Miami–Dade County
Department of Solid Waste Management

FUTURE WASTE-TO-ENERGY FACILITY PRELIMINARY SITING AIR MODELING REPORT

April 2024

Contents

Tables

Figures

Appendices

Acronyms and Abbreviations

$\mu g/m^3$	microgram per cubic meter
µm	micron/micrometer
ACC	Air Cooled Condenser
acfm	actual cubic feet per minute
AERMAP	AERMOD Terrain Preprocessor
AERMET	AERMOD Meteorological Preprocessor
AERMOD	atmospheric dispersion modeling system used by American Meteorological Society/Environmental Protection Agency Regulatory Model
AERSURFACE	determines surface characteristic values required by the meteorological processor AERMET
AMS	American Meteorological Society
amsl	above mean sea level
Analysis	Air Dispersion Analysis
APC	Air Pollution Control
AQRV	Air Quality Related Value
Arcadis	Arcadis, U.S., Inc.
arcsec	arc-second
ARM2	Ambient Ratio Method 2
BACT	Best Available Control Technology
BART	Best Available Retrofit Technology
BCC	Board of County Commissioners
BH	building height
BPIP	Building Profile Input Program
BPIPPRM	Building Profile Input Program PRIME
CAAA	Clean Air Act Amendments
CALMET	CALPUFF Meteorological Preprocessor
CALPUFF	advanced, integrated Lagrangian puff modeling system
CO	carbon monoxide
Code	Code of Ordinances
Commission	Board of County Commissioners
County	Miami-Dade County, Florida
D	Distance
DAT	deposition analysis threshold
Department	Department of Solid Waste Management

DSMW	Department of Solid Waste Management
dv	deciview
EC	elemental carbon
EPA / USEPA	United States Environmental Protection Agency
ERA	Ecological Risk Assessment
f(RH)	Relative Humidity Adjustment Factors
FAA	Federal Aviation Administration
FDEP	Florida Department of Environmental Protection
FIU	Florida International University
FLAG	Federal Land Manager Air Quality Related Values Workgroup
FLM	Federal Land Manager
ft	foot/feet
g/s	gram per second
g/m^2	grams per meter squared
GEP	good engineering practice
GRSM	generic reaction set method
H_2S	hydrogen sulfide
H_2SO_4	sulfuric acid
HCl	hydrogen chloride
HHRA	Human Health Risk Assessment
HNO_3	nitric acid
ILA	interlocal agreements
K	Kelvin
kg/ha/yr	kilogram per hectare per year
km	kilometer
Landfill	The final disposal site for the Residue produced by the Facility(ies), Unprocessible Waste delivered at the Facility Site and mixed loads of Processible Waste, and Unprocessible Waste delivered at the Facility Site
lb/hr	pounds per hour
LCC	Lambert conformal conic (coordinate system)
m	meter
m/s	meter/second
m^2/g	squared meter per gram
MACT	Maximum Achievable Control Technology

Mayor	Miami-Dade County Mayor
MERPS	Modeled Emission Rates for Precursors
mg/dscm	milligrams per dry standard cubic meter
MIA / KMIA	Miami International Airport
MO	Monin-Obukhov length
MSW	Municipal Solid Waste
MWC	Municipal Waste Combustor
N	nitrogen (as Nitrates)
NAAQS	National Ambient Air Quality Standards
NCDNRCD	North Carolina Department of Environment and Natural Resources
NED	National Elevation Dataset
NH_3	ammonia
NO_2	nitrogen dioxide
NO_3	nitrate
NO_X	nitrogen oxides
NP	National Park
NPS	National Park Service
NSR	New Source Review
NWS	National Weather Service
O_3	ozone
OLM	ozone limiting method
OPF	Miami-Opa Locka Executive Airport
Pb	Lead
PBREF No. 2	Palm Beach Renewable Energy Facility No. 2
PFAS	Polyfluoroalkyl substances
PM	Particulate Matter, filterable
PM_{10}	Particulate Matter, 10 microns or smaller
$PM_{2.5}$	Particulate Matter, 2.5 microns or smaller
PMC	coarse particulate matter
PMF	fine particulate matter
ppb	parts per billion
ppm	parts per million
ppmvd	parts per million volume dry
PPSA	Power Plant Siting Act

