Air Quality Impact Analysis for Proposed Modification Construction for Okeechobee Landfill, Facility ID No. 0930104

Prepared for Okeechobee Landfill, Inc.
Okeechobee, FL

Prepared by Shaw Environmental, Inc.

Project No. 121525

February 2008

Shaw® a world of Solutions™

WASTE MANAGEMENT

RECEIVED

FEB 12 2008

BUREAU OF AIR REGULATION

WASTE MANAGEMENT
2859 Paces Ferry Road SE
Suite 1600
Atlanta, GA 30339
(770) 805-4130
(770) 805-9145 Fax

VIA OVERNIGHT MAIL

February 11, 2008

A.A. Linero, P.E.
Program Administrator
Air Permitting South Section
Bob Martinez Center
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RE: Response to Comments, Florida Department of Environmental Protection Letter Dated November 14, 2007 for Okeechobee Landfill DEP file No. 0930104-AC, Application No. 1270-2

Dear Mr. Linero:

On November 14, 2007, Waste Management Inc. of Florida received a request for information from the Florida Department of Environmental Protection (FDEP) in response to the permit application (DEP File Number 0930104-014-AC). Attached is the response to your request for information provided by Shaw Environmental, Inc.

We are currently coordinating a meeting with the National Park Service (NPS) to discuss the Class I protocol that was forwarded to them from the FDEP. Okeechobee Landfill, Inc. respectively requests that an extension of time be granted so that the Okeechobee Landfill staff and consultants can meet with the NPS to discuss the protocol, incorporate any received comments, finalize the protocol, and perform the Class I analysis with the finalized protocol. We expect that an extension of time until May 9, 2008 ought to be sufficient in this regard. Thanks very much in advance for your consideration of this request.

If there are further questions on the application, please contact the Okeechobee District Manager located at the Okeechobee Landfill.

Sincerely,

John Van Gessel
Vice President and Assistant Secretary

cc: Kristin Alzheimer, P.E., Shaw Environmental: kristin.alzheimer@shawgrp.com

Jim Christiansen, Okeechobee Landfill, Inc.: jchristi@wm.com
David Thorley, Okeechobee Landfill, Inc.: dthorley@wm.com
Bruce Maillet, Project Manager, Shaw Environmental: bruce.maillet@shawgrp.com
Deborah Nelson, FDEP, Air Permitting – South: Deborah.Nelson@dep.state.fl.us

Attachment

Shaw® Shaw Environmental, Inc.

Shaw Environmental, Inc.
88C Elm Street
Hopkinton, MA 01748-1656
508-435-9561
FAX: 508-435-9641

February 8, 2008

Mr. John Van Gessel
Vice President and Assistant Secretary
Waste Management, Inc. of Florida
2859 West Paces Ferry Road, Suite 1600
Atlanta, GA 30339

RE: Response to Comments, Florida Department of Environmental Protection Letter Dated November 14, 2007 for Okeechobee Landfill DEP file No. 0930104-AC, Application No. 1270-2

Dear Mr. Van Gessel:

We are pleased to present our responses to Florida Department of Environmental Protection's (FDEP) request for information received by Waste Management, Inc. of Florida on November 14, 2007. The FDEP's request is in regards to the air construction permit application (DEP File Number 0930104-014-AC). Below we have listed the comments followed by the responses. Where the FDEP has referred to comments from an earlier letter requesting information by alpha-numerical designation, we have summarized that comment in the response.

A. Air Quality Impact Analysis Items

Comment 1: With regards to the Department's previous letter dated July 18, 2007, please submit the requested item A.1.

Further, the letter the Department received on October 16, states that the National Park Service (NPS) has not provided comments regarding the initial application. Class I modeling was not included in that submittal and the Department notified the Park Service that the application was incomplete with regards to many issues. The Department notified the NPS that the Department would inform them upon completion of the modeling so they may perform their review. Regardless, the NPS has provided comments regarding the need for the "interim" modeling and sensitive Class II modeling, which has been forwarded to Shaw Environmental, Inc. If comments from the Park Service regarding procedure are required, the NPS frequently recommends that applicants with procedural issues prepare a modeling protocol for their review.

Response: Item A.1. from the July 18, 2007 letter requested the following analysis be submitted: Class I Prevention of Significant Deterioration (PSD) Significant Impact Analysis, PSD Increment Analysis (if required) and an Air Quality Related Values (AQRV) analysis for the proposed expansion for all operating scenarios, including the "Interim" period. The letter further stated that the "Interim" period (prior to installation of controls) is subject to PSD review. The letter also requested that the Class I analysis include the Class II areas, Big Cypress National Preserve and Biscayne National Park.

As suggested by your department, a Class I Significant Impact and AQRV Analyses protocol for the interim and BACT scenarios was submitted to your department for

your and the NPS's review on January 2, 2008. The protocol includes the requested sensitive Class II areas. Upon receipt of these comments, a revised Class I analysis will be completed and submitted to your department. Please note that the initial Class I analysis was submitted on February 27, 2007. We believe resolution of Class I analysis should not be considered for determination of completeness of the application.

We believe the PSD Increment Analysis is part of the PSD analysis and should be considered after the BACT is installed. Since the Interim scenario is prior to BACT, the Florida Ambient Air Quality Standards (AAQS) will be met. FDEP uses the term AAQS, which has the same meaning as federal National Ambient Air Quality Standards (NAAQS). Florida AAQS are equal to or more stringent (24-hour average and annual SO_2) than NAAQS.

The Florida AAQS analysis for the Interim scenario is attached in the revised Air Quality Analysis report. The Florida AAQS and PSD Increment analyses for the BACT scenarios are also attached in aforementioned report. The Interim analysis is based on an average hydrogen sulfide gas content of 4987 ppmv and a flow rate of 2300 standard cubic feet per minute from the odor control flare. The Interim analysis also includes an average hydrogen sulfide gas content of 2990 ppmv and a flow rate of 1700 standard cubic feet per minute from each of the existing enclosed flares. These values reflect more recent hydrogen sulfide inlet gas analysis provided by Okeechobee Landfill.

Comment 2: With regards to the July 18, 2007 letter, please submit the requested item A.3.

Response: **Comment A.3. from the July 18 letter requested that a soils, vegetation and wildlife analysis be competed for the Interim scenario in the revised version of the analyses. A soils, vegetation, and wildlife analysis was presented in the amended application, dated February 27, 2007. The revised Air Quality Analysis report mentioned in the response to Comment 1 also includes the soils, vegetation, and wildlife analysis.**

Comment 3: With regards to the response to the letter dated July 18, 2007, Items A.4. and A.5., the Department helped create inventories. However, the Department did not conduct modeling to determine the significant impact area (SIA) for this project. Please include all sources in your SIA for increment modeling. Please provide all modeling discussed in this response.

Response: **The current significant modeling includes all new flares. The PSD Increment analysis, where applicable, includes the new flares, all other facility sources and other nearby sources from the Department inventory. There are no off-property sources within the immediate significant impact area. The revised Air Quality Analysis report mentioned in the response to Comment 1 will include a table of all the sources in the Florida AAQS and PSD increment modeling, if applicable.**

Comment 4: With regards to the response to the letter dated July 18, 2007, item A.8., the initial modeling should determine a significant impact area, if significant. This entire significant impact area, plus a buffer, should be modeled for Increment and National Ambient Air Quality Standards. Please contact the Department if further clarification is needed.

Response: **The receptors from the entire significant impact area receptors plus a 50-kilometer buffer are included in the PSD Increment and Florida AAQS modeling. The off-property sources from the SIA and the buffer are included in the PSD Increment and Florida AAQS analyses. Please see the attached revised Air Quality Analysis Report mentioned in the response to Comment 1 for further details.**

Comment 5: With regards to the letter dated July 18, 2007, item A.9 remains applicable.

Response: **A protocol was submitted to Air Permitting South Section on January 2, 2008 for review. Comments from the NPS and the USEPA will also be addressed, as applicable and appropriate.**

Additional Response:
Okeechobee Landfill and Shaw are currently coordinating a meeting with the NPS to discuss the Class I protocol that was forwarded to them from the FDEP. We respectively request that an extension be granted so we can meet with the NPS to discuss the protocol, incorporate any received comments, finalize the protocol, and perform the Class I analysis with the finalized protocol.

If there are further questions on the application, please contact me at 508-497-6108.

Sincerely,

Bruce Maillet
Senior Air Consultant

Seal

Kristin A. Alzheimer, P.E.

Cc: Kristin Alzheimer, P.E., Shaw Environmental: kristin.alzheimer@shawgrp.com (attachment/1 copy)
David Thorley, Okeechobee Landfill, Inc.: dthorley@wm.com (attachment/1 copy)
Jim Christiansen, Okeechobee Landfill, Inc.: jchristi@wm.com (attachment/1 copy)
Tony Bishop, Okeechobee Landfill, Inc.: tbishop@wm.com (attachment/1copy)
Bruce Maillet, Shaw Environmental: bruce.maillet@shawgrp.com
Arijit Pakrasi, Shaw Environmental: arijit.pakrasi@shawgrp.com
Kelly Fagan, Shaw Environmental: kelly.fagan@shawgrp.com
Leah Blinn, Shaw Environmental: leah.blinn@shawgrp.com

Attachment: Revised Air Analysis Report with Appendices C and D on Computer Disc.

SECTION III AIR CONSTRUCTION PERMIT APPLICATION 1270-2

AIR QUALITY IMPACT ANALYSIS FOR PROPOSED MODIFICATION CONSTRUCTION FOR OKEECHOBEE LANDFILL, FACILITY ID NO. 0930104

Prepared for:

Okeechobee Landfill, Inc.
Okeechobee, Florida

Prepared by:

Shaw® Shaw Environmental, Inc.

Shaw Environmental, Inc.
Monroeville, Pennsylvania

Project No. 121525
February 2008

Table of Contents

List of Tables

List of Figures

List of Appendices

List of Acronyms and Abbreviations

AAQS	Ambient air quality standard
AQRV	Air quality related values
BACT	Best Available Control Technology
BPIP	building profile Input program
CD	Control device
CO	Carbon monoxide
DEM	Digital elevation maps
F.A.C	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FLM	Federal land manager
GEP	Good engineering practice
H2SO4	Sulfuric acid
HAP	Hazardous air pollutant
K	Kelvin
Kw	kilowatt
LFG	Landfill gas
LFGTE	Landfill gas to energy
m/s	meters per second
NAAQS	National ambient air quality standard
NAD	North American datum
NMOC	Non methane organic compounds
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides
NPS	National park service
NSR	New Source Review
NWS	National weather service
OEPA	Ohio Environmental protection Agency
OLI	Okeechobee Landfill Incorporated
PBL	Planetary
PM10	Particulate matter with aerodynamic diameter less than or equal to 10 microns
PSD	Prevention of significant deterioration
PTE	Potential to emit
Scfm	standard cubic feet per minute
SIP	State implementation plan
SO_2	Sulfur dioxide
TCEQ	Texas Commission on Environmental Quality
USEPA	United States Environmental Protection Agency
USGS	United States Geological Service
UTM	Universal transverse mercaptor
VOC	Volatile organic compounds

1.0 Introduction

As mentioned in Section 1.0 of Prevention of Significant Deterioration (PSD) Air Construction Permit Application Report (Permit Application Report) the net emissions from the proposed changes in the facility exceeded the significant emission rates for New Source Review (NSR) for the following pollutants: SO_2, NOx, PM10, and CO. Therefore a Best Available Control Technology (BACT) analysis was conducted, which is described in Section 2.0 of the Permit Application Report. Per the NSR (40 CFR 52), the applicant is also required to conduct an air quality analysis associated with construction and operation of the new source or the modification. The main purpose of the air quality analysis is to demonstrate that new emissions from the proposed new source or modification after installation of the BACT will not cause or contribute to violation of any applicable National or Florida Ambient Air Quality Standards (AAQS) or Prevention of Significant Deterioration (PSD) increment. The air quality analysis is required for each regulated pollutant for which the emission from the new source or modifications are "significant" as defined by the United States Environmental Protection Agency (USEPA) in 40 CFR Part 52. In addition, additional impact analysis is required to identify impacts of growth on surrounding area as a result of the proposed new source or modification.

USEPA has delegated the NSR program to Florida Department of Environmental Protection (FDEP), which has jurisdiction over this program in the state. FDEP's NSR program is codified in Chapter 62-212 (Stationary Sources – Preconstruction Review) and closely follows the USEPA NSR program. The requirements for air quality analysis are similar to the federal program.

This Section III of the Air Construction Permit Application provides details of the air quality analysis conducted for the proposed changes in the Okeechobee Landfill facility (Facility). The Appendix is arranged as follows:

Section 2.0: Background Information
Section 3.0: Technical Approach and Methodology
Section 4.0: Air Quality Impact Analysis
Section 5.0: Additional Impact Analysis
Section 6.0: Conclusions

Please note that one element of an air quality analysis is Class I area impact analysis. The analysis requires estimation of impact of the proposed project on nearby federally designated Class I areas in terms of air quality, acidic deposition, and visibility degradation, which are part of the air quality related values (AQRVs).

2.0 Background Information

The Okeechobee Landfill Facility (Facility), which is owned and operated by Okeechobee Landfill, Inc. (OLI), is comprised of an existing municipal solid waste (MSW) landfill and supporting operations. The facility has been operational since 1981 and under the existing solid waste permit will continue to construct and operate the landfill until approximately 2058. The landfill is an emission unit for nonmethane organic compounds (NMOCs) and hazardous air pollutants (HAPs), which are landfill gas (LFG) constituents. The typical control device for NMOCs and HAPs in LFG is flaring of the gas. Combustion can also be achieved by engines and turbines. The proposed project includes the construction of a landfill-gas-to-energy (LFGTE) plant as the primary control devices. The LFGTE plant will consist of LFG turbines with flares as a back up option.

The Facility currently has two enclosed landfill gas flares with Evap® systems and an open, utility flare as a backup. The two enclosed flares and the backup flare are operated under the current Title V operation permit. There is currently an odor control flare that is operating under a first amended order between FDEP and Okeechobee Landfill Inc. (OLI). A second amended order allows up to five flares to be operated at the Facility. The estimated maximum potential-to-emit (PTE) based on LFG generation estimates occurs shortly after closure and will increase from current 5,700 standard cubic feet per minute (scfm) to 32,400 scfm. There is a current need to install more flaring capacity for control of collected LFG; however, as the landfill construction is ongoing, turbines will be installed and landfill gas will be diverted from the flares to the gas turbines, which will beneficially use the landfill gas by converting it into electricity. Under this scenario, the landfill gas will be always combusted in turbines (numbers increasing with time) and two flares (one operating at a third of the maximum flare capacity) to combust residual gas after full capacity is achieved in turbines. As the gas generation reaches the maximum for the flare, the gas will be transferred to a new turbine, and the flare will be ready for excess gas generated from the landfill.

Although the Facility is not a permitted as a major stationary source, recent fuel analysis for hydrogen sulfide indicates that the actual emissions do qualify the Facility as a major stationary source. Additionally, the expected emission increases from the current level to the predicted levels at the completion of the landfill construction are above the significant emission rate therefore, triggering PSD review under Chapter 62-212.400. The Application provides the information required by Chapter 62-212.400, F.A.C., for Prevention of Significant Deterioration (PSD) review.

The summary of significant emission rate evaluation for all PSD pollutants as described in Section 5.2 of the Permit Application Report is shown in Table 2-1. The pollutants exceeding the significant emission rates from the proposed changes are: i) SO_2; ii) NOx; iii) PM10; and iv) CO. A BACT analysis has been performed and would require installation of a LFG desulphurization system installed before the destructive control devices (e.g. flares) to control SO_2.

Table 2-1: PSD Significance Summary

Pollutant	PSD Emission Significant?
Nitrogen Oxides (NOx)	Yes
Carbon Monoxide (CO)	Yes
Sulfur Dioxide (SO_2)	Yes
Particulate Matter, diameter <10 microns (PM10)	Yes
Hydrogen Sulfide (H_2S)	No
Ozone as Volatile Organic Compounds (VOC)	No

Note: Other PSD regulated compounds are not emitted in any appreciable quantity during LFG combustion

2.1 Description of Site

The Facility is located in Okeechobee County in Central Florida near Lake Okeechobee at approximately 27°20'24" latitude and 80°41'27" longitude. Figure 2-1 shows the site within the state of Florida and nearby natural features. The 4300 acre site contains the existing Berman Road Landfill, the proposed Clay Farms expansion, and auxiliary services.

The terrain surrounding the Facility is mostly flat with terrain heights reaching 60 feet within 5 kilometers (km) from the property boundary line. The vegetation is mostly grassland and mangroves. Land use in the surrounding area is mostly rural. A large water body (Lake Okeechobee) is located approximately 30 km southwest of the Facility.

The area is not industrial and there are no large industrial sources within 10 km from the Facility. Okeechobee County is in attainment for all regulated pollutants with federal NAAQS and FDEP AAQS. The nearest Class I area is Everglades National Park approximately 169 km south of the southernmost property boundary of the Facility. FDEP has also requested a Class I analysis for two other Class II areas, Biscayne Bay National Park and Big Cypress National Preserve. Biscayne Bay is located approximately 193.5 km from the sources and Big Cypress is located approximately 121 km from the sources.

There is no meteorological monitoring station in the Facility. Meteorological data from nearest National Weather Service (NWS) station in West Palm Beach (approximately 60 km southeast of Facility) shows a predominantly westerly wind pattern. Climatological data shows that average and maximum wind speed in the area are approximately 4 meters per second (m/s) and 10 m/s. Average annual rainfall in the area is 1560 millimeter (mm).

Figure 2-2A shows a plot plan for the existing Facility. The location of the existing flares and the locations of the proposed turbines and proposed flares are also shown in Figure 2-2A. Figure 2-2B shows the location of the buildings used in the modeling.

2.2 Description of Emission Sources

The current and future operations have been described in detail in Section 2.0 and 3.0 of the Air Permit Application. For the purpose of air quality analysis, the following LFG combustion emission sources have been considered:

Existing Operation (prior to BACT):

i) Interim Scenario:

- Two existing enclosed flares (CD001 and CD002) used as control devices at 1,700 scfm of LFG each; and
- One new open flares (CD004) used as a control device at 2,300 scfm of LFG.
- Total flow of 5,700 scfm.

Future Operation:

Future operations require installation of gas turbines and flares in stages based on the increase in rates of generation of landfill gases. At the completion of the project, the following emission sources are considered for the air quality analysis:

ii) Routine Operating Scenario (BACT Scenario):

- Seven LFG turbines (CD011 to CD017) used as control devices each rated at 4,000 scfm of LFG;
- One open flare (CD003) used as a control device rated at 3,300 scfm of LFG; and
- One open flare (CD004) used as a control device rated at 3,300 scfm LFG, but only operating at one third capacity (1,100 scfm).
- Total potential flow of 32,400 scfm

iii) Alternative BACT Operating Scenario 1 (in case gas turbines are unavailable)

- Eight new open flares (CD003 through CD010) used as control devices each rated at 3,300 scfm of LFG
- Two existing enclosed flares (CD001 and CD002) used as control devices each rated at 3,000 scfm of LFG
- Total potential flow of 32,400 scfm

iv) Alternative BACT Operating Scenario 2 (in case gas turbines are unavailable)

- Eight new open flares (CD003 through CD010) used as control devices each rated at 3,300 scfm of LFG
- One new open flare (CD018) used as a control device replacing the existing enclosed flare (CD001) rated at 3,300 scfm of LFG
- One new open flare (CD019) used as a control device replacing the existing enclosed flare (CD002) rated at 3,300 scfm of LFG, but only operating at 2,700 scfm.
- Total potential flow of 32,400 scfm

All scenarios under the future conditions will have BACT installed for SO_2 as described earlier.

The emission rates used for the air quality analysis from these emission sources are described in Section 3.2 of this Appendix.

Federal and FDEP PSD regulations require the BACT scenarios only to be considered for air quality impact analysis. In this case, both BACT scenarios, namely the routine operating scenario and the back-up operating scenario were considered. Additionally, per FDEP request, air quality impact analysis for the interim operating scenario is also included.

2.3 *Elements of Air Quality Analysis*

Florida's State Implementation Plan (SIP), which contains the PSD regulations, has been approved by USEPA and therefore PSD approval authority has been granted to FDEP. FDEP's PSD regulations are codified in Rule 62.212.400, Florida Administrative Code (F.A.C.) and are same as the federal PSD regulations codified in 40 CFR Part 51.166. FDEP uses the term ambient air quality standard (AAQS), which has same meaning as federal NAAQS. Florida AAQS are equal or more stringent (24-hour average and annual SO_2) than NAAQS. Hereinafter the term AAQS will be used to represent FDEP terminology and compliance with AAQS will also mean compliance with NAAQS.

The air quality analysis involves two phases as follows:

Preliminary Analysis: The preliminary analysis includes only the significant net emission increase from proposed modifications. The result of the preliminary analysis is used to determine whether a more comprehensive "full impact analysis" is necessary. The full impact analysis is not required if the preliminary analysis shows that ambient impact of regulated pollutant is below "significance level".

Preliminary analysis is also used to determine the modeling domain (significant impact area) in case full impact analysis is required. Additionally, the analysis determines if pre-application monitoring is necessary based on whether the ambient impacts exceed PSD significant monitoring concentration.

Full Impact Analysis: This analysis is required for any regulated pollutant for which the ambient impact from the proposed modification exceeds the prescribed "significance level" concentration. The analysis expands the preliminary analysis in that it considers emissions from:

- The proposed source or modification;
- Existing sources (on-site and off-site)
- Secondary emissions resulting from the proposed new source or modification, if any.

For SO_2, NO_2, and PM10, the full impact analysis consists of separate analyses for AAQS and PSD increments. For AAQS compliance, the background concentration resulting from upwind and smaller (area) sources are also included either from a pre-application monitoring station data or from existing USEPA approved monitoring station data. The existing (both on-site and off-site sources) used for PSD increment and AAQS compliance demonstration are selected using different criteria as prescribed in 40 CFR Part 51 and 62.212.400 F.A.C.

Table 2-2 lists the USEPA and FDEP significance concentration level, significant monitoring concentration, AAQS and Class II PSD increments for SO_2, NO_2, PM10, and CO for reference.

Table 2-2: Reference Concentrations of Regulated Pollutants for PSD Analysis

Pollutant	Averaging Period	Significance Level Concentration (ug/m3)	Significant Monitoring Concentration (ug/m3)	FDEP AAQS ($\mu g/m^3$)	Class II PSD Increment (ug/m3)
NO_2	Annual	1	14	100	25
CO	1-Hour	2,000	N/A	40,000	N/A
	8-Hour	500	575	10,000	N/A
SO_2	3-Hour	25	N/A	1300	512
	24-Hour	5	13	260	91
	Annual	1	N/A	60	20
PM_{10}	24-Hour	5	10	150	37
	Annual	1	N/A	50	19

Notes:
1. Federal NAAQS values for the concentration are same as FDEP AAQS values except for 24-Hour and Annual SO_2, which are less than FDEP AAQS
2. Other PSD pollutants are not discussed since these are not relevant for this project

Additional Impact Analysis: All PSD permit applications are required to prepare additional impact analyses for each pollutant which are emitted by the proposed new source or modification. The elements of the additional impact analyses are:

- A projection of industrial, commercial, and residential growth that may occur in the area due to the proposed changes and associated impact on air quality;
- A projection of impact on soil and vegetation due to the proposed source; and
- Visibility impairment analysis associated with the project's emissions.

The depth of the analyses is dependent on the quantity of emissions, sensitivity of local soils, vegetation, and visibility in the source's impact area.

Class I Area Impact Analysis: Class I areas are areas of special national or regional value from a natural, scenic, recreational, or historic perspective. Adverse impacts on Class I areas are prevented by:

i) Ensuring that Class I area increments are not exceeded; and

ii) Ensuring that the air quality related values (AQRVs) in the Class I areas are not significantly affected.

Typically, Class I area within 100 km of the proposed source or modification is considered in the analysis. Currently, due to current emphasis in improving visibility in Class I areas via the Regional Haze Rule, Class I areas at greater distances are also being included in the analysis.

The Federal Class I area nearest to the source is the Everglades National Park in South Florida, Located approximately 169 kilometers from the facility's southern most property line. Biscayne Bay National Park and Big Cypress National Preserve are Class II areas; however, they are considered important relative to air pollution impacts and are also considered in the analyses.

The Class I area air quality analysis is conducted in two phases as follows:

i) <u>Significant Impact Analysis:</u> the net emissions increase from project is used in determining the air quality impact in the Class I area and is then compared to the Class I area significance levels concentration. The Draft New Source Review Workshop Manual (1990) lists Class I significance level concentration as 1 ug/m^3 for 24-hour average for all pollutants with a NAAQS. USEPA has subsequently proposed lower significance level concentration as shown in Table 2-3. These levels in Table 2-3 have not been officially promulgated as part of the PSD review process. However, FDEP has accepted the use of these significance level concentration for Class I areas.

If the project's air quality impact does not exceed the Class I significance level concentration, then no further air quality analysis is required.

ii) <u>Class I area PSD Increment Analysis:</u> This analysis is needed if the project's air quality impact exceeds the Class I area significance level concentration. Table 2-3 shows the Class I area PSD increments, which can not be exceeded by the project's air quality impact.

Table 2-3: Reference Concentrations of Regulated Pollutants for Class I Impact Analysis

Pollutant	Averaging Period	Proposed USEPA Class I Significance Level (ug/m^3)	Current USEPA Class I PSD Increments (ug/m^3)
NO_2	Annual	0.1	2.5
SO_2	3-Hour	1	25
	24-Hour	0.2	5
	Annual	0.1	2
PM_{10}	24-Hour	0.3	10
	Annual	0.2	5

Notes:
1. Current Class I area significance level is 1 ug/m3 for 24 hour average concentration for all PSD pollutants. Proposed Class I significance levels are guidelines at this time and have not been adopted yet in PSD regulations.

iii) <u>AQRV Analysis</u>

The AQRV analysis is required for submission to Federal land Managers (FLM) who are charged with affirmative responsibility to protect the AQRVs. The AQRVs vary with the Class I area being considered. Based on discussions with the National Park Service (NPS), the AQRVs to be considered for the Everglades National Park, Biscayne Bay National Park, and Big Cypress National Preserve are: i) deposition of total nitrates and sulfates; ii) visibility degradation; and iii) impact of ozone on vegetations. The results of these analyses are submitted to NPS for AQRV analyses.

3.0 Technical Approach and Methodology

Air dispersion was performed to determine ambient concentrations of applicable criteria pollutants in the near field from the various proposed emission points within the facility. The results of the air dispersion modeling were used to demonstrate compliance with PSD and AAQS.

The air dispersion was performed generally in conformance with the following guideline documents, with appropriate modifications based on site-specific data:

- "New Source Review Workshop Manual" Draft October 1990
- "Guidelines on Air Quality Models"; Appendix W of 40 CFR Part 51
- Building Profile Input Program (BPIP), USEPA, 1995
- SCREEN3 User's Guide September 1995
- AERMOD User's Guide September 2004, Addendum December 2006
- AERMAP User's Guide October 2004, Addendum December 2006
- AERMET User's Guide November 2004, Addendum December 2006
- AERMOD Implementation Guide dated January 9, 2008

The elements of the air quality impact analysis have been described in Section 2.3. The rest of this section describes the methodology of the air dispersion modeling and input data for the air dispersion model.

3.1 Air Dispersion Model

The latest version of USEPA's AERMOD (version 07026) air dispersion model was used for the air quality impact analysis. AERMOD is currently USEPA's regulatory approved air dispersion model for industrial sources as per Guidelines on Air Quality Models (Guideline), published in Appendix W to 40 CFR Part 51 (as revised).

AERMOD is a steady-state plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain. AERMOD tracks plume mass that penetrates into the elevated stable layer and then allows it to reenter the boundary layer when and where appropriate. For complex terrain, the plume is modeled as either impacting and/or following the terrain. The model calculates short-term and long-term concentration at selected receptor locations based on source emissions, meteorology and land use in the modeling domain. USEPA has recommended AERMOD to be used for modeling domain up to 50 km from a source.

The AERMOD modeling system includes companion pre-processors. AERMET for meteorological data processing and AERMAP for digital terrain processing) were used per EPA guidelines. Also, USEPA's AERMOD Implementation Guide dated January 9, 2008 was used in developing appropriate land use parameters for the model.

The regulatory default option was used (MODELOPT keyword in CO pathway) in the analysis per USEPA guidelines. The defaults options include:

- Use of elevated terrain algorithms requiring input of terrain data;
- Use of stack tip downwash (except for building downwash cases);
- Use of calms processing routines; and
- Use of missing data processing routines.

Since the site was considered rural, the default option of using a 4-hour life for exponential decay of SO_2 for urban sources was not relevant.

AERMOD requires several types of input data such as source emissions and locations (source parameters), meteorological data, land use data and receptor data for simulation of impact of emissions sources on ambient air. These input parameters are discussed in following sections.

3.2 *Source Parameters*

The emission points considered under various scenarios in the air dispersion modeling have been listed in Section 2.2. All of the proposed emission points were point sources with identified stacks venting the emissions to the atmosphere. This section describes the parameters required in AERMOD for point sources and the procedure for estimating the parameters.

Emission Rates: Emission rates were calculated using manufacturer's data where available. If not available, then USEPA's AP-42 emission factor database was used. For SO_2, a mass balance was used considering all sulfur bearing compounds converted 100 percent to SO_2. The details of the calculations are included in Appendix A. Table 3-1 summarizes the emission rates of modeled pollutants used in the analyses. For both gas turbines and flares, the short-term and annual average emission rates were the same and both set of control devices were used at full capacity of the units except for one flare possible used a 30 percent capacity to support the turbine operating scenario. These types of equipment typically run at full capacity since landfill gas generation can not be controlled. The CO emission rate was considered for 50 percent load for reasons explained in Section 3.2 below.

Table 3-1a: Interim Modeled Emission Rates

Pollutant	Averaging Period	Enclosed Flares[1] (lb/hr)	Open Flare (lb/hr)
NOx	Annual	-	4.7
CO	1-Hour	-	25.5
	8-Hour	-	25.5
SO_2	3-Hour	51.5	116.1
	24-Hour	51.5	116.1
	Annual	51.5	116.1
PM_{10}	24-Hour	-	1.1
	Annual	-	1.1

Notes:
1. For Interim scenario, only SO2 was required for PSD increment and NAAQS analysis. Therefore, emission rates of other pollutants are not included in this table.

Table 3-1b: BACT Modeled Emission Rates

Pollutant	Averaging Period	Enclosed Flares[1] (lb/hr)	Open Flares[2] (lb/hr)	LFG Turbines[3] (lb/hr)
NOx	Annual	5.4	6.7	31.1
CO	1-Hour	18.0	36.6	31.3
	8-Hour	18.0	36.6	31.3
SO_2	3-Hour	12.1	13.4	16.2
	24-Hour	12.1	13.4	16.2
	Annual	12.1	13.4	16.2
PM_{10}	24-Hour	1.4	1.5	2.2
	Annual	1.4	1.5	2.2

Notes:
1. For Alternative BACT scenarios
2. For Routine and Alternative BACT scenarios
3. For Routine BACT scenario

Stack Gas Parameters: Stack gas parameters included: i) stack gas exit temperature, and ii) stack gas exit velocity. These are discussed separately.

Stack gas exit temperatures for the enclosed flares and the turbines were obtained from manufacturer's information. For open flares, stack gas exit temperature could not be measured and was a function of the degree and rate of entrainment of ambient air in the flared gases. Ohio Environmental Protection Agency (OEPA) and Texas Commission on Environmental Quality (TCEQ) have guidelines for estimating stack gas temperature and flow rate from open industrial flares. Upon review, it was determined that the OEPA guidelines were more conservative and therefore it was used for the estimation of stack gas temperature. A copy of the guideline (Engineering Guide #69) is included in Appendix A. The guide assumed stack gas temperature of 1273 degrees Kelvin (K) for industrial flares.

Stack exit velocities for enclosed flares were obtained from stack gas flow rates and stack diameters. Stack gas flowrates for enclosed flares were obtained from combustion calculations of landfill gas flow rate through the flares and approximately at 230% excess air conditions, typical of enclosed landfill gas flares. Stack gas velocity for turbines was obtained from manufacturer's data. As per OEPA guide on flares described above, stack exit velocity of all open flares were considered as 20 meters per second (m/s) for modeling purposes.

Physical Stack Parameters: Physical stack parameters included: i) stack height, stack diameter; and stack location (coordinates). For enclosed flares and combustion turbines, the stack height and diameters were obtained from manufacturer's information.

The physical stack diameter and height were not considered (for air dispersion modeling purposes) for the open flares, as per the OEPA guide. Instead virtual stack diameter and stack height were calculated to be used for air dispersion modeling purposes. The virtual stack diameter was calculated from a buoyant flux based on a default stack temperature of 1273 K, a stack gas flow rate based on the buoyant flux, and the stack diameter based on a default stack exit velocity of 20 m/s. The virtual stack height was calculated as a function of total heat release in combustion of the gas. Details of the calculations are in Appendix A.

Stack coordinates for all flares and turbines were obtained from equipment layout and a digitized map of the facility. The stack locations were converted to NAD83 UTM coordinates for consistency with receptor coordinates. Table 3-2a-d shows the stack parameters used in the air dispersion modeling analysis.

Table 3-2a: Interim Modeled Stack Parameters

Control Device ID	Description	Location (UTM) Easting (m)	Location (UTM) Northing (m)	Stack Height (ft)	Stack Exit Gas Temperature (F)	Stack Velocity (ft/s)	Stack Diameter (ft)
CD001	Existing Enclosed Flare	530433.07	3023829.91	45	1,400	21.581	10.000
CD002	Existing Enclosed Flare	530433.07	3023836.01	45	1,400	21.581	10.000
CD004	Utility Flare 2 (odor)	530433.07	3023848.2	62.85	1,831.73	45.732	5.729

Table 3-2b: Routine BACT Modeled Stack Parameters

Control Device ID	Description	Location (UTM) Easting (m)	Location (UTM) Northing (m)	Stack Height (ft)	Stack Exit Gas Temperature (F)	Stack Velocity (ft/s)	Stack Diameter (ft)
CD003	Utility Flare 1 (backup)	530433.07	3023842.11	62.85	1,831.73	65.616	5.729
CD004	Utility Flare 2 (odor)	530433.07	3023848.2	62.85	1,831.73	21.872	5.729
CD011	Turbine 1	530470.48	3023713.24	50	894	58.68	8.371
CD012	Turbine 2	530470.48	3023719.33	50	894	58.68	8.371
CD013	Turbine 3	530470.48	3023725.43	50	894	58.68	8.371
CD014	Turbine 4	530470.48	3023731.53	50	894	58.68	8.371
CD015	Turbine 5	530470.48	3023737.62	50	894	58.68	8.371
CD016	Turbine 6	530470.48	3023743.72	50	894	58.68	8.371
CD017	Turbine 7	530470.48	3023749.81	50	894	58.68	8.371

Table 3-2c: Alternative BACT 1 Modeled Stack Parameters

Control Device ID	Description	Location (UTM) Easting (m)	Location (UTM) Northing (m)	Stack Height (ft)	Stack Exit Gas Temperature (F)	Stack Velocity (ft/s)	Stack Diameter (ft)
CD001	Existing Enclosed Flare	530433.07	3023829.91	45	1,400	38.084	10.000
CD002	Existing Enclosed Flare	530433.07	3023836.01	45	1,400	38.084	10.000
CD003	Utility Flare 1 (backup)	530433.07	3023842.11	62.85	1,831.73	65.616	5.729
CD004	Utility Flare 2 (odor)	530433.07	3023848.2	62.85	1,831.73	65.616	5.729
CD005	Utility Flare 3	530433.07	3023854.3	62.85	1,831.73	65.616	5.729
CD006	Utility Flare 4	530433.07	3023860.39	62.85	1,831.73	65.616	5.729
CD007	Utility Flare 5	530433.07	3023866.49	62.85	1,831.73	65.616	5.729
CD008	Utility Flare 6	530433.07	3023872.59	62.85	1,831.73	65.616	5.729
CD009	Utility Flare 7	530433.07	3023878.68	62.85	1,831.73	65.616	5.729
CD010	Utility Flare 8	530433.07	3023884.78	62.85	1,831.73	65.616	5.729

Table 3-2d: Alternative BACT 2 Modeled Stack Parameters

Control Device ID	Description	Location (UTM) Easting (m)	Location (UTM) Northing (m)	Stack Height (ft)	Stack Exit Gas Temperature (F)	Stack Velocity (ft/s)	Stack Diameter (ft)
CD018	Utility Flare 9 (replaces enclosed flare)	530433.07	3023829.91	62.85	1,831.73	65.616	5.729
CD019	Utility Flare 10 (replaces enclosed flare)	530433.07	3023836.01	62.85	1,831.73	65.616	5.729
CD003	Utility Flare 1 (backup)	530433.07	3023842.11	62.85	1,831.73	53.687	5.729
CD004	Utility Flare 2 (odor)	530433.07	3023848.2	62.85	1,831.73	65.616	5.729
CD005	Utility Flare 3	530433.07	3023854.3	62.85	1,831.73	65.616	5.729
CD006	Utility Flare 4	530433.07	3023860.39	62.85	1,831.73	65.616	5.729
CD007	Utility Flare 5	530433.07	3023866.49	62.85	1,831.73	65.616	5.729
CD008	Utility Flare 6	530433.07	3023872.59	62.85	1,831.73	65.616	5.729
CD009	Utility Flare 7	530433.07	3023878.68	62.85	1,831.73	65.616	5.729
CD010	Utility Flare 8	530433.07	3023884.78	62.85	1,831.73	65.616	5.729

3.3 Load Analysis

For many emission points, the operating load has impact on the emissions and also on the stack gas parameters. As such, the ambient impact might vary at different loads. For the proposed emission points, this analysis was relevant only for the combustion turbines, in which emission rates for CO and NOx varied at varying loads. The flares were considered to operate always at full load as per common practice in landfills, and therefore, the flares were not included in load analysis.

The analysis was conducted at 100%, 75%, and 50% of the operating load for a single turbine. Estimated stack gas flow parameters and emission rates were obtained from the manufacturers. The analysis was performed using USEPA's SCREEN3 model (version 96043). Technically, with USEPA's discontinuation of the ISCST3 model, the SCREEN3 model was also discontinued by USEPA, and a new screening level model AERSCREEN was to be used instead. However, USEPA did not issue a final version of AERSCREEN at the time of this report. With concurrence from FDEP, the SCREEN3 model was used therefore in this screening level analysis.

The results of the analysis are shown in Table 3-3. Model runs are included in Appendix D. While NOx impacts were highest at full load, carbon monoxide was determined to have maximum ground-level impact at partial load of 50%. This operating load was considered for CO in subsequent air dispersion modeling analysis.

