}, CO, VOC and SO_2. SO_2 is not a pollutant emitted in significant quantity by natural gas fuel engines. Combustion control is the technique used to control emissions from these proposed replacement engines. Combustion controlled by electronic engine controls, which are discussed in more detail below.

6.1 Air Pollutants[13]

6.1.1 Nitrogen Oxides (NOx) Emissions

Nitrogen oxides are formed through three fundamentally different mechanisms. The principal mechanism of NOx formation with gas-fired engines is thermal NOx. The thermal NOx mechanism occurs through the thermal dissociation and subsequent reaction of nitrogen (N_2) and oxygen (O_2) molecules in the combustion air. Most NOx formed through the thermal NOx mechanism occurs in high-temperature regions in the cylinder where combustion air has mixed sufficiently with the fuel to produce the peak temperature fuel/air interface. The second mechanism, called prompt NOx, occurs through early reactions of nitrogen molecules in the combustion air and hydrocarbon radicals from the fuel. Prompt NOx reactions occur within the flame and are usually negligible compared to the level of NOx formed through the thermal NOx mechanism. The third mechanism, fuel NOx, stems from the evolution and reaction of fuel-bound nitrogen compounds with oxygen. Most distillate oils, have no chemically bound, and natural gas has negligible chemically bound fuel N_2 and essentially all NOx formed is thermal NOx.

Essentially all NOx formed in natural gas-fired reciprocating engines occurs through the thermal NOx mechanism. The formation of NOx through the prompt NOx mechanism may be significant only under highly controlled situations in rich-burn engines when the thermal NOx mechanism is suppressed. The rate of NOx formation through the thermal NOx mechanism is highly dependent upon the stoichiometric ratio, combustion temperature, and residence time at the combustion temperature. Maximum NOx formation occurs through the thermal NOx mechanism near the stoichiometric air-to-fuel mixture ratio since combustion temperatures are greatest at this air-to-fuel ratio.

Nitrogen oxides form in the combustion process as a result of the dissociation of molecular nitrogen and oxygen to their atomic forms and subsequent recombination into seven different oxides of nitrogen. Thermal NOx forms as a result of high temperatures in the combustion chamber (cylinders in IC engines). Increased combustion temperatures lead to increased NOx formation. In internal combustion engines, combustion temperature is

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[13] Text of this section is adapted from *Compilation of Air Pollutant Emission Factors (AP- 42),* Volume I. Stationary Point and Area Sources, Chapter 3 Stationary Internal Combustion Sources, Fifth Edition.

dependent upon the inlet temperature of the intake air used in combustion, the ratio of air to fuel, and the formation of thermal NOx is highly dependent on this ratio.

Fuel NOx is formed when fuels containing chemically bound nitrogen are burned. This phenomenon is not important when combusting natural gas because natural gas has little or no fuel nitrogen. Because natural gas will be the only fuel used in the pump engines, the fuel NOx phenomenon is not important for this potion of the project.

The following figure illustrates the effect of the air/fuel ratio on emissions of NOx in natural gas fired internal combustion engines. To the rich side of the stoichiometric ratio, NOx decreases because of a lack of oxygen in the combustion chamber and lower combustion temperatures. Fuel quenching occurs under these conditions, which keeps combustion temperatures low. To the lean side of the stoichiometric ratio, NOx reaches a peak where combustion temperature is high and ample oxygen exists for thermal NOx formation. As conditions become leaner (air/fuel ratio increases) the combustion temperature decreases because of air quenching. The lowest NOx emissions occur in under the leanest combustion conditions.