PSD	Prevention of Significant Deterioration
PTE	potential to emit
PVMRM	plume volume molar ratio method
Q	total annual emissions in tpy
Q/D	annual emissions / distance
RDF	Refuse Derived Fuel
REF	Renewable Energy Facility
Report	Preliminary Solid Waste System Siting Report
RRF	Resources Recovery Facility
S	sulfur (as sulfates)
SAM	sulfuric acid mist
SER	Significant Emission Rate
SIA	Significant Impact Area
SIL	Significant Impact Level
Siting Report	Future Waste-to-Energy Facility Siting Alternatives Analysis Report
SO_2	sulfur dioxide
SO_4	sulfate
SOA	secondary organic aerosols
SOIL	fine filterable particulate matter
System	County’s Solid Waste System
TPD	tons per day
tpy	tons per year
Unit	Processing unit for municipal solid waste, including the feed hopper, combustion boiler and associated equipment, air pollution control equipment, and flue. USGS United States Geological Society
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Society
VISCREEN	Plume Visible Impact Screening Model
VISTA	Visibility Improvement State and Tribal Association of the Southeast
VOC	volatile organic compound
WTE	waste to energy

Executive Summary

Purpose and Scope

The Miami-Dade County (County) Department of Solid Waste Management (DSWM or Department), in accordance with direction from the Board of County Commissioners (Commission or BCC), began the process of locating appropriate siting alternatives for a new mass burn Waste-to-Energy (WTE) facility to replace the existing Resources Recovery Facility (RRF) in April 2022. The Department tasked Arcadis US, Inc. (Arcadis), the County's Solid Waste Bond Engineer, to conduct a siting analysis and review alternative sites for a WTE facility. Arcadis completed the analysis and submitted the *Preliminary Siting Alternatives Report* (Siting Report) in June 2022. The Siting Report recommended four potential sites (Medley, Ingraham Hwy. Site No. 1, Ingraham Hwy. Site No. 2, and the Existing RRF) as suitable for the development of a future WTE facility.

Subsequently, the Commission requested more detailed information on the four sites and information on solid waste technologies other than WTE that could move the County's Solid Waste System (System) towards a Zero Waste management strategy. On March 7, 2023, the Commission directed the Department to more comprehensively analyze the four potential siting alternatives for a new WTE facility to replace the existing RRF, explore alternative technologies to a WTE facility; and prepare a report regarding said analysis and recommendations, including costs and potential funding sources. The Department again tasked Arcadis to conduct the analysis. During the evaluation process, three additional sites (Dolphin Expressway, Airport West, and Okeechobee Road) were added to the original four potential sites at the request of the County. Arcadis completed the analysis and delivered the *Preliminary Solid Waste System Siting Alternatives Report* (Report) to the County on August 25, 2023.

After reviewing the Report, the Mayor issued a memorandum dated September 16, 2023, recommending (under Recommendation 2) that the Commission authorize the Administration to immediately take all actions necessary, including air quality impact analysis and modeling, to begin the pre-application process with the EPA and FDEP for a conceptual 4,000 ton per day (tpd) mass burn WTE facility at the Airport West site, plus the Existing RRF site and the Medley site.

At the Special Meeting of the BCC on September 19, 2023, the Commission followed the Mayor's recommendation and rejected four of the seven sites included in the Report. The Commission then adopted Special Item No. 6, directing the County Mayor to present the three remaining sites (Airport West, Medley, and the Existing RRF sites as shown in **Figure ES-1**) to the Florida Department of Environmental Protection (FDEP) as part of a preliminary review and provide a report.

The Department tasked Arcadis to do the work recommended in the Mayor's memorandum, which included conducting preliminary air dispersion modeling and preliminary qualitative human health and ecological screening level risk assessments on all three sites. Air dispersion modeling is one of the most important aspects of the permitting process for a new WTE facility, employing complex mathematical equations that relate the release of air pollutants from emission sources to the corresponding concentrations of pollutants in ambient air. Based on estimated emissions and meteorological inputs, an air dispersion model can be used to predict concentrations of specific pollutants at selected downwind receptor locations.