Table 3-3: Load Analysis for LFG Turbines

Pollutant	Averaging Period	100% Load (ug/m^3)	75% Load (ug/m^3)	50% Load (ug/m^3)
NOx	1-hour	28.73	18.17	12.99
CO	1-hour	29.15	21.06	39.53

3.4 Building Downwash Analysis

A Good Engineering Practice (GEP) stack height evaluation was conducted for the buildings and structures near the emission points to determine the potential for aerodynamic downwash. The analysis followed the guidance established in USEPA's Guidelines for Determination of Good Engineering Practice Stack Height (USEPA 1995a). The procedure is described in the following section.

As per "Guidelines for Determination of Good Engineering Practice Stack Height" (USEPA, 1995a), the maximum horizontal extent (H_x) of the aerodynamic downwash from a building/structure (in meters) is given by:

$$H_x = 5L$$

where,

H_x = Maximum horizontal extent of aerodynamic downwash in meters
L = Lesser of the height of the building/structure (H_g) and maximum projected width (W_p) in meters.

The maximum projected width of a rectangular building/structure is the diagonal. For a circular structure (such as cylindrical tanks, stacks), the maximum projected width is the diameter.

The next step of the analysis is to determine if the flare and turbine stacks were above the vertical extent of aerodynamic downwash from the buildings/structure, also known as the GEP stack height. This is the minimum height of a stack in the vicinity of buildings/structures to avoid aerodynamic downwash. The GEP stack height as expressed in the aforementioned USEPA document is:

$$H_g = H_b + 1.5L$$

where,

H_g	=	GEP Stack height in meters
H_b	=	Height of building/structure in meters
L	=	Lesser of the height or maximum projected width of the building/structure in meters.

The buildings used in the analysis are shown in Table 3-4. Locations of these buildings are shown in Figure 2-2B. There were no appreciable structures at the site for aerodynamic downwash.

Table 3-4: Buildings/Structures Considered for Aerodynamic Downwash

Building Name	Southwest Corner UTM (Northing/Easting) (m)	Building Height (m/ft)	Building Length (m)	Building Width (m)
Turbine Building	530468.95 / 3023710.19	7.62/25	126	58
Maintenance Building	530397.28 / 3023696.5	7.62/25	31	29

The building downwash potential was analyzed using USEPA's Building Profile Input Program (BPIP) version 04274 which using the latest PRIME algorithms. The output of the BPIP-PRIME is included in Appendix D. The output was integrated in the AERMOD input file to account for building downwash.

3.5 Meteorological Data

Five years of preprocessed meteorological data from the nearest representative National Weather Service (NWS) station was received from FDEP for use in this analysis. The surface data was for latest five years 2001-2005 from West Palm Beach Airport (Station ID: 12844) and upper air data was for the same period from West Palm Beach Airport (Station ID: 92830). The locations of the meteorological stations are shown in Figure 3-1. As directed by FDEP, Shaw used the pre-processed data for the analysis.

From information gathered from FDEP, AERMET (version 06341) was used for processing the meteorological data. Wind roses for each year of surface meteorological data are shown in Figures 3-2A to 3-2F. The data capture was determined to be 99.1% in 2001, 99.1% in 2002, and 100% for 2003-2005. Since these data capture meets EPA goals of at least 90%, no further data filling was performed.

The AERMET pre-processor requires the user to specify land use based parameters such as albedo, bowen ratio, and surface roughness. These values are typically used for each season and various wind sectors. FDEP determined that seasonal values were not practical for south Florida and therefore single values were used for all seasons. Sector averaged values used by FDEP for these parameters are included in the AERMET processed file sent to Shaw for the modeling analysis.

3.6 Receptor Layout

FDEP guidance was followed in generating receptor grids to determine the maximum impact of proposed source emissions on ambient air quality. The receptors used in the analysis were as follows:

Property Line Receptors:

These receptors were located all along the property boundary of the facility at a 100 meters spacing. The receptor layout is graphically shown in Figures 3-3A to 3-3D.

Preliminary Impact Analysis Receptors:

A Cartesian grid was used for locating receptors outside the property boundary for the preliminary analysis in determining the significance of impact of pollutants from the proposed emissions points. The receptor coverage utilized for this analysis consisted of the following:

- 100-meter spaced receptors to a distance of 500 kilometers from the fenceline (fine grid),
- 250-meter spaced receptors to a distance of 1000 meters from the fenceline (fine grid),
- 500-meter spaced receptors to a distance of 5000 meters from the fenceline (medium grid),
- 1000-meter spaced receptors to a distance of 10000 meters from the fenceline (medium grid), and
- 5000-meter spaced receptors beyond distance of 10000 meters from the fenceline (coarse grid).

A total of approximately 3600 receptors were included in this analysis.

The United States Geological Service (USGS) digital elevation maps (DEM) data for terrain within 50 kilometers of the facility were based on the NAD83 datum and in UTM Zone 17. Therefore, the NAD83 datum was used for the receptor UTM coordinates. Bowman Environmental Inc.'s "BEE-Line BEEST for Windows, V9.65" was used for calculating (interpolating) the terrain elevations for this analysis

The receptor layout is graphically shown in Figure 3-3A to 3-3D.

Full Impact Analysis Receptors:

The AAQS and PSD increment compliance demonstrations are required only at locations within the radius of impact area. In order to reduce computation time (for 3600 receptors and five years of meteorological data), these significance level receptors identified during the preliminary impact analyses were separated in a receptor file and used for refined analyses for AAQS and PSD compliance demonstration. The separate receptor files were used for each pollutant since the significance levels and significance level area coverage were different for each pollutant. As described later in Section 4.0, only NO_2 and SO_2 required full impact analysis. Figures 3-4A through 3-4C show the significance level receptors used in refined analysis for SO_2 for the Interim Scenario. Figures 3-5A through 3-5D show the significance level receptors used in refined analysis for NO_2 and SO_2 for the Routine BACT Scenario. Figures 3-6A through 3-6D show the significance level receptors used in the refined analysis for NO_2 and SO_2 for the Alternative BACT Scenario 1. Figures 3-7A through 3-7D show the significance level receptors used in the refined analysis for NO_2 and SO_2 for the Alternative BACT Scenario 2.

3.7 NOx to NO_2 Conversion

The NOx emission rates were used in the air dispersion modeling. Since the AAQS and PSD increments are based on NO_2, the national default NOx to NO_2 conversion factor of 75 percent was applied to the predicted impacts at receptors.

3.8 Terrain Data

The terrain data was processed with AERMAP, a preprocessor of AERMOD modeling system. Digital elevation maps (DEMs) of 7.5 minute quadrangle was used for area of 25 km from the source in all directions in the AERMAP, which developed characteristics of the planetary boundary layer (PBL) based on similarity theory. The heights of receptors were not required to be input in AERMOD separately.

4.0 Air Quality Analysis

This section contains the results of the ambient air quality impacts analyses. All modeling input and output files are included in electronic form on computer disks supplied as Appendix D in this report.

The details of the analysis are included in following sections. In summary, results of this modeling analysis revealed no anticipated adverse effects resulting from this project. There were no exceedances of Federal and FDEP standards as demonstrated in the AAQS analysis and PSD Class II increment analysis. In addition, the project was not expected to have an adverse effect on growth, animals, vegetation, soils, or visibility.

4.1 Preliminary Analysis

In the preliminary analysis, the impact of the proposed emission points on ambient air quality was estimated to determine if these pollutants have "significance level" impact, which required full impact analysis. The analysis was also used to determine if pre-application monitoring was required for the project.

The preliminary analysis includes emissions from proposed modification only. For the Interim scenario, one (1) new open flare, operating at 2,300 scfm was considered for the preliminary analysis. For the Alternative BACT operating scenario 1, the emissions from the proposed modification, eight (8) new open flares, were considered in the analysis. For the Alternative BACT operating scenario 2, the emissions from the proposed modification, ten (10) new open flares, were considered in the analysis (2 new open flares replace the existing enclosed flares). For the routine BACT operating scenario, the two existing enclosed flares each at 3,000 scfm (total 6,000 scfm) would be replaced by seven (7) new LFG turbines each at 4,000 scfm, one open flare at 3,300 scfm and one open flare operating at 30-percent capacity at 1,100 scfm for a total fuel throughput of 32,400 scfm. The existing flares will be on-site as emergency but will not run under this turbine BACT scenario (If they do run due to a outage in the turbines, their emission rates for all criteria pollutants, with the exception of CO, are lower than the turbines on a scfm of LFG basis).

Thus, the new emissions are from additional 26,700 scfm (32,400 scfm – 5,700 scfm). Thus, the net emission change (projected allowable or potential – baseline actual) is calculated as follows:

$$E_{net} = E_{BACT} - E_{existing}$$

Where

E_{net} = Net emission increase

E_{BACT} = Potential emissions from 7 turbines and 1.3 new flares, total 32,400 scfm LFG

And for the pollutant CO:

E_{BACT} = Potential emissions from 8 new open flares, total 32,400 scfm LFG

$E_{existing}$ = Actual emissions from 2 existing flares, total 5,700 scfm LFG

The emission increases and decreases are from two different types of sources (turbines vs. flares) which are located at two different locations in the facility; so the net emission increase could not be used directly in the model. Since the preliminary analysis is used for determination of ambient impact only, the following method was used in the preliminary analysis.

- AERMOD was run with 7 new turbines and 1 new flare with their full potential emissions and 1 new flare operated at 30-percent capacity (i.e. at total E_{BACT}); and
- In the same run, the existing flares were added as negative emission points with total negative emissions equal to $E_{existing}$

This way, we will have the net ambient impact of the net emissions and we will compare that with the "significance level" concentrations. Concurrence from FDEP was obtained for this approach.

Table 4-1 summarizes the maximum predicted ground-level concentrations (H1H) and the corresponding PSD/AAQS significance concentration levels for all pollutants for the interim scenario, the routine BACT scenario, the alternative BACT scenario 1, and the alternative BACT scenario 2, respectively.

Preliminary modeling results predicted CO and PM10 concentrations below the significance levels for all scenarios. The maximum predicted off-property SO_2 (3-hour, 24-hour, and annual) concentrations were greater than respective significance level concentrations for all operating scenarios. The maximum predicted off-property NO_2 (annual) concentration was greater than respective significance level concentrations for the Routine BACT and Alternative BACT scenarios. Refined modeling analyses were conducted for these pollutants.

Table 4-1: Significance Analysis Results

Scenario	Pollutant	Averaging Period	Maximum Predicted Concentration (H1H)	PSD/AAQS Signifiance Level	Exceeds Significance Level Concentration?	Area of Significant Impact (AOI)
			µg/m³	µg/m³	Yes/No	km
Interim[(1)]	NO_2	Annual	0.23	1	No	NA
	CO	1-Hour	19.16	2000	No	NA
		8-Hour	14.95	500	No	NA
	PM10	24-Hour	0.51	5	No	NA
		Annual	0.07	1	No	NA
	SO_2	3-Hour	81.66	25	Yes	1.4
		24-Hour	53.58	5	Yes	3.2
		Annual	7.57	1	Yes	2.0
Routine BACT	NO_2	Annual	6.63	1	Yes	2.6
	CO	1-Hour	136.62	2000	No	NA
		8-Hour	109.39	500	No	NA
	PM10	24-Hour	4.74	5	No	NA
		Annual	0.63	1	No	NA
	SO_2	3-Hour	56.59	25	Yes	1.1
		24-Hour	34.92	5	Yes	2.5
		Annual	4.65	1	Yes	1.7
Alternative BACT 1	NO_2	Annual	2.09	1	Yes	1.1
	CO	1-Hour	188.35	2000	No	NA
		8-Hour	151.97	500	No	NA
	PM10	24-Hour	4.70	5	No	NA
		Annual	0.62	1	No	NA
	SO_2	3-Hour	62.86	25	Yes	1.1
		24-Hour	41.95	5	Yes	2.5
		Annual	5.58	1	Yes	1.7
Alternative BACT 2	NO_2	Annual	2.29	1	Yes	1.2
	CO	1-Hour	210.67	2000	No	NA
		8-Hour	171.17	500	No	NA
	PM10	24-Hour	4.89	5	No	NA
		Annual	0.67	1	No	NA
	SO_2	3-Hour	65.02	25	Yes	1.2
		24-Hour	43.65	5	Yes	3.0
		Annual	5.98	1	Yes	1.9

(1) The results of interim scenario are provided per request of FDEP

4.2 *Pre-Application Monitoring Requirement Analysis*

The preliminary analysis results were also used to determine if pre-application monitoring was required for the pollutant which exceeded the significance level concentration, namely NO_2 and SO_2. The monitoring data is used to develop background concentrations for determination of compliance with AAQS. Pre-application monitoring is required if: i) maximum off-site predicted concentration exceeds PSD monitoring significance concentration and ii) there are no monitoring data available in the modeling region.

Table 4-2 summarizes the maximum predicted ground-level concentrations (H1H) and compares them with the PSD monitoring significance levels for the interim, routine BACT and alternative BACT scenarios, respectively. The results indicated that only SO_2 (24-hour average) was above the monitoring significance level for all operating scenarios. However, pre-application monitoring was not required for these pollutants because several monitoring sites were available in the modeling region and extensive monitoring data were available from these monitors. The issue of background monitoring concentration is separately discussed in Section 4.4.

Table 4-2: PSD Monitoring Requirement Analysis Results

Scenario	Pollutant	Averaging Period	Maximum Predicted Concentration (H1H)	PSD Monitoring Significance	Above Significance Level?
			? g/m³	µg/m³	Yes/No
Interim[1]	NO_2	Annual	0.23	14	No
	PM10	24-Hour	0.51	10	No
	CO	8-Hour	14.95	575	No
	SO_2	24-Hour	53.58	13	**Yes**
Routine BACT	NO_2	Annual	6.63	14	No
	PM10	24-Hour	4.74	10	No
	CO	8-Hour	109.39	575	No
	SO_2	24-Hour	34.92	13	**Yes**
Alternative BACT 1	NO_2	Annual	2.09	14	No
	PM10	24-Hour	4.70	10	No
	CO	8-Hour	151.97	575	No
	SO_2	24-Hour	41.95	13	**Yes**
Alternative BACT 2	NO_2	Annual	2.29	14	No
	PM10	24-Hour	4.89	10	No
	CO	8-Hour	171.17	575	No
	SO_2	24-Hour	43.65	13	**Yes**

(1) The results of interim scenario are provided per request of FDEP

The Facility is located in the federally designated Southeast Florida Intrastate Air Quality Control Region and is currently in attainment of all ambient air quality standards. Ambient air quality data for Florida are available from a monitoring network operated by the Florida Department of Environmental Protection (FDEP), Division of Air Resource Management. Monitoring data on the criteria pollutants are collected at many sites within the state. These monitoring data are obtained for the years 2004 through 2006 from the DEP "Quick Look Reports" web site.

The monitoring station in Riviera Beach, Palm Beach County was used for SO_2, background data as it is the most representative of the Okeechobee Landfill due to its relative proximity to the station compared to all other stations. The monitoring station in Fort Pierce, St. Lucie County was used for NO_2 background data. These were the closest monitoring sites to Okeechobee.

The highest annual average and highest second highest short term average concentrations (i.e. 3, and 24 hours) for the period 2004 through 2006 were used to obtain the necessary background pollutant concentrations for this analysis. These background concentrations are shown in Table 4-3.

Table 4-3: Background Concentrations Used for AAQS Analysis

Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$)
NO_2	Annual	20.95
SO_2	3-Hour	8.57
SO_2	24-hour	8.57
SO_2	Annual	3.43

Notes: The background concentrations for SO_2 and NO_2 were obtained from FDEP monitoring stations in Riviera Beach, Palm Beach County and Fort Pierce, St. Lucie County, respectively.

4.3 Full Impact Analysis

Guidance from the USEPA's *Guidance on Air Quality Models* (40 CFR 51, Appendix W) was followed in selecting the predicted concentrations used to determine compliance with the AAQS and PSD increment consumption limits. The guidelines state that "the design concentration based on the highest, second-highest short term concentration or the highest long term concentration...should be used to determine emission limitations to assess compliance with the AAQS and PSD increments" for SO_2, PM10, CO, Pb, and NO_2 (§8.2.1.1). Therefore, the "2nd" highest output was selected for the short-term analysis and the "1st" highest output was selected for the annual analyses. Table 4-4 shows the design concentration used for the various analyses.

Table 4-4: Design Concentrations for Full Impact Analyses

Pollutant	Refined Model	Averaging Time	Design Concentration
SO_2	AAQS	3-hr	H2H(1)
		24-hr	H2H
		Annual	H1H(2)
SO_2	Increment	3-hr	H2H
		24-hr	H2H
		Annual	H1H
NO_2	AAQS	Annual	H1H
	Increment	Annual	H1H

(1) H2H = Highest of 2nd high of each of 5 years of meteorological data
(2) H1H = Highest of 1st high of each of 5 years of meteorological data

4.3.1 Full Impact Analysis Receptors

The AAQS and PSD increment compliance demonstrations are required only at locations within the radius of impact area. In order to reduce computation time (for 3,600 receptors and five years of meteorological data), these significance level receptors identified during the preliminary impact analyses were separated in a receptor file and used for refined analyses for AAQS and

PSD compliance demonstration. The separate receptor files were used for each pollutant since the significance levels and significance level area coverage were different for each pollutant. Figures 3-4A through 3-7D show the significance level receptors used in refined analysis.

4.3.2 PSD Class II Increment Compliance Demonstration

For the full impact analysis, the model included: i) the proposed emission sources; ii) the existing on-site sources; and iii) off-site PSD increment inventory sources. The Facility has no existing sources of SO_2 and NO_2 emissions except for the two enclosed flares used for interim operating scenario and alternative BACT operating scenarios. There are few small generators in the Facility with capacity ranging from 20 kilowatt (kW) to 360 kW, which are operated infrequently. The emissions of SO_2 and NO_2 from these generators are insignificant to the flares and LFG turbines. Per discussions with FDEP, these emission sources were not required to be included in the modeling.

The off-site PSD source inventory was obtained from FDEP and is included in Appendix C. Per guidance from FDEP, emission sources in this inventory with allowable source emissions in tons per year less than 20 times the distance in km (i.e. E <20D) were eliminated from the modeling, as long as they were not within the site's radius of impact area, since these emission sources would have insignificant impact in the modeling domain. The revised off-site PSD source inventory is also included in Appendix C. The FDEP database also provided the source parameter and location for these emission sources. The FDEP also provided actual SO2 emissions from their Acid Rain database, which were used in the PSD Class II Increment analyses. These actual emissions are shown in Appendix C as well.

Table 4-5 shows the emission sources modeled for PSD Class II increment compliance for the various operating scenarios. The interim scenario was modeled per request of FDEP and for informational purposes only.

Table 4-5: Emission Sources Modeled for PSD Class II Increment Compliance

Scenario Modeled	New Emission Sources in Proposed modification	Existing On-site Emission Sources	Off-Site AAQS Inventory Emission Sources	Off-Site PSD Inventory Emission Sources
Interim	One new open flare (CD004)	Two enclosed flares (CD001 and CD002)	8 SO_2 emission sources from FDEP inventory	3 SO_2 emission sources from FDEP inventory
Routine BACT	7 LFG Turbines (CD011 to CD017); 2 open flares (CD003 and CD004)	None	8 SO_2 and 8 NOx emission sources from FDEP inventory	3 SO_2 and 5 NOx emission sources from FDEP inventory
Alternative BACT 1	8 proposed open flares (CD003 to CD010)	Two enclosed flares (CD001 and CD002) operating with BACT limits	8 SO_2 and 9 NOx emission sources from FDEP inventory	3 SO_2 and 5 NOx emission sources from FDEP inventory
Alternative BACT 2	10 proposed open flares (CD003 to CD010, CD0018, and CD0019)	None	8 SO_2 and 9 NOx emission sources from FDEP inventory	3 SO_2 and 5 NOx emission sources from FDEP inventory

The off-property source parameters that are included in the AAQS and PSD Increment modeling are shown in Table 4-6A through 4-6D.

Table 4-6A: Off-Property SO2 Sources Modeled for AAQS Analysis

Modeled Source ID	Description	Location (UTM) Easting (m)	Location (UTM) Northing (m)	Stack Height (ft)	Stack Exit Gas Temp. (F)	Stack Velocity (ft/s)	Stack Diameter (ft)	3-hr SO2 Emission Rate (lb/hr)	24-hr SO2 Emission Rate (lb/hr)	Annual SO2 Emission Rate (lb/hr)
OP1	City of Vero Beach, Unit No.1	561400	3056500	200	289	105.5	3.5	230.2	230.2	230.2
OP2	Ft Pierce Utilities Authority, Unit #9	566120	3036350	68	426	59.8	11.2	319.51	319.51	319.51
OP3	City of Vero Beach, Unit No. 2	561400	3056500	200	347	137.2	3.5	399.5	399.5	399.5
OP4	City of Vero Beach, Unit No. 4	561400	3056500	200	283	77.7	7	548	548	548
OP5	Indiantown Cogeneration, L.P., Main Boiler	547650	2990700	213.25	140	93.2	16	582	582	582
OP6	City of Vero Beach, Unit No. 3	561400	3056500	200	342	68.6	6	1127.5	1127.5	1127.5
OP7	FPL Martin Power Plant, Unit #1	542680	2992650	213.25	338	43.1	36	6920	6920	6920
OP8	FPL Martin Power Plant, Unit #1	542680	2992650	213.25	338	43.1	36	6920	6920	6920

Table 4-6B: Off-Property SO2 Sources Modeled for PSD Increment Analysis

Modeled Source ID	Description	Location (UTM) Easting (m)	Location (UTM) Northing (m)	Stack Height (ft)	Stack Exit Gas Temp. (F)	Stack Velocity (ft/s)	Stack Diameter (ft)	3-hr SO2 Emission Rate (lb/hr)	24-hr SO2 Emission Rate (lb/hr)	Annual SO2 Emission Rate (lb/hr)
OP5	Indiantown Cogeneration, L.P., Main Boiler	547650	2990700	213.25	140	93.2	16	586	586	586
OP7	FPL Martin Power Plant, Unit #1	542680	2992650	213.25	338	43.1	36	5980.0	4408.5	1699.9
OP8	FPL Martin Power Plant, Unit #1	542680	2992650	213.25	338	43.1	36	5980.0	4408.5	1699.9

Table 4-6C: Off-Property NOx Sources Modeled for AAQS Analysis

Modeled Source ID	Description	Location (UTM) Easting (m)	Location (UTM) Northing (m)	Stack Height (ft)	Stack Exit Gas Temp. (F)	Stack Velocity (ft/s)	Stack Diameter (ft)	Annual NOx Emission Rate (lb/hr)
OP0[1]	City of Vero Beach, Unit 4	561400	3056500	200	283	77.7	7	205.5
OP1	City of Vero Beach, Unit 3	561400	3056500	200	342	68.6	6	222.7
OP2	Indiantown Cogeneration, L.P., Main Boiler	547650	2990700	213.25	140	93.2	16	582
OP3	FPL Martin Power Plant, CT3A	542680	2992650	213	280	128.4	20	461
OP4	FPL Martin Power Plant, CT3B	542680	2992650	213	280	128.4	20	461
OP5	FPL Martin Power Plant, CT4A	542680	2992650	213	280	128.4	20	461
OP6	FPL Martin Power Plant, CT4B	542680	2992650	213	280	128.4	20	461
OP7	FPL Martin Power Plant, Unit #1	542680	2992650	213.25	338	43.1	36	2595
OP8	FPL Martin Power Plant, Unit #2	542680	2992650	213.25	338	43.1	36	2595

(1) Source OP0 is only used in the Alternative BACT modeling scenarios. Source OP0 is not required for the Routine BACT scenario.

Table 4-6D: Off-Property NOx Sources Modeled for PSD Increment Analysis

Modeled Source ID	Description	Location (UTM) Easting (m)	Location (UTM) Northing (m)	Stack Height (ft)	Stack Exit Gas Temp. (F)	Stack Velocity (ft/s)	Stack Diameter (ft)	Annual NOx Emission Rate (lb/hr)
OP2	Indiantown Cogeneration, L.P., Main Boiler	547650	2990700	213.25	140	93.2	16	582
OP3	FPL Martin Power Plant, CT3A	542680	2992650	213	280	128.4	20	461
OP4	FPL Martin Power Plant, CT3B	542680	2992650	213	280	128.4	20	461

Modeled Source ID	Description	Location (UTM) Easting (m)	Location (UTM) Northing (m)	Stack Height (ft)	Stack Exit Gas Temp. (F)	Stack Velocity (ft/s)	Stack Diameter (ft)	Annual NOx Emission Rate (lb/hr)
OP5	FPL Martin Power Plant, CT4A	542680	2992650	213	280	128.4	20	461
OP6	FPL Martin Power Plant, CT4B	542680	2992650	213	280	128.4	20	461

The results of the PSD Increment modeling are shown in Table 4-7 for the routine BACT operating scenario and the alternative BACT operating scenarios. Since PSD increments are relevant to the "modifications" (or new sources) after BACT implementation, the interim scenario (existing conditions) was not included in the PSD increment consumption analysis. The details of the model runs are included in Appendix D. The results showed that PSD Class II increments were not exceeded for any pollutant for any averaging time in any scenario.

Table 4-7: PSD Increment Consumption Analysis Results

Scenario	Pollutant	Averaging Period	Maximum Predicted Concentration from Increment Consuming Project and Non-Project Sources	PSD Increment Consumption Limit	Percent of PSD Increment Consumed at Maximum Concentration	Exceed PSD Increment?
			µg/m³	µg/m³	%	Yes/No
Routine BACT	NO_2	Annual(1)	7.00	25	28.02%	No
	SO_2	3-Hour(2)	60.30	512	11.78%	No
		24-Hour(2)	36.82	91	40.47%	No
		Annual(1)	5.69	20	28.43%	No
Alternative BACT 1	NO_2	Annual(1)	2.54	25	10.15%	No
	SO_2	3-Hour(2)	74.87	512	14.62%	No
		24-Hour(2)	45.04	91	49.50%	No
		Annual(1)	6.79	20	33.97%	No
Alternative BACT 2	NO_2	Annual(1)	2.72	25	10.87%	No
	SO_2	3-Hour(2)	75.77	512	14.80%	No
		24-Hour(2)	45.80	91	50.33%	No
		Annual(1)	7.16	20	35.81%	No

(1) H1H annual results
(2) H2H results

4.3.3 AAQS Compliance Demonstration

The AAQS modeling was similar to the PSD increment modeling except that: i) AAQS inventory emission sources obtained from FDEP were used instead of PSD inventory emission sources; and ii) background concentration was added to modeled concentration for comparison with AAQS.

As explained in Section 4.2, pre-application monitoring was not conducted for the project since adequate data were available for background concentration. The background concentrations used for AAQS compliance demonstrations are shown in Table 4-3 above.

Table 4-8 shows the results of AAQS modeling for the interim operating scenario, the routine BACT operating scenario, and the alternative BACT operating scenarios, respectively. The results show that the AAQS was not exceeded for any pollutant for any averaging time all scenarios.

Table 4-8: AAQS Analysis Results

Scenario	Pollutant	Averaging Period	Maximum Predicted Concentration from Project and Non-Project Sources	Background Concentration	Maximum Predicted Concentration from Project, Non-Project, and Background Sources	AAQS	Percent of AAQS at Location of Maximum Concentration	Exceed AAQS with Monitored Concentrations ?
			$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	%	Yes/No
Interim(1)	SO_2	3-Hour(3)	159.45	8.57	168.02	1300	12.92%	No
		24-Hour(3)	92.41	8.57	100.98	260	38.84%	No
		Annual(2)	15.25	3.43	18.68	60	31.13%	No
Routine BACT	NO_2	Annual(2)	7.20	20.95	28.15	100	28.15%	No
	SO_2	3-Hour(3)	60.31	8.57	68.88	1300	5.30%	No
		24-Hour(3)	36.87	8.57	45.44	260	17.48%	No
		Annual(2)	6.32	3.43	9.75	60	16.25%	No
Alternative BACT 1	NO_2	Annual(2)	2.74	20.95	23.68	100	23.68%	No
	SO_2	3-Hour(3)	74.89	8.57	83.46	1300	6.42%	No
		24-Hour(3)	45.13	8.57	53.70	260	20.65%	No
		Annual(2)	7.43	3.43	10.86	60	18.10%	No
Alternative BACT 2	NO_2	Annual(2)	2.92	20.95	23.86	100	23.86%	No
	SO_2	3-Hour(3)	75.78	8.57	84.35	1300	6.49%	No
		24-Hour(3)	45.85	8.57	54.42	260	20.93%	No
		Annual(2)	7.80	3.43	11.22	60	18.71%	No

(1) The results of interim scenario are provided per request of FDEP
(2) H1H annual results
(3) H2H results

5.0 *Additional Impact Analysis*

The additional impact analyses include: i) Class I area impact analysis for visibility and AQRVs; ii) analysis of growth in the significant impact area and its effect on air quality; iii) impact of proposed modifications on soils, vegetation, and wildlife in the significant impact area; and iv) impact on visibility in the significant impact area. These analyses are described in this section.

5.1 *Class I Area Air Quality Analysis*

Class I areas are areas of special national or regional value from a natural, scenic, recreational, or historic perspective. Adverse impacts on Class I areas are prevented by:

iii) Ensuring that Class I area increments are not exceeded; and

iv) Ensuring that the air quality related values (AQRVs) in the Class I areas are not significantly affected.

Typically, Class I area within 100 km of the proposed source or modification is considered in the analysis. Currently, due to current emphasis in improving visibility in Class I areas via the Regional Haze Rule, Class I areas at greater distances are also being included in the analysis.

The Federal Class I area nearest to the source is the Everglades National Park in South Florida, Located approximately 169 kilometers from the facility's southern most property line. The Biscayne Bay National Park and Big Cypress National Preserve are Class II areas; however, they are considered important relative to air pollution impacts and are also considered in the analyses.

The Class I area air quality analysis is conducted in two phases as follows:

iv) Significant Impact Analysis: the net emissions increase from project is used in determining the air quality impact in the Class I area and is then compared to the Class I area significance levels concentration. The Draft New Source Review Workshop Manual (1990) lists Class I significance level concentration as 1 ug/m^3 for 24-hour average for all pollutants with NAAQS. USEPA has subsequently proposed lower significance level concentrations. The proposed levels have not been officially promulgated as part of the PSD review process. However, FDEP has accepted the use of these significance level concentration for Class I areas.

If the project's air quality impact does not exceed the Class I significance level concentration, then no further air quality analyses is required.

v) Class I area Increment and AQRV Analysis: These analyses are needed if the project's air quality impact exceeds the Class I area significance level concentration. The impact from the project can not exceed the Class I PSD increments.

vi) AQRV Analysis: The AQRV analysis is required for submission to Federal land Managers (FLM) who are charged with affirmative responsibility to protect the AQRVs. The AQRVs vary with the Class I area being considered. Based on discussions with the National Park Service (NPS), the AQRVs to be considered for the Everglades NP, Biscayne Bay NP, and Big Cypress National Preserve are: i) deposition of total nitrates and sulfates; ii) visibility degradation; and iii) impact of ozone on vegetations. The results of these analyses are submitted to NPS for AQRV analyses. Since the VOC emissions (PSD surrogate for ozone) did not exceed the significant emission rate, ozone impact assessment is not required for this project.

The CALPUFF modeling system, with associated processors such as CALMET, CALPOST and POSTUTIL, were used for the Class I area impact analysis. Both the routine BACT and alternative BACT scenarios were modeled. The modeling followed USEPA and NPS guidance in following documents:

- Interagency Workgroup on Air Quality Models (IWAQM) Phase 2 Summary report in Modeling Long Range Transport Impacts (USEPA,1998), commonly referred to as IWAQM Phase 2 Report;
- Federal Land Manager's Air Quality Related Values Workgroup, Phase I Report (12/00), commonly referred to as the FLAG Document.

Meteorological data was received from FDEP in MM5 format for 2001, 2002, and 2003 for the subdomain 5 of VISTAS, in which the source and the receptors are located.

A protocol for the Class I impact analysis has been submitted to the Federal Land Manager (FLM). Subject to approval of this protocol, the results of the modeling indicated that:

- The ambient air quality impacts were less than both the current and proposed the Class I significance level concentrations. Thus, Class I PSD increment analysis was not required.

- The total nitrogen and total sulfate depositions for all years were lower than the NPS deposition analysis threshold (DAT) of 0.01 Kg/ha-yr

- The visibility impairment was less than 5% of the background in all 24-hour periods in 2001, 2002, and 2003.

5.2 Growth Analysis

Rule 62.212.400(3)(h)(5), F.A.C. requires an in-depth growth analysis in a PSD permitting review if the project is expected to result in significant shifts in population or if it could result in population increases on the order of thousands within the areas of significant impact of the project's emissions. The proposed project will be implemented over a period of 50 years and is not expected to create jobs sufficient to trigger the requirement for an in-depth growth analysis and is not expected to significantly increase the emissions of air contaminants from secondary sources. No additional industrial, commercial or residential growth is expected from this project, which will require 1 or 2 personnel only for operation of the new equipment. Neither any additional mobile source emissions are expected due to the proposed emission sources. Therefore, no air quality impact is predicted from the growth associated with the project.

Rule 62.212.400(3)(h)(5), F.A.C. also requires the application to include air quality impacts of, and the nature and extent of general, residential, commercial, industrial, and other growth that has occurred since August 7, 1977, in the area the modification would affect. As shown in the Figures 3-4 and 3-5, the area of impact from this modification is only few kilometers from the facility boundary. This is primarily rural farmland with no other residential, commercial, industrial or other growth. Therefore, there is no air quality impact from growth in this area of impact.

5.3 *Analysis of Impact on Soil Vegetation and Wildlife*

According to USDA Soil Survey, three types of soils are found in the vicinity of the Facility: Terra Ceia muck, tidal; and Pennsuco marl, tidal. There are no significant urban developments in this area. The natural vegetations are black and red mangroves. There are no known wildlife or endangered species within the impact area from this proposed modification.

The background air concentration for SO_2 and NO_2 are both well below the secondary NAAQS levels. This is applicable for both the interim scenario and the BACT scenarios. These levels will not be exceeded due to operation of interim scenario and for addition of the new sources in the proposed modification. Both the soils have high buffering capacity and are not expected to be impacted from the increased emissions from the proposed modification.

Similarly, no impact is expected on the vegetation in the significant impact area from the proposed modification.

5.4 *Visibility Impairment Analysis*

Visibility analysis for the Class I area is included in Section 5.1. This section describes the methodology and results of the visibility analysis within the impact area for both interim scenario and the BACT scenarios.

The flares and turbines will combust LFG that for the purposes of the analysis is approximately 50 percent methane, a clean burning gas and primary constituent of natural gas. The balance of LFG is carbon dioxide, which does not take part in combustion. A typical fuel analysis for LFG may be found in Appendix C of the Air Permit Application Report. Additionally, the flares and turbines will be in compliance with applicable opacity standards. Thus, no adverse visibility impairment in the impact area is predicted for the proposed modification.

6.0 Conclusions

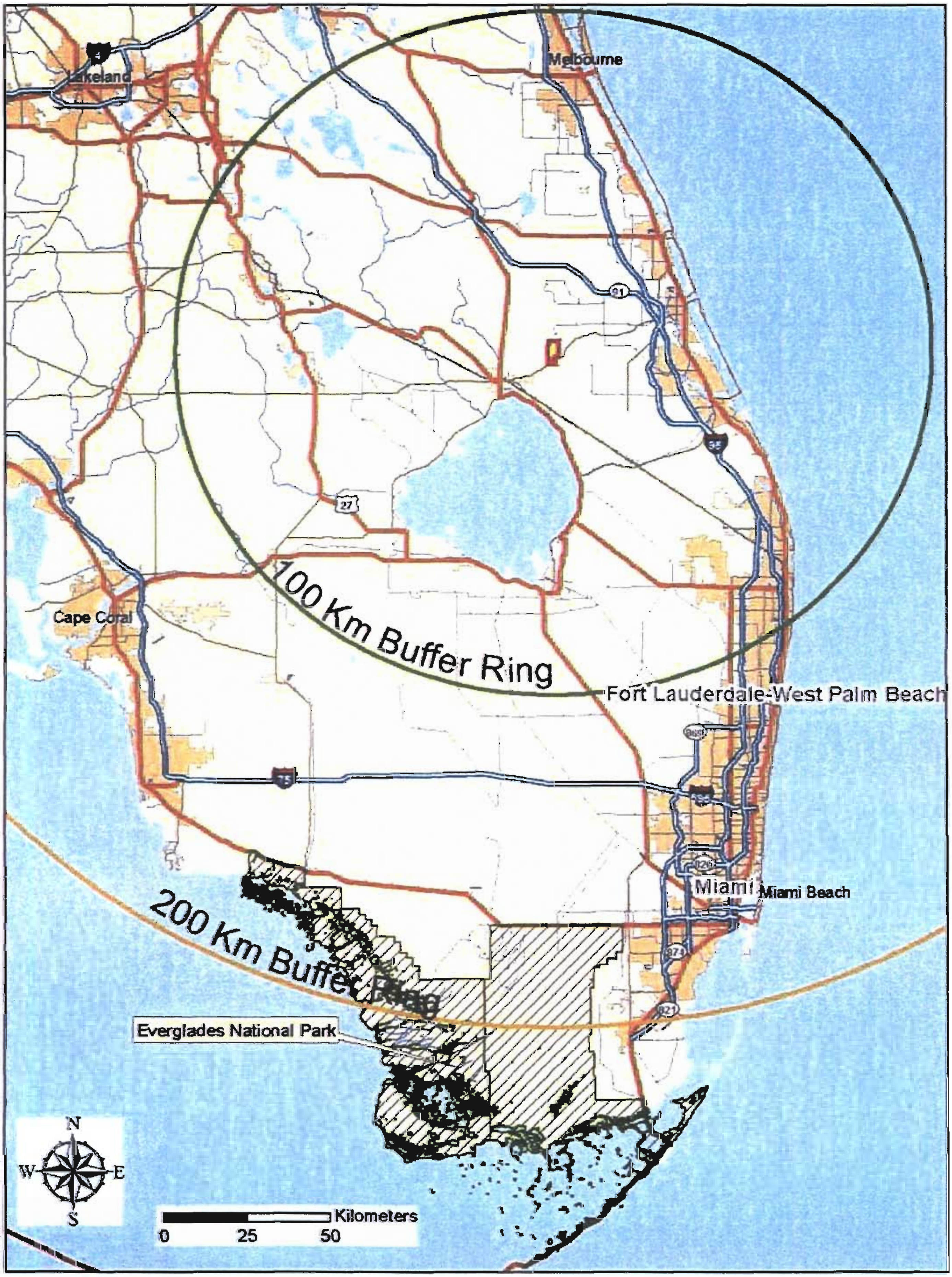
Air quality impact analysis was performed for the interim scenario and proposed modifications at the Okeechobee Landfill in Okeechobee County. The analysis included both PSD Class II increment and AAQS compliance demonstrations as well as additional impact analysis. Five operating scenarios were considered: i) interim operating scenario ii) routine BACT operating scenario; iii) alternative operating scenario 1; and iv) alternative operating scenario 2.