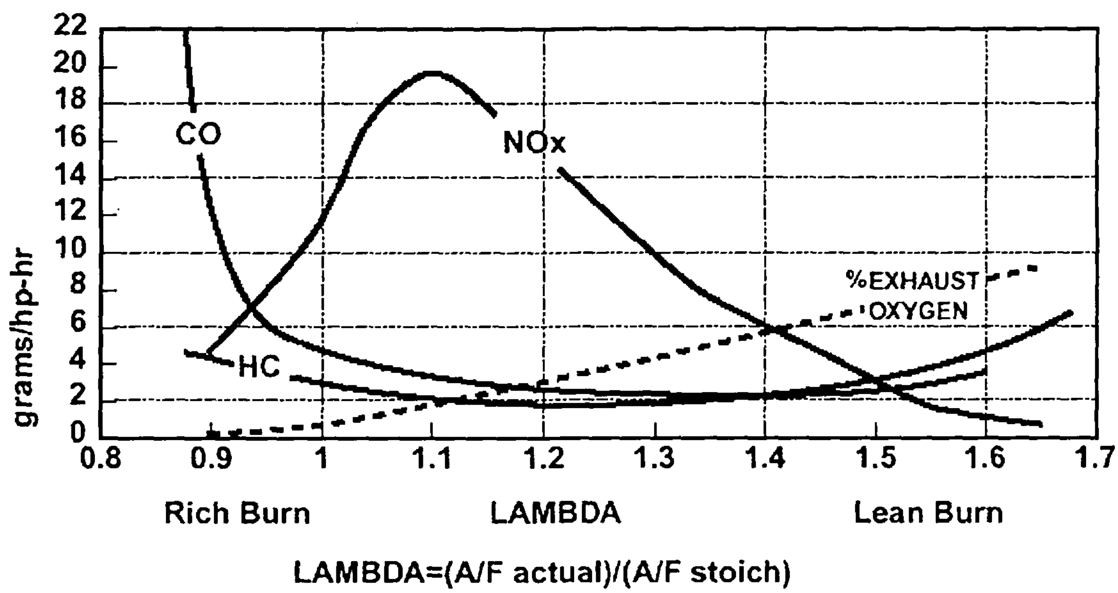

Figure 10 - Exhaust Emissions from Natural Gas Engines (grams/hp-hr vs. Lambda)[14]

Prestratified charge combustion is a retrofit system that is limited to 4-stroke carbureted natural gas engines. In this system, controlled amounts of air are introduced into the intake manifold in a specified sequence and quantity to create a fuel-rich and fuel-lean zone. This stratification provides both a fuel-rich ignition zone and rapid flame cooling in the fuel-lean zone, resulting in reduced formation of NOx.

[14] Excepted from Caterpillar Brochure LEKQ7261 *Gas Engines Application and Installation Guide G3600-G3300* © 1997 Caterpillar Inc.

6.1.2 Particulate Matter (PM/PM_{10}) Emissions

White, blue, and black smoke may be emitted from IC engines. Liquid particulates appear as white smoke in the exhaust during an engine cold start, idling, or low load operation. These are formed in the quench layer adjacent to the cylinder walls, where the temperature is not high enough to ignite the fuel. Blue smoke is emitted when lubricating oil leaks, often past worn piston rings, into the combustion chamber and is partially burned. Proper maintenance is the most effective method of preventing blue smoke emissions from all types of IC engines. The primary constituent of black smoke is agglomerated carbon particles (soot). Particulate matter is formed in internal combustion engines primarily through combustion of fuel oil and lubricating oil. The particulate matter emitted from IC engines will mainly be less than 10 microns in diameter (PM_{10}). PM emissions from natural gas fired engines are very low because natural gas is efficiently combusted and contains no ash. Combustion of natural gas under lean fuel conditions results in low PM and PM_{10} emissions.

6.1.3 Carbon Monoxide (CO) Emissions

Carbon monoxide is a colorless, odorless, relatively inert gas formed as an intermediate combustion product that appears in the exhaust when the reaction of CO to CO_2 cannot proceed to completion. This situation occurs if there is a lack of available oxygen near the hydrocarbon (fuel) molecule during combustion, if the gas temperature is too low, or if the residence time in the cylinder is too short. The oxidation rate of CO is limited by reaction kinetics and, as a consequence, can be accelerated only to a certain extent by improvements in air and fuel mixing during the combustion process.

Carbon monoxide is emitted from combustion processes due to incomplete fuel combustion. Incomplete combustion occurs when insufficient oxygen exists near the fuel molecule or when quenching of combustion occurs, thus preventing complete conversion of fuel carbon-to-carbon dioxide. Proper combustion design and operation ensure that CO emissions are minimized. The previous figure also illustrates the effect of fuel to air ratio on CO emissions. CO emissions are lowest under combustion conditions that are slightly lean of the stoichiometric ratio because sufficient oxygen is present for complete oxidation of the fuel carbon while temperature is at its greatest. Under fuel rich conditions, there is not sufficient oxygen for complete combustion. CO emissions increase slightly under the leanest combustion conditions because of lower combustion temperatures and lower fuel mixture flammability.

6.1.4 Volatile Organic Compound (VOC) Emissions

In natural gas fired IC engines, hydrocarbon emissions are present in exhaust gas because of incomplete combustion of fuel. Natural gas is composed of several gaseous hydrocarbons including methane, ethane, propane, butane and heavier hydrocarbons. A portion of these will pass through the combustion chamber without reacting and will be found in the engine exhaust. Regulated volatile organic compounds (VOC) are comprised of the non-methane portion of the total hydrocarbons, because methane is considered to be not photochemically reactive. Emissions of VOC are similar to CO emissions: higher at operating conditions richer and leaner than the stoichiometric ratio. This is illustrated in the previous figure.

6.1.5 Sulfur Oxides (SO_x) Emissions

Sulfur oxide emissions are a function of only the sulfur content in the fuel rather than any combustion variables. In fact, during the combustion process, essentially all the sulfur in the fuel is oxidized to sulfur dioxide (SO_2). The oxidation of SO_2 yields sulfur trioxide (SO_3), which reacts with water to give sulfuric acid (H_2SO_4), a contributor to acid rain. Sulfuric acid also reacts with basic substances to give sulfates, which are fine particulates that contribute to PM-10 and visibility reduction.