The calculations from these models are used to determine compliance with National Ambient Air Quality Standards (NAAQS) and other regulatory requirements such as New Source Review (NSR) and Prevention of Significant Deterioration (PSD) regulations. Although not permit-level modeling, preliminary air dispersion modeling can provide the County with insight into potential future permitting issues (e.g., airport flight path concerns, Class I and Class II impacts and emission/stack height effects, other nearby influential emission sources, etc.) and the relative level of permitting difficulty between the three remaining sites, from an air quality impact standpoint.

Preliminary air dispersion modeling analyses were completed for a conceptual WTE facility layout for all three potential sites. The modeling was performed in consultation with the FDEP and the Federal Land Manager (FLM) for Everglades National Park, the two entities that will be primarily responsible for an air permit approval at any of the three potential sites. Meteorological datasets and offsite emissions source inventories were provided by FDEP, and modeling methodologies based on FDEP and FLM guidance were followed throughout the modeling effort. The preliminary air dispersion modeling was performed using the most stringent emissions limits permitted for a mass burn WTE facility in the US. If more stringent emissions limits are applied for certain pollutants (i.e., new MACT standards proposed by USEPA) then predicted model impacts for those pollutants would be lower.

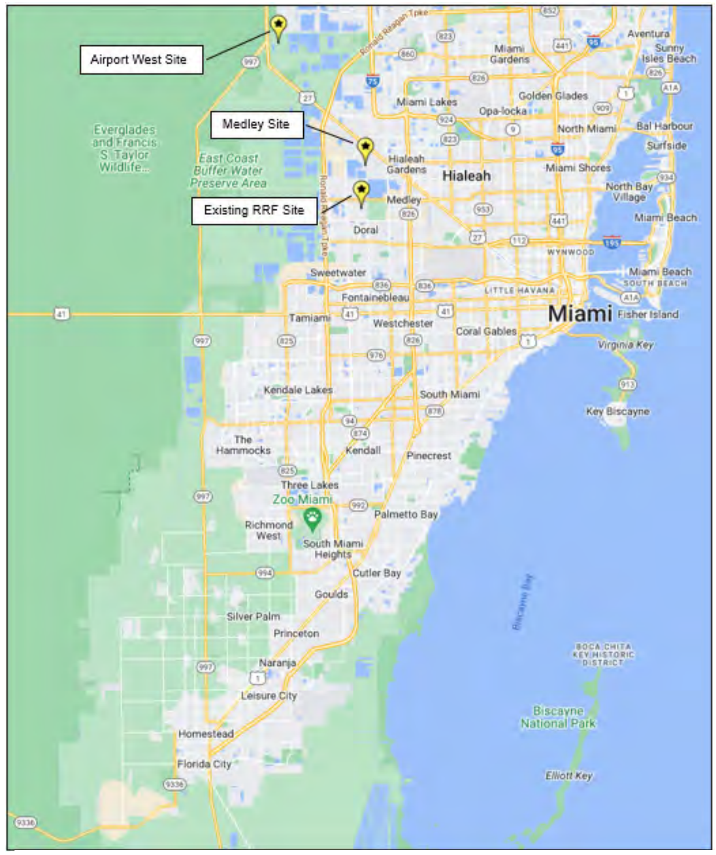

Figure ES-1 Potential WTE Sites

As part of this effort, Arcadis also conducted a *Preliminary Qualitative Human Health and Ecological Screening Level Risk Assessment*. A Human Health Risk Assessment (HHRA) is a detailed modeling analysis used by governmental regulatory agencies to conservatively estimate the risks to human health posed by exposures to chemical substances from different sources, including industrial facilities, waste disposal sites, consumer products, pharmaceuticals, food additives, and others.

In the context of municipal solid waste management, HHRAs are performed to answer questions raised by regulators and members of the community about an existing or planned facility's safety. Such HHRAs estimate the cancer and noncancer (e.g., cardiovascular disease) risks to potentially exposed populations. They are particularly useful at the planning stage because the results can be used to make informed siting and facility design decisions. Ecological Risk Assessments (ERAs) are similar conservative tools that predict the impacts of a facility on terrestrial and aquatic ecological receptors, such as birds, mammals, fish, sediment invertebrates, and plants. To ensure adequate conservatism, ERAs focus on the most sensitive known species and pay particular attention to threatened and endangered species. HHRAs and ERAs are not required by the FDEP to obtain a permit for a WTE as they are in some other localities. However, such assessments can be helpful tools in the planning stage to compare potential site locations and essential design features, such as stack location and height.