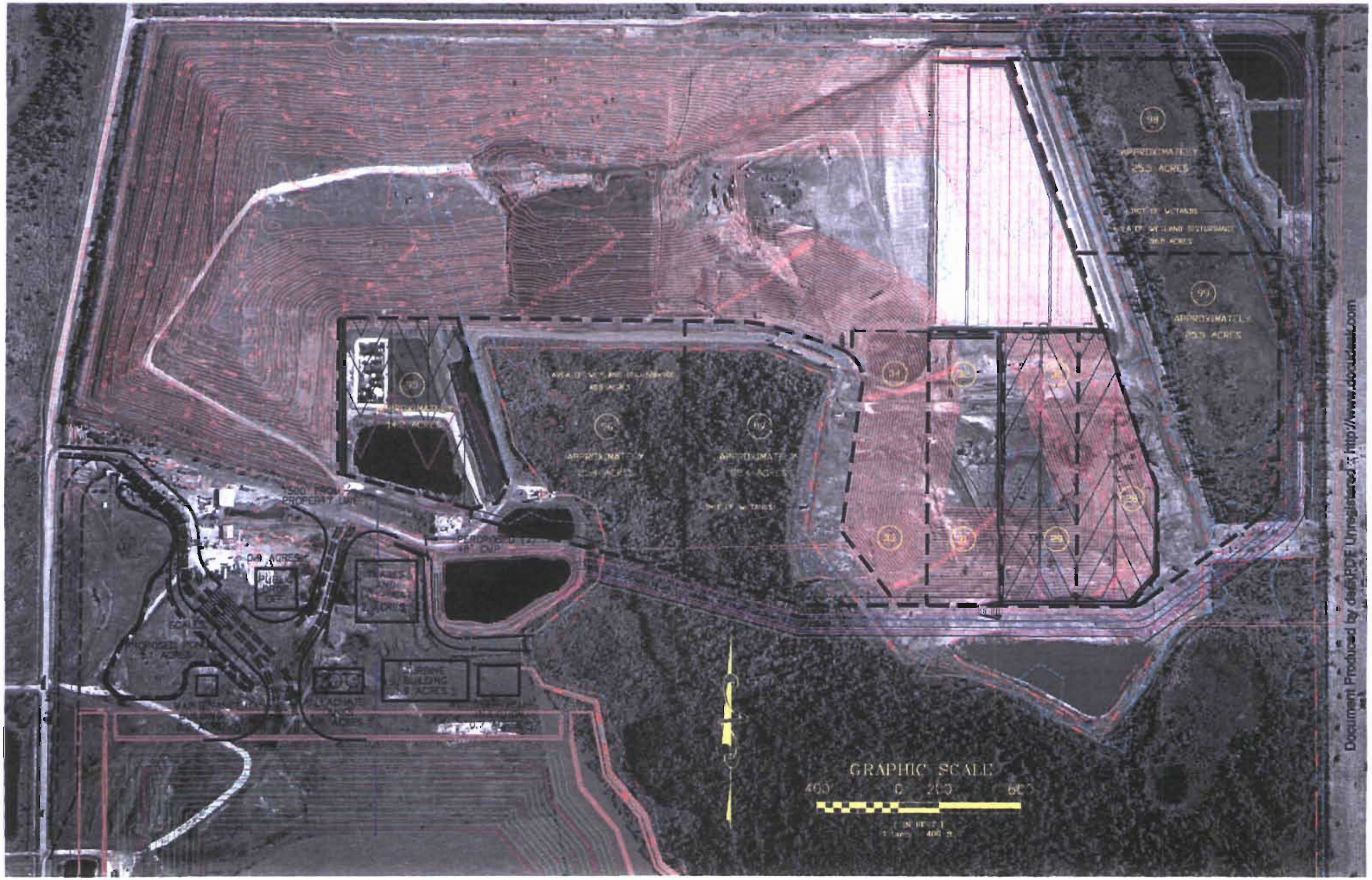
USEPA approved model AERMOD was used for the analysis. The technical approach and modeling procedure followed USEPA approved methodology and FDEP instructions as needed.

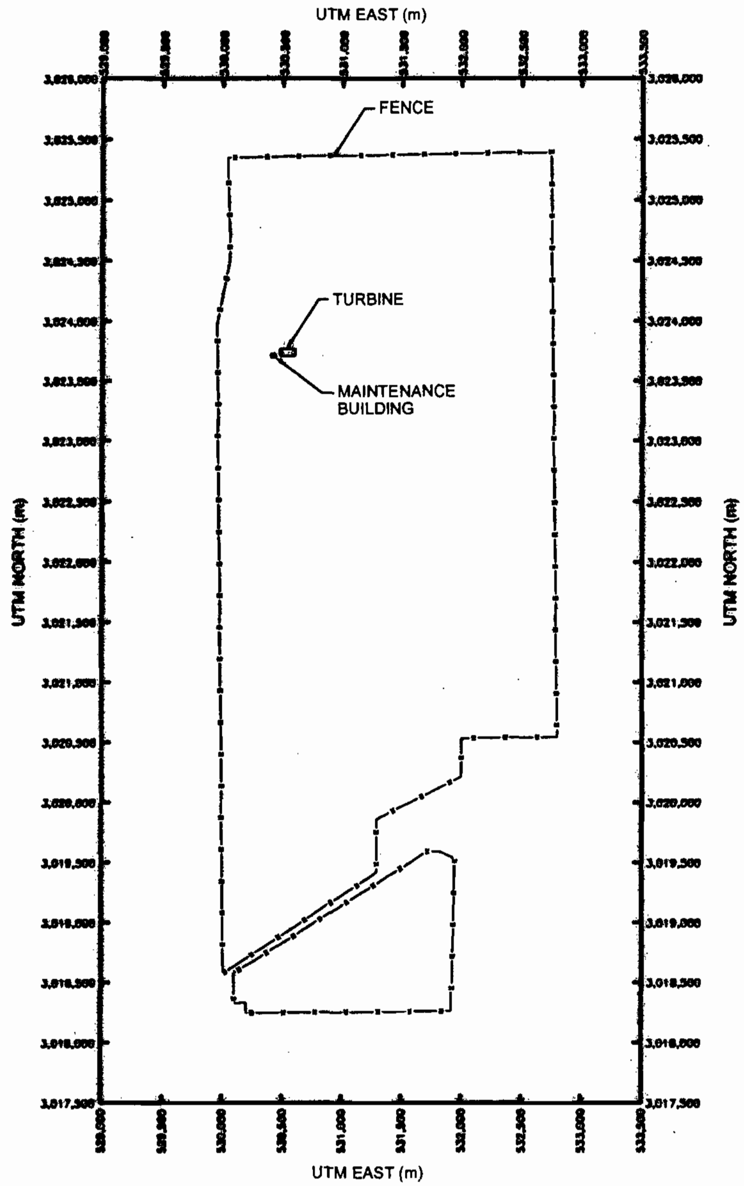
In all operating scenarios, the Class II PSD increments and AAQS were not exceeded for any regulated pollutant. No adverse impact was predicted on soil, vegetation, wildlife and visibility in the impact area from this project.

FIGURES

Figure 2-1 Location of Okeechobee Landfill




98
APPROXIMATELY
99
APPROXIMATELY
GRAPHIC SCALE
400 0 200 600



Shaw Environmental, Inc.

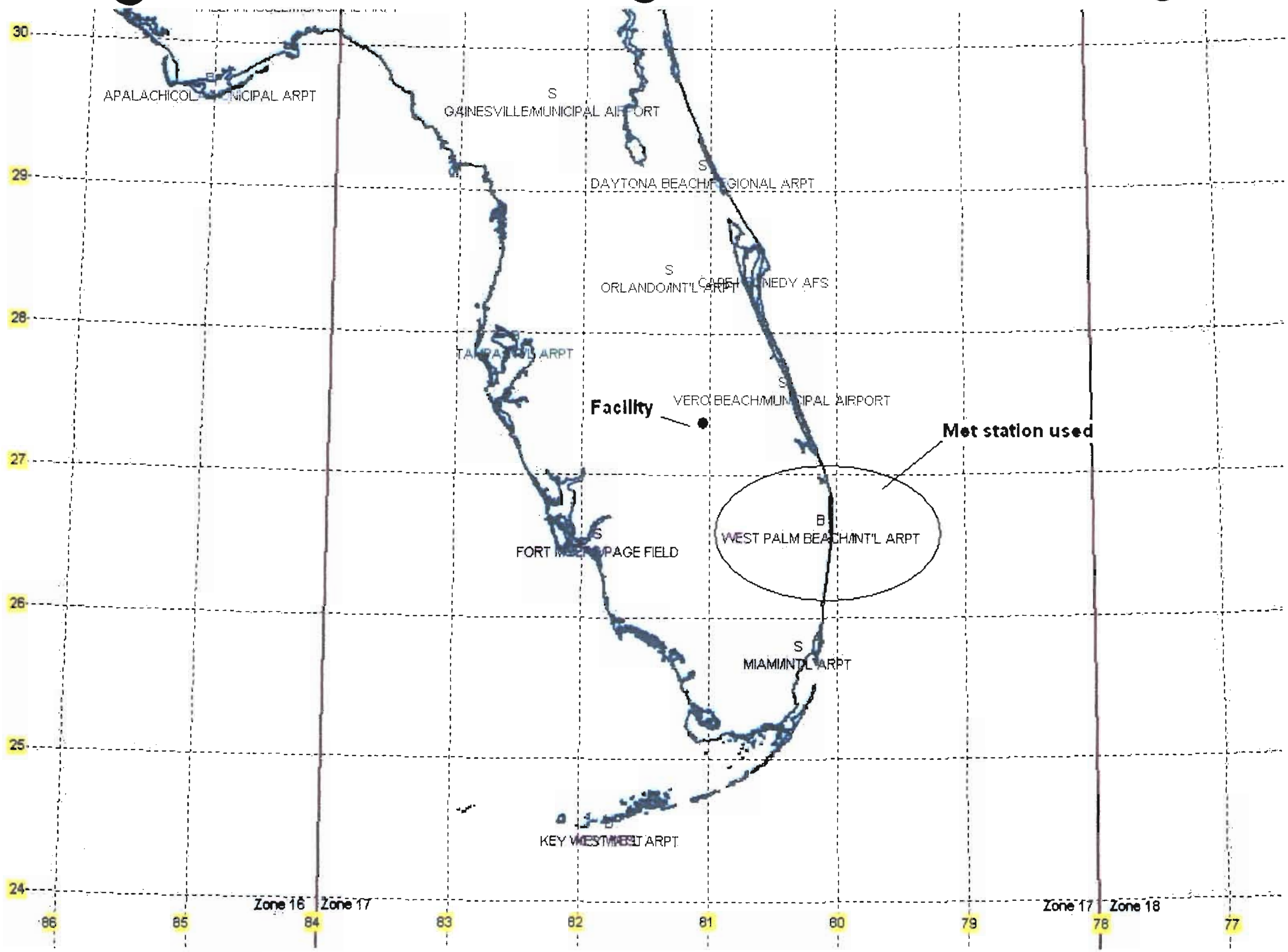
OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

FIGURE 2-2B

BUILDING LOCATION

OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

Figure 3-1 Location Meterological Station



WIND ROSE PLOT:

Okeechobee Landfill, Inc.
Okeechobee, Fl

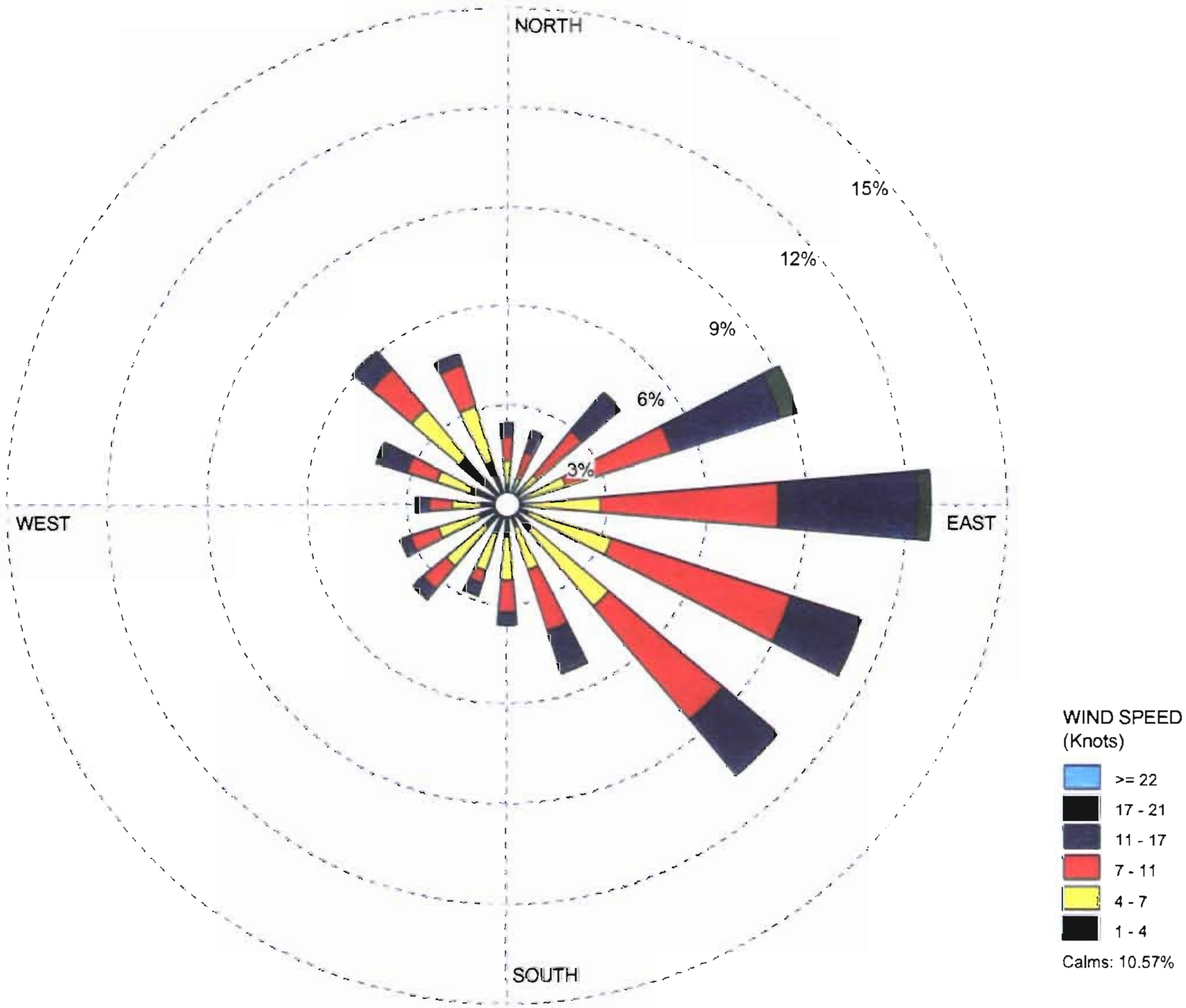
DISPLAY:

Wind Speed
Direction (blowing from)

COMMENTS:

Figure 3-2A

CY2001 Windrose



CALM WINDS:

10.57%

AVG. WIND SPEED:

7.86 Knots

COMPANY NAME:

Okeechobee Landfill, Inc.

MODELER:

Shaw E & I, Pittsburgh, PA

DATE:

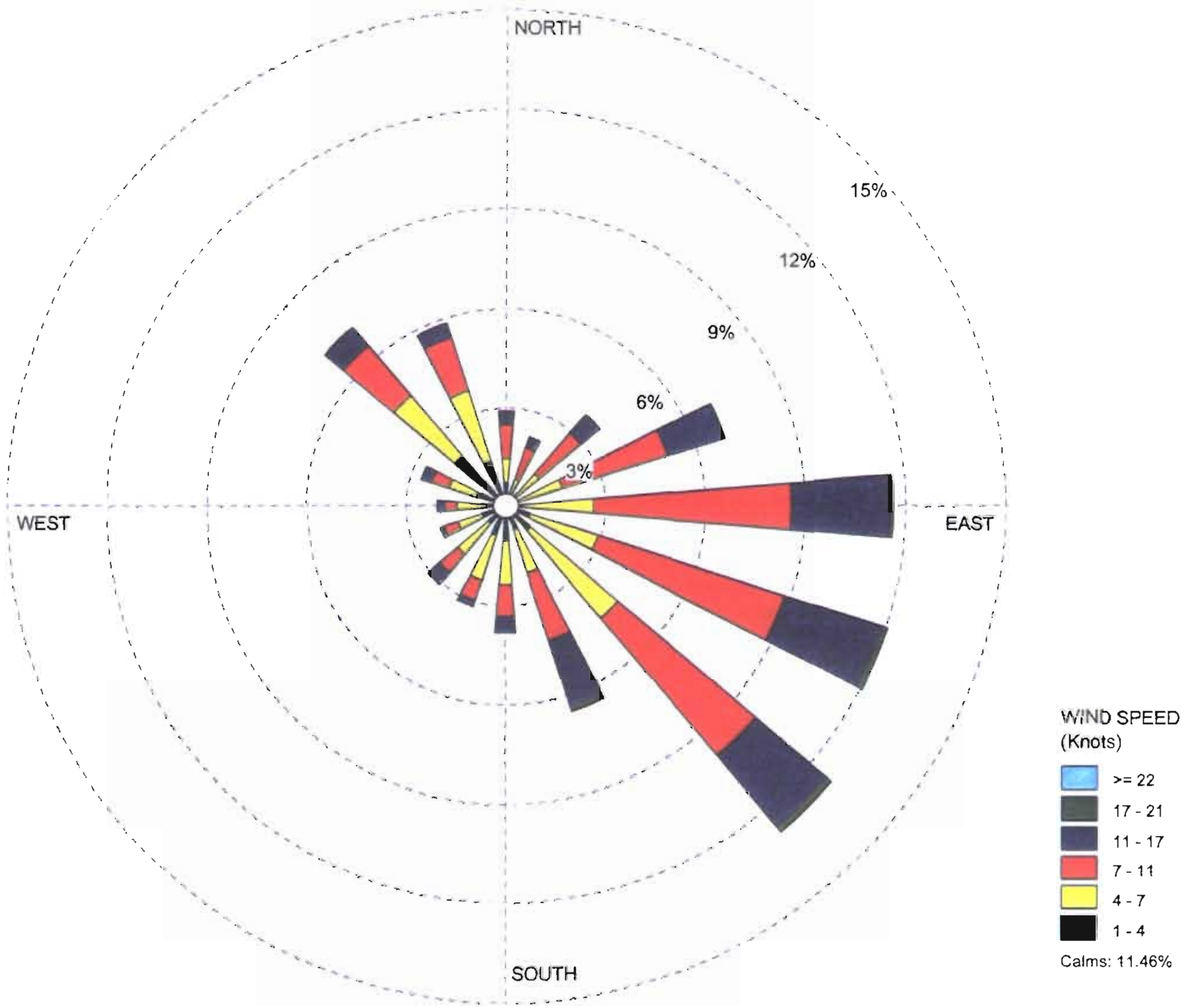
2/13/2007

PROJECT NO.:

121525

WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:	DISPLAY:
Okeechobee Landfill, Inc. **Okeechobee, Fl**	**Wind Speed** **Direction (blowing from)**



COMMENTS:

Figure 3-2B

CY2002 Windrose

CALM WINDS:

11.46%

AVG. WIND SPEED:

7.55 Knots

COMPANY NAME:

Okeechobee Landfill, Inc.

MODELER:

Shaw E & I, Pittsburgh, PA

DATE:

2/13/2007

PROJECT NO.:

121525

WIND ROSE PLOT:

Okeechobee Landfill, Inc.
Okeechobee, Fl

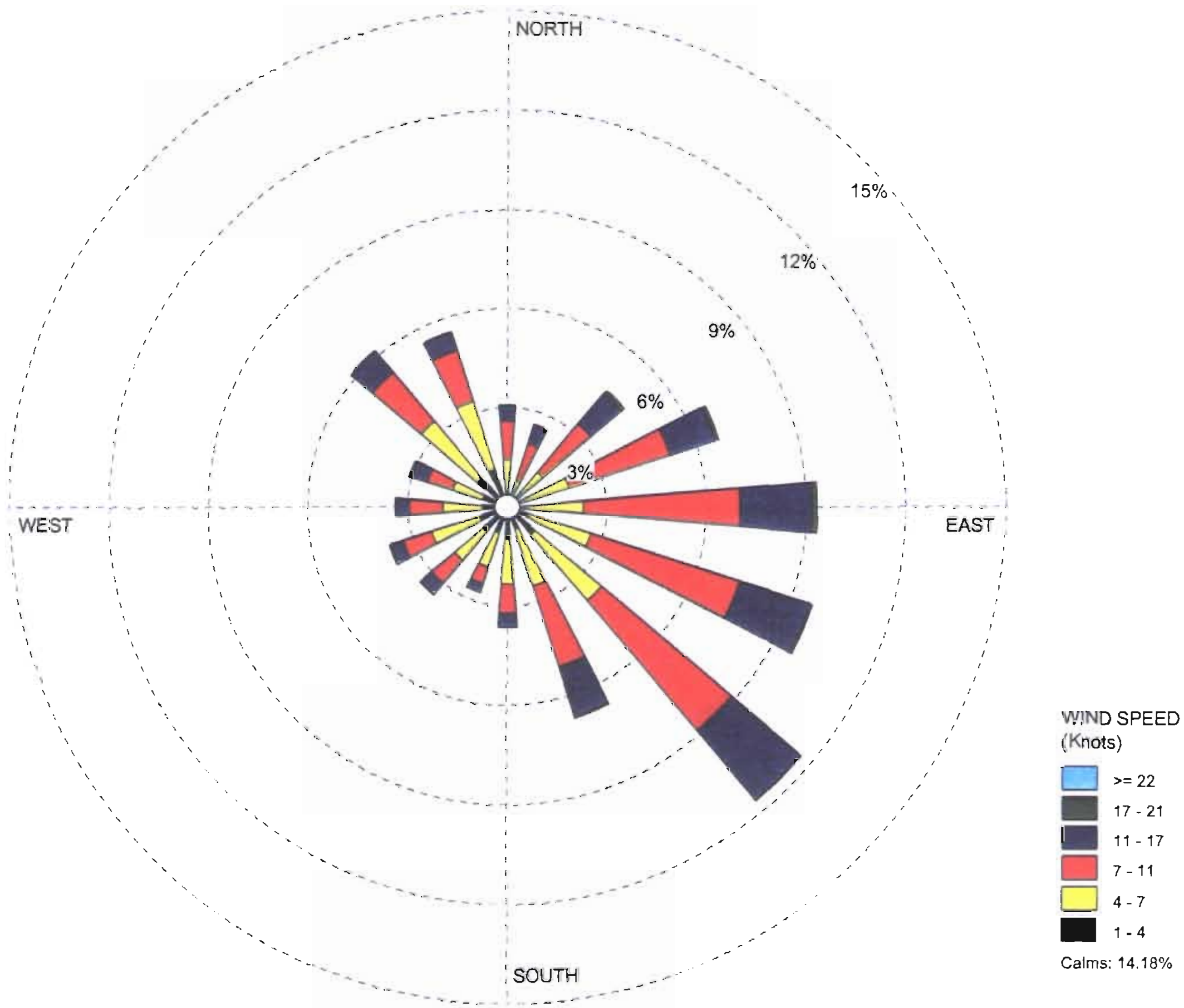
DISPLAY:

Wind Speed
Direction (blowing from)

COMMENTS:

Figure 3-2C

CY2003 Windrose



CALM WINDS:

14.18%

AVG. WIND SPEED:

7.31 Knots

COMPANY NAME:

Okeechobee Landfill, Inc.

MODELER:

Shaw E & I, Pittsburgh, PA

DATE:

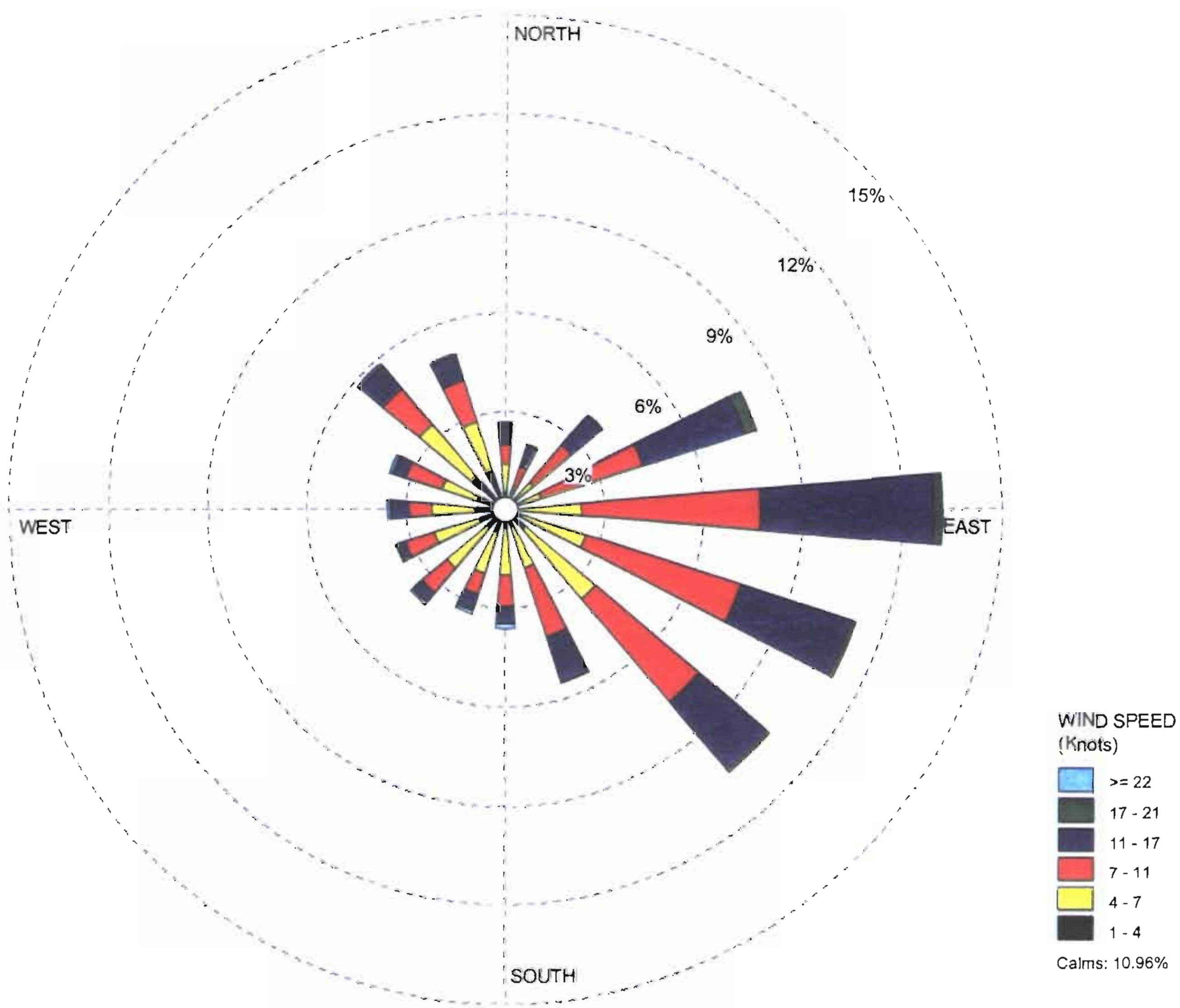
2/13/2007

PROJECT NO.:

121525

WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:	DISPLAY:	COMMENTS:
Okeechobee Landfill, Inc. **Okeechobee, Fl**	**Wind Speed** **Direction (blowing from)**	Figure 3-2D CY2004 Windrose



CALM WINDS:	**10.96%**
AVG. WIND SPEED:	**8.28 Knots**
COMPANY NAME:	**Okeechobee Landfill, Inc.**
MODELER:	**Shaw E & I, Pittsburgh, PA**
DATE:	**2/13/2007**
PROJECT NO.:	**121525**

WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

Okeechobee Landfill, Inc.
Okeechobee, Fl

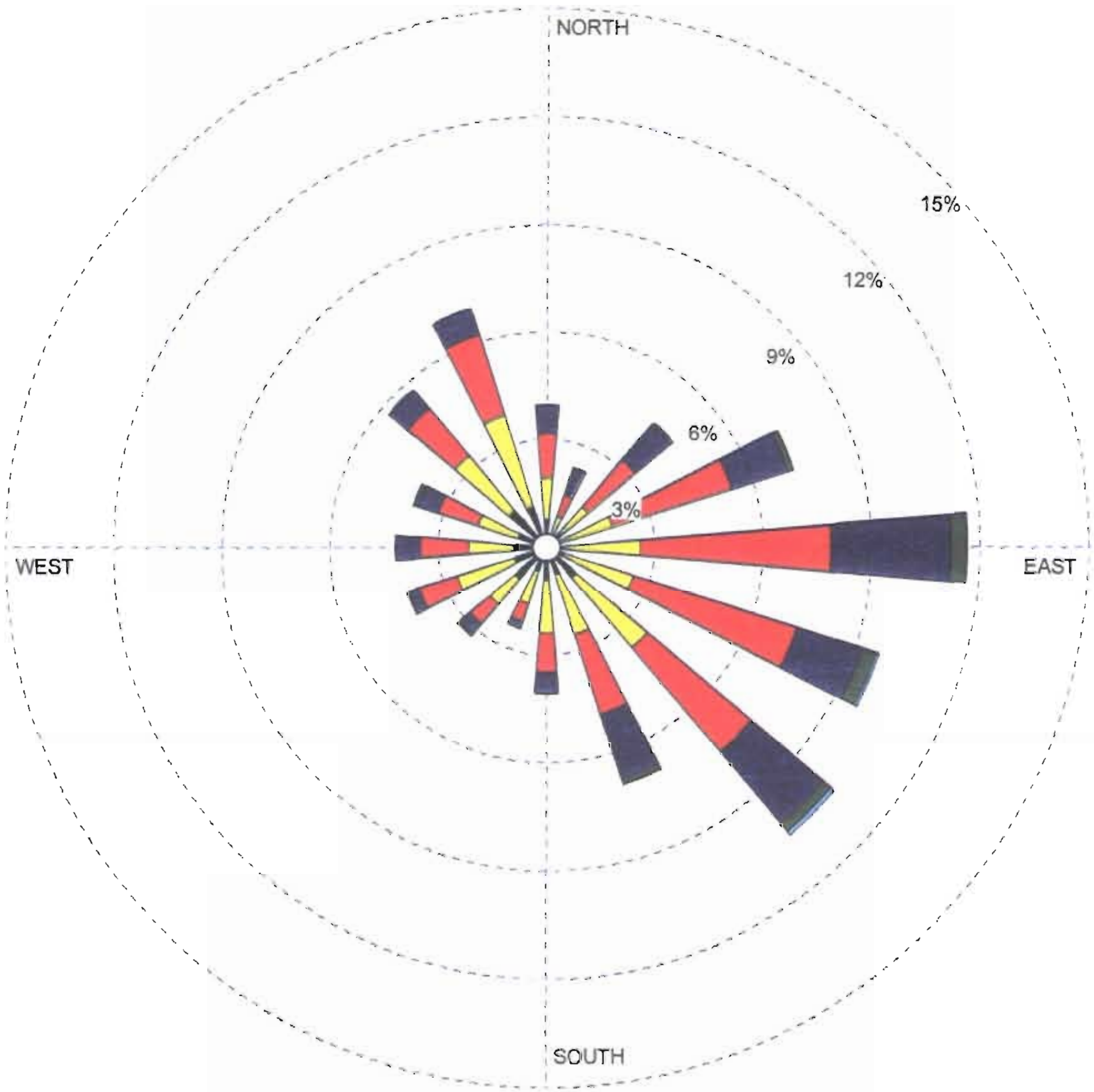
DISPLAY:

Wind Speed
Direction (blowing from)

COMMENTS:

Figure 3-2E

CY2005 Windrose



WIND SPEED
(Knots)

- >= 22
- 17 - 21
- 11 - 17
- 7 - 11
- 4 - 7
- 1 - 4

Calms: 8.88%

CALM WINDS:

8.88%

AVG. WIND SPEED:

8.02 Knots

COMPANY NAME:

Okeechobee Landfill, Inc.

MODELER:

Shaw E & I, Pittsburgh, PA

DATE:

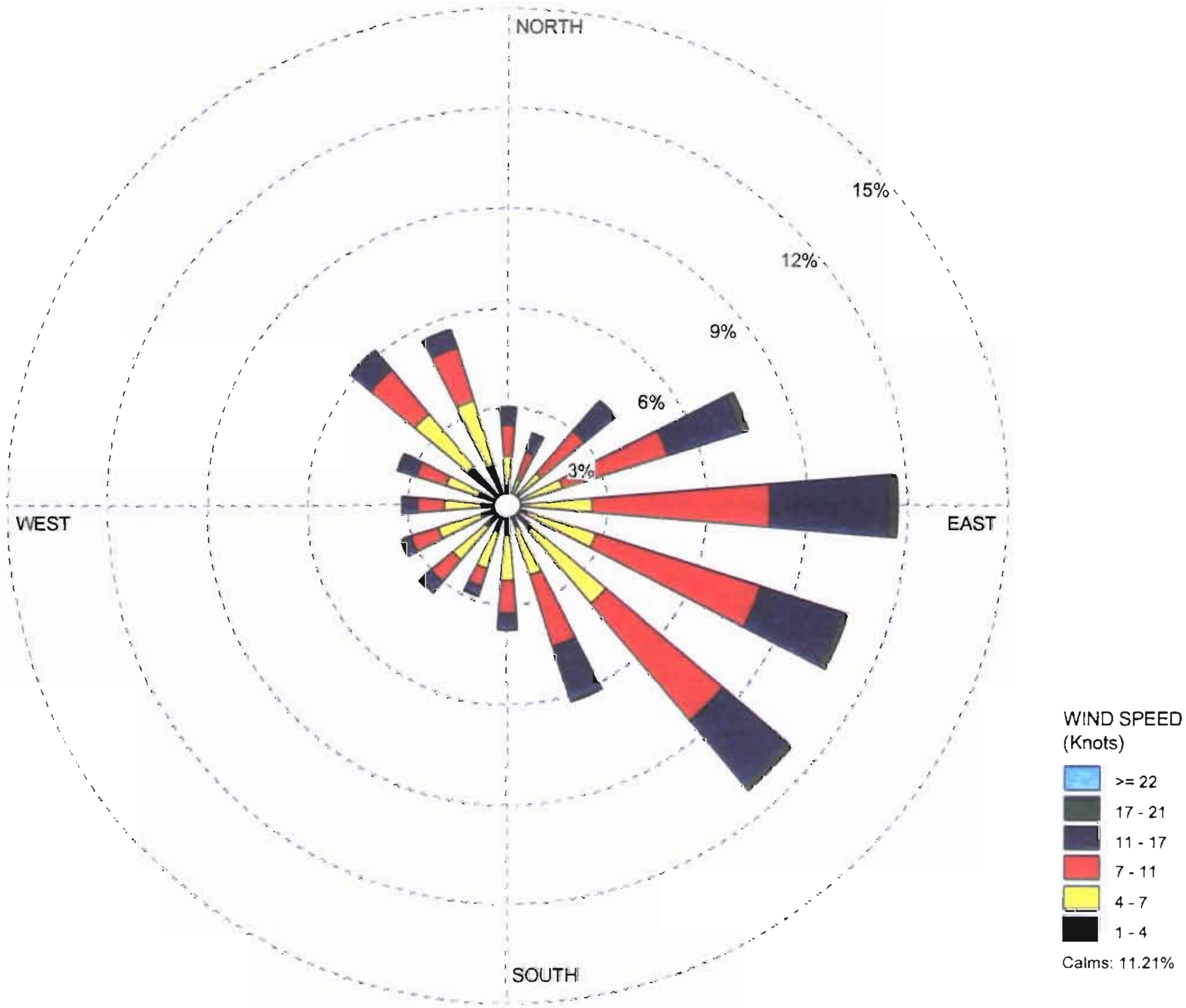
2/13/2007

PROJECT NO.:

121525

WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:	DISPLAY:
Okeechobee Landfill, Inc. **Okeechobee, Fl**	**Wind Speed** **Direction (blowing from)**



COMMENTS:

Figure 3-2F

Five-year Windrose

CALM WINDS:

11.21%

AVG. WIND SPEED:

7.80 Knots

COMPANY NAME:

Okeechobee Landfill, Inc.