6.2 Emission Controls[15]

Caterpillar controls emissions by controlling combustion process. In all the proposed engine replacements, Caterpillar uses inlet air coolers (also referred to as an intercooler or aftercooler when used to cool compressed air charge from either a turbocharger or blower) to reduce the temperature of the intake air used in combustion to reduce the formation of thermal NOx emissions.

Caterpillar uses electronic controls to operate the natural gas fueled engines under lean air/fuel combustion conditions. Operation in the lean combustion range results in the lowest NOx emissions, with minimal CO and VOC emissions. Although CO and VOC emissions are lower under conditions just leaner than the stoichiometric ratio, emissions of these pollutants do not substantially increase under the leanest conditions. Operation under the leanest conditions results in a good compromise between dramatically reducing emissions of NOx and slightly increasing emissions of CO and VOC.

The Caterpillar Model G3608 engine is equipped with precombustion chambers. The engine uses a spark plug to ignite a small volume of near stoichiometric air/fuel mixture in a precombustion chamber. This combustion in the precombustion chamber rapidly expands through holes in the prechamber nozzle to ignite the very lean mixture in the main chamber or cylinder. The prechamber provides a high temperature, high speed ignition source for the combustion process which, overall is very lean (lambda>2.0). Effectively, the prechamber pushes out the lean limit observed for open chamber engines. Prechambers have the capability to operate at higher efficiency and lower NOx levels than open chamber engines. CO and HC levels will be somewhat higher than open chamber engines due to the larger quench (cool) zone around the cylinder wall.

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[15] Information excerpted from Caterpillar product brochures, LEKQ7261, *Gas Engines Application and Installation Guide G3600-G3300* © 1997 Caterpillar Inc., LEKQ7257, *Gas Engines Application and Installation Guide G3500-G3300* © 1998 Caterpillar Inc., LEKQ7518, *G3500 Engine Basics, © 1999 Caterpillar Inc.*, and LEKQ9085, *G3600 Engine Basics, © 1999 Caterpillar Inc.*

To insure proper ignition, Caterpillar uses an Electronic Ignition System (EIS) on both the Model G3500 and G3600 series spark ignition natural gas engines to provide detonation protection and precision spark control for each cylinder. Detonation is controlled as it occurs and timing is retarded only as much and as long as necessary to prevent engine damage. The system consists of three basic groups: the control module, ignition transformers and sensors. The control module monitors engine operation through a series of sensors. The control module uses input from the sensors and the control panel settings to determine ignition timing. Detonation sensors (RHDS and LHDS) monitor the engine for excessive detonation (vibration). A speed/timing sensor provides accurate spark timing information for the control module. A manifold air pressure sensor provides engine load information to the EIS Control Module. The EIS system allows improved operation; economy, lower emission levels and also protects the engine from detonation and costly downtime, and maximizes power availability under adverse conditions.

Caterpillar's Industrial Air/Fuel Ratio Control System provides air/fuel ratio control (exhaust emissions control and performance tolerance to fuel BTU changes) and engine speed governing. Contains two subsystems, air-to-fuel ratio control and speed governing control that work together to maintain optimum engine operation throughout various operating conditions.

The Model G3608 is also fitted with Caterpillar's Engine Supervisory System (ESS). The ESS integrates several control systems installed on the engine. The ESS communicates with the Engine Control System that controls the air/fuel ratio, the ignition timing, and the limiting of power.

These electronic engine controls optimize engine operation by continually balancing power output, fuel economy and air/fuel ratio. While not specifically designed for emissions control, these controls work to maintain lean combustion conditions, which result in the lowest emissions, while maintaining a large operating range for the engines.

6.2 Compliance Procedures

There are no specific compliance requirements for the natural gas fueled pump engines because there are no unit-specific limitations on emissions or operation. The diesel fueled generator is subject to an operating limit of 500 hours per year and NOx RACT emission limitation of 4.75 lb/million BTU. The engines are subject to the general visible emissions limitation of less than 20% opacity of Rule 62-296.320(4)(b), F.A.C.

SECTION 7

Source Impact Analysis

A source impact analysis was not conducted for this project because it is not subject to the requirements of PSD.

SECTION 8
Conclusion

Based on the foregoing technical evaluation and other available information, a preliminary determination that the proposed project will comply with all applicable state and federal air pollution regulations. The FDEP should issue a draft permit to MDWASD that allows removal and replacement of the existing engine driven pumps #1 through #5 with a new diesel fueled engine driven generator and natural gas fuel engine driven pumps 3, 4 and 5.

The new engines will be subject to the requirements of the facility-wide specific conditions of Section II of the permit. The diesel fueled engine driven generator will be subject to an operating limit of 500 hours per year and NOx RACT emission limitation of 4.75 lb/million BTU, but the natural gas fueled pump engines will not be subject to any unit-specific emission limits.