This *Preliminary Waste to Energy Air Modeling Report* presents the methodology followed and the results of the preliminary air dispersion modeling for all three potential sites, which are summarized below. The *Preliminary Qualitative Human Health and Ecological Screening Level Risk Assessment*, which includes the results of the preliminary HHRAs and ERAs for all three potential sites, is included as **Appendix A**.

Note: The results of the air dispersion modeling, HHRA and ERA contained in this report are preliminary in nature, intended to give the County additional information for consideration in final WTE site selection. The air dispersion modeling, HHRA and ERA activities conducted for this report are preliminary analyses based on a conceptual WTE facility model to determine the relative air permitting difficulty of the three potential sites and differentiators between them. They are not the permitting-level analyses required to be included in a Power Plant Site Certification Application. Furthermore, additional analyses may be required or requested by the regulatory permitting agencies (i.e., FDEP, USEPA, and FLMs) during the formal air permitting application and approval process.

Preliminary Results

Anticipated Emissions

A conceptual 4,000 tpd mass burn WTE facility is expected to have emissions from four Municipal Waste Combustor (MWC) units. For the anticipated emissions determination, Arcadis assumed that the new WTE facility MWC would have similar air pollution controls and emissions as the most recently constructed, state of the art, mass burn WTE facility in the United States, the existing Palm Beach Renewable Energy Facility No. 2 (PBREF No. 2), which has been in operation since 2015. A summary of anticipated emissions from the conceptual facility is provided in **Table ES-1**.

Table ES-1 Preliminary Emission Estimates for Municipal Waste Combustors

Pollutant	Maximum Concentration	Units[2]	Maximum Estimated Emissions (per MWC)[1]		Total for Four MWCs tons/yr[5]
			lbs/hr[3]	tons/yr[5]	
Nitrogen Oxides (NO_x), 24-hour basis	50	ppmvd	37.4	--	--
Nitrogen Oxides (NO_x), 12-month basis	45	ppmvd	--	133.9	536
Sulfur Dioxide (SO_2), 24-hour basis	24	ppmvd	25.0	99.5	398
Carbon Monoxide (CO)	100	ppmvd	45.5	181.2	725
Particulate Matter (PM_{10}, total)[4]	30	mg/dscm	11.7	46.7	187
Particulate Matter ($PM_{2.5}$, total)[4]	30	mg/dscm	11.7	46.7	187
VOCs (as propane)	7	ppmvd	5.0	19.9	80
Sulfuric Acid Mist (H_2SO_4)	5	ppmvd	8.0	31.7	127

Notes:

1 Maximum estimated emissions reflect a single MWC unit with a nominal rated MSW processing capacity of 1,000 tpd.

2 Limits shown reflect concentrations corrected to 7% oxygen.

3 Hourly emissions shown reflect maximum hourly values calculated at 110% of the maximum continuous rating (MCR) for the combustor.

4 Maximum estimated emissions for PM_{10} and $PM_{2.5}$ include both filterable and condensable PM emissions.

5 Annual emissions (tons/yr) are based on anticipated normal operating conditions.

ppmvd = parts per million volume dry

mg/dscm = milligrams per dry standard cubic meter

Air Dispersion Analysis

The objectives of the preliminary Air Dispersion Analysis (Analysis) are to estimate preliminary ambient air impacts associated with the implementation of a new WTE facility at each of the three potential sites and determine the relative level of air permitting difficulty that each site presents. The siting evaluation included the following analyses:

- **Load Analysis** – The primary source of emissions at the proposed facilities are the MWC units. The MWC emissions will be exhausted from a tall stack which contains four identical flues (one for each of the four identical MWC units). The four identical flues will be adjacent to each other within an outer concrete shell; and were modeled as a single merged stack point source, with an equivalent diameter following regulatory guidance. The anticipated emissions and stack parameters are based on three load conditions (Normal, Maximum, and Low). **Table ES-2** presents the anticipated emissions from each scenario.