MODELER:

Shaw E & I, Pittsburgh, PA

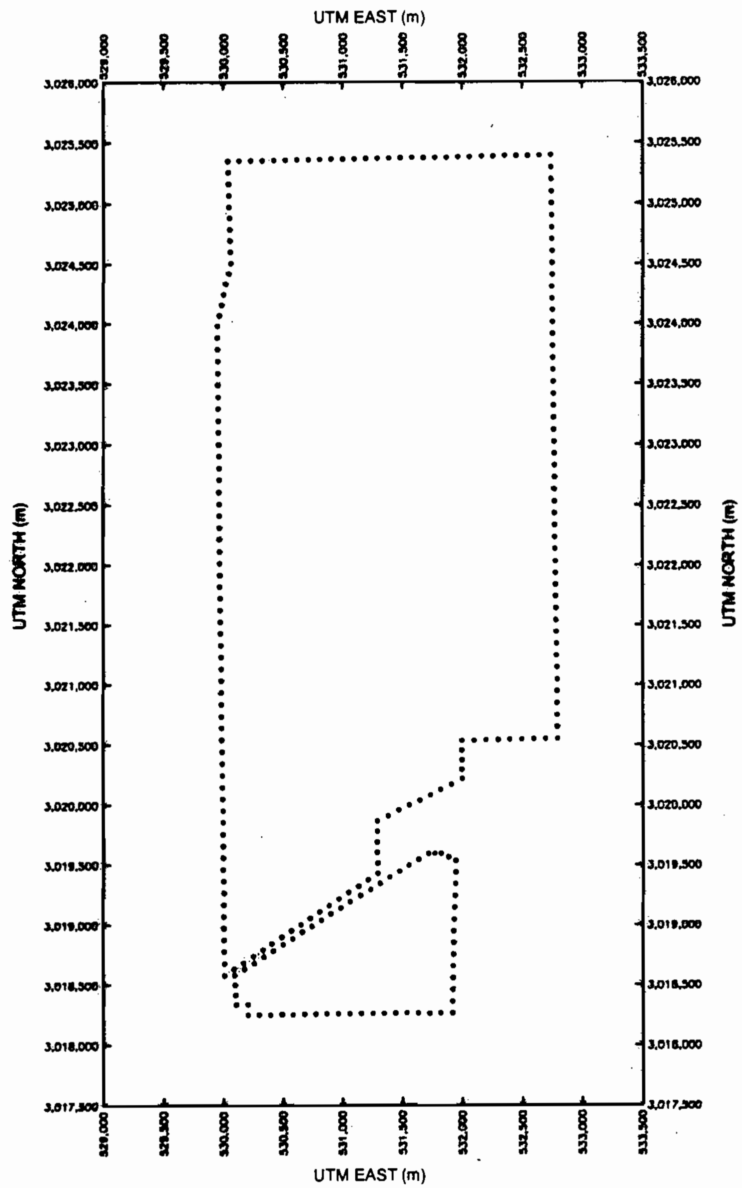
DATE:

2/13/2007

PROJECT NO.:

121525

WRPLOT View - Lakes Environmental Software

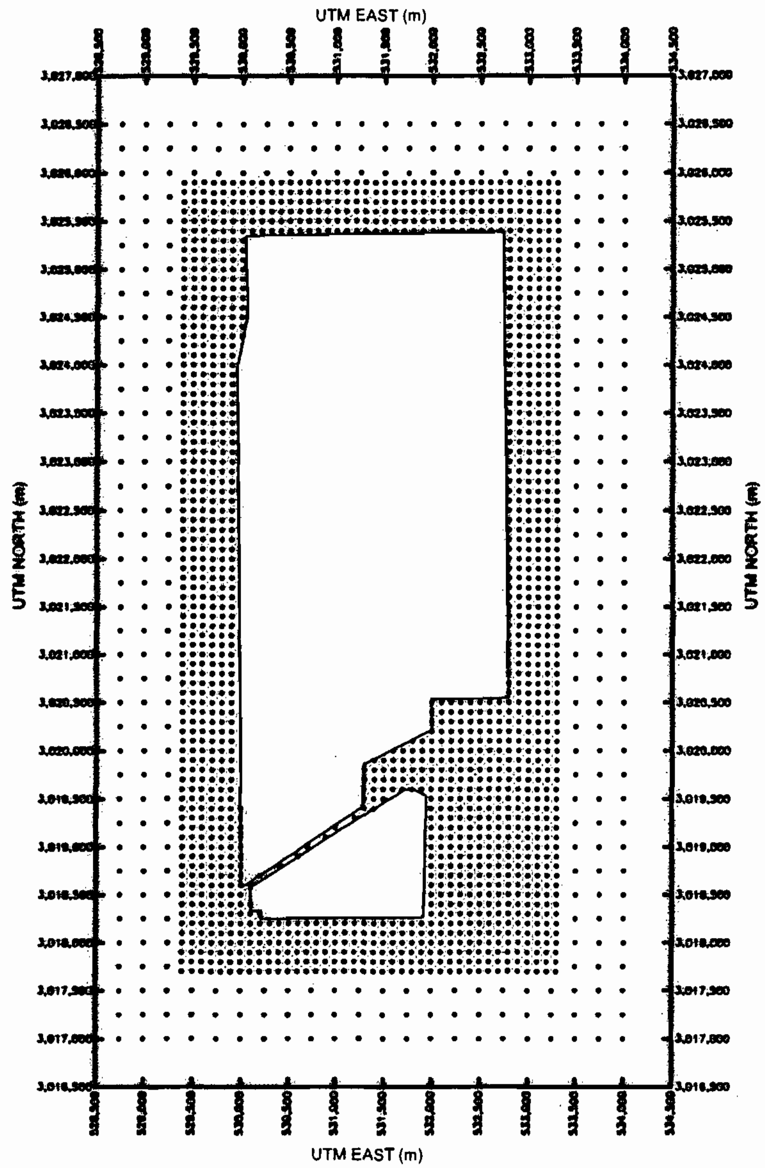


DRAWING NUMBER 121525-B1

Shaw Environmental, Inc.

OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

FIGURE 3-3A
RECEPTOR LOCATIONS FOR THE FENCE LINE GRID
OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

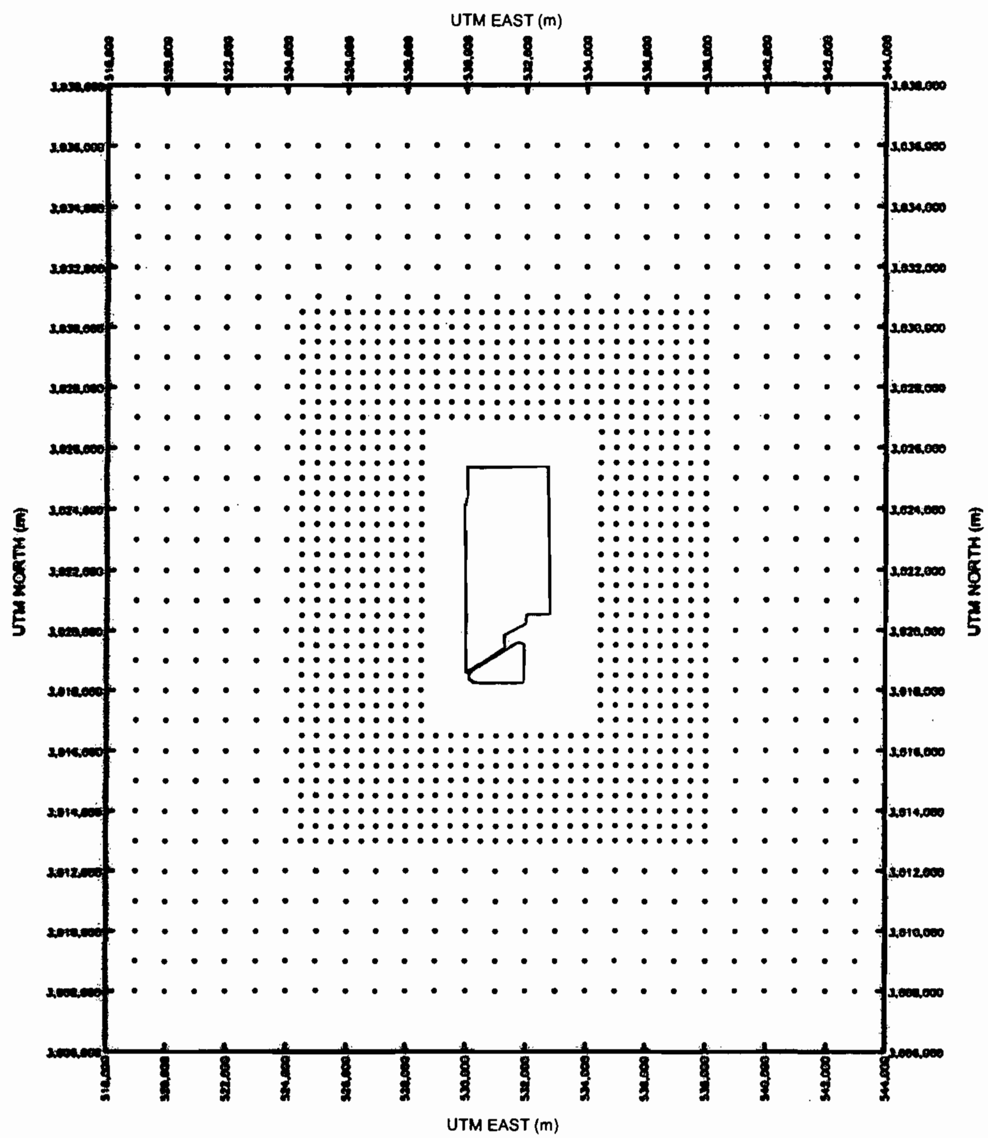


OFFICE	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
						121325-B2

Shaw Environmental, Inc.

OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

FIGURE 3-3B
RECEPTOR LOCATIONS FOR THE FINE GRID
OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA



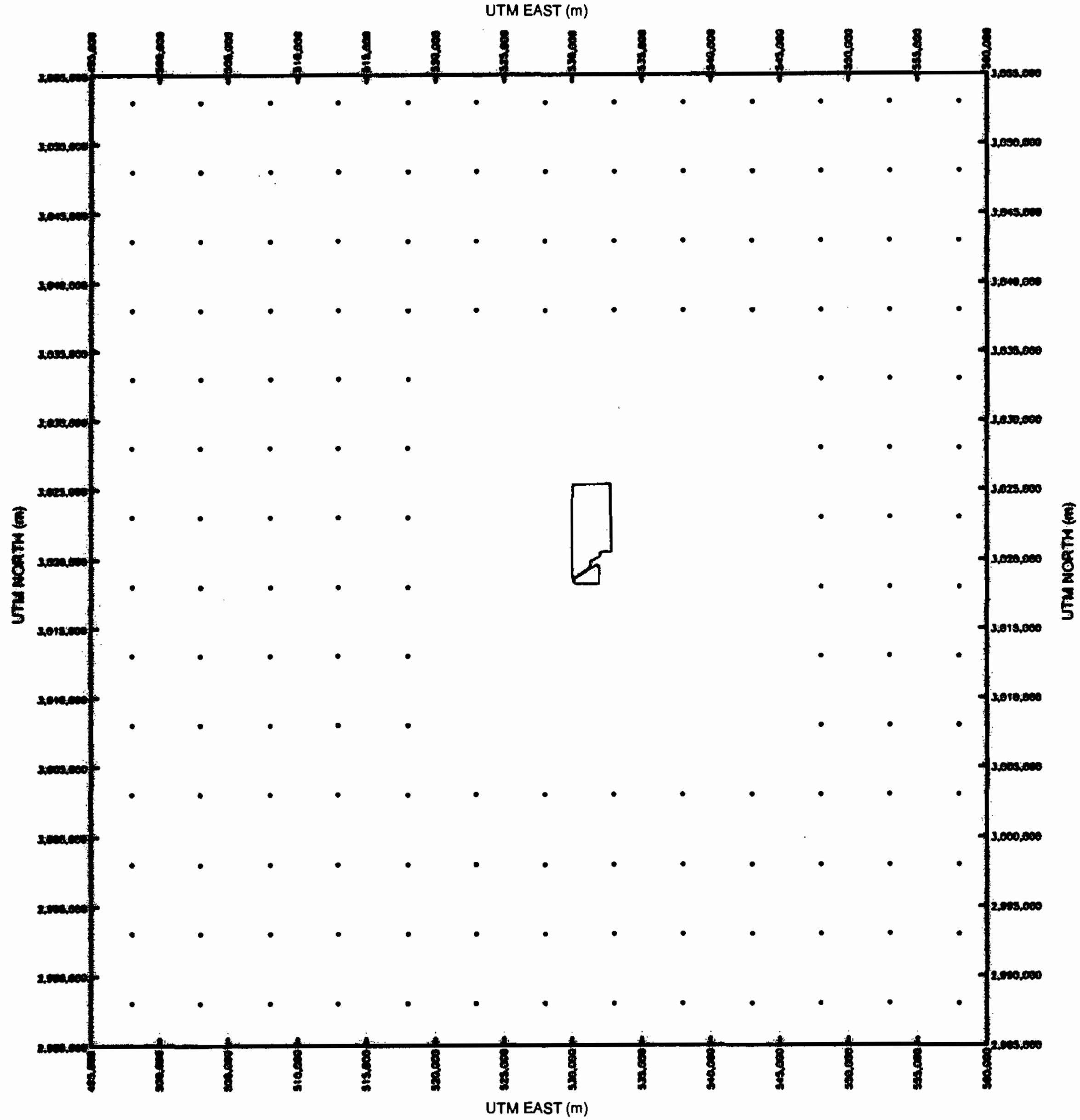
DRAWING NUMBER 121525-B3

Shaw Environmental, Inc.

OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

FIGURE 3-3C
RECEPTOR LOCATIONS FOR THE MEDIUM GRID

OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

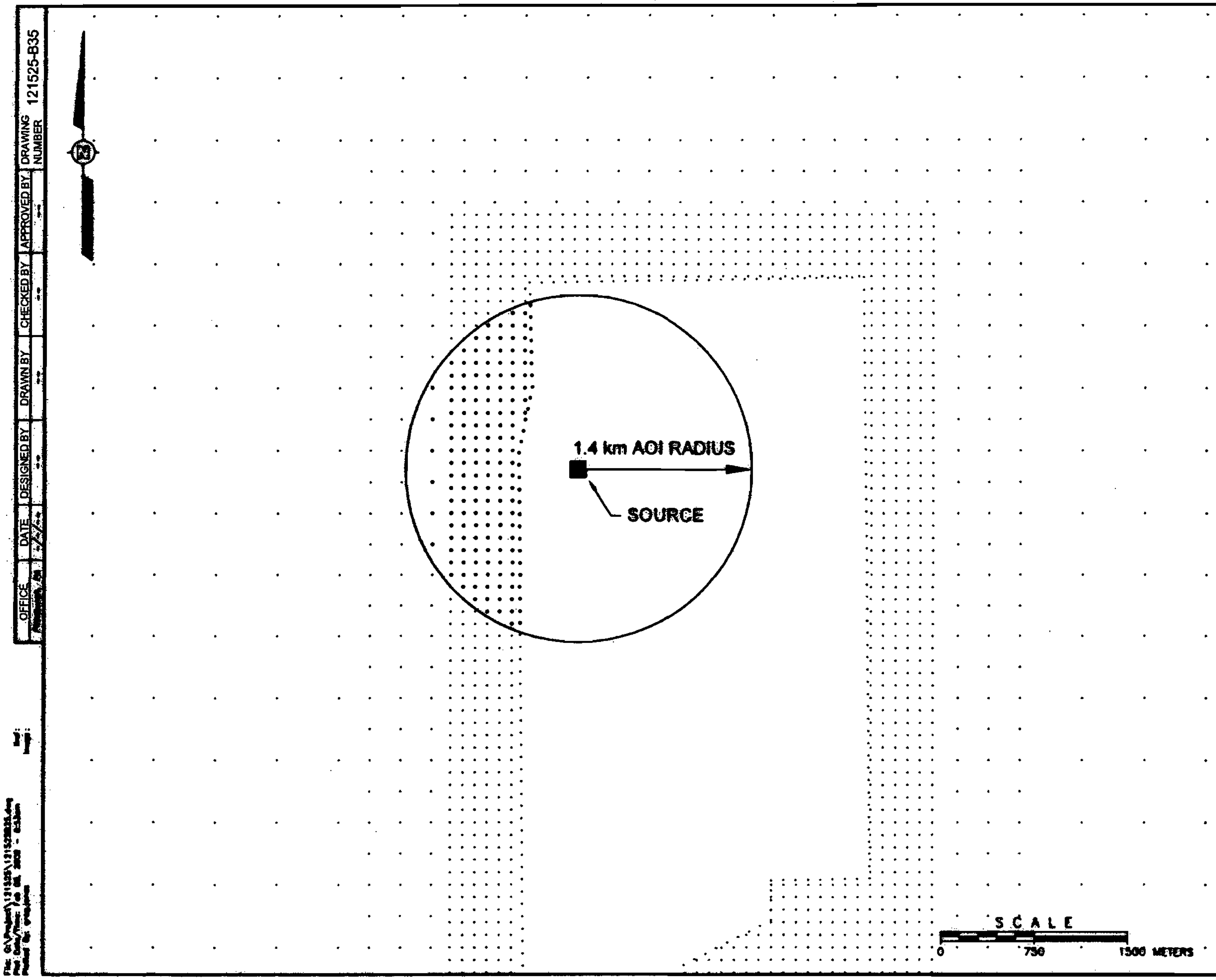


Shaw Environmental, Inc.

OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

FIGURE 3-3D
RECEPTOR LOCATIONS FOR THE COARSE GRID
OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

DRAWING NUMBER 121525-B4



Shaw Environmental, Inc.

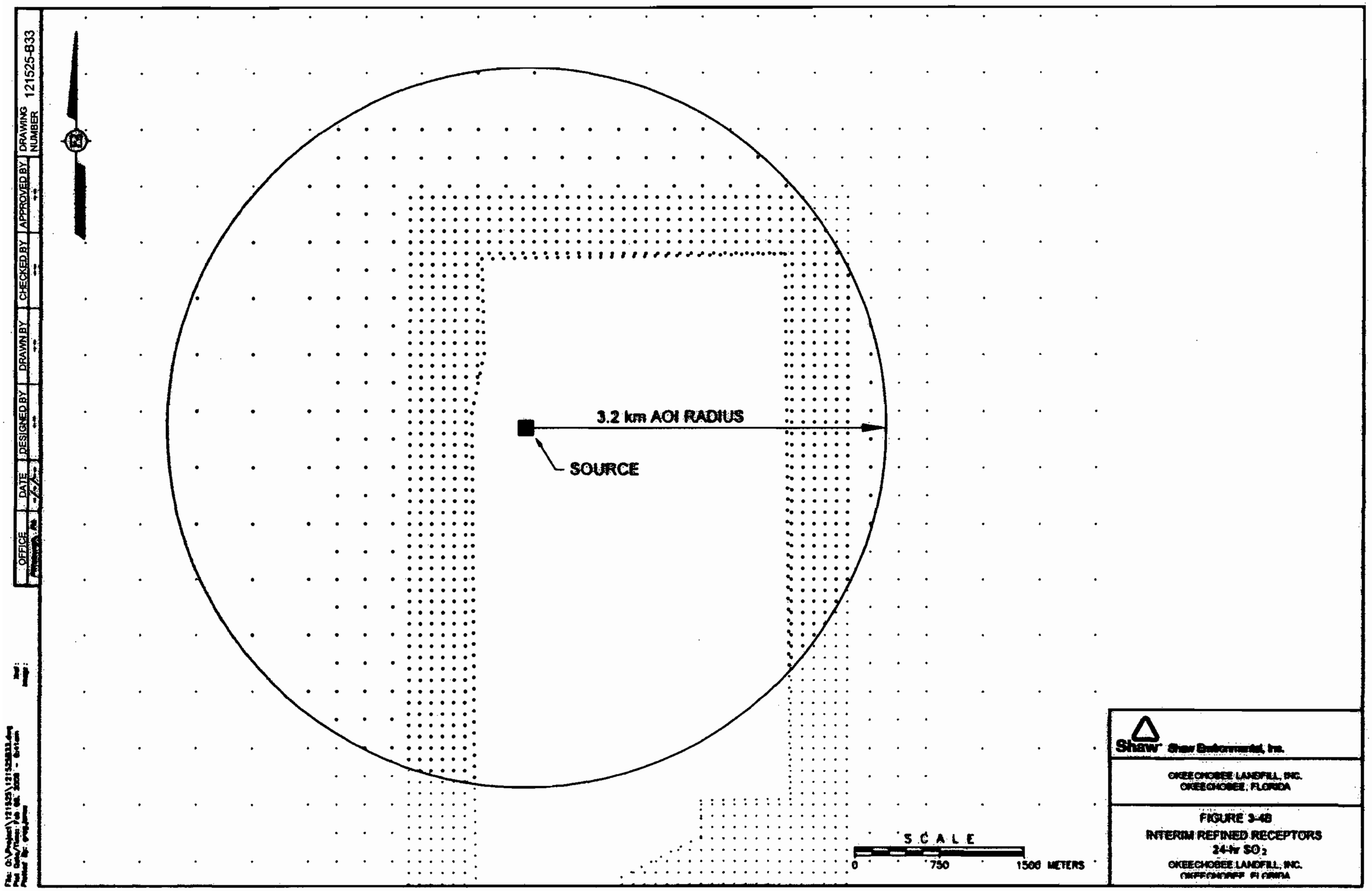
OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

FIGURE 3-4A

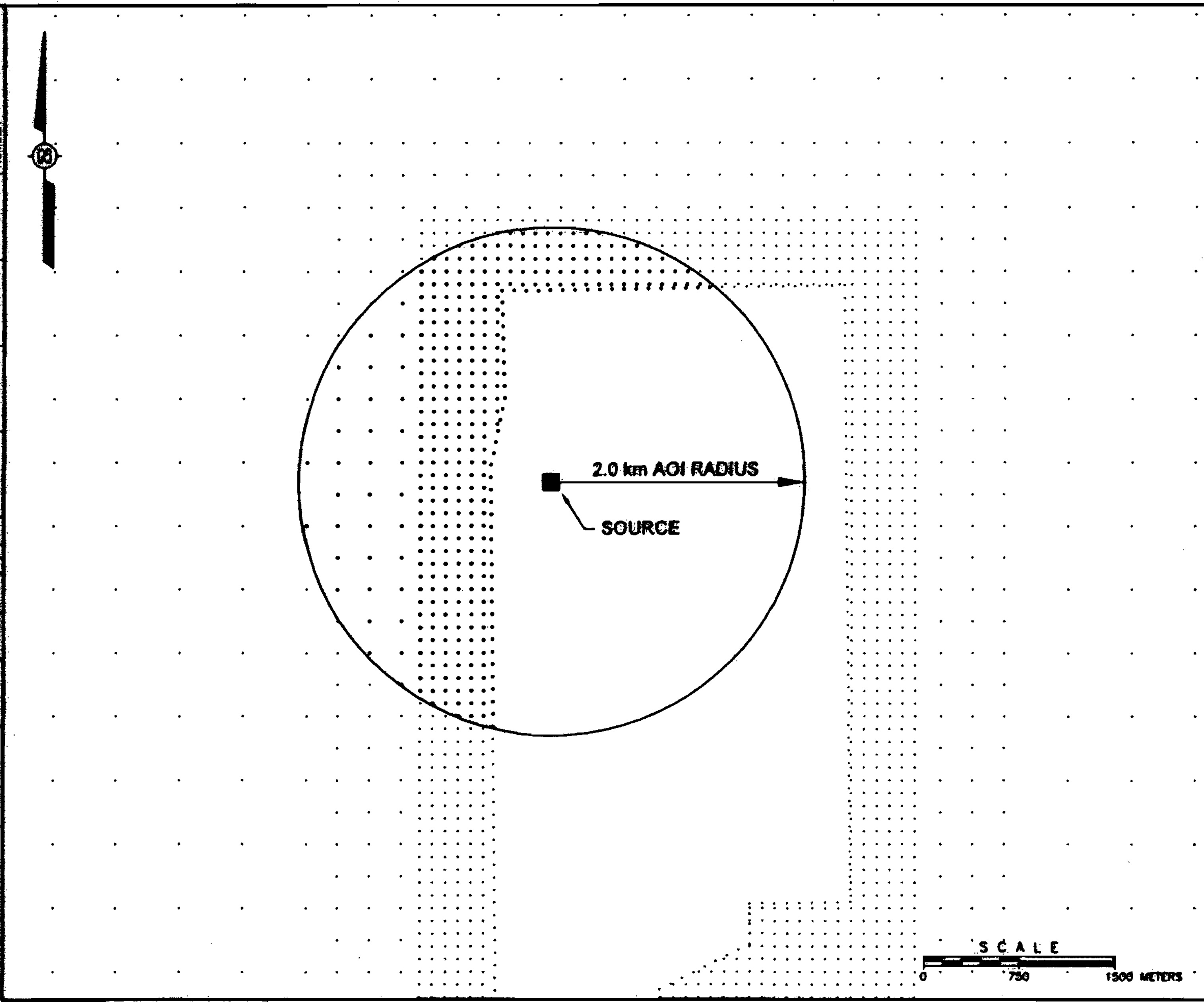
INTERIM REFINED RECEPTORS

3-HR SO_2

OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA



DRAWING NUMBER 121525-B33
APPROVED BY
CHECKED BY
DRAWN BY
DESIGNED BY
DATE
OFFICE
3.2 km AOI RADIUS
SOURCE
SCALE
0
750
1500 METERS
Shaw
OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA
FIGURE 3-4B
INTERIM REFINED RECEPTORS
24-hr SO_2
OKEECHOBEE LANDFILL, INC.

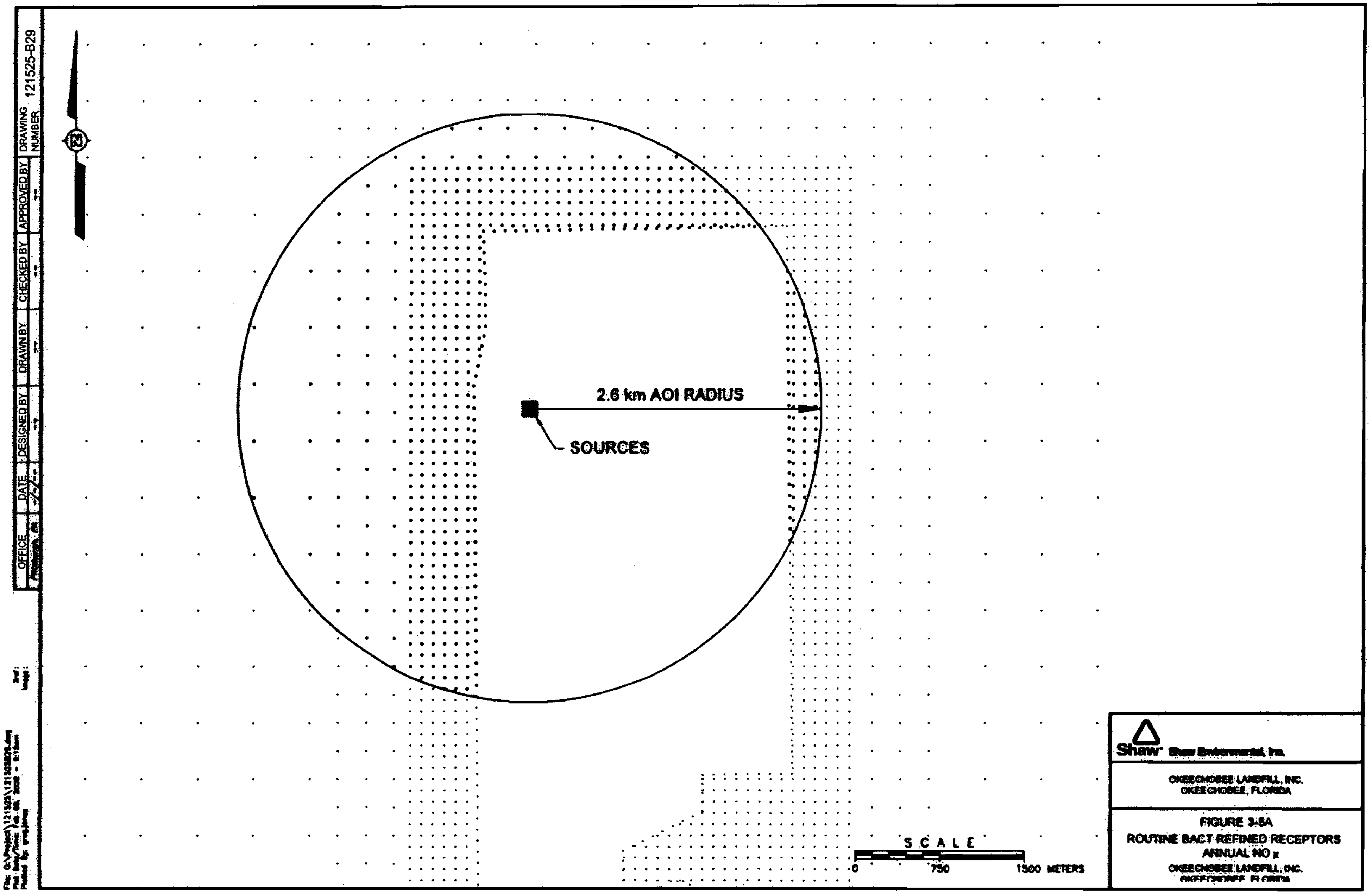


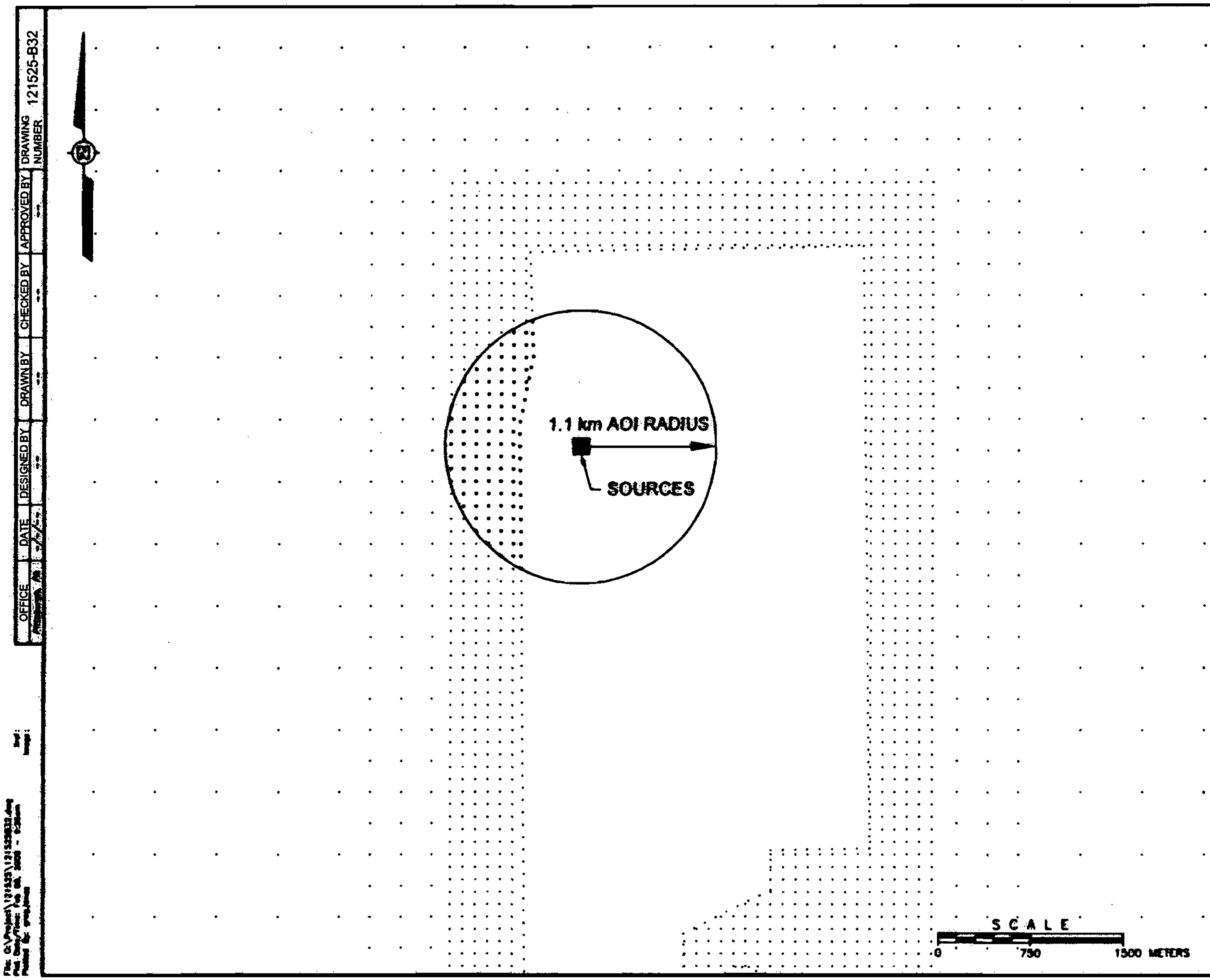
OFFICE | DATE | DESIGNED BY | DRAWN BY | CHECKED BY | APPROVED BY | DRAWING NUMBER 121525-B34

Shaw Environmental, Inc.

OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

FIGURE 3-4C
INTERIM REFINED RECEPTORS
ANNUAL SO_2
OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

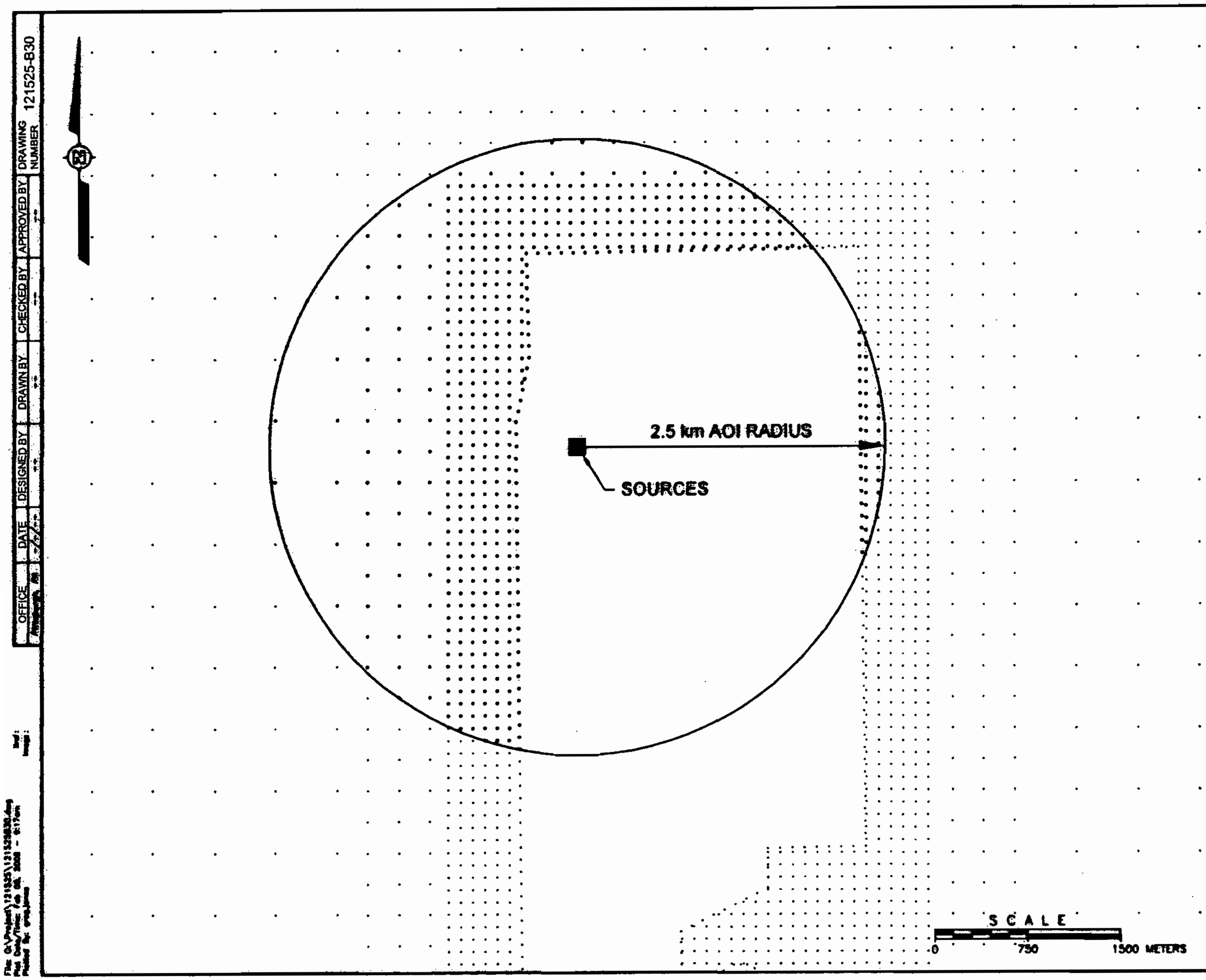

OFFICE
DATE
DESIGNED BY
DRAWN BY
CHECKED BY
APPROVED BY
DRAWING NUMBER
121525-B29
2.6 km AOI RADIUS
SOURCES
SCALE
0
750
1500 METERS
Shaw
OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA
FIGURE 3-5A
ROUTINE BACT REFINED RECEPTORS
ANNUAL NO_x
OKEECHOBEE LANDFILL, INC.



Shaw Environmental, Inc.

OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

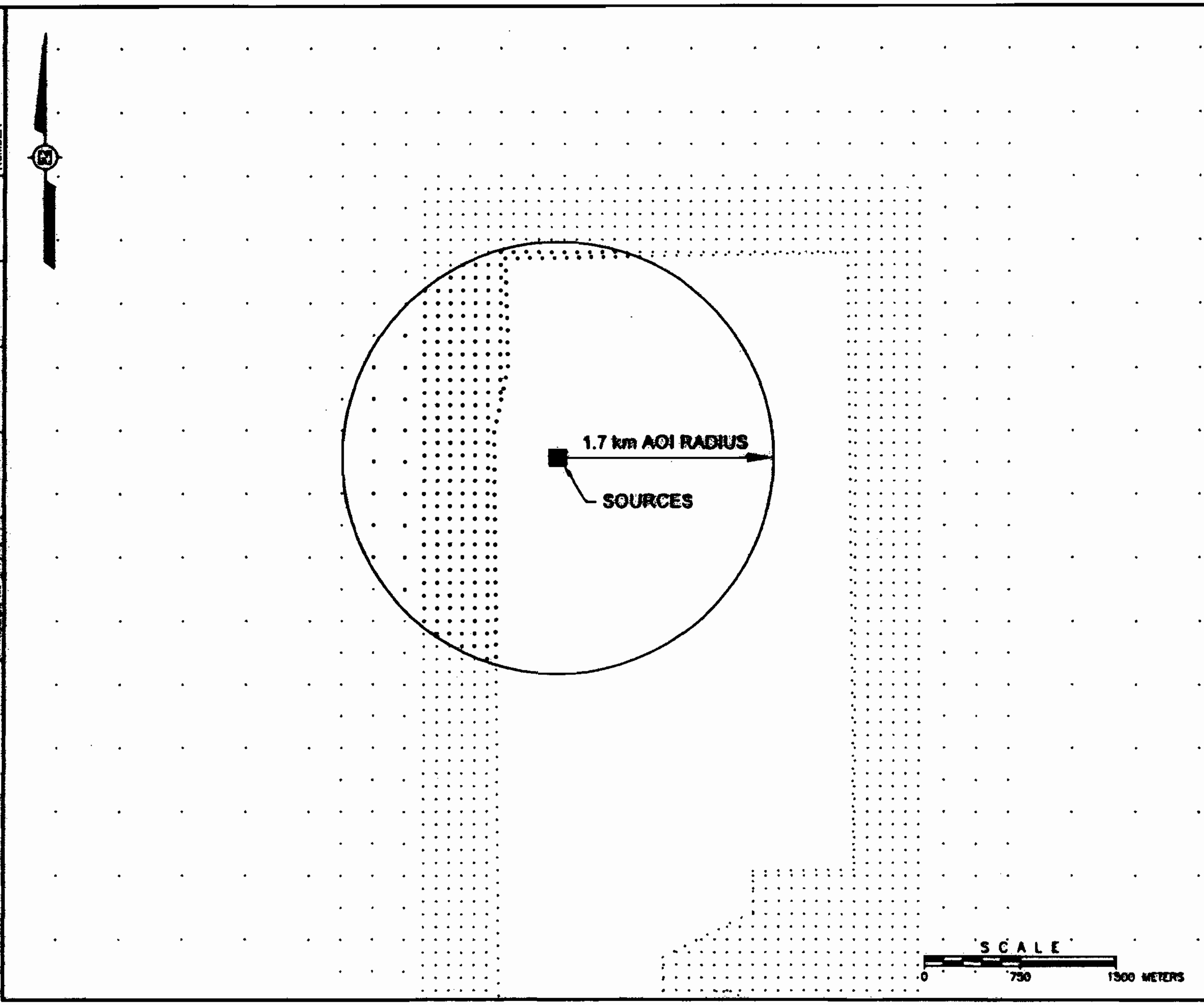
FIGURE 3-5B
ROUTINE BACT REFINED RECEPTORS
3-hr SO_2
OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA



Shaw Environmental, Inc.

OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

FIGURE 3-6C
ROUTINE BACT REFINED RECEPTORS
24-hr SO_2
OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA



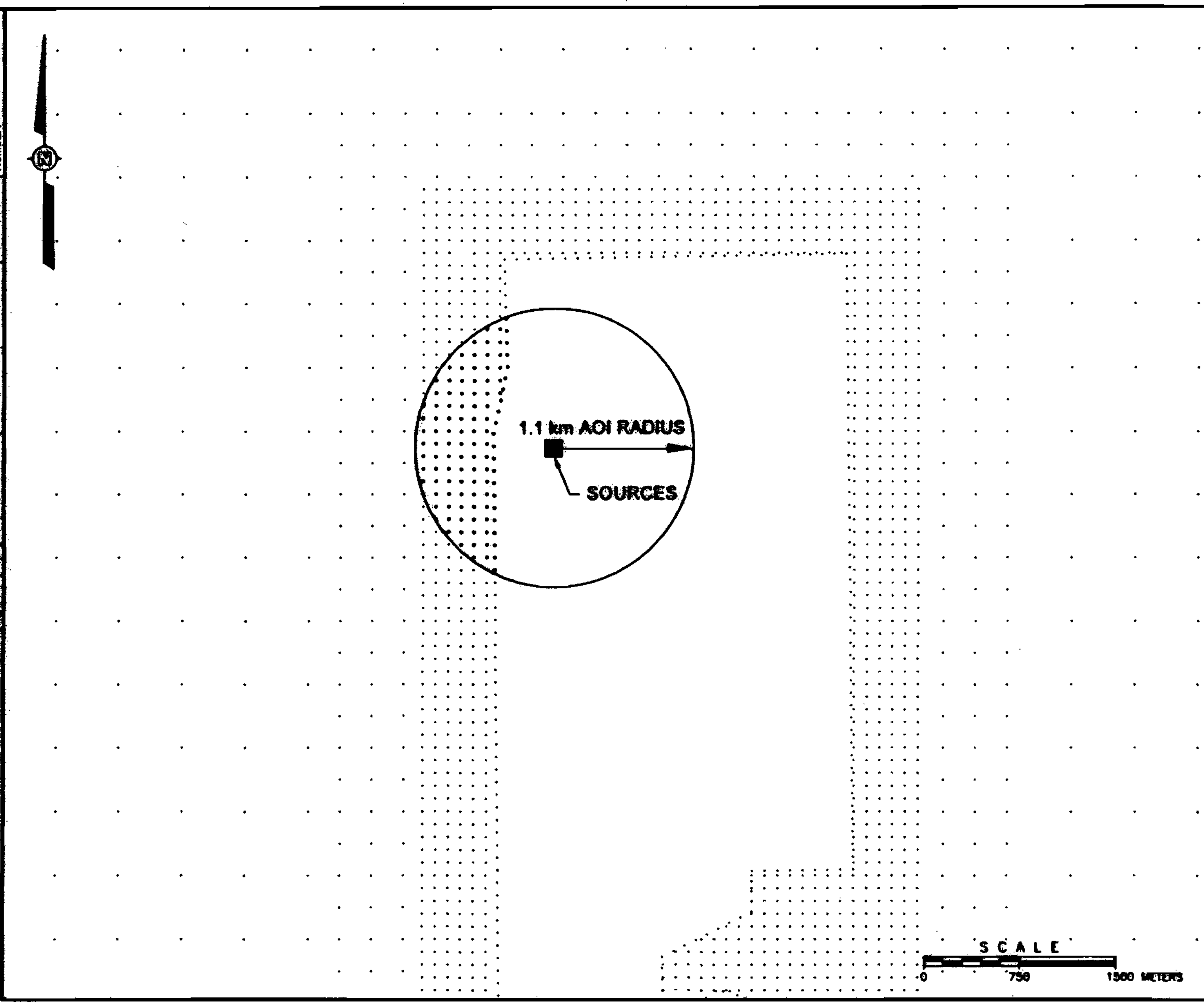
Shaw Environmental, Inc.

OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

FIGURE 3-5D
ROUTINE BACT REFINED RECEPTORS
ANNUAL SO_2
OKEECHOBEE LANDFILL, INC.

OFFICE	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
	-/-/--	--	--	--	--	121525-B31

DRAWING NUMBER 121525-B28

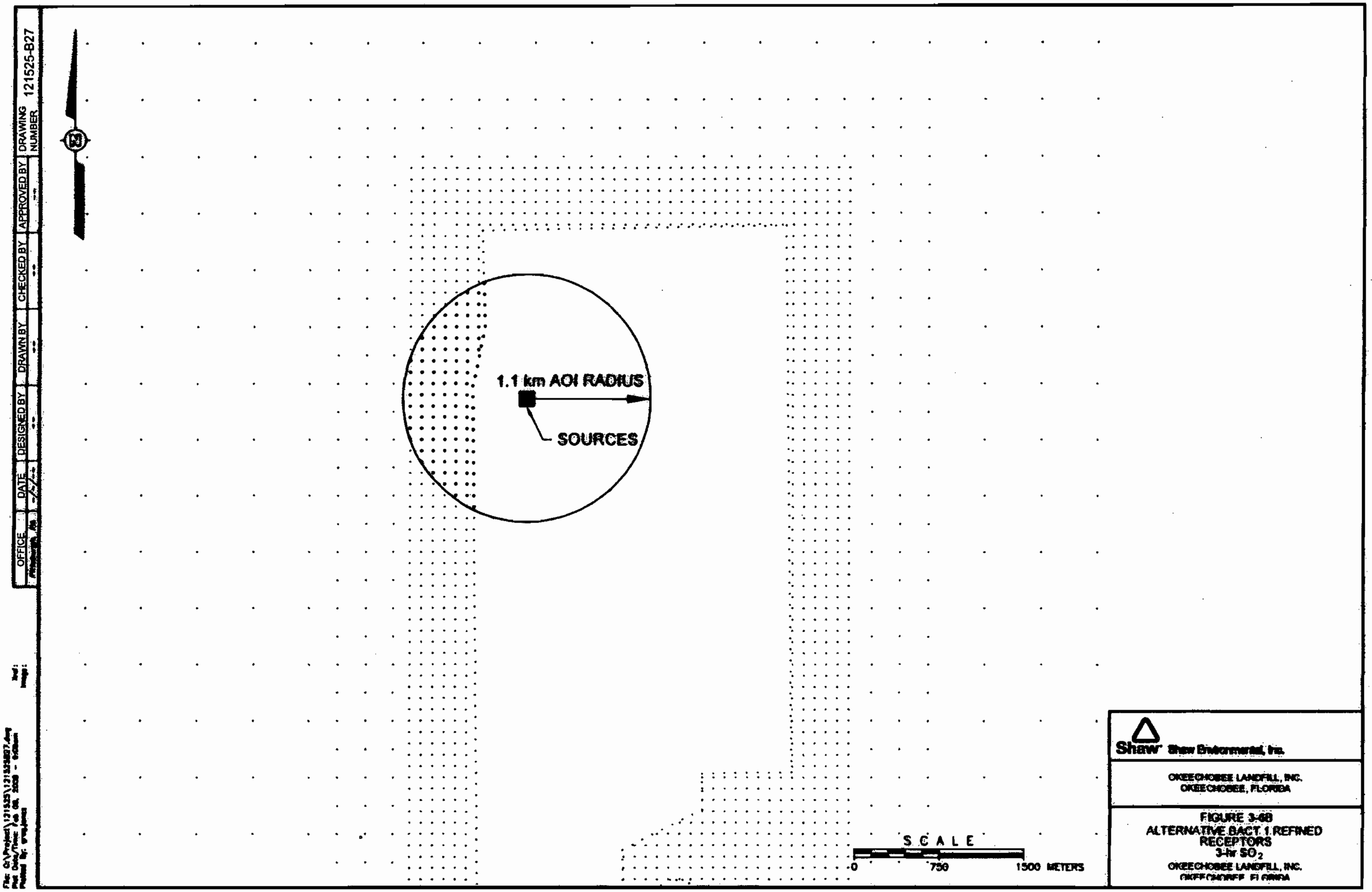


Shaw Environmental, Inc.

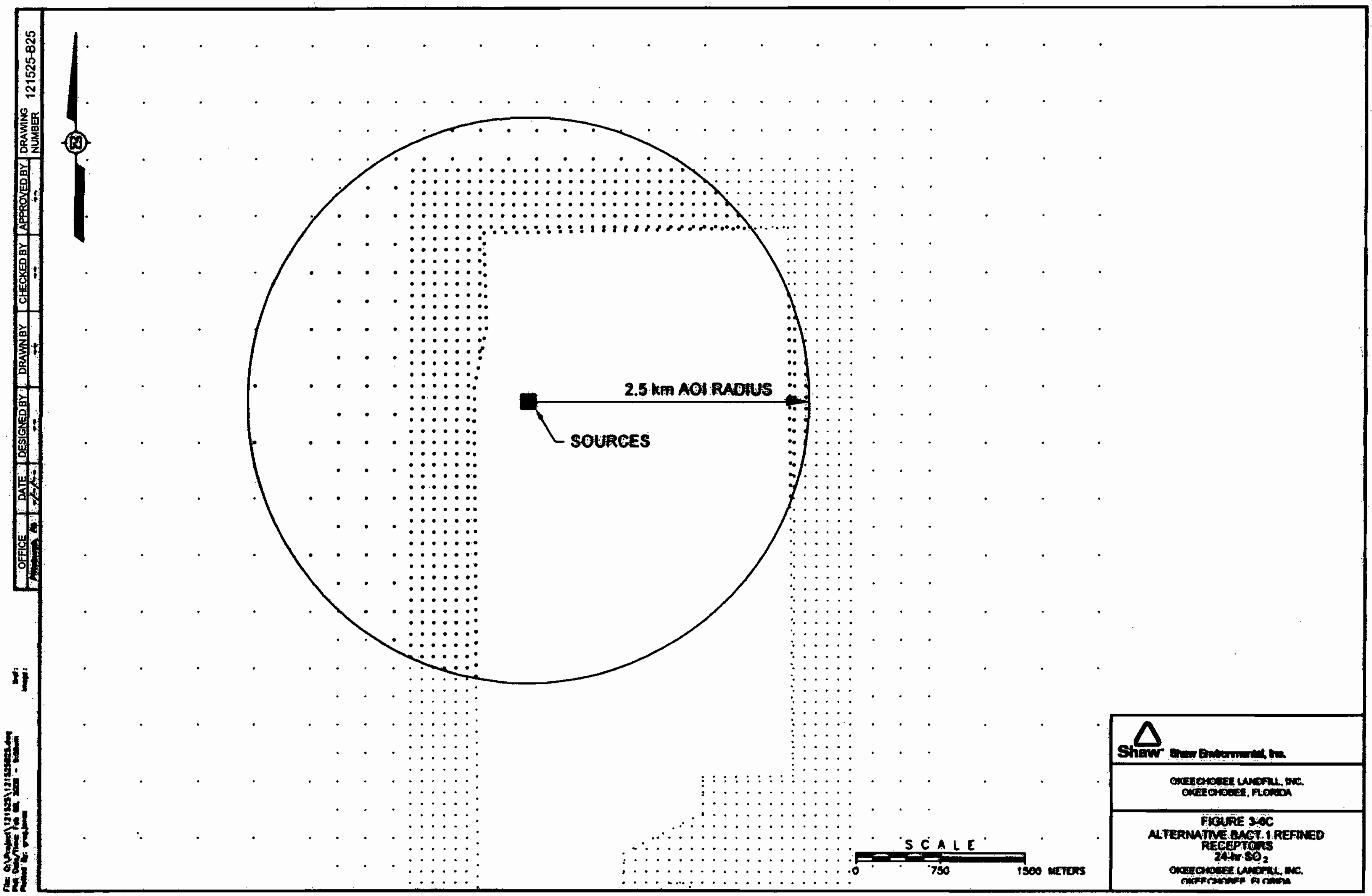
OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

FIGURE 3-4A
ALTERNATIVE BACT 1 REFINED RECEPTORS
ANNUAL NO_2

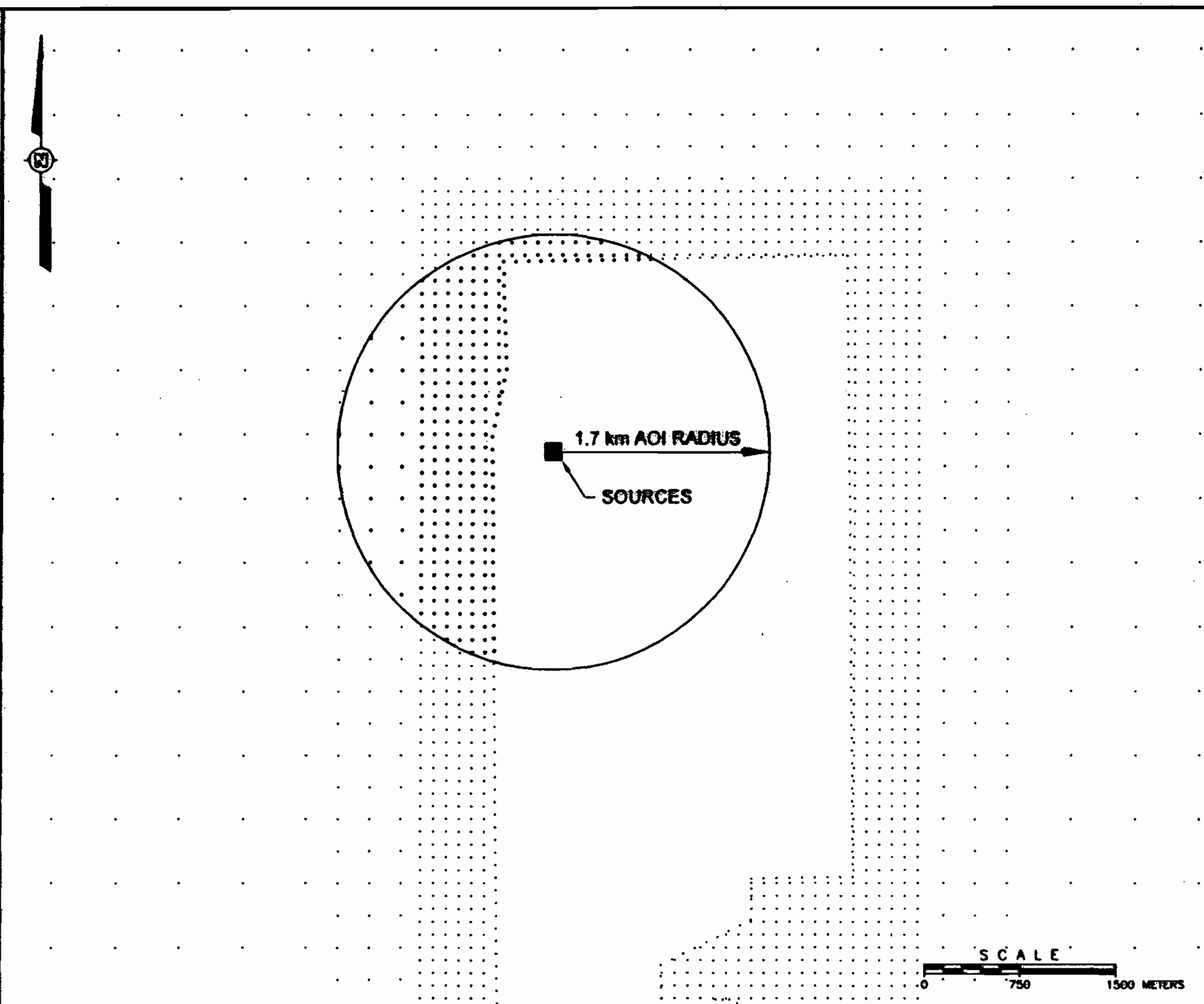
OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA



1.1 km AOI RADIUS
SOURCES
SCALE
0
750
1500 METERS
OFFICE
DATE
DESIGNED BY
DRAWN BY
CHECKED BY
APPROVED BY
DRAWING NUMBER
121525-B27
Shaw Shaw Environmental, Inc.
OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA
FIGURE 3-68
ALTERNATIVE BACT 1 REFINED RECEPTORS
3-hr SO2
OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA



DRAWING NUMBER 121525-B25
OFFICE
DATE
DESIGNED BY
DRAWN BY
CHECKED BY
APPROVED BY
2.5 km AOI RADIUS
SOURCES
SCALE
0
750
1500 METERS
Shaw Shaw Environmental, Inc.
OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA
FIGURE 3-6C
ALTERNATIVE BACT 1 REFINED
RECEPTORS
24-hr SO2
OKEECHOBEE LANDFILL, INC.



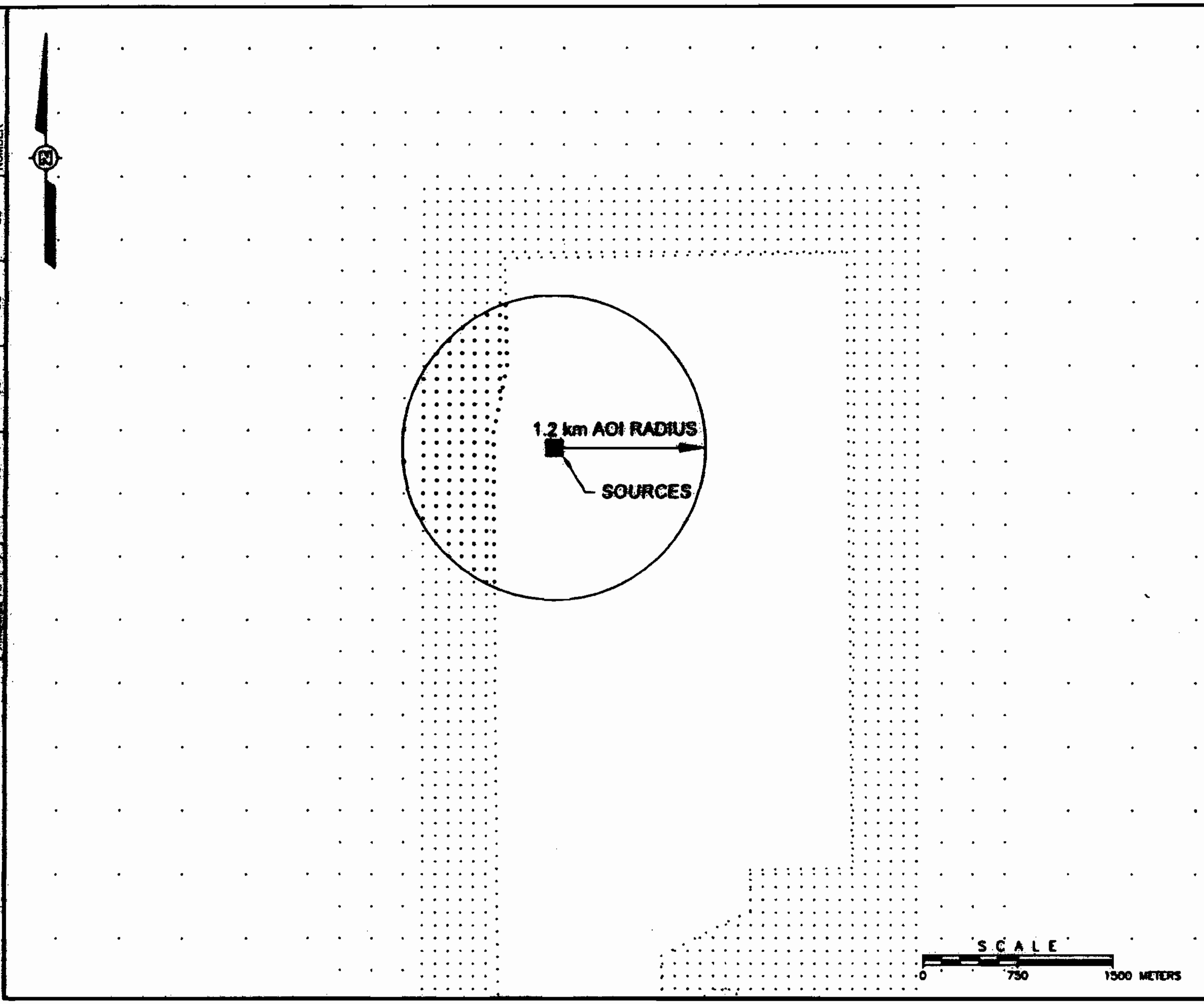
OFFICE	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
Pittsburgh, PA	--/--/--	--	--	--	--	121525-B26

Shaw Environmental, Inc.

OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

FIGURE 3-6D
ALTERNATIVE BACT 1 REFINED RECEPTORS
ANNUAL SO_2

OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA



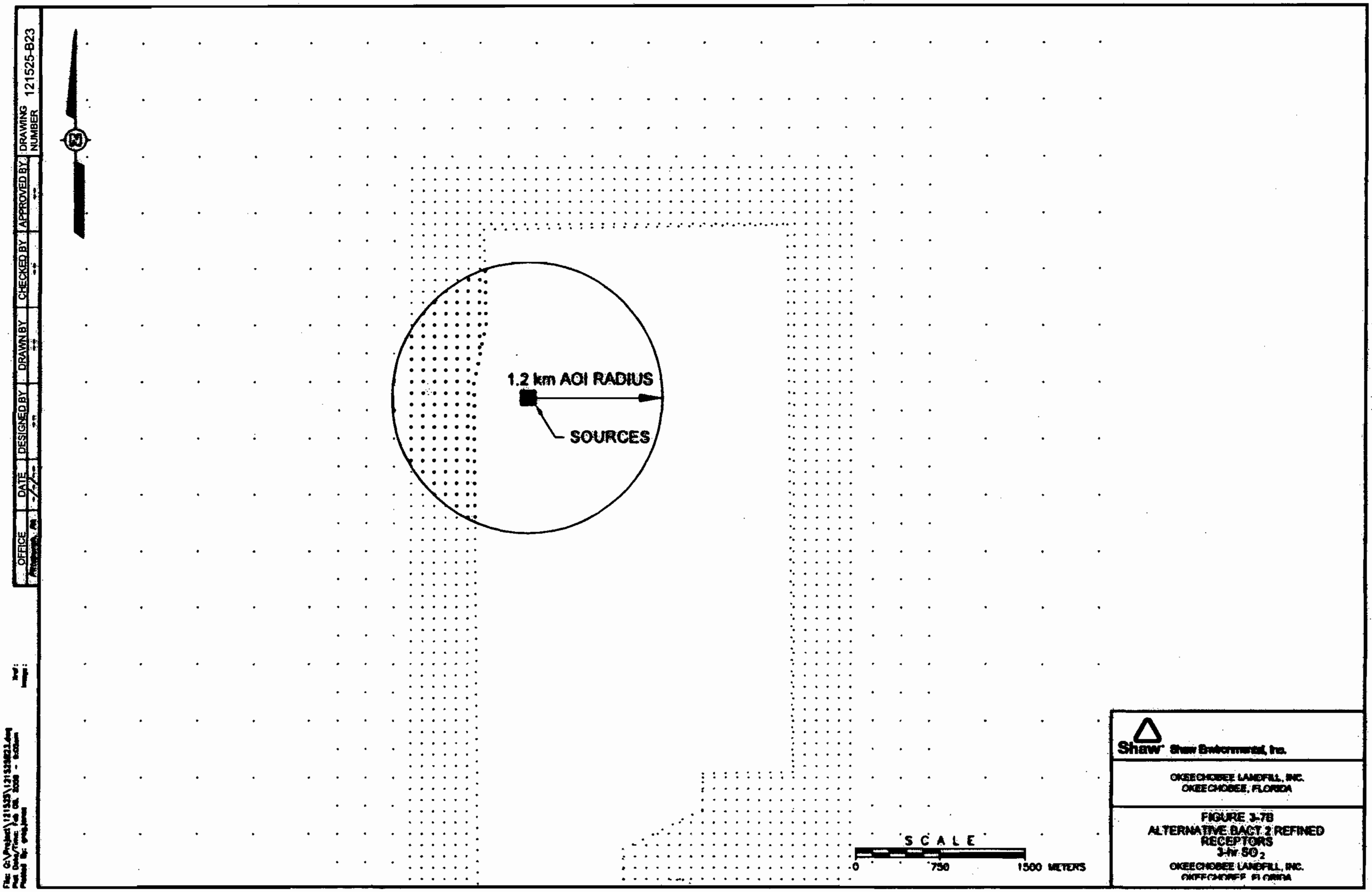
DRAWING NUMBER 121525-B24

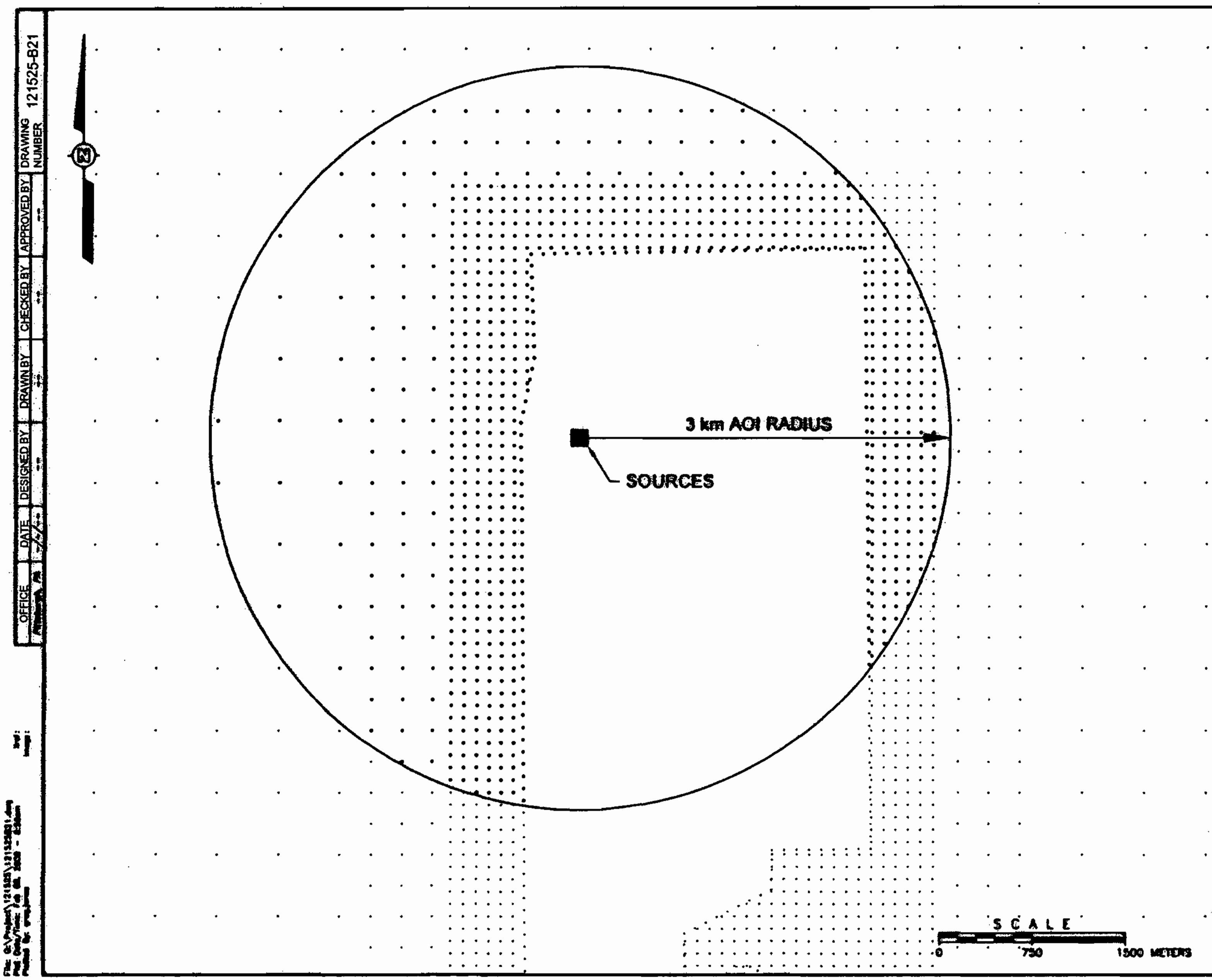
Shaw Environmental, Inc.

OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

FIGURE 3-7A
ALTERNATIVE BACT 2 REFINED RECEPTORS
ANNUAL NO_x

OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

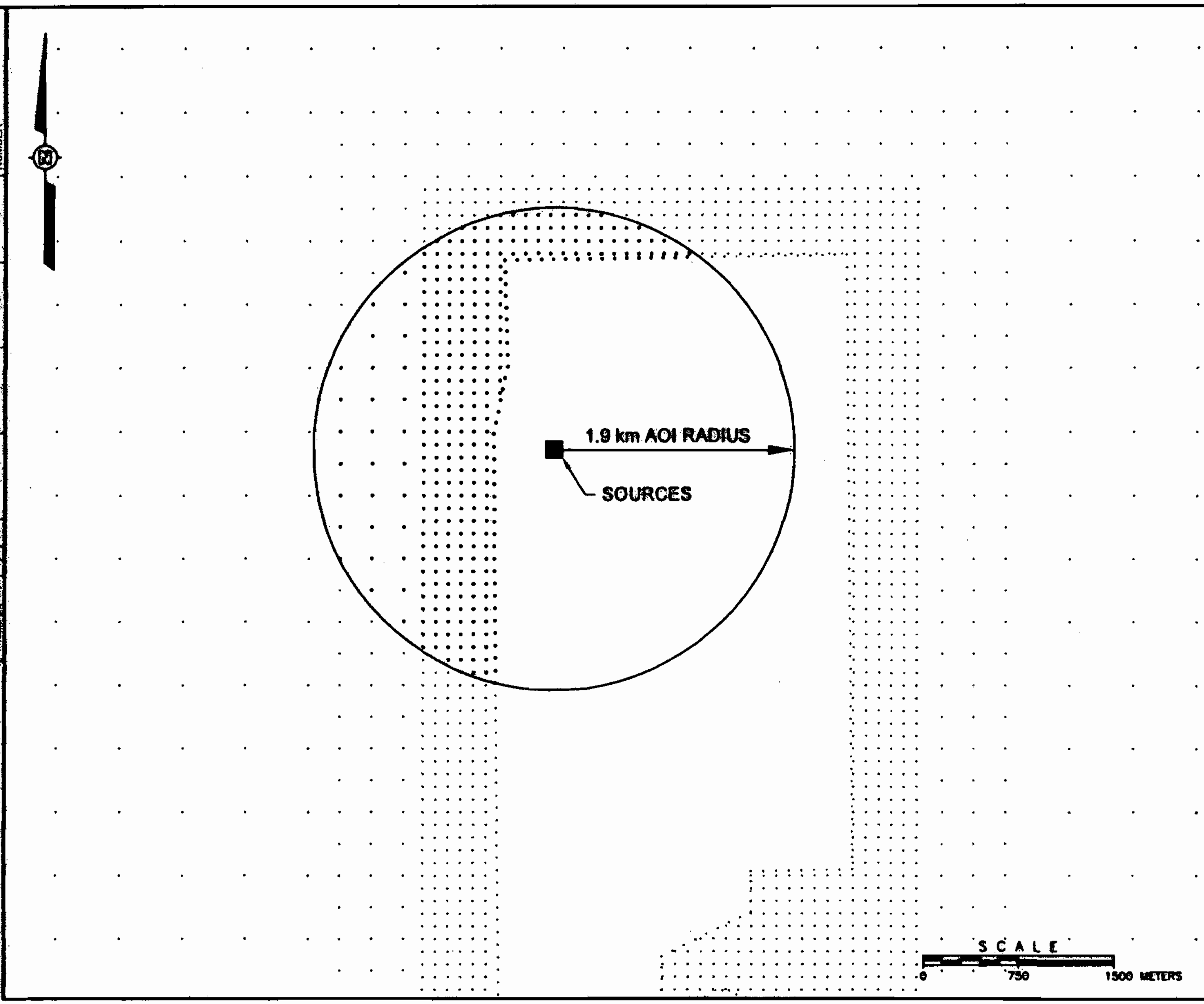

DRAWING NUMBER 121525-B23
OFFICE
DATE
DESIGNED BY
DRAWN BY
CHECKED BY
APPROVED BY
1.2 km AOI RADIUS
SOURCES
SCALE
0
750
1500 METERS
Shaw Environmental, Inc.
OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA
FIGURE 3-7B
ALTERNATIVE BACT 2 REFINED RECEPTORS
3-hr SO2
OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA



Shaw Environmental, Inc.

OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

FIGURE 3-7C
ALTERNATIVE BACT 2 REFINED RECEPTORS
24-hr SO_2
OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA



OFFICE	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
		--	--	--	--	121525-B22

Shaw Environmental, Inc.

OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

FIGURE 3-7D
ALTERNATIVE BACT 2 REFINED RECEPTORS
ANNUAL SO_2
OKEECHOBEE LANDFILL, INC.
OKEECHOBEE, FLORIDA

APPENDIX A

Solar Turbines
A Caterpillar Company

PREDICTED ENGINE PERFORMANCE

Customer: *Waste Management*	Model: MARS 100-15000
	Package Type: GSC
Job ID:	Match: 59F MATCH
Run By: Donald C Lyons — Date Run: 24-Oct-06	Fuel System: GAS
Engine Performance Code: REV. 3.40 — Engine Performance Data: REV. 3.0	Fuel Type: CHOICE NATURAL GAS

DATA FOR NOMINAL PERFORMANCE

Elevation	feet	50
Inlet Loss	in H20	3.5
Exhaust Loss	in H20	3.5

		1	2	3
Engine Inlet Temperature	deg F	59.0	59.0	59.0
Relative Humidity	%	60.0	60.0	60.0
Specified Load*	kW	FULL	75.0%	50.0%
Net Output Power*	kW	10924	8193	5462
Fuel Flow	mmBtu/hr	114.28	90.11	68.99
Heat Rate*	Btu/kW-hr	10461	10999	12630
Therm Eff*	%	32.619	31.023	27.015
Engine Exhaust Flow	lbm/hr	342595	306920	263057
Exhaust Temperature	deg F	894	818	778

Fuel Gas Composition (Volume Percent)

Methane (CH4)	50.00
Carbon Dioxide (CO2)	50.00
Sulfur Dioxide (SO2)	0.0001

Fuel Gas Properties

LHV (Btu/Scf)	454.7	Specific Gravity	1.0366	Wobbe Index at 60F	446.6

**Electric power measured at the generator terminals.*

Notes: Florida

EMISSIONS DATA PROVIDED BY MANUFACTURER VIA EMAIL

-----Original Message-----
From: Chris D. Lyons [mailto:Lyons_Chris_D@solarturbines.com]
Sent: Tuesday, October 24, 2006 11:52 AM
To: Unger, Dave (Renewable Energy)
Subject: Mars 100 emissions

Dave,

I need to get an official engineering response to your request. The landfill in Paris had a different fuel composition than your site in Florida. I am assuming 50% methane, 50% carbon dioxide.
I have attached the expected performance and below are what I believe will be the emissions.

Full	load				
NOx	=	60 ppmv @15%oxygen	=	31.067	lb/hr
CO	=	60 ppmv @15%oxygen	=	31.517	lb/hr
	75% Load				
NOx	=	42 ppmv @15%oxygen	=	16.782	lb/hr
CO	=	80 ppmv @15%oxygen	=	19.457	lb/hr
	50% Load				
NOx	=	30 ppmv @15%oxygen	=	10.278	lb/hr
CO	=	150 ppmv @15%oxygen	=	31.279	lb/hr

Let me know if you will need any other data. It will take a few days to receive an official response back from engineering.
Regards,
Chris Lyons
Solar Turbines
Phone: 1-858-694-6586

Parameter	Value	Units	Reference
Exhaust Temp	894	F	Mars 100-15000, 100% Load
Exhaust Temp	818	F	Mars 100-15000, 75% Load
Exhaust Temp	778	F	Mars 100-15000, 50% Load
Stack Height	50	ft	required minimum height, permit requirement necessary
Stack Side	87.5	in	Solar Turbines
Stack Side	90.5625	in	Solar Turbines
Stack Interior Diameter	100	in	Calculated
PM10 Rate	0.023	lb/MMBtu	AP-42, Table 3.1-2b
Turbine Inlet	4000	scfm	Solar Turbines
Average Landfill gas HHV	400	Btu/scf	AP-42, Table 3.1-2b
PM10 Rate	2.2	lb/hr	Calculated

Calculation of Flow Rate

		100%	75%	50%
Total Mass Out Solar Turbines (see above)	lb/hr	342,595	306,920	263,057
Solar Turbines Inc. Mass out (see pdf at right)	lb/hr	354239	PDF Adobe Solar Turbine Calcs	
Solar Turbines Inc. Exhaust Flow (see pdf at right)	acfm	200336		
Total Flow out	acfm	193,751	173,575	148,769
Total Flow out	ft/s	58.68	52.57	45.06

Availability 51 weeks/yr 98%

Criteria Pollutant Emissions - Turbines

Operation Period	8,760	hr
LFG inlet flow, standard	4,000	scfm
Heat Input	120	MMBtu/hr
Standard Temperature[a]	60	°F
	520	°R

500 Btu/cf

SO_2 Emission Rate

SO_2 concentration in exhaust gas	400.05	ppmv		
SO_2 emission rate	16.20	lb/hr	71.0	tpy

LFG Compound	CAS	MW (lb/lb-mol)	Conc (ppmv)[a]	Control Eff[a,b]	Individual Compound Contribution to SO_2: No. of S Atoms	S Conc (ppmv)	SO_2 Emiss (lb/hr)
Carbon Disulfide	75-15-0	76.13	0.58	100.0%	2	1.17	0.05
Carbonyl Sulfide	463-58-1	60.07	0.49	100.0%	1	0.49	0.02
Dimethyl Sulfide (methyl sulfide)	75-18-3	62.13	7.82	100.0%	1	7.82	0.32
Ethyl Mercaptan (ethanethiol)	75-08-1	62.13	2.28	100.0%	1	2.28	0.09
Hydrogen Sulfide	7783-06-4	34.08	**385.80**	100.0%	1	385.8	15.62
Methyl Mercaptan	74-93-1	48.11	2.49	100%	1	2.49	0.10
				Total Contribution to SO_2 :		400.05	16.20

NMOC Emission Rate

NMOC conc inlet gas[a]	595	ppmv		
MW hexane	86.18	lb/lb-mol		
destruction efficiency	98%			
mass NMOC inlet gas	32.4	lb/hr		
NMOC emission rate	0.65	lb/hr	2.84	tpy

VOC Emission Rate

NMOC conc inlet gas[a]	595	ppmv		
VOC fraction of NMOC[a]	39%			
VOC concentration in inlet gas	232	ppmv		
MW hexane	86.18	lb/lb-mol		
mass VOC inlet gas	12.6	lb/hr		
destruction efficiency	98%			
VOC emission rate	0.25	lb/hr	1.11	tpy

[a]U.S. E.P.A., *Compilation of Air Pollutant Emission Factors, Volume I. Stationary Point and Area Sources* ("AP-42"), *5th Ed.,* November 1998.
[b]AP-42 gives ranges for control efficiencies. Control efficiencies for halogenated species range from 91 to 99.7 percent. The upper end of the range is used here resulting in maximum calculated emissions of SO_2.
[c]LFG Specialties Inc. (typical)

Current enclosed flare for interim scenario

EU003 3,000-scfm enclosed flare w/evap

EU004 3,000-scfm enclosed flare w/evap

Standard Conditions, Constants, and Typical Values

Category	**Value**		**Equivalent**
Standard Temperature[a]	60	°F	520 °R
Universal Gas Constant	0.7302	atm-ft³/lb-mol°R	
Pressure[a]	1	atm	
Methane Heating Value[b]	1,000	Btu/ft³	
LFG Methane Component[c]	50%		
LFG Typical Heating Value	500	Btu/ft³	
LFG Temperature[c]	100	°F	560 °R
LFG Moisture[c]	8%		
Methane Combustion Constant[d]	9.53	ft³ air/ft³ CH_4	

[a]Industrial STP (60°F, 30.00 in. Hg, 1 atm)

[b]Typical

[c]Assumed

[d]*Professional Engineering Registration Program*, 23-9.