This evaluation was prepared by:

Mr. Richard M. O'Rourke, P.E.
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SECTION 8

Conclusion

Based on the foregoing technical evaluation and other available information, a preliminary determination that the proposed project will comply with all applicable state and federal air pollution regulations. The FDEP should issue a draft permit to MDWASD that allows removal and replacement of the existing engine driven pumps #1 through #5 with a new diesel fueled engine driven generator and natural gas fuel engine driven pumps 3, 4 and 5.

The new engines will be subject to the requirements of the facility-wide specific conditions of Section II of the permit. The diesel fueled engine driven generator will be subject to an operating limit of 500 hours per year and NOx RACT emission limitation of 4.75 lb/million BTU, but the natural gas fueled pump engines will not be subject to any unit-specific emission limits.

This evaluation was prepared by:

Mr. Richard M. O'Rourke, P.E.
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South Florida
Environmental Services

FINAL REPORT

NOx RACT COMPLIANCE TEST PROGRAM

MIAMI-DADE WATER & SEWER DEPARTMENT

ALEXANDER ORR JR. FACILITY

Prepared For:
Miami-Dade Water & Sewer Department
3575 South Le Jeune Road
Miami, Florida 33133

Concerning:

NOx RACT Compliance Testing
Alexander Orr Jr. Plant #2
Standby Generators and Pumps
September October, 1997

Prepared By:

South Florida Environmental Services
6821 Vista Parkway North
West Palm Beach, Florida 33411

Ron C. Cook Jr.
Manager Technical Operations

Date 11/14/97

REVIEW BY : Thomas S. Siegert
Thomas S. Siegert
Environmental Scientist

TABLE OF CONTENTS

APPENDICES

South Florida Environmental Services

1.0 COMPENDIUM

South Florida Environmental Services conducted an emissions compliance test program on behalf of Miami-Dade Water & Sewer Department at their Alexander Orr Jr. facility located in Miami, Florida. Testing was performed on Standby Generators 1, 2, 3, and 4 and Pumps 1, 3, 4, 5, and 6 for the determination of NOx, O2 and Visible Emissions. Testing was conducted on September 23, 24, 25, 26 and October 2, 1997.

Emissions testing was conducted to demonstrate compliance with NOx RACT. All testing was conducted in accordance with procedures set forth in Appendix A of 40 CFR 60, as amended. A detailed explanation of these procedures can be found in Section 3.0 of this report.

A compliance test series consisting of three one hour runs was conducted on each unit. Compliance testing was conducted at or above 90% of full load for each unit. All unit were tested while firing #2 fuel oil except Pump #6 which fired a combination of natural gas and #2 fuel oil.

The results of the NOx emissions test program can be found in Table 1-1 and Visible Emission results can be found in table 1-2.

Ron C. Cook Jr., Manager Technical Operations, was responsible for all phases of the emissions test program, He was assisted by Carl Adams. Richard O'Rourke of Miami-Dade Water & Sewer Department was responsible for coordinating plant operations.

South Florida Environmental Services

1.0 COMPENDIUM (cont.)

Table 1-1

STANDBY GENERATOR #1
Date Tested 23-Sep-97

Run #	% O_2	Unit Load	NOx lb/mmbtu	NOx lb/hr	Start Time	Stop Time
1	12.46	2500KW	3.74	82.95	1405	1505
2	12.39	2500KW	3.65	80.88	1515	1615
3	12.47	2500KW	3.74	82.90	1645	1745
Average	**12.44**	**2500KW**	**3.71**	**82.24**		

STANDBY GENERATOR #2
Date Tested 23-Sep-97

Run #	% O_2	Unit Load	NOx lb/mmbtu	NOx lb/hr	Start Time	Stop Time
1	12.32	2500KW	4.06	89.90	1030	1130
2	12.36	2500KW	3.46	76.61	1140	1240
3	12.30	2500KW	3.48	77.26	1250	1350
Average	**12.33**	**2500KW**	**3.66**	**81.26**		

STANDBY GENERATOR #3
Date Tested 24-Sep-97

Run #	% O_2	Unit Load	NOx lb/mmbtu	NOx lb/hr	Start Time	Stop Time
1	12.35	2500KW	2.81	62.37	0820	0920
2	12.28	2500KW	3.24	71.87	0930	1030
3	12.35	2500KW	3.06	67.84	1035	1135
Average	**12.33**	**2500KW**	**3.04**	**67.36**		

South Florida Environmental Services

1.0 COMPENDIUM (cont.)

Table 1-1 (cont.)

STANDBY GENERATOR #4
Date Tested 24-Sep-97

Run #	% O_2	Unit Load	NOx lb/mmbtu	NOx lb/hr	Start Time	Stop Time
1	12.14	2500KW	3.12	69.26	1145	1245
2	12.09	2500KW	3.09	68.52	1250	1350
3	12.10	2500KW	3.15	69.83	1355	1455
Average	**12.11**	**2500KW**	**3.12**	**69.20**		

PUMP #1
Date Tested 25-Sep-97

Run #	% O_2	Unit Load	NOx lb/mmbtu	NOx lb/hr	Start Time	Stop Time
1	12.82	410RPM	2.12	9.44	1110	1210
2	12.64	410RPM	2.16	9.13	1245	1345
3	12.10	410RPM	2.09	8.83	1351	1451
Average	**12.52**	**410RPM**	**2.12**	**9.13**		

PUMP #3
Date Tested 25-Sep-97

Run #	% O_2	Unit Load	NOx lb/mmbtu	NOx lb/hr	Start Time	Stop Time
1	13.24	420RPM	1.69	7.52	0745	0845
2	13.19	420RPM	1.87	7.90	0850	0950
3	13.30	420RPM	1.93	8.14	0955	1055
Average	**13.24**	**420RPM**	**1.83**	**7.85**		

60

1.0 COMPENDIUM (cont.)

Table 1-1

PUMP #4
Date Tested 2-Oct-97

Run #	% O_2	Unit Load	NOx lb/mmbtu	NOx lb/hr	Start Time	Stop Time
1	13.48	430RPM	2.94	13.09	0925	1025
2	13.78	430RPM	2.92	12.35	1035	1135
3	13.74	430RPM	3.00	12.69	1145	1245
Average	**13.66**	**430RPM**	**2.95**	**12.71**		

PUMP #5
Date Tested 25-Sep-97

Run #	% O_2	Unit Load	NOx lb/mmbtu	NOx lb/hr	Start Time	Stop Time
1	12.76	400RPM	2.64	20.81	1455	1555
2	12.71	405RPM	2.58	20.34	1601	1701
3	12.67	405RPM	2.59	20.44	1720	1820
Average	**12.71**	**403RPM**	**2.60**	**20.53**		

PUMP #6
Date Tested 26-Sep-97

Run #	% O_2	Unit Load	NOx lb/mmbtu	NOx lb/hr	Start Time	Stop Time
1	11.64	320RPM	1.92	24.33	0900	1000
2	11.55	330RPM	1.79	22.68	1005	1105
3	11.64	330RPM	1.81	22.87	1110	1210
Average	**8.71**	**327RPM**	**1.84**	**23.28**		

South Florida Environmental Services

1.0 COMPENDIUM (cont.)

Table 1-3
Visible Emission Tests

Unit #	Length of Test	Highest 6 min. Average	Readings above 20%
PUMP #1	30	5%	NONE
PUMP #3	30	5%	NONE
PUMP #4	30	5%	NONE
PUMP #5	30	6.25	NONE
PUMP #6	30	5%	NONE
STBY GEN #1	60	0%	NONE
STBY GEN #2	60	0%	NONE
STBY GEN #3	60	0%	NONE
STBY GEN #4	60	0%	NONE

2.0 SAMPLING POINT LOCATION

Sampling was conducted in the exhaust stack of each unit downstream of the silencers and prior to entering the atmosphere. Based upon the requirements in 40 CFR 60 Appendix B, Specification 2, Section 3.2, Reference Method Measurement Location and Sampling Points, the CEM probe sampled a total of three points during each one hour test run. A rake probe was used to satisfy this criteria.

3.0 SAMPLING TRAIN AND ANALYTICAL PROCEDURES

As discussed in Section 1, the subject units at the facility were tested for nitrogen oxides and Visible Emissions. Each pollutant parameter was tested in strict accordance with official EPA procedures set forth in 40 CFR 60 Appendix A at the sampling location described in Sections 1 and 2 of this Report. In this section, the test procedures that were followed, including sampling and analysis, are discussed.

3.1 DESCRIPTION OF METHODOLOGY

3.1.1 Oxygen

Oxygen was measured in accordance with EPA Method 3A. This method utilizes continuous emissions monitoring instrumentation. SFES used a Teledyne Model 326A monitor with a range from 0-25%. The instrument meets all of the performance specifications of these methods. It was calibrated before and after each test period with gases prepared according to EPA Protocol #1.

3.1.2 Carbon Dioxide

Carbon Dioxide was measured in accordance with EPA Method 3A. This method utilizes continuous emissions monitoring instrumentation. SFES used a Fuji Model 3400 non-dispersive infra red analyzer with a 0-20% range. This instrument meets all of the performance specifications of the method. It was calibrated before and after each test period with gases prepared according to EPA Protocol #1.

3.1.3 Oxides of Nitrogen

Oxides of nitrogen was measured in accordance with EPA Method 7E. This Method utilizes continuous emissions monitoring instrumentation. SFES uses a Thermo Electron Model 10A NOx chemiluminescent monitor with 8 ranges from 0-10,000 PPM. The instrument meets all of the performance specifications of the Method. It was calibrated before and after each test period using calibration gases prepared according to EPA Protocol #1.

3.0 SAMPLING TRAIN AND ANALYTICAL PROCEDURES (cont.)

3.2. DESCRIPTION OF CEM SAMPLING

What follows is a description of the transportable continuous emissions monitor system that was used to quantify oxygen, carbon dioxide, and oxides of nitrogen from subject boilers at the facility. The system meets all the specifications of Reference Methods 3A (O2, CO2), and 7E (NOx).