Fuel & Equipment - Enclosed Flare

Flare Information	**Value**		**Equivalent**
Operation Period[a]	8,760	hr	
LFG inlet flow, standard[b]	1,700	scfm	
LFG Inlet Flow, dry standard	1,564	dscfm	
Heat Input	51	MMBtu/hr	
Design Flare Operating Temperature[c]	1,400	°F	1,860 °R
Excess Air for Combustion[c]	230%		
Flare Tip Flow, standard	28,432	scfm	
Flare Tip Flow, actual	101,698	acfm	
Flare Tip Diameter[b]	10.0	ft	
Flare Tip Exhaust Velocity	1,295	ft/min	21.6 ft/s
Flare Tip Height, above local grade[b]	45	ft	

[a]Permit Applicant

[b]Flare manufacturer - based on LFG model EF1045I12

[c]Function of design flame temperature; values are typical and are provided for 1400°F, 1600°F, 1800°F, and 2000°Fby a flare manufactuer

Current enclosed flare for interim scenario

Criteria Pollutant Emissions - Enclosed Flare

EU003 and EU004 3,000-scfm enclosed flares w/evap

Operation Period	8,760	hr
LFG inlet flow, standard	1,700	scfm
Heat Input	51	MMBtu/hr

SO_2 Emission Rate without BACT

SO_2 concentration in exhaust gas	2990.58	ppmv		
SO_2 emission rate	51.47	lb/hr	225.4	tpy

LFG Compound	CAS	MW (lb/lb-mol)	Conc (ppmv)[a]	Control Eff[a,b]	Individual Compound Contribution to SO_2: No. of S Atoms	S Conc (ppmv)	SO_2 Emiss (lb/hr)
Carbon Disulfide	75-15-0	76.13	0.58	100.0%	2	1.17	0.02
Carbonyl Sulfide	463-58-1	60.07	0.49	100.0%	1	0.49	0.01
Dimethyl Sulfide (methyl sulfide)	75-18-3	62.13	7.82	100.0%	1	7.82	0.13
Ethyl Mercaptan (ethanethiol)	75-08-1	62.13	2.28	100.0%	1	2.28	0.04
Hydrogen Sulfide	7783-06-4	34.08	2976.34	100.0%	1	2976.3	51.22
Methyl Mercaptan	74-93-1	48.11	2.49	100.0%	1	2.49	0.04
				Total Contribution to SO_2 :		2990.58	51.47

PM_{10} Emission Rate

PM emission factor[a]	17	lb/MM dscf CH_4		
PM emission rate	0.80	lb/hr	3.5	tpy

NO_2 Emission Rate

NO_2 emission factor[c]	0.06	lb/MMBtu		
NO_2 emission rate	3.1	lb/hr	13.4	tpy

CO Emission Rate

CO emission factor[c]	0.20	lb/MMBtu		
CO emission rate	10.2	lb/hr	45	tpy

NMOC Emission Rate

NMOC conc inlet gas[a]	595	ppmv		
MW hexane	86.18	lb/lb-mol		
destruction efficiency	98%			
mass NMOC inlet gas	13.8	lb/hr		
NMOC emission rate	0.28	lb/hr	1.21	tpy

VOC Emission Rate

NMOC conc inlet gas[a]	595	ppmv		
VOC fraction of NMOC[a]	39%			
VOC concentration in inlet gas	232	ppmv		
MW hexane	86.18	lb/lb-mol		
mass VOC inlet gas	5.4	lb/hr		
destruction efficiency	98%			
VOC emission rate	0.11	lb/hr	0.47	tpy

[a]U.S. E.P.A., *Compilation of Air Pollutant Emission Factors, Volume I. Stationary Point and Area Sources* ("AP-42"), *5th Ed.,* November 1998.

[b]AP-42 gives ranges for control efficiencies. Control efficiencies for halogenated species range from 91 to 99.7 percent. The upper end of the range is used here resulting in maximum calculated emissions of SO_2.

[c]LFG Specialties Inc. (typical)

Current open flare for interim scenario
EU NEW - Proposed 3,300-scfm utility flare

Standard Conditions, Constants, and Typical Values

Category	Value		Equivalent
Standard Temperature[a]	60	°F	520 °R
Universal Gas Constant	0.7302	atm-ft³/lb-mol°R	
Pressure[a]	1	atm	
Methane Heating Value[b]	1,000	Btu/ft³	
LFG Methane Component[c]	50%	%	
LFG Typical Heating Value	500	Btu/ft³	
LFG Temperature[c]	100	°F	560 °R
LFG Moisture[c]	8%	%	

[a]Industrial STP (60°F, 30.00 in. Hg, 1 atm)
[b]Typical
[c]Assumed

Fuel & Equipment - Open Flare

Flare Information	Value		Equivalent
No. of Hours of Operation Per Day[a]	24	hr	
No. of Days in Averaging Period[a]	365	day	
Operation Period[a]	8,760	hr	
LFG inlet flow, standard[a]	2,300	scfm	
LFG Inlet Flow, dry standard	2,116	dscfm	
Heat Input	69.0	MMBtu/hr	
Design Flare Operating Temperature[b]	1,400	°F	1,860 °R
Flare Tip Flow, standard	2,300	scfm	
Flare Tip Flow, actual	2,477	acfm	
Flare Tip Diameter[b]	1.17	ft	
Flare Tip Exhaust Velocity	2,317	ft/min	38.6 ft/s
Flare Tip Height, above local grade[b]	35	ft	

[a]Permit Applicant

Current open flare for interim scenario

Criteria Pollutant Emissions - Open Flare

Operation Period	8,760	hr
LFG inlet flow, standard	2,300	scfm
Heat Input	69.0	MMBtu/hr

SO_2 Emission Rate

SO_2 concentration in exhaust gas	4987.58	ppmv		
SO_2 emission rate	116.13	lb/hr	508.66	ton/yr

LFG Compound	CAS	MW (lb/lb-mol)	Conc (ppmv)[a]	Control Eff[a,b]	Individual Compound Contribution to SO_2: No. of S Atoms	S Conc (ppmv)	SO_2 Emiss (lb/hr)
Carbon Disulfide	75-15-0	76.13	0.58	100.0%	2	1.17	0.03
Carbonyl Sulfide	463-58-1	60.07	0.49	100.0%	1	0.49	0.01
Dimethyl Sulfide (methyl sulfide)	75-18-3	62.13	7.82	100.0%	1	7.82	0.18
Ethyl Mercaptan (ethanethiol)	75-08-1	62.13	2.28	100.0%	1	2.28	0.05
Hydrogen Sulfide	7783-06-4	34.08	4973.34	100.0%	1	4973.3	115.80
Methyl Mercaptan	74-93-1	48.11	2.49	100.0%	1	2.49	0.06
					Total Contribution to SO_2:	4987.58	116.13

PM_{10} Emission Rate

PM emission factor[a]	17	lb/MM dscf CH_4		
PM emission rate	1.08	lb/hr	4.73	tpy

NO_2 Emission Rate

NO_2 emission factor[c]	0.068	lb/MMBtu		
NO_2 emission rate	4.69	lb/hr	20.55	tpy

CO Emission Rate

CO emission factor[c]	0.37	lb/MMBtu		
CO emission rate	25.5	lb/hr	111.8	tpy

NMOC Emission Rate

NMOC conc inlet gas[a]	595	ppmv		
MW hexane	86.18	lb/lb-mol		
destruction efficiency	98%			
mass NMOC inlet gas	18.64	lb/hr		
NMOC emission rate	0.37	lb/hr	1.63	tpy

VOC Emission Rate

NMOC conc inlet gas[a]	595	ppmv		
VOC fraction of NMOC[a]	39%			
VOC concentration in inlet gas	232	ppmv		
MW hexane	86.18	lb/lb-mol		
mass VOC inlet gas	7.27	lb/hr		
destruction efficiency	98%			
VOC emission rate	0.15	lb/hr	0.64	tpy

[a]EPA 1998. "Compilation of Air Pollutant Emission Factors, Volume I. Stationary Point and Area Sources" (AP-42), 5th Ed., November

[b]AP-42 gives ranges for control efficiencies. Control efficiencies for halogenated species range from 91 to 99.7 percent. The upper end range is used here resulting in maximum calculated emissions of SO

[c]LFG Specialties Inc. (typical)

Existing enclosed flare baseline

EU003 3,000-scfm enclosed flare w/evap

Standard Conditions, Constants, and Typical Values

Category	Value		Equivalent
Standard Temperature[a]	60	°F	520 °R
Universal Gas Constant	0.7302	atm-ft^3/lb-mol°R	
Pressure[a]	1	atm	
Methane Heating Value[b]	1,000	Btu/ft^3	
LFG Methane Component[c]	50%		
LFG Typical Heating Value	500	Btu/ft^3	
LFG Temperature[c]	100	°F	560 °R
LFG Moisture[c]	8%		
Methane Combustion Constant[d]	9.53	ft^3 air/ft^3 CH_4	

[a]Industrial STP (60°F, 30.00 in. Hg, 1 atm)

[b]Typical

[c]Assumed

[d]*Professional Engineering Registration Program*, 23-9.

Fuel & Equipment - Enclosed Flare

Flare Information	Value		Equivalent
Operation Period[a]	8,760	hr	
LFG inlet flow, standard[b]	2,237	scfm	
LFG Inlet Flow, dry standard	2,058	dscfm	
Heat Input	67	MMBtu/hr	
Design Flare Operating Temperature[c]	1,400	°F	1,860 °R
Excess Air for Combustion[c]	230%		
Flare Tip Flow, standard	37,413	scfm	
Flare Tip Flow, actual	133,822	acfm	
Flare Tip Diameter[b]	10.0	ft	
Flare Tip Exhaust Velocity	1,704	ft/min	28.4 ft/s
Flare Tip Height, above local grade[b]	45	ft	

[a]Permit Applicant

[b]Flare manufacturer - based on LFG model EF1045I12

[c]Function of design flame temperature; values are typical and are provided for 1400°F, 1600°F, 1800°F, and 2000°Fby a flare manufactuer

Existing enclosed flare baseline

Criteria Pollutant Emissions - Enclosed Flare

EU003 3,000-scfm enclosed flare w/evap

Operation Period	8,760	hr
LFG inlet flow, standard	2,237	scfm
Heat Input	67	MMBtu/hr

SO_2 Emission Rate with BACT

Sulfur concentration in exhaust gε	400.05	ppmv		
SO_2 emission rate	9.06	lb/hr uncontrolled	39.7	tpy

LFG Compound	CAS	MW (lb/lb-mol)	Conc (ppmv)[a]	Control Eff[a,b]	Individual Compound Contribution to SO_2: No. of S Atoms	S Conc (ppmv)	SO_2 Emiss (lb/hr)
Carbon Disulfide	75-15-0	76.13	0.58	100.0%	2	1.17	0.03
Carbonyl Sulfide	463-58-1	60.07	0.49	100.0%	1	0.49	0.01
Dimethyl Sulfide (methyl sulfide)	75-18-3	62.13	7.82	100.0%	1	7.82	0.18
Ethyl Mercaptan (ethanethiol)	75-08-1	62.13	2.28	100.0%	1	2.28	0.05
Hydrogen Sulfide	7783-06-4	34.08	**385.80**	100.0%	1	385.8	8.74
Methyl Mercaptan	74-93-1	48.11	2.49	100.0%	1	2.49	0.06
					Total Contribution to SO_2 :	400.05	9.06

PM_{10} Emission Rate

PM emission factor[a]	17	lb/MM dscf CH_4		
PM emission rate	1.05	lb/hr	4.6	tpy

NO_2 Emission Rate

NO_2 emission factor[c]	0.06	lb/MMBtu		
NO_2 emission rate	4.0	lb/hr	17.6	tpy

CO Emission Rate

CO emission factor[c]	0.20	lb/MMBtu		
CO emission rate	13.4	lb/hr	59	tpy

NMOC Emission Rate

NMOC conc inlet gas[a]	595	ppmv		
MW hexane	86.18	lb/lb-mol		
destruction efficiency	98%			
mass NMOC inlet gas	18.1	lb/hr		
NMOC emission rate	0.36	lb/hr	1.59	tpy

VOC Emission Rate

NMOC conc inlet gas[a]	595	ppmv		
VOC fraction of NMOC[a]	39%			
VOC concentration in inlet gas	232	ppmv		
MW hexane	86.18	lb/lb-mol		
mass VOC inlet gas	7.1	lb/hr		
destruction efficiency	98%			
VOC emission rate	0.14	lb/hr	0.62	tpy

[a]U.S. E.P.A., *Compilation of Air Pollutant Emission Factors, Volume I. Stationary Point and Area Sources* ("AP-42"), *5th Ed.,* November 1998.

[b]AP-42 gives ranges for control efficiencies. Control efficiencies for halogenated species range from 91 to 99.7 percent. The upper end of the range is used here resulting in maximum calculated emissions of SO_2.

[c]LFG Specialties Inc. (typical)

Existing enclosed flare baseline

EU003 3,000-scfm enclosed flare w/evap

Standard Conditions, Constants, and Typical Values

Category	Value		Equivalent
Standard Temperature[a]	60	°F	520 °R
Universal Gas Constant	0.7302	atm-ft^3/lb-mol°R	
Pressure[a]	1	atm	
Methane Heating Value[b]	1,000	Btu/ft^3	
LFG Methane Component[c]	50%		
LFG Typical Heating Value	500	Btu/ft^3	
LFG Temperature[c]	100	°F	560 °R
LFG Moisture[c]	8%		
Methane Combustion Constant[d]	9.53	ft^3 air/ft^3 CH_4	

[a]Industrial STP (60°F, 30.00 in. Hg, 1 atm)
[b]Typical
[c]Assumed
[d]*Professional Engineering Registration Program*, 23-9.

Fuel & Equipment - Enclosed Flare

Flare Information	Value		Equivalent
Operation Period[a]	8,760	hr	
LFG inlet flow, standard[b]	2,246	scfm	
LFG Inlet Flow, dry standard	2,066	dscfm	
Heat Input	67	MMBtu/hr	
Design Flare Operating Temperature[c]	1,400	°F	1,860 °R
Excess Air for Combustion[c]	230%		
Flare Tip Flow, standard	37,563	scfm	
Flare Tip Flow, actual	134,361	acfm	
Flare Tip Diameter[b]	10.0	ft	
Flare Tip Exhaust Velocity	1,711	ft/min	28.5 ft/s
Flare Tip Height, above local grade[b]	45	ft	

[a]Permit Applicant
[b]Flare manufacturer - based on LFG model EF1045I12
[c]Function of design flame temperature; values are typical and are provided for 1400°F, 1600°F, 1800°F, and 2000°Fby a flare manufactuer

Existing enclosed flare baseline
Criteria Pollutant Emissions - Enclosed Flare
EU003 3,000-scfm enclosed flare w/evap

Operation Period	8,760	hr
LFG inlet flow, standard	2,246	scfm
Heat Input	67	MMBtu/hr

SO_2 Emission Rate with BACT

Sulfur concentration in exhaust ga	400.05	ppmv		
SO_2 emission rate	9.10	lb/hr uncontrolled	39.8	tpy

LFG Compound	CAS	MW (lb/lb-mol)	Conc (ppmv)[a]	Control Eff[a,b]	Individual Compound Contribution to SO_2: No. of S Atoms	S Conc (ppmv)	SO_2 Emiss (lb/hr)
Carbon Disulfide	75-15-0	76.13	0.58	100.0%	2	1.17	0.03
Carbonyl Sulfide	463-58-1	60.07	0.49	100.0%	1	0.49	0.01
Dimethyl Sulfide (methyl sulfide)	75-18-3	62.13	7.82	100.0%	1	7.82	0.18
Ethyl Mercaptan (ethanethiol)	75-08-1	62.13	2.28	100.0%	1	2.28	0.05
Hydrogen Sulfide	7783-06-4	34.08	**385.80**	100.0%	1	385.8	8.77
Methyl Mercaptan	74-93-1	48.11	2.49	100.0%	1	2.49	0.06
				Total Contribution to SO_2 :		400.05	9.10

PM_{10} Emission Rate

PM emission factor[a]	17	lb/MM dscf CH_4		
PM emission rate	1.05	lb/hr	4.6	tpy

NO_2 Emission Rate

NO_2 emission factor[c]	0.06	lb/MMBtu		
NO_2 emission rate	4.0	lb/hr	17.7	tpy

CO Emission Rate

CO emission factor[c]	0.20	lb/MMBtu		
CO emission rate	13.5	lb/hr	59	tpy

NMOC Emission Rate

NMOC conc inlet gas[a]	595	ppmv		
MW hexane	86.18	lb/lb-mol		
destruction efficiency	98%			
mass NMOC inlet gas	18.2	lb/hr		
NMOC emission rate	0.36	lb/hr	1.59	tpy

VOC Emission Rate

NMOC conc inlet gas[a]	595	ppmv		
VOC fraction of NMOC[a]	39%			
VOC concentration in inlet gas	232	ppmv		
MW hexane	86.18	lb/lb-mol		
mass VOC inlet gas	7.1	lb/hr		
destruction efficiency	98%			
VOC emission rate	0.14	lb/hr	0.62	tpy

[a]U.S. E.P.A., *Compilation of Air Pollutant Emission Factors, Volume I. Stationary Point and Area Sources* ("AP-42"), *5th Ed.*, November 1998.
[b]AP-42 gives ranges for control efficiencies. Control efficiencies for halogenated species range from 91 to 99.7 percent. The upper end of the range is used here resulting in maximum calculated emissions of SO_2.
[c]LFG Specialties Inc. (typical)

Proposed operation of existing flares

EU003 3,000-scfm enclosed flare w/evap

Standard Conditions, Constants, and Typical Values

Category	**Value**		**Equivalent**
Standard Temperature[a]	60	°F	520 °R
Universal Gas Constant	0.7302	atm-ft^3/lb-mol°R	
Pressure[a]	1	atm	
Methane Heating Value[b]	1,000	Btu/ft^3	
LFG Methane Component[c]	50%		
LFG Typical Heating Value	500	Btu/ft^3	
LFG Temperature[c]	100	°F	560 °R
LFG Moisture[c]	8%		
Methane Combustion Constant[d]	9.53	ft^3 air/ft^3 CH_4	

[a]Industrial STP (60°F, 30.00 in. Hg, 1 atm)

[b]Typical

[c]Assumed

[d]*Professional Engineering Registration Program*, 23-9.

Fuel & Equipment - Enclosed Flare

Flare Information	**Value**		**Equivalent**
Operation Period[a]	8,760	hr	
LFG inlet flow, standard[b]	3,000	scfm	
LFG Inlet Flow, dry standard	2,760	dscfm	
Heat Input	90	MMBtu/hr	
Design Flare Operating Temperature[c]	1,400	°F	1,860 °R
Excess Air for Combustion[c]	230%		
Flare Tip Flow, standard	50,174	scfm	
Flare Tip Flow, actual	179,467	acfm	
Flare Tip Diameter[b]	10.0	ft	
Flare Tip Exhaust Velocity	2,285	ft/min	38.1 ft/s
Flare Tip Height, above local grade[b]	45	ft	

[a]Permit Applicant

[b]Flare manufacturer - based on LFG model EF1045I12

[c]Function of design flame temperature; values are typical and are provided for 1400°F, 1600°F, 1800°F, and 2000°Fby a flare manufactuer

Proposed operation of existing flares.
Criteria Pollutant Emissions - Enclosed Flare
EU003 3,000-scfm enclosed flare w/evap

Operation Period	8,760	hr
LFG inlet flow, standard	3,000	scfm
Heat Input	90	MMBtu/hr

SO_2 Emission Rate without BACT

SO_2 concentration in exhaust gas	2990.58	ppmv		
SO_2 emission rate	90.83	lb/hr	397.8	tpy

LFG Compound	CAS	MW (lb/lb-mol)	Conc (ppmv)[a]	Control Eff[a,b]	Individual Compound Contribution to SO_2: No. of S Atoms	S Conc (ppmv)	SO_2 Emiss (lb/hr)
Carbon Disulfide	75-15-0	76.13	0.58	100.0%	2	1.17	0.04
Carbonyl Sulfide	463-58-1	60.07	0.49	100.0%	1	0.49	0.01
Dimethyl Sulfide (methyl sulfide)	75-18-3	62.13	7.82	100.0%	1	7.82	0.24
Ethyl Mercaptan (ethanethiol)	75-08-1	62.13	2.28	100.0%	1	2.28	0.07
Hydrogen Sulfide	7783-06-4	34.08	2976.34	100.0%	1	2976.3	90.39
Methyl Mercaptan	74-93-1	48.11	2.49	100.0%	1	2.49	0.08
				Total Contribution to SO_2 :		2990.58	90.83

SO_2 Emission Rate with BACT

Sulfur concentration in exhaust g:	400.05	ppmv		
SO_2 emission rate	12.15	lb/hr uncontrolled	53.2	tpy

LFG Compound	CAS	MW (lb/lb-mol)	Conc (ppmv)[a]	Control Eff[a,b]	Individual Compound Contribution to SO_2: No. of S Atoms	S Conc (ppmv)	SO_2 Emiss (lb/hr)
Carbon Disulfide	75-15-0	76.13	0.58	100.0%	2	1.17	0.04
Carbonyl Sulfide	463-58-1	60.07	0.49	100.0%	1	0.49	0.01
Dimethyl Sulfide (methyl sulfide)	75-18-3	62.13	7.82	100.0%	1	7.82	0.24
Ethyl Mercaptan (ethanethiol)	75-08-1	62.13	2.28	100.0%	1	2.28	0.07
Hydrogen Sulfide	7783-06-4	34.08	**385.80**	100.0%	1	385.8	11.72
Methyl Mercaptan	74-93-1	48.11	2.49	100.0%	1	2.49	0.08
				Total Contribution to SO_2 :		400.05	12.15

PM_{10} Emission Rate

PM emission factor[a]	17	lb/MM dscf CH_4		
PM emission rate	1.41	lb/hr	6.2	tpy

NO_2 Emission Rate

NO_2 emission factor[c]	0.06	lb/MMBtu		
NO_2 emission rate	5.4	lb/hr	23.7	tpy

CO Emission Rate

CO emission factor[c]	0.20	lb/MMBtu		
CO emission rate	18.0	lb/hr	79	tpy

NMOC Emission Rate

NMOC conc inlet gas[a]	595	ppmv		
MW hexane	86.18	lb/lb-mol		
destruction efficiency	98%			
mass NMOC inlet gas	24.3	lb/hr		
NMOC emission rate	0.49	lb/hr	2.13	tpy

VOC Emission Rate

NMOC conc inlet gas[a]	595	ppmv		
VOC fraction of NMOC[a]	39%			
VOC concentration in inlet gas	232	ppmv		
MW hexane	86.18	lb/lb-mol		
mass VOC inlet gas	9.5	lb/hr		
destruction efficiency	98%			
VOC emission rate	0.19	lb/hr	0.83	tpy

[a]U.S. E.P.A., *Compilation of Air Pollutant Emission Factors, Volume I. Stationary Point and Area Sources* ("AP-42"), *5th Ed.*, November 1998.
[b]AP-42 gives ranges for control efficiencies. Control efficiencies for halogenated species range from 91 to 99.7 percent. The upper end of the range is used here resulting in maximum calculated emissions of SO_2
[c]LFG Specialties Inc. (typical)

Proposed operation of new flares

EU NEW - Proposed 3,000-scfm utility flare

Standard Conditions, Constants, and Typical Values

Category	Value		Equivalent
Standard Temperature[a]	60	°F	520 °R
Universal Gas Constant	0.7302	atm-ft³/lb-mol°R	
Pressure[a]	1	atm	
Methane Heating Value[b]	1,000	Btu/ft³	
LFG Methane Component[c]	50%	%	
LFG Typical Heating Value	500	Btu/ft³	
LFG Temperature[c]	100	°F	560 °R
LFG Moisture[c]	8%	%	

[a]Industrial STP (60°F, 30.00 in. Hg, 1 atm)

[b]Typical

[c]Assumed

Fuel & Equipment - Open Flare

Flare Information	Value		Equivalent
No. of Hours of Operation Per Day[a]	24	hr	
No. of Days in Averaging Period[a]	365	day	
Operation Period[a]	8,760	hr	
LFG inlet flow, standard[a]	3,300	scfm	
LFG Inlet Flow, dry standard	3,036	dscfm	
Heat Input	99.0	MMBtu/hr	
Design Flare Operating Temperature[b]	1,400	°F	1,860 °R
Flare Tip Flow, standard	3,300	scfm	
Flare Tip Flow, actual	3,554	acfm	
Flare Tip Diameter[b]	1.17	ft	
Flare Tip Exhaust Velocity	3,324	ft/min	55.4 ft/s
Flare Tip Height, above local grade[b]	35	ft	

[a]Permit Applicant

Proposed operation of new flares

Criteria Pollutant Emissions - Open Flare

Operation Period	8,760	hr
LFG inlet flow, standard	3,300	scfm
Heat Input	99.0	MMBtu/hr

SO_2 Emission Rate

SO_2 concentration in exhaust gas	4987.58	ppmv		
SO_2 emission rate	166.62	lb/hr	729.81	ton/yr

LFG Compound	CAS	MW (lb/lb-mol)	Conc (ppmv)[a]	Control Eff[a,b]	Individual Compound Contribution to SO_2: No. of S Atoms	S Conc (ppmv)	SO_2 Emiss (lb/hr)
Carbon Disulfide	75-15-0	76.13	0.58	100.0%	2	1.17	0.04
Carbonyl Sulfide	463-58-1	60.07	0.49	100.0%	1	0.49	0.02
Dimethyl Sulfide (methyl sulfide)	75-18-3	62.13	7.82	100.0%	1	7.82	0.26
Ethyl Mercaptan (ethanethiol)	75-08-1	62.13	2.28	100.0%	1	2.28	0.08
Hydrogen Sulfide	7783-06-4	34.08	4973.34	100.0%	1	4973.3	166.15
Methyl Mercaptan	74-93-1	48.11	2.49	100.0%	1	2.49	0.08
				Total Contribution to SO_2:		4987.58	166.62

SO_2 Emission Rate with BACT

SO_2 concentration in exhaust gas	400.05	ppmv		
SO_2 emission rate	13.36	lb/hr	58.54	tpy

LFG Compound	CAS	MW (lb/lb-mol)	Conc (ppmv)[a]	Control Eff[a,b]	Individual Compound Contribution to SO_2: No. of S Atoms	S Conc (ppmv)	SO_2 Emiss (lb/hr)
Carbon Disulfide	75-15-0	76.13	0.58	100.0%	2	1.17	0.04
Carbonyl Sulfide	463-58-1	60.07	0.49	100.0%	1	0.49	0.02
Dimethyl Sulfide (methyl sulfide)	75-18-3	62.13	7.82	100.0%	1	7.82	0.26
Ethyl Mercaptan (ethanethiol)	75-08-1	62.13	2.28	100.0%	1	2.28	0.08
Hydrogen Sulfide	7783-06-4	34.08	385.80	100.0%	1	385.8	12.89
Methyl Mercaptan	74-93-1	48.11	2.49	100.0%	1	2.49	0.08
				Total Contribution to SO_2:		400.05	13.36

PM_{10} Emission Rate

PM emission factor[a]	17	lb/MM dscf CH_4		
PM emission rate	1.55	lb/hr	6.78	tpy

NO_2 Emission Rate

NO_2 emission factor[c]	0.068	lb/MMBtu		
NO_2 emission rate	6.73	lb/hr	29.49	tpy

CO Emission Rate

CO emission factor[c]	0.37	lb/MMBtu		
CO emission rate	36.6	lb/hr	160.4	tpy

NMOC Emission Rate

NMOC conc inlet gas[a]	595	ppmv		
MW hexane	86.18	lb/lb-mol		
destruction efficiency	98%			
mass NMOC inlet gas	26.74	lb/hr		
NMOC emission rate	0.53	lb/hr	2.34	tpy

VOC Emission Rate

NMOC conc inlet gas[a]	595	ppmv		
VOC fraction of NMOC[a]	39%			
VOC concentration in inlet gas	232	ppmv		
MW hexane	86.18	lb/lb-mol		
mass VOC inlet gas	10.43	lb/hr		
destruction efficiency	98%			
VOC emission rate	0.21	lb/hr	0.91	tpy

[a]EPA 1998. "Compilation of Air Pollutant Emission Factors, Volume I. Stationary Point and Area Sources" (AP-42), 5th Ed., November

[b]AP-42 gives ranges for control efficiencies. Control efficiencies for halogenated species range from 91 to 99.7 percent. The upper end range is used here resulting in maximum calculated emissions of SO

[c]LFG Specialties Inc. (typical)

Ohio EPA

Division of Air Pollution Control

Air Quality Modeling and Planning Section

Engineering Guide #69

Air Dispersion Modeling Guidance

2003

The Division of Air Pollution Control has received several questions concerning computer modeling of air pollution sources. This guide is intended to respond to those questions. Below is a list of all of the questions. The rest of the Guide contains the Division's responses. The Division welcomes comments on the application of this Guide and additional questions related to air dispersion modeling.

This document will answer the most commonly asked questions to provide a basis for consistent model application although many other questions require case-specific responses. The answers in this document do not reflect a rule or regulation, are not intended to be treated as a rule or regulation, and are subject to change on a case-by-case basis. The information within is provided so that permitting personnel, regulated entities and the public will have an understanding of the expected outcome of the situations described in this document. If you have additional questions on modeling, or comments on this guide, you should contact the Division of Air Pollution Control (614-644-2270).

....

Table of Contents

TABLES

Question 1: What specific modeling requirements are incorporated by Ohio EPA in the review of air contaminant sources?

Question 2: What models are to be used?

Question 3: What meteorological data sets are to be used?

Question 4: What modeled emission rate(s) should be used?

Question 4.1: Are fugitive emissions modeled?

Question 4.2: Are there any exceptions to the modeling thresholds for modeling criteria pollutants and toxics contained in Table 3?

Question 4.3: Should sources be modeled that emit pollutants listed in the ACGIH book, do not have a TWA, but do have a Ceiling or STEL?

Question 4.4: Are minor and exempt sources included in the modeling for a project which exceeds the thresholds in Table 3?

Question 4.5: Do you model sources within a building that have no direct vent to the outside or do not have an identified control device for capture, control and release of the emissions from the unit?

Question 5: Is building downwash required for state modeling?

Question 5.1: What building height do I use if the building has a pitched roof?

Question 6: Reserved/Deleted

Question 7: Is there any special guidance for nonstandard point source emissions?

Question 7.1: How do I model rain caps and horizontal releases?

Question 7.2: How do I model flares?

Question 7.3: What special modeling considerations are necessary for modeling combustion turbines?

Question 8: Reserved/Deleted

Question 9: What receptor grids must I use?

Question 10: What are the state significant emission rates which trigger modeling?

Question 10.5: Can a source modification trigger a requirement for modeling even where there is no increase in emission rate?

Question 11: What are the state target concentrations for acceptable incremental impacts?

Question 12: What special requirements exist for sources of fluoride?

Question 13: How do I obtain background values when performing NAAQS analyses in Ohio?

Question 14: What sources do I include in a major source PSD and/or NAAQS analysis?

Question 15: How do I model major sources in nonattainment areas to demonstrate net air quality improvement?

Question 16: Can I use SCREEN to model multiple sources?

Question 17: If multiple pollutants are being emitted, does an individual model run have to be performed for each pollutant?

Question 18: For PSD and non-PSD sources, can facilities be installed if modeling shows that more than ½ the available PSD increment is consumed?

Question 19: What determines whether a locale is rural or urban?

....

Question 1: What specific modeling requirements are incorporated by Ohio EPA in the review of air contaminant sources?

Answer 1: The following is intended to identify current Ohio EPA, Division of Air Pollution Control requirements for air pollution control modeling applications within Ohio. Where applicable, Ohio EPA is consistent with U.S. EPA guidance. In real world applications, the US EPA Guideline on Air Quality Models and supplementary guidance does not always address detailed problems that confront modelers.

The purpose of air dispersion modeling is to predict pollutant concentrations resulting from a source or group of sources under various meteorological conditions. Modeling is necessary to demonstrate that the subject source or sources will not 1) cause or significantly contribute to a violation of the National Ambient Air Quality Standards (NAAQS); 2) cause ambient concentrations which exceed allowable PSD increments; 3) comply with Ohio EPA's policy of no new source consuming more than one half of the available PSD increment (one half the increment is the effective goal for all new source modeling of criteria pollutants, regardless of the size or location of the new source.); and/or 4) cause ground level concentrations which exceed Ohio EPA's maximum allowable ground level concentration (MAGLC) for toxic air pollutants. For criteria pollutants which do not have identified PSD increments, maximum incremental impact of new source emissions is limited to one quarter of the NAAQS.

The combined emission increases from all of the new or modified sources must be evaluated to determine the maximum incremental impact if the total emissions exceed the amounts indicated in Table 3. For criteria pollutants, the incremental impact cannot exceed one half of any PSD increment or, if no PSD increment exists, one quarter of the NAAQS. There is no requirement to model VOC emissions for incremental impact on ozone concentrations (although specific VOC constituents may require air toxic modeling). **For exceptions to the one half PSD increment policy, see Answer 18.**

New or increased emissions of toxics that exceed the levels identified in Table 3 must be evaluated to determine the maximum incremental impact of these emissions for comparison with the MAGLC as described in Ohio EPA's current procedure for reviewing new sources of air toxics.

Where the permit includes both emission increases and decreases (generally restricted to a contemporaneous 5-year period), the net increase should be modeled. Ohio EPA must approve the 'netting' emissions prior to modeling.

Question 2: What models are to be used?

Answer 2: The specific source/receptor situation dictates the appropriate model for determining ambient concentrations for comparison with NAAQS, PSD increments, short or long term exposure limits, etc. The size and complexity of the source, the toxicity of the emissions along with other factors will dictate whether a screening model or a refined model is appropriate.

Screening models are generally the first level tools for evaluating air quality impacts. High predicted concentrations from a screening model may indicate the need for further refined modeling. Larger more significant sources and groups of sources will require the application of a refined model.

Sources in areas where terrain elevation is significant relative to the stack height will require evaluation using receptor elevations. Where terrain exceeds the stack height, a complex or intermediate terrain modeling analysis is necessary. This applies to both criteria and toxic pollutants.

Generally, the most recent version of a model is to be used. The most recent model versions of models contained in The Guideline on Air Quality Models (GAQM) can be obtained by accessing the U.S. EPA Support Center for Regulatory Air Models (SCRAM), Technology Transfer Network at http:\\www.epa.gov\ttn\scram. The SCRAM web page also provides model users manuals, ancillary programs, meteorological data and additional model application information. This Engineering Guide and meteorological data for Ohio sources are available on the Ohio EPA DAPC web page located at http://www.epa.state.oh.us/dapc/aqmp/aqmp.html

Note: The Guideline on Air Quality Models (Appendix W of 40 CFR Part 51) will be revised. AERMOD has been identified as the replacement for the ISC models. Federal guidance has indicated that both AERMOD and ISC will be acceptable for no more than one year after the final rule is published. At which time ISC will no longer be acceptable for PSD and SIP related modeling. Ohio EPA will continue to accept ISC for state-only permits and modeling projects until further notice.

Screening models:

Note: There is currently no screening version of AERMOD to replace SCREEN3. Until further notice, SCREEN3 will still be accepted by Ohio EPA for state-only permit modeling.

The current recommended model for screening point or area sources in simple terrain is the most recent version of SCREEN3 (or its successor), for criteria pollutants or for applications where maximum ambient concentrations of neutral buoyancy pollutants are desired. A fundamental assumption for pollutants being modeled with traditional Gaussian models is that the concentration of the pollutant in the plume will not make the plume disperse or diffuse differently than air.

Applications requiring an evaluation of emergency release scenarios or sources emitting 'light' or 'heavy' plumes may use one of the commercially available toxic release models to determine if ambient impacts exceed the applicable MAGLC. Most routine releases, even of heavy compounds, will have a density close to that of air due to high dilution.

Point sources with stacks less than good engineering height (discussed below) must be evaluated for downwash impacts using the SCREEN3 or SCREEN3C model (or their successors).

Initial screening estimates of source impacts involving intermediate or complex terrain should utilize SCREEN3 or CTSCREEN (or their successors). SCREEN3 is available as an interactive program by itself or within the TSCREEN model set.

The output from these models identifies short term (1-hour) maximum impacts. The following are the conversion factors to be used to convert these short term estimates to the averaging time of concern. Separate conversion factors have been recommended by U.S. EPA for terrain below stack tip (simple terrain) and terrain above stack tip (complex terrain).

Conversion Factors

	Desired Averaging Period						
Model output	1-hr	3-hr	8-hr	24-hr	month	qtr	ann
Simple 1-hr:	1.000	0.900	0.700	0.400	0.180	0.130	0.080
Complex 1-hr	1.000	0.700	0.500	0.150		0.060	0.030

Additional guidance on the use of SCREEN and TSCREEN is provided in Appendix A of this document.

Cornplex and intermediate terrain screening for state-only permit requirements can also be performed using ISC3 with five years of NWS data.

Refined models:

The most commonly used refined models for point, area and volume sources involving simple, intermediate and complex terrain are the most recent versions of ISCST3 and ISCLT3 (or their successors) using representative meteorological data in the regulatory default modes. Several commercial versions of these models have been granted model equivalency by U.S. EPA and are therefore also acceptable. For refined toxic analyses, the same procedures used for criteria pollutants are used to determine ambient concentrations. There are currently no requirements for deposition calculations. Modeling involving pollutant transformations (ozone, nitrates, sulfates) is not generally required for new or modified sources and is not addressed in this guide.

Question 3: What meteorological data sets are to be used?

Answer 3: Short Term: ISC Data Sets: Hourly surface observations are combined with twice-daily mixing height measurement to create a RAMMET meteorological input file. RAMMET data files can be created using on-site tower measurements or off-site National Weather Service (NWS) surface data sets.

If the modeling is for NAAQS or PSD analyses, at least one year of on-site or the most recent available five years of representative off-site NWS data are required. If the source of concern is located in intermediate or complex terrain, U.S. EPA believes that NWS data are not representative for the above stack portion of the analysis and are therefore not acceptable. For state-only modeling requirements, 5 years of NWS data are considered acceptable for use in a conservative screening analysis.