3.2.1 CEM Sampling System

Sample Probe - A stainless steel probe of sufficient length to sample three locations specified in Section 2.0.

Sample Line - Approximately 75' to 100' of 3/8" Teflon tubing (1/16" wall) to transport the sample gas from the probe to the sample conditioning system.

Sample Conditioning System-

Filter - A spun glass fiber filter, located near the probe to remove particulate from the gas stream.
Condenser (2) - a Universal Analyzer Sample Cooler or ice cooled condenser located near the probe for bulk moisture removal and a thermo-electric condenser system downstream from the pump to remove any remaining moisture from the gas stream.

Sample Pump - A diaphragm type vacuum pump to draw gas from the probe through the conditioning system and to the analyzers. The pump head is stainless steel, the valve disks are Viton and the diaphragm is Teflon coated.

Calibration Valve - A tee valve, located at the base of the probe, allows the operator to select either the sample stream or inject calibration gas to the CEM system.

Sample Distribution System - A series of flow meters, valves and back pressure regulators allows the operator to maintain constant flow and pressure conditions during sampling and calibration.

3.0 SAMPLING TRAIN AND ANALYTICAL PROCEDURES (cont.)

Gas Analyzers - capable of the continuous determination of O2, CO2, and NOx concentrations in a sample gas stream. They each meet or exceed the following specifications:

Calibration Error	- Less than ±2% of span for the zero, mid- and hi-range calibration gases.
System Bias	- Less than ±5% of span for the zero, mid- or hi-range calibration gases.
Zero Drift	- Less than ±3% of span over the period of each test run (1 hour).
Calibration Drift	- Less than ±3% of span over the period of each test run (1 hour).

Data Acquisition System - A Molytek strip chart/data logger system was used to record analyzer response to the sample and calibration gas streams. The chart recorder operated continuously while the data logger recorded thirty (30) minute interval averages.

The Molytek was linked, via an RS232 cable, to an IBM compatible computer system with a VGA screen. Data was written to file at fifteen (15) second intervals. Separate files for each run, and associated calibrations, were generated. Data was loaded into a spreadsheet for calculation of interval averages and emission rates. Preliminary reports were available on-site.

3.2.2 CEMS Sampling Procedures

All sampling and analytical procedures were conducted in accordance with EPA Reference Methods 3A, and 7E (40CFR60, Appendix A). The following is the sequence of events leading up to and including the compliance test:

Selection of Sampling Traverse Point Locations - Sampling point locations were determined prior to testing in accordance with EPA Methods 3A, and 7E.

Determination of System Response Time - System response time was determined prior to testing. System response time was determined according to procedures delineated in Performance Specification 2 (40CFR60, Appendix B).

Determination of Analyzer Calibration Error - Analyzer calibration error was determined immediately prior to testing in accordance with EPA Methods 3A, and 7E.

Determination of Sampling System Bias - Sampling system bias was determined immediately prior to testing in accordance with EPA Methods 3A, and 7E.

3.0 SAMPLING TRAIN AND ANALYTICAL PROCEDURES (cont.)

Determination of Zero and Calibration Drift - Before and after each test run each analyzer's response to zero and mid- or hi-range calibration gases was determined. The pre-and post-test analyzer responses were compared to determine drift. The results were evaluated based upon specifications defined in EPA Methods 3A, and 7E.

Data Reduction - An average pollutant/diluent concentration for each test run was determined from the data acquisition system. This data was then reduced to determine relative pollutant concentrations.

4.0 QUALITY CONTROL PROCEDURES

Sampling was conducted by trained personnel with extensive experience in Reference Method sampling. All sampling and analysis was conducted in strict accordance with EPA test procedures, including quality control procedures found in the EPA Quality Assurance Handbook for Air Pollution Measurement Systems.

South Florida Environmental Services entire equipment inventory is on a schedule of routine maintenance and calibration.

All calculations were conducted in strict accordance with the equations found in the individual Methods. Emission rate calculations were conducted on a computer and the input data was checked by a person other than the original operator to ensure that it was correct.

These specific procedures, in addition to South Florida Environmental Services usual high standard of quality control, validate the results obtained during the test program. South Florida Environmental Services is staffed by a team of qualified, experienced environmental professionals. As the majority of our emissions testing work is done for compliance purposes, strict QC procedures are incorporated into our everyday work performance.

South Florida
Environmental Services

October 23, 1998

Mr. Richard O'Rourke
Miami-Dade Water & Sewer Department
4200 Salzedo Street
Room 112
Miami, Florida 33146

Dear Mr. O'Rourke:

Enclosed please find five (5) copies of the compliance report for testing conducted at Miami-Dade Water and Sewer Department 's Alexander Orr Jr. facility. Testing was conducted on the Diesel Pumps for Visible Emissions (VE) and Oxides of Nitrogen (NOx).