The most recent five-year off-site NWS data sets currently available from Ohio EPA are for the period 1987-1991. These data are acceptable. Later NWS data are also acceptable but not required. Off-site NWS data sets are assigned by county. Table 1 identifies the appropriate data set for each county in Ohio.

Certain southeastern counties of the state have been assigned Parkersburg/Huntington RAMMET and STAR data for modeling. For counties assigned 'Parkersburg' surface data, 1973-1977 data are the most recent available. This surface site is the most representative available for modeling in this region of Ohio and the older data set is considered more representative for these counties than more recent Huntington or Pittsburgh data.

NOTE: While the State of Ohio accepts NWS data for use in modeling in both simple and complex terrain for state-only modeling requirements, U.S. EPA has a more restrictive interpretation of 'representative' meteorological data when modeling impacts at receptors with elevations above the stack tip. For this and other reasons, it is important when preparing to model major PSD or nonattainment sources, that a protocol is developed and approved to assure that acceptable model calculations will be obtained for each source/receptor relationship.

AERMOD Data Sets: On-site or NWS surface data sets are combined with local surface characteristics and upper air observations within the AERMET preprocessor program to create the needed modeling meteorological data sets for AERMOD. The latest five-year data sets for use in Ohio will be provided on the Ohio EPA web page at http://www.epa.state.oh.us/dapc/aqmp/aqmp.html after Appendix W is finalized and final guidance is issued by U.S. EPA.

Long term: Long term (e.g., monthly, quarterly, annually) meteorological data sets are developed from short term on-site or off-site (NWS) surface data sets. These long term STAR (STability ARray) data sets are necessary to run ISCLT3 or other ISCLT3-based long term models.

ISCST3 and AERMOD can also be used for long term modeling periods by modeling specific blocks of days and selecting appropriate n-day average concentrations.

Question 4: What modeled emission rate(s) should be used?

Answer 4: Tables 9-1 and 9-2 in the Guideline on Air Quality Models (Appendix W of 40 CFR Part 51) identify the various emission rates to be used in modeling a source. In general, the short term maximum potential (allowable) emission rate is used in the evaluation of a short term standard. For an existing source, a representative long term actual emission rate can be used to evaluate a longer term (quarterly or annual) standard. An annual permit restriction can also be used to develop a long term average emission rate to be used in evaluating a long term standard for a new source.

For state permit modeling, including Ohio air toxics modeling, the peak short term increase which the permit will allow is the emission rate to be modeled to determine the peak ambient impact this permit action will allow. This could involve the combined peak impact of several sources if there are several sources included in the same project.

For a federal netting or synthetic minor permit, the difference between existing actuals emissions and permit allowable emissions, as determined in the netting calculation, is modeled for comparison to the Ohio acceptable incremental impacts. For state-only netting modeling evaluations, the allowable to allowable difference is usually acceptable. For PSD or federal netting, though, modeled emissions should be consistent with the netting evaluation performed for the permit.

For a modification which involves an emission increase only, the net change allowed by the permit is evaluated. For PSD and other federal analyses, the net change is the difference between the existing actual emissions and the new potential allowable emissions. For state-only review, modeling the difference in allowables is usually acceptable.

For a modification involving a change in stack parameters which could increase the ambient impact due to the source(s), the emissions affected by the modification (potential allowable) are modeled to determine if the impact of the modification is below the Ohio acceptable incremental impacts. If necessary, the present (before modification) emissions can be modeled as negatives in a refined analysis to determine the net impact of the permitted modification for comparison to the Ohio acceptable incremental impacts.

Like-kind replacements would not need modeling if all emissions parameters remain the same since there would be no increase in impact due to the permit action. If, however, the replacement involves the use of a shorter stack, lower temperatures, etc., the replacement may cause an increased peak impact which would need evaluation. As noted above, if the replacement, when viewed alone, exceeds the Ohio acceptable incremental impacts as identified in Table 3, the source being replaced can be modeled with a negative emission rate in a refined modeling analysis to determine the net peak impact for comparison to the Ohio acceptable incremental impacts. Also, see Question 14 for additional information on emission inventories.

Question 4.1: Are fugitive emissions modeled?

Answer 4.1: Major new source PSD and Nonattainment Review includes all significant sources, including fugitive sources such as storage piles and roadways.

In minor source state permit modeling, though, only the boiler or process source criteria and toxic emissions increases (both controlled and fugitive) are to be modeled. Non-process fugitive sources such as roadways and parking lots, material storage and material transfer operations are not modeled. Grinding, crushing, mixing and screening operations are considered processes and should be modeled. An evaluation of all project emissions may be required in a state analysis if circumstances warrant.

Question 4.2: Are there any exceptions to the modeling thresholds for modeling criteria pollutants and toxics contained in Table 3?

Answer 4.2: There are several new source emissions scenarios which Ohio EPA has historically not reviewed for state-only permits. These scenarios generally involve fugitive emissions from parking lots, roadways, material handling and storage piles. These scenarios usually represent situations where modeling results often indicate potential problems due to unreliable emission factors and/or unusual or extreme source configurations. Field experience with these sources, though, indicates that normal operating practices and compliance with required controls result in acceptable ambient impacts as demonstrated by ambient monitoring, field measurements of visible emissions or a lack of verified complaints by local citizens.

Therefore, the following list of source/pollutant scenarios will not be required to perform an air quality analysis in support of a state-only permit **unless factors such as source size, tons of emissions, particle size, pre-existing concerns or proximity to other sources or citizen populations indicate that a modeling review is warranted**:

Toxic or criteria pollutants from parking lots
Toxic or criteria pollutants from storage piles
Toxic or criteria pollutants from storage tanks
Toxic or criteria pollutants from transfer operations
Toxic or criteria pollutants from grain silos or dryers

Toxic or criteria pollutants from emergency generators
Toxic or criteria pollutants from gasoline dispensing

In addition, the following pollutants will be treated as PM but not as a toxic for modeling purposes:

Wood dust
Sand
Glass dust
Coal dust
Silica
Grain dust

Source/Toxic Pollutant combinations subject to a MACT, NESHAP or an NSPS that would restrict the amount of that pollutant that could be released are not subject to toxics modeling. Toxics modeling is also not required for pollutants subject to a NAAQS (e.g., lead).

Question 4.3: Should sources be modeled that emit pollutants listed in the ACGIH book, do not have a TWA, but do have a Ceiling or STEL?

Answer 4.3: Yes, pollutants not having a listed TWA are addressed by multiplying the Ceiling or STEL by 0.737 and then following the procedures in 'Option A' to develop a MAGLC.

Question 4.4: Are minor and exempt sources included in the modeling for a project which exceeds the thresholds in Table 3?

Answer 4.4: All sources or units contained in the permits that make up a project are initially considered significant with respect to the potential impact due to the project. Many small sources, while individually insignificant, could combine to cause or contribute to an ambient problem. Smaller sources can be removed from the modeling analysis if it can be demonstrated that their emissions are insignificant relative to the rest of the project.

Question 4.5: Do you model sources within a building that have no direct vent to the outside or do not have an identified control device for capture, control and release of the emissions from the unit?

Answer 4.5: Sources can be located within an enclosure or building with no obvious control and/or vent moving the emissions to the outside. It must be assumed that all emissions coming from the device are either captured and controlled or are escaping to ambient air. If they are not being captured and controlled (with the cleaned air being reintroduced to the work area), the emissions must be escaping the building and the modeler must determine how the emissions are being removed from the building or enclosure to the ambient air. The emission rate leaving the building or enclosure is assumed to be the same as the emission rate from the source(s). Any credit for some portion of the emissions being retained in the building due to "building capture" must be supportable and will be evaluated on a case-by-case basis.

Often the emissions are removed by the building ventilation system. In other situations, the only exchange between indoor and outdoor air occurs through open doors and windows. In any event, the modeler must identify the egress point(s) and characterize the releases as one of the available modeling release scenarios (i.e., point, area or volume). If best engineering judgement justifies assigning a fraction of the total emissions through specific egress points, the individual points can be modeled with their assigned emission rates. When using a single source screening model, the individual modeled peaks are then added together.

If it is unclear which potential egress point the emissions are actually venting through, the worst case egress point is assumed. If it is not clear which egress point is worst case, each scenario should be tested.

Question 5: Is building downwash required for state modeling?

Answer 5: Any stack source file must include building dimension data if the stack is not at or above good engineering practice (GEP) stack height. GEP is determined by evaluating all nearby structures using the formula GEP = H + 1.5L where H is the height of the structure and L is the lesser of the height or projected width of the structure. The GEP height is the highest height calculated for any nearby structure (a structure is 'nearby' if it is within five times the lesser of its height or width from the stack). If direction specific building dimensions (discussed below) are not calculated, the most conservative dimensions should be used for all directions. The most conservative building dimensions are usually associated with the height and diagonal width of the tallest nearby building.

Direction specific building dimensions may be determined for 36 wind directions for ISCST or AERMOD and 16 wind directions for ISCLT. This allows the model to include the effects of the critical structure for each wind direction. Direction specific building dimensions are calculated using facility plot plans and manually determining the dominant structure dimensions for each wind direction for each stack. Alternatively, the BPIP program provided by the U.S. EPA as well as several commercial software packages are available which will calculate the dimensions for each wind direction from a single building or group of buildings for each stack.

Buildings with multiple segments can be viewed as multiple buildings. For example, a predominantly flat one story building is interrupted by a three-story tower, the flat, one story building is evaluated and the 'four story' building (1 + 3), with lateral dimensions of the tower is also evaluated.

Building dimensions are not contained in state or federal emissions data bases. These data need to be obtained from facility personnel if sources at that facility are subject to building downwash. Distant background sources might be modeled without downwash with Ohio EPA permission since this would most likely maximize those sources' impact in the study area and therefore be 'conservative'.

Question 5.1: What building height do I use if the building has a pitched roof?

Answer 5.1: Pitched roofs present a nonstandard modeling scenario. The horizontal dimensions at the peak are reduced to a single line. A conservative approach is to assume that the entire horizontal dimensions are covered by a flat roof at the elevation of the peak of the pitched roof. An acceptable alternative is to assume a building height one half the distance up the pitched roof and the corresponding horizontal dimensions below that 'roof' (i.e., one horizontal dimension would also be halved).

Question 7: Is there any special guidance for nonstandard point source emissions?

Answer 7: Nonstandard source emissions are not specifically addressed in the above screening or refined models. For example, if emissions do not exit the stack in an upward (vertical) direction, alternative characterizations of the source should be developed to more accurately represent the release point. If a 'point source' is still assumed, even though the exit velocity is blocked or diverted sideways or downward (such as in a rain cap, discussed below), an exit velocity of 0.001 m/s should be input to the model so that a fictitious upward momentum is not credited to that source.

If the temperature of the release is near ambient, a characterization as an area or volume source might be appropriate. If temperature is significant, a virtual stack might be created to represent the emission point. Alternative characterizations should be discussed with Ohio EPA staff prior to modeling.

Question 7.1: How do I model rain caps and horizontal releases?

Answer 7.1: U.S. EPA has provided a specific solution to address hot stack plumes that are interrupted by a rain cap or which are released horizontally. U.S. EPA requires that these sources reduce their stack exit velocity to 0.001 m/s.

While it would be conservative to simply reduce the velocity, the source would lose the effect of the buoyancy that the volume of hot gas would normally have. The Ohio EPA recommended adjustment provides for retention of the buoyancy while addressing the impediment to the vertical momentum of the release. The procedure is as follows (stack parameters' units are assumed to be in metric units):

1) The stack exit velocity (V_s) is set equal to 0.001 m/s (V_s')

2) Stack diameter (d_s) is adjusted using the equation

$$d_s' = 31.6 * d_s * (V_s)^{0.5}$$

(Where V_s is the actual stack exit velocity, <u>NOT</u> 0.001 m/s)

3) Use V_s' and d_s' in the model

The results of this approach can create an extremely large modeled stack diameter. Receptors should not be placed within the calculated diameter, d_s'.

Question 7.2: How do I model flares?

Answer 7.2: For screening purposes, the flare option in SCREEN3 or TSCREEN is acceptable. For refined modeling, it is necessary to compute equivalent emission parameters, i.e., adjusted values of temperature and stack height and diameter. Several methods appear in the literature, none of which seems to be universally accepted. Ohio EPA/DAPC has used the following procedure, which is believed to be consistent with SCREEN3:

1) compute the adjustment to stack height as a function of heat release Q in MMBtu/hr:

$$H_{equiv.} = H_{actual} + 0.944(Q)^{0.478} \quad (a)$$

Where H has units of meters;

2) assume temperature of 1273 deg. K;

3) assume exit velocity of 20 meters/sec;

4) assume the following buoyant flux:

$$F_b = 1.162(Q)$$

5) back-calculate the stack diameter that corresponds to the above assumed parameters. Recall the definition of buoyant flux:

$$F_b = 3.12(V)(T_{stack} - T_{ambient})/T_{stack}$$

Where V is the volumetric flow rate, actual m^3/sec.

Substituting for F_b and solving for the equivalent stack diameter $d_{equiv.}$:

$$d_{equiv.} = 0.1755(Q)^{0.5}$$

This method pertains to the "typical" flare, and will be more or less accurate depending on various parameters of the flare in question, such as heat content and molecular weight of the fuel, velocity of the uncombusted fuel/air mixture, presence of steam for soot control, etc. Hence, this method may not be applicable to every situation, and the applicant may submit his own properly documented method.

(a) Beychok, M., 1979. Fundamentals of Stack Gas Dispersion, Irvine, CA.

Question 7.3: What special modeling considerations are necessary for modeling combustion turbines?

Answer 7.3: Combustion turbines are unique in that stack temperatures and flow rates, as well as emission rates, are dependant on ambient conditions, especially ambient temperature. Determining a worst case operating scenario resulting in peak source impacts involves evaluating the source at multiple loads (50%, 75% and 100%) as well as average and extreme ambient temperatures. Three general approaches are normally followed to establish the worst case operating scenario. The approaches described below address a PSD application.

<u>Approach 1:</u> Each scenario is modeled using SCREEN3. If each scenario results in insignificant impact, then the demonstration is complete. If one or more scenarios result in significant impact, the worst case scenario is carried forward into the PSD and NAAQS analyses using ISC or AERMOD. If there is no clear cut worst case scenario, multiple scenarios may need to be carried forward into the subsequent comprehensive analyses. All other things being equal, it is preferable to move forward with a 100% load scenario rather than a reduced load scenario.

<u>Approach 2:</u> Each scenario is modeled with ISC or AERMOD using the latest year of meteorology. The worst case scenario(s) is then run with five years of meteorology to determine if the proposed project will have a significant impact. If there is a significant impact, then the worst case scenarios are carried forward into the PSD and NAAQS analyses.

<u>Approach 3:</u> Worst case emission rates and stack parameters from all scenarios are used to estimate a worst case impact. This virtual worst case stack can be used through all phases of the analysis.

The same approaches can be followed for state-only (e.g., synthetic minors) modeling, with the only goal to be achieved being the Ohio Acceptable Incremental Impacts.

Question 9:What receptor grids must I use?

Answer 9: Sufficient receptors are necessary in the vicinity of projected maximum concentrations to assure that the peak concentration(s) has been found. For most applications, the spacing should be 100 meters at the 'hotspot', determined from the preliminary modeling results (either ISC, AERMOD or a screening model), out to a distance sufficient to assure that the maximum concentration has been found. Additional receptors should also be placed in areas of special concern (e.g., areas of source interaction and areas of significant terrain). It is also important that the extent of the grid covers the entire area of significant impact from the proposed project.

Receptor elevations are required unless a demonstration that the study area is flat is made. The absence of terrain above stack height is not sufficient to ignore terrain heights. 'Simple' terrain does not mean 'flat' terrain. Topographical data indicating no significant terrain features in the expected significant impact area of the source(s) or indicating flat but gently sloping terrain could justify not including terrain heights for the receptors in that study area.

Receptor elevation information as well as source and receptor location information can be derived from information contained on United States Geological Service topographical maps as well as from internet sources such as www.topozone.com. Information is also available from Digital Elevation Model (DEM) files which are also available from various host sites on the internet. DEM files are available free of charge at http://data.geocomm.com/dem/.

AERMOD receptor grids must be exclusively developed using the AERMAP preprocessor using DEM data. Receptor information must contain calculated information concerning the relative height of the nearby terrain (receptor height scales) in addition to the location and elevation of the receptor.

Question 10: What are the state significant emission rates which trigger modeling?

Answer 10: A comprehensive list of emission rates which trigger state and federal modeling requirements is contained in Table 3 under the heading "Ohio Modeling Significant Emission Rates." The emissions increase which will be allowed by this permit action (potential allowable increase) are compared to these levels.

Question 10.5: Can a source modification trigger a requirement for modeling even where there is no increase in emission rate?

Answer 10.5: OAC 3745-31-01(VV)(1)(b) defines "modification" to include "Any physical change in, or change in the method of operation of any significant air contaminant source that, for the specific air contaminant . . . for which the source is classified as significant, results in an increase in the ambient air quality impact . ." greater than certain values specified in the rule. Thus, if the source is "significant" (as defined in OAC 3745-31-01(RRR)) and the proposed incremental impact at any receptor exceeds the specified value (listed under the "3745-31-01(VV)(1)(b)" heading in Table 3) then the change is a modification requiring a permit-to-install, notwithstanding the fact that it may entail no increase in emissions.

It should be kept in mind that the provisions for OAC 3745-31-01(VV)(1)(b) were promulgated for the sole purpose of ensuring that the ambient air quality standards are protected. If this provision is triggered, BAT is not required. Also, this provision is not required under any federal regulation and has not been submitted to U.S. EPA for approval as part of the SIP.

It should also be noted that the concentrations in (VV) are only trigger concentrations and are not maximum allowable impacts. The ambient air quality standards and, if applicable, the PSD increments would be the limiting factor.

An example is a coal-fired boiler where a scrubber is proposed to be installed to remove sulfur dioxide. Even though the actual and allowable emissions of NOx might not increase, the reduced stack temperature and velocity associated with the scrubber could result in an increase of ambient concentration at some receptor exceeding the 15 ug/m^3 limit under (VV)(1)(b), thereby triggering the requirement to obtain a PTI before beginning construction. Another example is any reduction of stack height. For either example the need for modeling is apparent, to resolve the PTI question. A screening model may be used, or if a refined model is selected, the controlling concentration will be the high-high increase of concentration anywhere on the receptor grid, for the relevant averaging period, using five years of off-site or one-year of on-site meteorological data.

Question 11: What are the state target concentrations for acceptable incremental impacts?

Answer 11: Table 3 also contains a listing of national ambient air quality standards and PSD increments as well as state target ambient concentrations for criteria pollutants and specific toxic emissions subject to the state air toxic policy. The state target concentrations for criteria and toxic pollutants listed under the heading "Ohio Acceptable Incremental Impact" represent the acceptable incremental impact of the new emissions which are the subject of a state permit requirement. The Ohio significant impacts under OAC 3745-31-01 (VV)(1)(b) identify modeled impact levels which trigger permit to install requirements for a source modification (including stack height changes).

Question 12: What special requirements exist for sources of fluoride?

Answer 12: The potential for secondary impacts due to fluorides is greater than the probability for primary human health effects. Therefore, there may be observable impacts and actual complaints of damage to plants and property when the MAGLC has not been exceeded.

The approach to follow when evaluating the secondary impacts due to fluorides is as follows. The secondary ' target' is 0.5 ug/m^3 as a 30-day average. The screening approach is to model a 1-hour concentration using SCREEN and convert it to a 'monthly' average using the 0.18 conversion. Monthly averages can also be modeled directly using ISCST or ISCLT or AERMOD. The incremental impact of the new emissions is modeled.

This 'secondary' approach would also be appropriate for any other pollutants where it is determined that there may be significant non health related impacts at levels below the MAGLC.

Question 13: How do I obtain background values when performing NAAQS analyses in Ohio?

Answer 13: Modeling analyses which must estimate total concentrations of a pollutant (e.g., PSD analyses which evaluate the NAAQS) must account for those sources which are either too small or too distant to be included in the modeling analysis. This is accomplished by adding a background value to the modeled concentrations.

A separate background value is needed for each NAAQS pollutant and for each NAAQS averaging time. Actual monitored data for the most recent year, from a representative monitoring site(s) are the basis for acceptable background values. Ideally, the monitor should not be impacted by any major sources or any local smaller sources. If an unimpacted monitor is available, the second highest value for each short-term period would represent the short term backgrounds. The annual average is the annual background. The highest quarterly average would be used for lead.

If an unimpacted monitor is not available, nonimpacted values from monitors which are near a limited number of sources and which have nonimpacted sectors (no upwind sources) can be used to develop background values. **Unadjusted impacted monitor values can also be used as a conservative background.**

A nonimpacted value is a monitored value measured during a period when the wind was not blowing from a 90-degree sector centered on a line between the monitor and the potentially impacting source. For a 3-hour value, no winds should be from the impacting sectors. For 24-hour values, no more than two hours should have winds from the impacting sectors. For short term backgrounds, the second highest nonimpacted value is chosen as a fixed background. Long term background values are the average of the nonimpacted values for the specific averaging time period.

Question 14: What sources do I include in a major source PSD and/or NAAQS analysis?

Answer 14: Major Source NAAQS Analysis: All sources within the significant impact area (SIA) of the emissions increase with potential allowable emissions greater than the PSD significant emission rates (listed in Table 3), must be included in a new source review NAAQS analyses. SIA is defined as the region over which any exceedance of a PSD significant impact increment (listed in Table 3) occurs, based on each high-high concentration over five years of modeling (one year if on-site, representative data are available). In addition, all major sources with potential allowable emissions greater than 100 tons/yr outside of the SIA and within 50 km must also be included if they interact with the new source.

Whether to include a potentially interacting source can be determined using the '20D' approach. Under this approach, the modeler may exclude sources whose potential allowable emissions in tons/yr are less than 20 times the distance between the two sources in kilometers. Prior to commencement of final modeling, though, Ohio EPA must be advised as to what sources the modeler chooses to exclude using the 20D method. Ohio EPA reserves the right to require any or all of these sources to be included in a final analysis if Ohio EPA believes that any or all are potentially significant.

Major Source PSD Increment Analysis: All PSD sources located within an area where PSD baseline has been triggered or within the SIA of the new source, whichever is larger, must be included in the PSD increment analysis modeling inventory. PSD sources located outside of the baseline area or SIA which interacts with the new source must also be included. These sources may be screened using the 20D approach.

Inventory data should be obtained from the state emissions inventory system or the AIRS national data base system. Basic modeling source parameters (stack height or release height, diameter, temperature, exit velocity or volume flow, emission rate, etc.) are contained in these data systems.

The DAPC emissions inventory unit has placed several data sets on the Ohio EPA web page at: http://www.epa.state.oh.us/dapc/aqmp/eiu/eiu.html. While the later data sets have significant amounts of current information, it is important to check the 1990 and 1995 data bases which contain information on short term allowable emission rates.

The short term allowable rates and source capacities are included in these earlier data sets. These are important for determining maximum short term allowable emission rates for the significant sources consistent with Section 9.1 of the GAQM. If source information is missing or is suspect, you will need to contact the local air pollution agency or field office to obtain current, correct information.

Question 15: How do I model major sources in nonattainment areas to demonstrate net air quality improvement?

Answer 15: OAC 3745-31-25 discusses the requirements for determination of net air quality benefit for major sources wishing to locate in a nonattainment area (NAA). Both the rule and U.S. EPA guidance indicate the need for demonstrating area-wide benefit and progress toward attainment.

VOC emissions are not required to be modeled for net air quality benefit. All major PM and SO2 emissions increases and corresponding offsetting emissions will need to be modeled for a net air quality benefit. The entire state is attainment for CO, NOx and Pb so no net air quality benefit modeling is required.

In general, PM and SO2 NAAs have undergone SIP modeling at some time and the state has identified receptor areas which were key for the SIP attainment demonstrations. In cases where the potential offsets could impact critical receptors, those receptors must show impacts less than or equal to zero. For the remaining receptors, the receptors within the significant impact area of the increasing emissions must, on average, show no net increase for each averaging period.

If greater than zero impacts at critical receptors or net area-wide increases are modeled, the applicant may present a complete NAAQS demonstration for the significant impact area of the project.

Question 16: Can I use SCREEN to model multiple sources?

Answer 16: While the SCREEN model is a single-source model, it can be used to develop a conservative estimate of the peak potential impact of emissions from multiple egress locations.

A conservative approach combines the peak impact from each individual SCREEN run as if the peak impact from each emission point occurred at the same point in space.

In the case of multiple identical stacks, all of the emissions can be assumed to come from one stack (modeled using the combined emission rate with the stack flow parameters for a single stack).

If the egress points are not identical, all of the emission could be to assume to be emitted from the 'worst case' emission point. Sometimes the determination of worst case is straightforward (e.g., shortest, coldest, lowest flow stack). In other situations, the choice may not be clear and the Local Air Agency, District Office or Central Office should be consulted.

The approaches described above will result in conservative estimates. If the source(s) does not pass using the above assumptions, less conservative approaches can be considered in consultation with the Local Air Agency, District Office or Central Office. A multisource refined model may also be appropriate to use to model the actual separation of emission points and estimate their combined peak impact.

Question 17: If multiple pollutants are being emitted, does an individual model run have to be performed for each pollutant?

Answer 17: If the emission characteristics are identical for each pollutant (all of the pollutants are emitted in the same proportion from each of the egress points) one run can be performed and the results can be adjusted. Gaussian models such as AERMOD, SCREEN and ISC are 'linear' models in that the impacts will vary proportionally to the emission rate. Therefore, in this example case, if one pollutant is being emitted at twice the rate of another pollutant, the impact of the second pollutant will be twice as high.

In the case of multiple pollutants being emitted from a single emission point, an emission rate of 1 gram per second can be modeled and the results multiplied by each allowable emission rate (expressed in grams per second) to determine the predicted ambient concentration of each of the pollutants.

If emission characteristics vary for different pollutants, or the pollutants do not vary proportionately from each egress point, then a separate modeling analysis for each pollutant is necessary.

Question 18: For PSD and non-PSD sources, can facilities be installed if modeling shows that more than ½ the available PSD increment is consumed?

Answer 18: The purpose of PSD is to keep clean areas clean. The intent of the one half increment portion of the policy is to allow future growth by preventing any single emissions increase from consuming all of the available increment.

Non-PSD sources still consume increment and increase background concentrations. Therefore, these emissions can also threaten future growth.

As such, it is Ohio EPA's practice that any new source, whether PSD or not, will not consume more than one half the available PSD increment (In application, state-only permits do not involve modeling which would assess available increment, therefore, one half the increment is the effective goal.) .

In some cases, Ohio EPA will grant exceptions to this policy for new PSD or non-PSD sources where modeling predicts exceedances of one half of, but less than 83 percent of the available increment. (For example: If the available increment were 30 ug/m3, between 15 and 25 ug/m3.) Exceptions will be granted on a case-by-case basis (but only when public health will not be adversely affected or where modeling ~~is~~ results are suspect). The following are examples of where exceptions will be granted:

1) Modeling shows that the exceedance of the one half of the available increment occurs in a very localized area near the emissions source either due to the source parameters or due to downwash and, in the Ohio EPA's judgement, it is unlikely that other new sources located near the facility will significantly impact the same exceedance locations. In other words, if it is unlikely that another source would be negatively impacted by the exceedance then the Ohio EPA may grant the exception. An example of this would be a fugitive source with low release points having close proximity maximum impact areas that in the Ohio EPA's judgement would not be areas that other facilities would impact.

2) If the source is located such that it is unlikely in the Ohio EPA's judgement that any other major source would locate in the same area (for instance, in an extremely remote, rural area).

3) If the source is temporary and the increment consumed will become available in the near future for future growth (for instance, at a clean up site where the source will be operated for only a couple of years.)

4) If the source is locating in a 'brownfield' area and otherwise would locate in a greenfield site.

Question 19: What determines whether a locale is rural or urban?

Answer 19: The Guideline on Air Quality Models-(Appendix W of 40 CFR Part 51) outlines two methods by which an area can be categorized as either 'urban' or 'rural'. These methods rely on evaluating either the land use or population density within a three-kilometer radius circle around the subject source. Either of these methods is acceptable for the determination of the proper classification for that source, although the land use approach is preferred.

In Ohio, many counties have had significant SIP development modeling performed which included sources from across the county. Due to the inability of the models used to incorporate both rural and urban in a single run, a single, predominate classification was assigned for the entire county. Therefore, if multiple facilities over a wider area are being modeled as part of a PSD or NAAQS analysis, the Central Office should be consulted as to the historic classification for the overall analysis so that a consistent approach will be maintained.

WFS/JTT/wfs

July 1, 2003

TABLES

Table 1

METEOROLOGICAL ASSIGNMENTS

(meteorological years 1987-1991 unless otherwise specified)

COUNTY	SURFACE	MIXING HEIGHT
ADAMS	Huntington	Huntington
ALLEN	Dayton	Dayton
ASHLAND	Akron	Pittsburgh
ASHTABULA	Erie	Buffalo
ATHENS	Parkersburg	Huntington (1973-1977)
AUGLAIZE	Dayton	Dayton
BELMONT	Pittsburgh	Pittsburgh
BROWN	Cincinnati	Dayton
BUTLER	Cincinnati	Dayton
CARROLL	Pittsburgh	Pittsburgh
CHAMPAIGN	Dayton	Dayton
CLARK	Dayton	Dayton
CLERMONT	Cincinnati	Dayton
CLINTON	Cincinnati	Dayton
COLUMBIANA	Pittsburgh	Pittsburgh
COSHOCTON	Columbus	Pittsburgh
CRAWFORD	Columbus	Dayton
CUYAHOGA	Cleveland	Buffalo
DARKE	Dayton	Dayton
DEFIANCE	Fort Wayne	Flint
DELAWARE	Columbus	Dayton
ERIE	Cleveland	Buffalo
FAIRFIELD	Columbus	Dayton
FAYETTE	Columbus	Dayton
FRANKLIN	Columbus	Dayton
FULTON	Toledo	Flint
GALLIA	Huntington	Huntington
GEAUGA	Cleveland	Buffalo
GREENE	Dayton	Dayton
GUERNSEY	Pittsburgh	Pittsburgh
HAMILTON	Cincinnati	Dayton
HANCOCK	Toledo	Dayton
HARDIN	Dayton	Dayton

METEOROLOGICAL ASSIGNMENTS

HARRISON	Pittsburgh	Pittsburgh
HENRY	Toledo	Flint
HIGHLAND	Cincinnati	Dayton
HOCKING	Columbus	Huntington
HOLMES	Akron	Pittsburgh
HURON	Cleveland	Buffalo
JACKSON	Huntington	Huntington
JEFFERSON	Pittsburgh	Pittsburgh
KNOX	Columbus	Dayton
LAKE	Cleveland	Buffalo
LAWRENCE	Huntington	Huntington
LICKING	Columbus	Dayton
LOGAN	Dayton	Dayton
LORAIN	Cleveland	Buffalo
LUCAS	Toledo	Flint
MADISON	Columbus	Dayton
MAHONING	Youngstown	Pittsburgh
MARION	Columbus	Dayton
MEDINA	Akron	Pittsburgh
MEIGS	Parkersburg	Huntington (1973-1977)
MERCER	Fort Wayne	Dayton
MIAMI	Dayton	Dayton
MONROE	Parkersburg	Pittsburgh (1973-1977)
MONTGOMERY	Dayton	Dayton
MORGAN	Parkersburg	Huntington (1973-1977)
MORROW	Columbus	Dayton
MUSKINGUM	Columbus	Pittsburgh
NOBLE	Parkersburg	Pittsburgh (1973-1977)
OTTAWA	Toledo	Flint
PAULDING	Fort Wayne	Dayton
PERRY	Columbus	Huntington
PICKAWAY	Columbus	Dayton
PIKE	Huntington	Huntington
PORTAGE	Akron	Pittsburgh
PREBLE	Dayton	Dayton
PUTNAM	Fort Wayne	Dayton
RICHLAND	Columbus	Dayton
ROSS	Columbus	Dayton

METEOROLOGICAL ASSIGNMENTS

SANDUSKY	Toledo	Flint
SCIOTO	Huntington	Huntington
SENECA	Toledo	Dayton
SHELBY	Dayton	Dayton
STARK	Akron	Pittsburgh
SUMMIT	Akron	Pittsburgh
TRUMBULL	Youngstown	Pittsburgh
TUSCARAWAS	Akron	Pittsburgh
UNION	Columbus	Dayton
VAN WERT	Fort Wayne	Dayton
VINTON	Huntington	Huntington
WARREN	Cincinnati	Dayton
WASHINGTON	Parkersburg	Huntington (1973-1977)
WAYNE	Akron	Pittsburgh
WILLIAMS	Toledo	Flint
WOOD	Toledo	Flint
WYANDOT	Columbus	Dayton

Table 2

National Weather Service Anemometer Heights and Station Number

Site	Anemometer Height	Station Number
Akron/Canton	20 feet	14895
Cincinnati/Covington	20 feet	93814
Cincinnati/Abbe Obs.	51 feet	93890
Cleveland	10 meters	14820
Columbus	20 feet	14821
Dayton	22 feet	93815(surface)
Dayton (Wright Pat)	NA	13840(upper air)
Mansfield	20 feet	14891
Toledo	30 feet	94830
Youngstown	20 feet	14852
Buffalo, NY	10 meters	14733
Erie, Pa.	20 feet	14860
Flint, Mi.	21 feet	14826
Fort Wayne, In.	20 feet	14827
Huntington, WV	20 feet	03860
Charleston WV	117 feet	13866
Elkins WV	20 feet	13729
Pittsburgh, Pa.	20 feet	94823
Parkersburg, WV	100 feet	13867

Table 3
Federal and State Modeling Standards and Significant Emission Rates

POLLUTANT	AVERAGING PERIOD	National Ambient Air Quality Standards (NAAQS) (ug/m³) PRIMARY	SECONDARY	CLASS II PSD INCREMENTS (ug/m³)	PSD SIGNIFICANT EMISSION RATES (tons/year)	PSD SIGNIFICANT IMPACT INCREMENTS (ug/m³)	PSD MONITORING DE MINIMIS CONC (ug/m³)	OHIO MODELING SIGNIFICANT EMISSION RATES (tons/year)	OHIO SIGNIFICANT IMPACTS UNDER 3745-31-01(vv) (ug/m³)	OHIO ACCEPTABLE INCREMENTAL IMPACT (ug/m³)
PM10	Annual	50 a	c	17 a	15	1 h	-	10		8.5 a
	24-Hour	150 b	c	30 b	--	5 h	10 h	--	10 (24-hr TSP) i	15 b
Sulfur Dioxide	Annual	80 a	c	20 a	40	1 h	--	25		10 a
	24 Hour	365 b	c	91 b	--	5 h	13 h	--	15 i	45.5 b
	3-Hour	--	1300 b	512 b	--	25 h	--	--		256 b
Nitrogen Dioxide	Annual	100 a	c	25 a	40	1 h	14 h	25	15 (24-hr) i	12.5 a
Ozone	1-Hour	244 d	c	--	40 e	--	--			
Carbon Monoxide	8-Hour	10,000 b	c	--	100	500 h	575 h	100	575la	2500 b
	1-Hour	40,000 b	c	--	--	2000 h		--		10000 b
Lead	Calendar Quarter	1.5 a	c	--	0.6	--	0.1 h	0.6	0.1 i	0.375 a
Toxics Listed by ACGIH f	1-Hour	--	--	--	--	--	--	1		g, a

a Concentration not to be exceeded
b Concentration not to be exceeded more than once per year
c Same as primary NAAQS.
d Not to be exceeded on more than one day per year, three year average.
e Emissions of volatile organic compounds.
f Any toxics included in the latest handbook of The American Conference of Governmental Industrial Hygienists.
g Value calculated by procedure outlined in current version of the Ohio EPA Division of Air Pollution Control document entitled "Review of New Sources of Air Toxic Emission"
h Peak concentration.
i Concentration that initiates PTI requirements

Appendix A

SCREEN/TSCREEN
Model Application Guidance

The type of SCREEN source to be chosen is dependant on how the emissions leave the source (if the source is not enclosed) or how they leave the building or enclosure if emitted within a building or enclosure. Once the egress points are identified and characterized, one of the following source types is applied to the emissions at the point of egress (stack, window, vent, etc.)

The following information identifies the SCREEN/TSCREEN model choices to be used when modeling for Ohio new source review. Since the TSCREEN model does not directly identify which release scenarios lead to the use of the SCREEN model, "TSCREEN pathways" are identified to assist TSCREEN users in making scenario choices that will lead to the SCREEN model and the desired source type.

Point Source

TSCREEN pathways; There are several TSCREEN release scenarios which utilize the SCREEN3 point source option including Gaseous Release Type, Stacks, Vents, Conventional Point Sources or Particulate Matter Release Type, Stacks, Vents.

- Emission rate (g/s)
- Stack Height (above ground, not roof (m))
- Stack inside diameter (m, diameter of equivalent area circle if stack is not round)
- Stack exit velocity (m/s) or flow rate (ACFM or m^3/s)
- Stack gas temperature (K)
- Ambient temperature (use default of 293 K)
- Receptor height above ground (use 0, ground level)
- Urban/Rural (based on land use within 3 km of the source)
- Building downwash (Building information is necessary if stack is within the influence of a building: i.e., within five times the lesser building dimension)
- Do not consider building cavity calculations. **Note:** After mmm dd, 2002, AERMOD will replace ISC and be the only acceptable refined model. This model does incorporate building wake and cavity effects. After mmm dd, 2002, users of SCREEN will also need to consider the building cavity calculations when determining peak impacts.
- Complex terrain (yes if terrain above stack height is present in the potential impact area of the source)
- Simple or flat (yes for simple: if terrain above stack base is present in the potential impact area of the source. When in doubt, say yes and perform the analysis)
- Choice of meteorology (option 1, full meteorology)
- Automated distance array (yes, minimum distance (m) begins at "ambient air" (usually the fence line) and should extend to a point which ensures that the

maximum concentration has been found, up to a maximum of 50,000 m)
- Discrete distance option (used for informational purposes only)
- Fumigation Option (fumigation calculations are not used for state permit modeling)

Area Source

TSCREEN pathway; There are several TSCREEN pathways which utilize the SCREEN3 area source option including Particulate Matter Release Type, Fugitive/Windblown Dust Emissions or Storage Piles or Gaseous Release Type, Multiple Fugitive Sources. The TSCREEN pathways **do not** allow the characterization of non-square area sources which is now an option with SCREEN3.

General option choices are the same as for point source except for the following;
- Emission rate (g/s/m^2)
- Source height (mean height of source, m)
- Length of longer side of rectangular area, (m)
- Length of shorter side of rectangular area, (m)
- Wind direction search (yes)

Volume Source

TSCREEN pathway:(the SCREEN volume source option is not available through TSCREEN)

General options choices are the same as for point source except for the following;
- Initial lateral dimension (modified per table below (m))
- Initial vertical dimension (modified per table below (m))
- Height of release (the midpoint of the opening (m))

SUMMARY OF SUGGESTED PROCEDURES FOR ESTIMATING
INITIAL LATERAL DIMENSIONS (σ_{yo}) AND
INITIAL VERTICAL DIMENSIONS (σ_{zo}) FOR VOLUME SOURCES

Description of Source		Initial Dimension
(a) Initial Lateral Dimensions (σ_{yo})		
Single Volume Source	σ_{yo} =	length of side divided by 4.3
(b) Initial Vertical Dimensions (σ_{zo})		
Surface-Based Source ($h_e \sim 0$)	σ_{zo} =	vertical dimension of source divided by 2.15
Elevated Source ($h_e > 0$) on or Adjacent to a Building	σ_{zo} =	building height divided by 2.15

Elevated Source ($h_e > 0$) not on or Adjacent to a Building	σ_{zo} =	vertical dimension of source divided by 4.3

APPENDIX B

Blinn, Leah

From: Blinn, Leah
Sent: Monday, January 07, 2008 8:19 PM
To: 'Nelson, Deborah'
Subject: RE: SIA Buffer and Off-Property Sources

Thank you Debbie for all your help!

It appears that some of the sources that we were using for the Increment modeling fall out from the 20D method due to their actual emissions (Vero Beach and HD King) and the FPL plants actual emissions are lower than their potential. So thank you for going to the trouble of getting me the actual emissions.

Leah E. Blinn
Project Engineer
Shaw Environmental & Infrastructure
2790 Mosside Boulevard
Monroeville, PA 15146
412-380-6260 direct
412-372-8968 fax
www.shawgrp.com

From: Nelson, Deborah [mailto:Deborah.Nelson@dep.state.fl.us]
Sent: Monday, January 07, 2008 5:35 PM
To: Blinn, Leah
Subject: RE: SIA Buffer and Off-Property Sources

Yes, if they screen out using 20D, you can eliminate them from the Increment modeling. However, the AAQS requires that potential emissions be used therefore, the AAQS inventory may need to include some of the sources you are able to eliminate due to actual emissions.

Debbie Nelson
Meteorologist
Air Permitting South
850-921-9537
deborah.nelson@dep.state.fl.us

From: Blinn, Leah [mailto:leah.blinn@shawgrp.com]
Sent: Monday, January 07, 2008 5:26 PM
To: Nelson, Deborah
Subject: RE: SIA Buffer and Off-Property Sources

Debbie,

The only sources that would potentially affect OLI are the sources below.

CITY OF VERO BEACH	Fossil Fuel Steam Generator Unit No.1
FT PIERCE UTILITIES AUTHORITY	23.4 MW CCGT with 8.2 MW HRSG Unit # 9
CITY OF VERO BEACH	Fossil Fuel Steam Generator Unit No.2
CITY OF VERO BEACH	Fossil Fuel Steam Generator Unit 4 (Phase II Acid Rain Unit)
INDIANTOWN COGENERATION, L.P.	Pulverized Coal Main Boiler

CITY OF VERO BEACH	Fossil Fuel Steam Generator Unit 3 (Phase II Acid Rain Unit)
FLORIDA POWER & LIGHT (PMR)	Fossil Fuel Fired Steam Generator #1(Acid Rain, Phase II)
FLORIDA POWER & LIGHT (PMR)	Fossil Fuel Fired Steam Generator #2(Acid Rain, Phase II)

Also, I just wanted to clarify something. I screened out Vero Beach and HD King due to the actual emissions being 16 ton/yr for the whole facility using the 20D method. So based on that I can eliminate them from the PSD Increment modeling?

Thanks as always for all your help!

Leah E. Blinn
Project Engineer
Shaw Environmental & Infrastructure
2790 Mosside Boulevard
Monroeville, PA 15146
412-380-6260 direct
412-372-8968 fax
www.shawgrp.com

From: Nelson, Deborah [mailto:Deborah.Nelson@dep.state.fl.us]
Sent: Monday, January 07, 2008 3:48 PM
To: Blinn, Leah
Subject: RE: SIA Buffer and Off-Property Sources

Leah,

Regarding HD King, that facility emitted less than 1 TPY over the last 2 years, therefore it can be dropped from the Increment inventory. However, the potential to emit emission rates will need to be modeled as part of the AAQS modeling.

Are there any sugar industries in the SIA with buffer?

Thanks,

Debbie

Debbie Nelson
Meteorologist
Air Permitting South
850-921-9537
deborah.nelson@dep.state.fl.us

From: Blinn, Leah [mailto:leah.blinn@shawgrp.com]
Sent: Monday, December 03, 2007 12:43 PM
To: Nelson, Deborah
Subject: RE: SIA Buffer and Off-Property Sources

Debbie,

Attached is the list of off-property sources that may potentially be located within our impact area. Could you please give me the potential present SO2 emissions that I can use in the AAQS and PSD Increment models?

Thank you,

Leah E. Blinn
Project Engineer
Shaw Environmental & Infrastructure
2790 Mosside Boulevard
Monroeville, PA 15146
412-380-6260 direct
412-372-8968 fax
www.shawgrp.com

From: Nelson, Deborah [mailto:Deborah.Nelson@dep.state.fl.us]
Sent: Tuesday, November 20, 2007 3:38 PM
To: Blinn, Leah
Subject: RE: SIA Buffer and Off-Property Sources

Leah,

We require a 50km buffer. The only project that has been permitted recently is at the website below. I'm not sure if it affects you or not (depending on your SIA). Your source inventory for increment may be potential baseline-to- potential present emission rates. We have updated the SO2 inventory to include actual emissions. Once you determine your sources, please send me the list so I can give you the updated emission rates.

http://www.dep.state.fl.us/air/permitting/construction/westcounty.htm

Thanks. Happy Thanksgiving to you too.

Debbie Nelson
Meteorologist
Air Permitting South
850-921-9537
deborah.nelson@dep.state.fl.us

From: Blinn, Leah [mailto:leah.blinn@shawgrp.com]
Sent: Tuesday, November 20, 2007 3:22 PM
To: Nelson, Deborah
Cc: Pakrasi, Arijit
Subject: SIA Buffer and Off-Property Sources

Debbie,

We are currently working on the revision to the air quality analysis for Okeechobee Landfill Inc. in response to the FDEP comments, and I had a few questions for you.

1. What does FDEP consider a good significant impact area buffer? The SIA for the modeling will range approximately between 1 and 15 km.
2. We last completed the Class II analysis in February 2007. Since we are revising the modeling, I wanted to check if

there are any additional permits that have been approved, which we should be including with the off-property sources.

Thank you as always for all your help! Have a Happy Thanksgiving!

Leah E. Blinn
Project Engineer
Shaw Environmental & Infrastructure
2790 Mosside Boulevard
Monroeville, PA 15146
412-380-6260 direct
412-372-8968 fax
www.shawgrp.com

Blinn, Leah

From: Nelson, Deborah [Deborah.Nelson@dep.state.fl.us]
Sent: Monday, January 07, 2008 3:48 PM
To: Blinn, Leah
Subject: RE: SIA Buffer and Off-Property Sources

Leah,

Regarding HD King, that facility emitted less than 1 TPY over the last 2 years, therefore it can be dropped from the Increment inventory. However, the potential to emit emission rates will need to be modeled as part of the AAQS modeling.

Are there any sugar industries in the SIA with buffer?

Thanks,

Debbie

Debbie Nelson
Meteorologist
Air Permitting South
850-921-9537
deborah.nelson@dep.state.fl.us

From: Blinn, Leah [mailto:leah.blinn@shawgrp.com]
Sent: Monday, December 03, 2007 12:43 PM
To: Nelson, Deborah
Subject: RE: SIA Buffer and Off-Property Sources

Debbie,

Attached is the list of off-property sources that may potentially be located within our impact area. Could you please give me the potential present SO2 emissions that I can use in the AAQS and PSD Increment models?

Thank you,

Leah E. Blinn
Project Engineer
Shaw Environmental & Infrastructure
2790 Mosside Boulevard
Monroeville, PA 15146
412-380-6260 direct
412-372-8968 fax
www.shawgrp.com

From: Nelson, Deborah [mailto:Deborah.Nelson@dep.state.fl.us]
Sent: Tuesday, November 20, 2007 3:38 PM
To: Blinn, Leah
Subject: RE: SIA Buffer and Off-Property Sources

Leah,

We require a 50km buffer. The only project that has been permitted recently is at the website below. I'm not sure if it affects you or not (depending on your SIA). Your source inventory for increment may be potential baseline-to- potential present emission rates. We have updated the SO2 inventory to include actual emissions. Once you determine your sources, please send me the list so I can give you the updated emission rates.

http://www.dep.state.fl.us/air/permitting/construction/westcounty.htm

Thanks. Happy Thanksgiving to you too.

Debbie Nelson
Meteorologist
Air Permitting South
850-921-9537
deborah.nelson@dep.state.fl.us

From: Blinn, Leah [mailto:leah.blinn@shawgrp.com]
Sent: Tuesday, November 20, 2007 3:22 PM
To: Nelson, Deborah
Cc: Pakrasi, Arijit
Subject: SIA Buffer and Off-Property Sources

Debbie,

We are currently working on the revision to the air quality analysis for Okeechobee Landfill Inc. in response to the FDEP comments, and I had a few questions for you.

1. What does FDEP consider a good significant impact area buffer? The SIA for the modeling will range approximately between 1 and 15 km.
2. We last completed the Class II analysis in February 2007. Since we are revising the modeling, I wanted to check if there are any additional permits that have been approved, which we should be including with the off-property sources.

Thank you as always for all your help! Have a Happy Thanksgiving!

Leah E. Blinn
Project Engineer
Shaw Environmental & Infrastructure
2790 Mosside Boulevard
Monroeville, PA 15146
412-380-6260 direct
412-372-8968 fax
www.shawgrp.com

Blinn, Leah

From: Nelson, Deborah [Deborah.Nelson@dep.state.fl.us]
Sent: Monday, January 07, 2008 3:35 PM
To: Blinn, Leah
Subject: RE: SIA Buffer and Off-Property Sources

Leah,

Again, the same with Vero Beach. Their facility emitted 16 TPY. Another one that may be "screened out" depending on distance.

Debbie

Debbie Nelson
Meteorologist
Air Permitting South
850-921-9537
deborah.nelson@dep.state.fl.us

From: Blinn, Leah [mailto:leah.blinn@shawgrp.com]
Sent: Monday, December 03, 2007 12:43 PM
To: Nelson, Deborah
Subject: RE: SIA Buffer and Off-Property Sources

Debbie,

Attached is the list of off-property sources that may potentially be located within our impact area. Could you please give me the potential present SO2 emissions that I can use in the AAQS and PSD Increment models?

Thank you,

Leah E. Blinn
Project Engineer
Shaw Environmental & Infrastructure
2790 Mosside Boulevard
Monroeville, PA 15146
412-380-6260 direct
412-372-8968 fax
www.shawgrp.com

From: Nelson, Deborah [mailto:Deborah.Nelson@dep.state.fl.us]
Sent: Tuesday, November 20, 2007 3:38 PM
To: Blinn, Leah
Subject: RE: SIA Buffer and Off-Property Sources

Leah,

We require a 50km buffer. The only project that has been permitted recently is at the website below. I'm not sure if it affects you or not (depending on your SIA). Your source inventory for increment may be potential baseline-to- potential present emission rates. We have updated the SO2 inventory to include actual emissions. Once you determine your sources, please send me the list so I can give you the updated emission rates.

http://www.dep.state.fl.us/air/permitting/construction/westcounty.htm

Thanks. Happy Thanksgiving to you too.

Debbie Nelson
Meteorologist
Air Permitting South
850-921-9537
deborah.nelson@dep.state.fl.us

From: Blinn, Leah [mailto:leah.blinn@shawgrp.com]
Sent: Tuesday, November 20, 2007 3:22 PM
To: Nelson, Deborah
Cc: Pakrasi, Arijit
Subject: SIA Buffer and Off-Property Sources

Debbie,

We are currently working on the revision to the air quality analysis for Okeechobee Landfill Inc. in response to the FDEP comments, and I had a few questions for you.

1. What does FDEP consider a good significant impact area buffer? The SIA for the modeling will range approximately between 1 and 15 km.
2. We last completed the Class II analysis in February 2007. Since we are revising the modeling, I wanted to check if there are any additional permits that have been approved, which we should be including with the off-property sources.

Thank you as always for all your help! Have a Happy Thanksgiving!

Leah E. Blinn
Project Engineer
Shaw Environmental & Infrastructure
2790 Mosside Boulevard
Monroeville, PA 15146
412-380-6260 direct
412-372-8968 fax
www.shawgrp.com

Blinn, Leah

From: Nelson, Deborah [Deborah.Nelson@dep.state.fl.us]
Sent: Wednesday, January 02, 2008 5:17 PM
To: Blinn, Leah
Subject: RE: SIA Buffer and Off-Property Sources

Leah,

Regarding Indiantown, I do not have actual data but after researching the facility operations, the facility does run close to their limit therefore, I would use the 2563 TPY or 586 lb/hr for the coal unit with auxillary boiler. These emission rates should be used for the Class II Increment and AAQS inventories.

More is to come!

Debbie

Debbie Nelson
Meteorologist
Air Permitting South
850-921-9537
deborah.nelson@dep.state.fl.us

From: Blinn, Leah [mailto:leah.blinn@shawgrp.com]
Sent: Monday, December 03, 2007 12:43 PM
To: Nelson, Deborah
Subject: RE: SIA Buffer and Off-Property Sources

Debbie,

Attached is the list of off-property sources that may potentially be located within our impact area. Could you please give me the potential present SO_2 emissions that I can use in the AAQS and PSD Increment models?

Thank you,

Leah E. Blinn
Project Engineer
Shaw Environmental & Infrastructure
2790 Mosside Boulevard
Monroeville, PA 15146
412-380-6260 direct
412-372-8968 fax
www.shawgrp.com

From: Nelson, Deborah [mailto:Deborah.Nelson@dep.state.fl.us]
Sent: Tuesday, November 20, 2007 3:38 PM
To: Blinn, Leah
Subject: RE: SIA Buffer and Off-Property Sources

Leah,

We require a 50km buffer. The only project that has been permitted recently is at the website below. I'm not sure if it affects you or not (depending on your SIA). Your source inventory for increment may be potential baseline-to- potential present emission rates. We have updated the SO2 inventory to include actual emissions. Once you determine your sources, please send me the list so I can give you the updated emission rates.

http://www.dep.state.fl.us/air/permitting/construction/westcounty.htm

Thanks. Happy Thanksgiving to you too.

Debbie Nelson
Meteorologist
Air Permitting South
850-921-9537
deborah.nelson@dep.state.fl.us

From: Blinn, Leah [mailto:leah.blinn@shawgrp.com]
Sent: Tuesday, November 20, 2007 3:22 PM
To: Nelson, Deborah
Cc: Pakrasi, Arijit
Subject: SIA Buffer and Off-Property Sources

Debbie,

We are currently working on the revision to the air quality analysis for Okeechobee Landfill Inc. in response to the FDEP comments, and I had a few questions for you.

1. What does FDEP consider a good significant impact area buffer? The SIA for the modeling will range approximately between 1 and 15 km.
2. We last completed the Class II analysis in February 2007. Since we are revising the modeling, I wanted to check if there are any additional permits that have been approved, which we should be including with the off-property sources.

Thank you as always for all your help! Have a Happy Thanksgiving!

Leah E. Blinn
Project Engineer
Shaw Environmental & Infrastructure
2790 Mosside Boulevard
Monroeville, PA 15146
412-380-6260 direct
412-372-8968 fax
www.shawgrp.com

Blinn, Leah

From: Nelson, Deborah [Deborah.Nelson@dep.state.fl.us]
Sent: Friday, December 28, 2007 1:30 PM
To: Blinn, Leah
Subject: RE: SIA Buffer and Off-Property Sources

Leah,

Here is what I have for FPL Martin:

Baseline Units 1 and 2 - 13,840 lb/hr for the 3 and 24-hour averaging times
Current Acid Rain Actuals Units 1 & 2 - Annual 14,891 TPY, 8817 lb/hr (24-hr), and 11,960 lb/hr (3-hr).
Auxillary Boiler - 102.38 lb/hr (24-hr)
Units 3 & 4 - 4 lb/hr (24 hour)
Diesel Generator - 4.05 lb/hr (24-hr)
Unit 8 - 16 lb/hr (24-hr)

Thanks,

Debbie

Debbie Nelson
Meteorologist
Air Permitting South
850-921-9537
deborah.nelson@dep.state.fl.us

From: Blinn, Leah [mailto:leah.blinn@shawgrp.com]
Sent: Monday, December 03, 2007 12:43 PM
To: Nelson, Deborah
Subject: RE: SIA Buffer and Off-Property Sources

Debbie,

Attached is the list of off-property sources that may potentially be located within our impact area. Could you please give me the potential present SO2 emissions that I can use in the AAQS and PSD Increment models?

Thank you,

Leah E. Blinn
Project Engineer
Shaw Environmental & Infrastructure
2790 Mosside Boulevard
Monroeville, PA 15146
412-380-6260 direct
412-372-8968 fax
www.shawgrp.com

From: Nelson, Deborah [mailto:Deborah.Nelson@dep.state.fl.us]
Sent: Tuesday, November 20, 2007 3:38 PM
To: Blinn, Leah
Subject: RE: SIA Buffer and Off-Property Sources

Leah,

We require a 50km buffer. The only project that has been permitted recently is at the website below. I'm not sure if it affects you or not (depending on your SIA). Your source inventory for increment may be potential baseline-to- potential present emission rates. We have updated the SO2 inventory to include actual emissions. Once you determine your sources, please send me the list so I can give you the updated emission rates.

http://www.dep.state.fl.us/air/permitting/construction/westcounty.htm

Thanks. Happy Thanksgiving to you too.

Debbie Nelson
Meteorologist
Air Permitting South
850-921-9537
deborah.nelson@dep.state.fl.us

The Department of Environmental Protection values your feedback as a customer. DEP Secretary Michael W. Sole is committed to continuously assessing and improving the level and quality of services provided to you. Please take a few minutes to comment on the quality of service you received. Simply click on this link to the DEP Customer Survey. Thank you in advance for completing the survey.

From: Blinn, Leah [mailto:leah.blinn@shawgrp.com]
Sent: Tuesday, November 20, 2007 3:22 PM
To: Nelson, Deborah
Cc: Pakrasi, Arijit
Subject: SIA Buffer and Off-Property Sources

Debbie,

We are currently working on the revision to the air quality analysis for Okeechobee Landfill Inc. in response to the FDEP comments, and I had a few questions for you.

1. What does FDEP consider a good significant impact area buffer? The SIA for the modeling will range approximately between 1 and 15 km.
2. We last completed the Class II analysis in February 2007. Since we are revising the modeling, I wanted to check if there are any additional permits that have been approved, which we should be including with the off-property sources.

Thank you as always for all your help! Have a Happy Thanksgiving!

Leah E. Blinn
Project Engineer
Shaw Environmental & Infrastructure

2790 Mosside Boulevard
Monroeville, PA 15146
412-380-6260 direct
412-372-8968 fax
www.shawgrp.com

From: Pakrasi, Arijit
Sent: Tuesday, November 21, 2006 4:55 PM
To: Blinn, Leah
Subject: FW:
Please put this up in the portal for records

thanks

Arijit Pakrasi, Ph.D., P.E.
Senior Consultant
Shaw Environmental, Inc.
2790 Mosside Boulevard
Monroeville, PA 15146
Ph: 412 858 3921
Fax: 412 372 8968
email: arijit.pakrasi@shawgrp.com

-----Original Message-----
From: Nelson, Deborah [mailto:Deborah.Nelson@dep.state.fl.us]
Sent: Tuesday, November 21, 2006 4:50 PM
To: Pakrasi, Arijit
Subject:

Just use SCREEN3 for your screening analysis. The AERSCREEN is a beta version and is not ready for distribution.

Debbie Nelson
Meteorologist
Air Permitting South
850-921-9537
deborah.nelson@dep.state.fl.us

SOLAR TURBINES INCORPORATED
ENGINE PERFORMANCE CODE REV. 3.40
JOB ID:

DATE RUN: 22-Dec-06
RUN BY: Donald C Lyons

--- SUMMARY OF ENGINE EXHAUST ANALYSIS ---
POINT NUMBER 1

GENERAL INPUT SPECIFICATIONS

ENGINE FUEL: CHOICE NATURAL GAS

29.88	in Hg	AMBIENT PRESSURE
60.0	percent	RELATIVE HUMIDITY
0.0038	---	SP. HUMIDITY (LBM H2O/LBM DRY AIR)

FUEL GAS COMPOSITION (VOLUME PERCENT)
LHV (Btu/Scf) = 454.7 SG = 1.0366 W.I. @60F (Btu/Scf) = 446.6

Methane (CH4)	= 49.9999
Carbon Dioxide (CO2)	= 49.9999
Sulfur Dioxide (SO2)	= 0.0001

*** Wobbe Index of fuel gas is outside of standard gaseous fuel ***
** limits per ES 9-98. Please submit SER for this application. **

*** Landfill and digester gas sources must be disclosed to Solar Turbines via an SER. Landfill and digester gases may contain Siloxanes which cause rapid deterioration of performance and component life. ***

*** Methane content less than 80%. ***
** Please submit SER for this application. **

GENERAL OUTPUT DATA

20617.	lbm/hr	FUEL FLOW
5747.	Btu/lbm	LOWER HEATING VALUE
455.	Btu/Scf	LOWER HEATING VALUE
77379.	Scfm	EXHAUST FLOW @ 14.7 PSIA & 60F
200336.	Acfm	ACTUAL EXHAUST FLOW CFm
354239.	lbm/hr	EXHAUST GAS FLOW
4214.7	deg R	ADIA STOICH FLAME TEMP, CHOICE GAS
4674.0	deg R	ADIA STOICH FLAME TEMP, SDNG
28.96	---	MOLECULAR WEIGHT OF EXHAUST GAS
16.24	---	AIR/FUEL RATIO

EXHAUST GAS ANALYSIS

ARGON	CO2	H2O	N2	O2	
0.88	5.60	6.15	73.28	14.08	VOLUME PERCENT WET
0.93	5.97	0.00	78.08	15.01	VOLUME PERCENT DRY
4283.	30169.	13556.	251097.	55126.	lbm/hr
0.21	1.46	0.66	12.18	2.67	G/(G FUEL)

```
------------------------------------------------
- WARNING!!!  PLEASE SUBMIT FUEL SUITABILITY    -
- INQUIRY TO SAN DIEGO!!!!!!!!!!!!!!!!!!!!!!    -
------------------------------------------------
------------------------------------------------
```

SOLAR TURBINES INCORPORATED DATE RUN: 22-Dec-06
ENGINE PERFORMANCE CODE REV. 3.40 RUN BY: Donald C Lyons
JOB ID:

--- SUMMARY OF ENGINE EXHAUST ANALYSIS ---
POINT NUMBER 2

GENERAL INPUT SPECIFICATIONS

ENGINE FUEL: CHOICE NATURAL GAS

29.88	in Hg	AMBIENT PRESSURE
60.0	percent	RELATIVE HUMIDITY
0.0064	---	SP. HUMIDITY (LBM H2O/LBM DRY AIR)

FUEL GAS COMPOSITION (VOLUME PERCENT)
LHV (Btu/Scf) = 454.7 SG = 1.0366 W.I. @60F (Btu/Scf) = 446.6

Methane (CH4)	= 49.9999
Carbon Dioxide (CO2)	= 49.9999
Sulfur Dioxide (SO2)	= 0.0001

*** Wobbe Index of fuel gas is outside of standard gaseous fuel ***
** limits per ES 9-98. Please submit SER for this application. **

*** Landfill and digester gas sources must be disclosed to Solar Turbines via an SER. Landfill and digester gases may contain Siloxanes which cause rapid deterioration of performance and component life. ***

*** Methane content less than 80%. ***
** Please submit SER for this application. **

GENERAL OUTPUT DATA

19862.	lbm/hr	FUEL FLOW
5747.	Btu/lbm	LOWER HEATING VALUE
455.	Btu/Scf	LOWER HEATING VALUE
74854.	Scfm	EXHAUST FLOW @ 14.7 PSIA & 60F
195493.	Acfm	ACTUAL EXHAUST FLOW CFm
342170.	lbm/hr	EXHAUST GAS FLOW
4221.8	deg R	ADIA STOICH FLAME TEMP, CHOICE GAS
4682.0	deg R	ADIA STOICH FLAME TEMP, SDNG
28.92	---	MOLECULAR WEIGHT OF EXHAUST GAS
16.28	---	AIR/FUEL RATIO

EXHAUST GAS ANALYSIS

ARGON	CO2	H2O	N2	O2	
0.87	5.57	6.50	73.00	14.05	VOLUME PERCENT WET
0.93	5.95	0.00	78.08	15.02	VOLUME PERCENT DRY
4128.	28994.	13865.	241990.	53186.	lbm/hr
0.21	1.46	0.70	12.18	2.68	G/(G FUEL)

```
-----------------------------------------------
- WARNING!!!  PLEASE SUBMIT FUEL SUITABILITY   -
- INQUIRY TO SAN DIEGO!!!!!!!!!!!!!!!!!!!!!!!  -
-----------------------------------------------
-----------------------------------------------
```

SOLAR TURBINES INCORPORATED
ENGINE PERFORMANCE CODE REV. 3.40
JOB ID:

DATE RUN: 22-Dec-06
RUN BY: Donald C Lyons

--- SUMMARY OF ENGINE EXHAUST ANALYSIS ---
POINT NUMBER 3

GENERAL INPUT SPECIFICATIONS

ENGINE FUEL: CHOICE NATURAL GAS

29.88	in Hg	AMBIENT PRESSURE
60.0	percent	RELATIVE HUMIDITY
0.0179	---	SP. HUMIDITY (LBM H2O/LBM DRY AIR)

FUEL GAS COMPOSITION (VOLUME PERCENT)
LHV (Btu/Scf) = 454.7 SG = 1.0366 W.I. @60F (Btu/Scf) = 446.6

Methane (CH4) = 49.9999
Carbon Dioxide (CO2) = 49.9999
Sulfur Dioxide (SO2) = 0.0001

*** Wobbe Index of fuel gas is outside of standard gaseous fuel ***
** limits per ES 9-98. Please submit SER for this application. **

*** Landfill and digester gas sources must be disclosed to
Solar Turbines via an SER. Landfill and digester gases
may contain Siloxanes which cause rapid deterioration of
performance and component life. ***

*** Methane content less than 80%. ***
** Please submit SER for this application. **

GENERAL OUTPUT DATA

18132.	lbm/hr	FUEL FLOW
5747.	Btu/lbm	LOWER HEATING VALUE
455.	Btu/Scf	LOWER HEATING VALUE
69041.	Scfm	EXHAUST FLOW @ 14.7 PSIA & 60F
183969.	Acfm	ACTUAL EXHAUST FLOW CFm
313581.	lbm/hr	EXHAUST GAS FLOW
4234.6	deg R	ADIA STOICH FLAME TEMP, CHOICE GAS
4696.5	deg R	ADIA STOICH FLAME TEMP, SDNG
28.73	---	MOLECULAR WEIGHT OF EXHAUST GAS
16.35	---	AIR/FUEL RATIO

EXHAUST GAS ANALYSIS

ARGON	CO2	H2O	N2	O2	
0.86	5.45	8.07	71.78	13.83	VOLUME PERCENT WET
0.93	5.93	0.00	78.08	15.05	VOLUME PERCENT DRY
3744.	26188.	15861.	219468.	48314.	lbm/hr
0.21	1.44	0.87	12.10	2.66	G/(G FUEL)

```
-------------------------------------------------
- WARNING!!!  PLEASE SUBMIT FUEL SUITABILITY    -
- INQUIRY TO SAN DIEGO!!!!!!!!!!!!!!!!!!!!!!    -
-------------------------------------------------
-------------------------------------------------
```

SOLAR TURBINES INCORPORATED
ENGINE PERFORMANCE CODE REV. 3.40
JOB ID:

DATE RUN: 22-Dec-06
RUN BY: Donald C Lyons

MARS 100-15000
GSC
59F MATCH
GAS
TMF-2 REV. 3.0

DATA FOR NOMINAL PERFORMANCE

Fuel Type CHOICE NATURAL GAS

Elevation	feet	50		
Inlet Loss	in H20	4.0		
Exhaust Loss	in H20	4.0		
Engine Inlet Temp.	deg F	45.0	59.0	89.0
Relative Humidity	%	60.0	60.0	60.0
Elevation Loss	kW	20	19	17
Inlet Loss	kW	181	175	159
Exhaust Loss	kW	71	69	65
Gas Generator Speed	RPM	11168	11168	11168
Specified Load*	kW	FULL	FULL	FULL
Net Output Power*	kW	11429	10894	9644
Fuel Flow	mmBtu/hr	118.48	114.14	104.20
Heat Rate*	Btu/kW-hr	10367	10477	10804
Therm Eff*	%	32.915	32.568	31.582
Inlet Air Flow	lbm/hr	334793	323440	296487
Engine Exhaust Flow	lbm/hr	354239	342170	313581
PCD	psiG	254.9	246.1	225.3
Display T5 S/W	deg F	1338	1341	1342
Exhaust Temperature	deg F	883	895	923

FUEL GAS COMPOSITION (VOLUME PERCENT)
LHV (Btu/Scf) = 454.7 SG = 1.0366 W.I. @60F (Btu/Scf) = 446.6

Methane (CH4) = 49.9999
Carbon Dioxide (CO2) = 49.9999
Sulfur Dioxide (SO2) = 0.0001

*** Wobbe Index of fuel gas is outside of standard gaseous fuel ***
** limits per ES 9-98. Please submit SER for this application. **

*** Landfill and digester gas sources must be disclosed to Solar Turbines via an SER. Landfill and digester gases may contain Siloxanes which cause rapid deterioration of performance and component life. ***

*** Methane content less than 80%. ***
** Please submit SER for this application. **

*Electric power measured at the generator terminals.

From: Nelson, Deborah [Deborah.Nelson@dep.state.fl.us]
Sent: Friday, February 09, 2007 2:55 PM
To: Pakrasi, Arijit
Subject: RE: Clarification on Modeling Net Emissions for Preliminary Air Quality Analysis to Determine if Significance Level Concentration is Exceeded Okeechobee Landfill Project

Yes. This is OK when modeling the Significant Impact Analysis, determining the Significant Impact Area if multi-source modeling is required. In the write-up, explain this so I don't wonder what happened to the 2 exisitng flares. Also, make note that these flares will be for emergency use only.

Debbie Nelson
Meteorologist
Air Permitting South
850-921-9537
deborah.nelson@dep.state.fl.us

From: Pakrasi, Arijit [mailto:Arijit.Pakrasi@shawgrp.com]
Sent: Friday, February 09, 2007 11:51 AM
To: Nelson, Deborah
Cc: Blinn, Leah
Subject: Clarification on Modeling Net Emissions for Preliminary Air Quality Analysis to Determine if Significance Level Concentration is Exceeded Okeechobee Landfill Project

Debbie:

We are conducting the preliminary air quality analysis for the project to determine if the ambient concentrations due to ***net*** emission increases are above the "Significance level". If they are above "significance level" then we will need to do the full impact analysis for Class II PSD increment and NAAQS compliance demonstration. We need a clarification on how we do this for the following case.

To give you a background, the existing emissions are due to 2 existing flares, combusting approximately 6,000 cfm total of landfill gas. The BACT scenario is to replace these flares with 7 LFG turbines @4000 cfm each and a new flare at 3300 cfm, totaling to 31,300 cfm. The existing flares will be on-site as emergency but will not run under this BACT scenario (If they do run due to a outage in the turbines, their emission rates for all criteria pollutants are lower than the turbines on a cfm of LFG basis).

Thus, the net emission change (projected allowable or potential – baseline actual) is calculated as follows:

$E_{net} = E_{BACT} - E_{existing}$

Where

E_{net} = Net emission increase

E_{BACT} = Potential emissions from 7 turbines and 1 new flare

$E_{existing}$ = Actual emissions from 2 existing flares

Since the emission increases and decreases are from two different types of sources (turbines vs flares) which are located at two different locations in the facility, we can not just model the net emission increase. So, I was planning to determine the net ambient impact from the net emission increase in the following manner for the preliminary analysis:

- Run AERMOD with 7 new turbines and 1 new flare with their full potential emissions (i.e. at total E_{BACT})
- In the same run, add the existing flares negative emission points with total negative emissions equal to $E_{existing}$

This way, we will have the net ambient impact of the net emissions and we will compare that with the "significance level" concentrations.

Does this seem okay with you?

Thanks

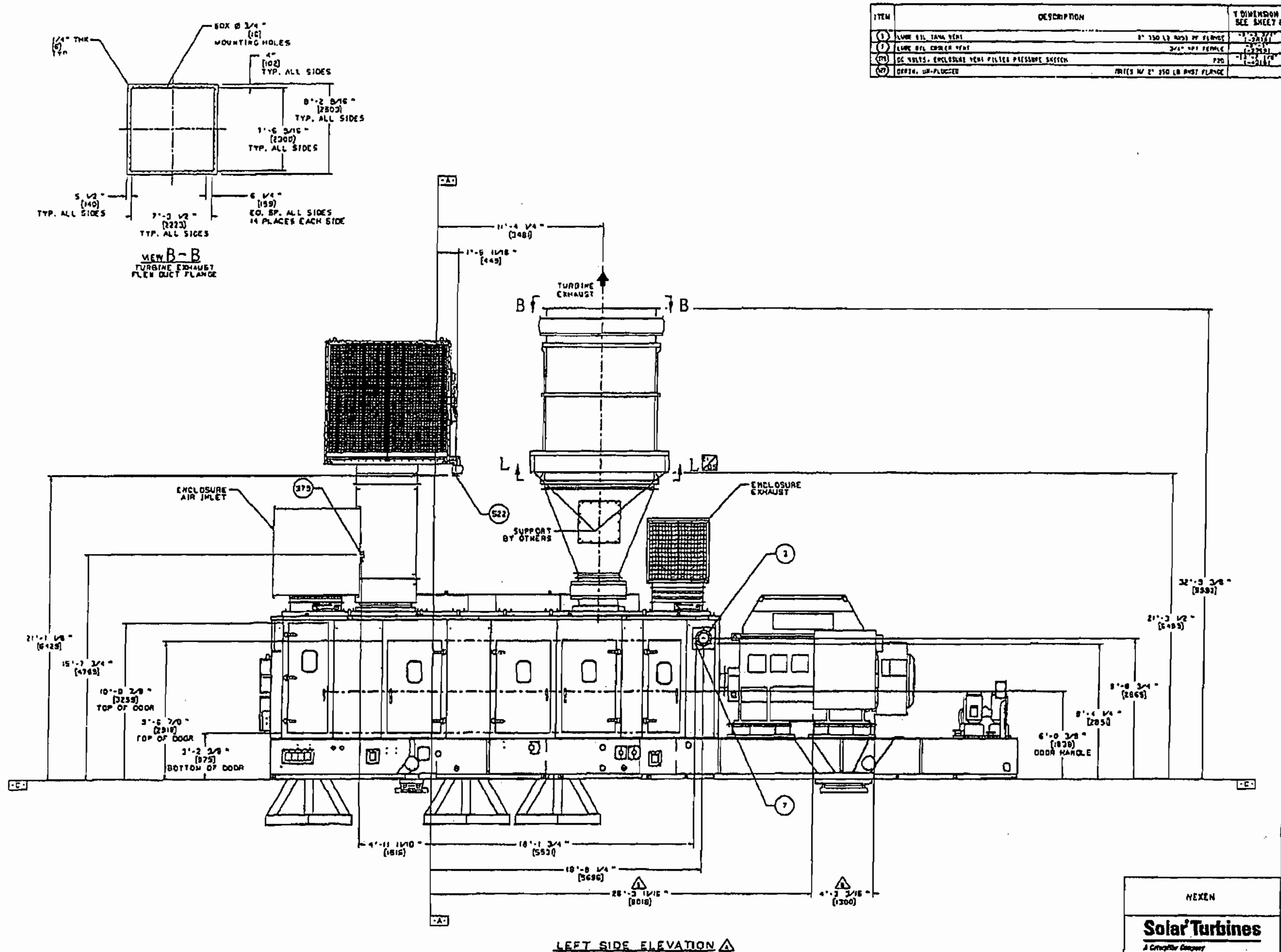
Arijit Pakrasi, Ph.D., P.E.
Senior Consultant
Shaw Environmental, Inc.
2790 Mosside Boulevard
Monroeville, PA 15146
Ph: 412 858 3921
Fax: 412 372 8968
email: arijit.pakrasi@shawgrp.com

The Shaw Group Inc.
http://www.shawgrp.com

Best Available Copy

TABLE 1 - CONNECTIONS

ITEM	DESCRIPTION		Y DIMENSION SEE SHEET 8
3	LUBE OIL TANK VENT	3" 150 LB ANSI RF FLANGE	[illegible]
7	LUBE OIL COOLER VENT	3/4" NPT FEMALE	[illegible]
[illegible]	DC VOLTS, ENCLOSURE VENT FILTER PRESSURE SWITCH	[illegible]	[illegible]
[illegible]	[illegible], UN-PLUGGED	MATES W/ 2" 150 LB ANSI FLANGE	



NEXEN

Solar Turbines

A Caterpillar Company

DRAWING NO. 78421-149095 | REV B | SHEET 9

Solar Turbines
A Caterpillar Company

PREDICTED ENGINE PERFORMANCE

Customer: Waste Management	Model: MARS 100-15000
	Package Type: GSC
Job ID:	Match: 59F MATCH
Run By: Donald C Lyons — Date Run: 24-Oct-06	Fuel System: GAS
Engine Performance Code: REV. 3.40 — Engine Performance Data: REV. 3.0	Fuel Type: CHOICE NATURAL GAS

DATA FOR NOMINAL PERFORMANCE

Elevation	feet	50
Inlet Loss	in H20	3.5
Exhaust Loss	in H20	3.5

		1	2	3
Engine Inlet Temperature	deg F	59.0	59.0	59.0
Relative Humidity	%	60.0	60.0	60.0
Specified Load*	kW	FULL	75.0%	50.0%
Net Output Power*	kW	10924	8193	5462
Fuel Flow	mmBtu/hr	114.28	90.11	68.99
Heat Rate*	Btu/kW-hr	10461	10999	12630
Therm Eff*	%	32.619	31.023	27.015
Engine Exhaust Flow	lbm/hr	342595	306920	263057
Exhaust Temperature	deg F	894	818	778

Fuel Gas Composition (Volume Percent)

Methane (CH4)	50.00
Carbon Dioxide (CO2)	50.00
Sulfur Dioxide (SO2)	0.0001

Fuel Gas Properties

LHV (Btu/Scf)	454.7	Specific Gravity	1.0366	Wobbe Index at 60F	446.6

**Electric power measured at the generator terminals.*

Notes
Florida

APPENDIX C AND D


Shaw®
a world of Solutions™
Air Quality Impact Analysis
Appendix C and D
February 2008
PN: 121525
Prepared for
Okeechobee Landfill, Inc.
DEP File No. 0930104-AC,
Application No. 1270-2