All testing and data reduction was conducted in accordance with EPA Methods 3A, 7E and 9 as found in 40 CFR 60 Appendix A, as amended.

Copies of this report have been sent to Mr. Tom Tittle of the Florida Department of Environmental Protection in West Palm Beach and Mr. Frank Delgaldo of the Miami-Dade County Environmental Resource Management in Miami.

If you have any question or comments, please do not hesitate to call.

Sincerely,

Tom Siegert

Tom Siegert
Environmental Scientist

6821 Vista Parkway North, West Palm Beach, FL 33411
Tel: 561-687-5300 Fax: 561-687-3676

South Florida
Environmental Services

EMISSIONS TEST REPORT

PREPARED FOR: Miami-Dade Water & Sewer Department
4200 Salzedo Street
Room 112
Coral Gables, FL 33146

CONCERNING: Visible Emissions and NOx RACT Testing
Alexander Orr Jr. Water Treatment Plant
Diesel Pumps
September 16 & 17, 1998

PREPARED BY: South Florida Environmental Services
6821 Vista Parkway North
West Palm Beach, Florida 33411

PROJECT #: 97-584.AO

S. Joseph Mercadante
President

10/23/98
Date

Reviewed By:

Thomas S. Siegert
Environmental Scientist

10/23/98
Date

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TABLE OF CONTENTS

APPENDICES

1.0 COMPENDIUM

South Florida Environmental Services a division of Eastmount Environmental Inc. conducted an emissions testing program on behalf of Miami-Dade Water & Sewer Department at their Alexander Orr Jr. facility located in Miami, Florida. Testing was performed on Diesel Pumps 1, 3, 4, 5, and 6 for the determination of NOx, O2 and Visible Emissions. Testing was conducted on September 16 and 17, 1998.

Testing was conducted to demonstrate compliance with Visible Emissions and NOx RACT standards. All testing was conducted in accordance with procedures set forth in Appendix A of 40 CFR 60, as amended. A detailed explanation of these procedures can be found in Section 3.0 of this report.

Each compliance test series consisted of three one hour runs. Compliance testing was conducted at or above 90% of full load for each unit. All unit were tested while firing #2 fuel oil except Pump #6 which fired a combination of natural gas and #2 fuel oil.

The results of the NOx emissions test program can be found in Table 1-1 and Visible Emission results can be found in table 1-2.

Michael Mercadante was responsible for all phases of the emissions test program. Francis Morlu assisted throughout the sampling phase of the program. S. Joseph Mercadante conducted the calculations and wrote the Final Report. Thomas Siegert assisted in the report preparation and reviewed the Final Report. Richard O'Rourke of Miami-Dade Water and Sewer Department was responsible for coordination plant operations. Ms. Raisa Neginsky of the Florida Department of Environmental Protection in West Palm Beach observed the testing.

1.0 COMPENDIUM (cont.)

SUMMARY OF RESULTS

Table 1-1

NOx Tests

NOx lb/mm Btu				
Source	Run 1	Run 2	Run 3	Average
Pump #1	2.33	2.29	2.15	2.26
Pump #3	2.46	2.26	2.35	2.36
Pump #4	2.58	2.65	2.49	2.57
Pump #5	2.43	1.99	2.44	2.29
Pump #6	1.20	1.27	1.55	1.34

Results of the NOx testing can be compared to the State of Florida's allowable RACT limit of 4.75 lb/mm Btu.

Table 1-2

Visible Emissions Tests

Source	Highest Six Minute Average	Overall Opacity Average
Diesel Pump #1	2.29 %	0.79 %
Diesel Pump #3	6.43 %	4.59 %
Diesel Pump #4	2.92 %	0.98 %
Diesel Pump #5	13.21 %	10.34 %
Diesel Pump #6	0.00 %	0.00 %

Results of the Visible Emission testing can be compared to the State of Florida's allowable Visible Emissions limit of 20% opacity.

South Florida Environmental Services

2.0 SAMPLING POINT LOCATION

Sampling was conducted in the exhaust stack of each unit downstream of the silencers and prior to entering the atmosphere. Based upon the requirements in 40 CFR 60 Appendix B, Specification 2, Section 3.2, Reference Method Measurement Location and Sampling Points, the CEM probe sampled a total of three points during each test run.

3.0 SAMPLING TRAIN AND ANALYTICAL PROCEDURES

As discussed in Section 1, the subject units at the facility were tested for Oxides of Nitrogen and Visible Emissions. Each parameter was tested in strict accordance with official EPA procedures set forth in 40 CFR 60 Appendix A as amended.

3.1 DESCRIPTION OF METHODOLOGY

3.1.1 Oxygen

Oxygen was measured in accordance with EPA Method 3A. This method utilizes continuous emissions monitoring instrumentation. SFES used a Teledyne Model 326A monitor with a range from 0-25%. The instrument meets all of the performance specifications of these methods. It was calibrated before and after each test period with gases prepared according to EPA Protocol #1.

3.1.2 Oxides of Nitrogen

Oxides of Nitrogen were measured in accordance with EPA Method 7E. This Method utilizes continuous emissions monitoring instrumentation. SFES uses a Thermo Electron Model 10A NOx chemiluminescent monitor with 8 ranges from 0-10,000 PPM. The instrument meets all of the performance specifications of the Method. It was calibrated before and after each test period using calibration gases prepared according to EPA Protocol #1.

3.2. DESCRIPTION OF CEM SAMPLING

What follows is a description of the transportable continuous emissions monitor system that was used to quantify Oxygen and Oxides of Nitrogen from subject boilers at the facility. The system meets all the specifications of Reference Methods 3A (O2), and 7E (NOx).

3.0 SAMPLING TRAIN AND ANALYTICAL PROCEDURES (cont.)

3.2.1 CEM Sampling System

Sample Probe - A stainless steel probe of sufficient length to sample three locations specified in Section 2.0.

Sample Line - Approximately 75' to 100' of 3/8" Teflon tubing (1/16" wall) to transport the sample gas from the probe to the sample conditioning system.

Sample Conditioning System-

Filter - A spun glass fiber filter, located near the probe to remove particulate from the gas stream.
Condenser (2) - a Universal Analyzer Sample Cooler or ice cooled condenser located near the probe for bulk moisture removal and a thermo-electric condenser system downstream from the pump to remove any remaining moisture from the gas stream.

Sample Pump - A diaphragm type vacuum pump to draw gas from the probe through the conditioning system and to the analyzers. The pump head is stainless steel, the valve disks are Viton and the diaphragm is Teflon coated.

Calibration Valve - A tee valve, located at the base of the probe, allows the operator to select either the sample stream or inject calibration gas to the CEM system.

Sample Distribution System - A series of flow meters, valves and back pressure regulators allows the operator to maintain constant flow and pressure conditions during sampling and calibration.

Gas Analyzers - capable of the continuous determination of O2, CO2, and NOx concentrations in a sample gas stream. They each meet or exceed the following specifications:

Calibration Error	- Less than ±2% of span for the zero, mid- and hi-range calibration gases.
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Zero Drift	- Less than ±3% of span over the period of each test run (1 hour).
Calibration Drift	- Less than ±3% of span over the period of each test run (1 hour).

South Florida Environmental Services

3.0 SAMPLING TRAIN AND ANALYTICAL PROCEDURES (cont.)

Data Acquisition System - A Molytek strip chart/data logger system was used to record analyzer response to the sample and calibration gas streams. The chart recorder operated continuously while the data logger recorded thirty (30) minute interval averages.

The Molytek was linked, via an RS232 cable, to an IBM compatible computer system with a VGA screen. Data was written to file at fifteen (15) second intervals. Separate files for each run, and associated calibrations, were generated. Data was loaded into a spreadsheet for calculation of interval averages and emission rates. Preliminary reports were available on-site.

3.2.2 CEMS Sampling Procedures

All sampling and analytical procedures were conducted in accordance with EPA Reference Methods 3A, and 7E (40CFR60, Appendix A). The following is the sequence of events leading up to and including the compliance test:

Selection of Sampling Traverse Point Locations - Sampling point locations were determined prior to testing in accordance with EPA Methods 3A, and 7E.

Determination of System Response Time - System response time was determined prior to testing. System response time was determined according to procedures delineated in Performance Specification 2 (40CFR60, Appendix B).

Determination of Analyzer Calibration Error - Analyzer calibration error was determined immediately prior to testing in accordance with EPA Methods 3A, and 7E.

Determination of Sampling System Bias - Sampling system bias was determined immediately prior to testing in accordance with EPA Methods 3A, and 7E.

Determination of Zero and Calibration Drift - Before and after each test run each analyzer's response to zero and mid- or hi-range calibration gases was determined. The pre-and post-test analyzer responses were compared to determine drift. The results were evaluated based upon specifications defined in EPA Methods 3A, and 7E.

Data Reduction - An average pollutant/diluent concentration for each test run was determined from the data acquisition system. This data was then reduced to determine relative pollutant concentrations.

4.0 QUALITY CONTROL PROCEDURES

Sampling was conducted by trained personnel with extensive experience in Reference Method sampling. All sampling and analysis was conducted in strict accordance with EPA test procedures, including quality control procedures found in the EPA Quality Assurance Handbook for Air Pollution Measurement Systems.

South Florida Environmental Services entire equipment inventory is on a schedule of routine maintenance and calibration.

All calculations were conducted in strict accordance with the equations found in the individual Methods. Emission rate calculations were conducted on a computer and a person other than the original operator to ensure that it was correct checked the input data.

These specific procedures, in addition to South Florida Environmental Services usual high standard of quality control, validate the results obtained during the test program. South Florida Environmental Services is staffed by a team of qualified, experienced environmental professionals. As the majority of our emissions testing work is done for compliance purposes, strict QC procedures are incorporated into our everyday work performance.