Table ES-2 Emission Rates for MWC Units Stack per Load Scenario

Load Condition:	Normal	Maximum	Low
Scenario:	1a	3a	4
Emission Rate NO_X (gram/second [g/s]) (Annual; 45 parts per million [ppm])	15.41	16.96	10.77
Emission Rate NO_X (g/s) (1- hour; 50 ppm)	17.13	18.84	11.97
Emission Rate SO_2 (g/s)	11.46	12.6	8.0
Emission Rate H_2SO_4 (g/s)	3.65	4.02	2.55
Emission Rate PM_{10} (g/s)	5.38	5.92	3.76
Emission Rate $PM_{2.5}$ (g/s)	5.38	5.92	3.76
Emission Rate CO (g/s)	20.85	22.93	14.57

** Emission rates represent one 4,000 tons/day stack, except for the case at the Existing RRF site where the two existing stacks are modeled. Emissions and flow rate were split between the two existing stacks.

- **Class II Significant Impact Level (SILs) Analysis** – The Class II Air Dispersion Analysis consists of two distinct phases. The first phase represents the preliminary modeling analysis called the significance analysis, which determines if PSD regulations would require a full impacts analysis to demonstrate compliance. The projected pollutants over the Significant Emission Rate (SER) thresholds will be evaluated via the preliminary modeling analysis to determine if impacts from the project are likely to cause a significant impact on air quality. The project modeling results are compared against appropriate Significant Impact Levels (SILs). This SIA also determines the area of impact used in the full impacts analysis. The results from the Class II SIL analysis for each site and for each stack height scenario are shown in **Table ES-3**. Values that are highlighted in bolded text show predicted impacts greater or equal to the pollutant specific SIL, and therefore require the further evaluation.

Table ES-3 Class II Area SIL Analysis Results

Site		Airport West			Existing RRF		Medley			SILs ($\mu g/m^3$)
Criteria Pollutant	Averaging Period	250 ft Stack ($\mu g/m^3$)	310 ft Stack ($\mu g/m^3$)	410 ft (GEP) Stack ($\mu g/m^3$)	250 ft Stacks[1] (µg/m3)	310 ft Stack[2] ($\mu g/m^3$)	250 ft Stack ($\mu g/m^3$)	310 ft Stack ($\mu g/m^3$)	410 ft (GEP) Stack ($\mu g/m^3$)	
SO_2	1-hour	**18.66**	**9.47**	4.44	**22.22**	**11.66**	**28.72**	**11.38**	4.44	7.86
	3-hour	17.82	10.19	3.82	24.93	11.12	**26.99**	9.18	4.33	25
	24-hour	**11.66**	3.68	1.47	**14.81**	**7.42**	**10.46**	**5.01**	1.69	5
	Annual	0.86	0.44	0.32	**1.40**	0.58	0.73	0.45	0.32	1
PM_{10}	24-hour	**5.47**	1.73	0.69	**6.98**	3.50	4.92	2.77	0.79	5
	Annual	0.40	0.21	0.15	0.66	0.27	0.34	0.22	0.66	1
$PM_{2.5}$	24-hour	**4.30**	**1.50**	0.94	**5.96**	**2.92**	**3.85**	**2.03**	0.95	1.2
	Annual	**0.35**	0.16	0.12	**0.61**	**0.28**	**0.35**	0.19	0.12	0.2
NO_2	1-hour	**25.10**	**12.74**	5.97	**29.97**	**15.77**	**38.70**	**15.38**	5.97	7.55
	Annual	**1.04**	0.53	0.39	**1.7**	0.70	0.88	0.54	0.39	1

Table ES-3 Class II Area SIL Analysis Results

Site		Airport West			Existing RRF		Medley			SILs (µg/m³)
Criteria Pollutant	Averaging Period	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	250 ft Stacks[1] (µg/m3)	310 ft Stack[2] (µg/m³)	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	
CO	1-hour	36.50	20.05	10.10	49.04	22.45	54.07	23.06	14.22	2000
	8-hour	26.31	14.15	6.23	35.54	16.21	31.26	14.26	7.40	500

Notes:
1 The two existing 250 ft stacks at the Existing RRF site were modeled for the 250 ft scenario.
2 A 410 ft stack analysis was not conducted at the Existing RRF site due to potential concerns with Federal Aviation Administration (FAA) stack height restrictions.
ft = foot/feet GEP = good engineering practice

The second phase represents the full impacts analysis (i.e. the NAAQS and PSD Increment analyses), as follows:

- **Class II NAAQS** – The NAAQS analysis is performed to assess compliance with federal ambient concentration standards. The NAAQS is the maximum concentration "ceiling" allowed in the air, designed to protect public health and welfare. There are currently NAAQS designated for six pollutants: sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), lead (Pb), ozone (O_3), and particulate matter (PM_{10} and $PM_{2.5}$). The results from the Class II NAAQS cumulative modeling for each site and for each stack height scenario are shown in **Table ES-4**. Values that are highlighted in bolded text show predicted impacts greater or equal to the pollutant specific NAAQS, and therefore require the further evaluation. Note that if a pollutant and averaging time screened out of the NAAQS analysis during the Significance Impact Level Analysis, the table shows "< SIL" for below the significant impact level.

Table ES-4 Class II NAAQS Modeling Results

Site		Airport West			Existing RRF		Medley			NAAQS (µg/m³)
Criteria Pollutant	Averaging Period	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	250 ft Stacks (µg/m³)	310 ft Stack[1] (µg/m³)	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	
SO_2	1-hour	22.8	19.5	< SIL	64.3	37.8	63.3	40.4	< SIL	196
	3-hour	< SIL	< SIL	< SIL	<SIL	<SIL	29.6	< SIL	< SIL	1300
	24-hour	16.7	< SIL	< SIL	17.5	11.7	27.6	16.6	< SIL	365
	Annual	< SIL	< SIL	< SIL	8.5	<SIL	< SIL	< SIL	< SIL	80
PM_{10}	24-hour	90.0	< SIL	< SIL	82.4	<SIL	< SIL	< SIL	< SIL	150
$PM_{2.5}$	24-hour	29.9	29.4	< SIL	20.4	18.7	**45.7**	21.3	< SIL	35
	Annual	7.9	< SIL	< SIL	7.4	6.8	7.5	< SIL	< SIL	9
NO_2	1-hour	126.0	125.8	< SIL	**216.4**	**211.1**	**207.5**	**206.1**	< SIL	188
	Annual	27.5	< SIL	< SIL	31.3	<SIL	< SIL	< SIL	< SIL	100

Notes:
1 Existing RRF site does not include 410 ft stack height scenario due to potential concerns with FAA stack height restrictions.

- **Class II PSD Increment** – The PSD Increment analysis is conducted to assess compliance with the federal limits on industrial expansion. To maintain air quality in areas that meet the NAAQS, the CAAA established maximum allowable increases over baseline concentrations in clean air areas, called PSD increments. PSD increments are promulgated for NO_2, SO_2, PM_{10}, and $PM_{2.5}$. For pollutants with a modeled concentration greater than the significance levels, PSD regulations require a PSD Increment

Analysis. Class II areas allow for some industrial growth whereas Class I areas (discussed later in the analysis), are established sensitive areas that only allow for light industrial growth.

PSD Increment analysis modeling incorporates both facility-wide and off-property emission sources. The same emissions inventory sources that were developed and modeled for the Class II NAAQS Analysis is used in the Class II PSD Increment analysis. The results from the Class II PSD Increment analysis for each site and for each stack height scenario are shown in **Table ES-5**. Values that are highlighted in **bolded** text show predicted impacts greater or equal to the pollutant specific PSD increment, and therefore require the further analysis to comply with the PSD Increments. Note that if a pollutant and averaging time screened out of the PSD increment analysis during the Significance Impact Level Analysis the table shows "< SIL" for below the significant impact level.

Table ES-5 Class II PSD Increment Results

Site		Airport West			Existing RRF		Medley			SILs (µg/m³)
Criteria Pollutant	Averaging Period	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	
SO_2	3-hour	< SIL	< SIL	< SIL	< SIL	< SIL	25.3	< SIL	< SIL	512
	24-hour	12.4	< SIL	< SIL	13.2	7.4	23.3	12.3	< SIL	91
	Annual	< SIL	< SIL	< SIL	4.2	< SIL	< SIL	< SIL	< SIL	20
PM_{10}	24-hour	12.7	< SIL	< SIL	6.2	< SIL	< SIL	< SIL	< SIL	30
	Annual	< SIL	< SIL	< SIL	< SIL	< SIL	< SIL	< SIL	< SIL	17
$PM_{2.5}$	24.hour	4.6	2.7	< SIL	6.3	3.0	**34.8**	6.5	< SIL	9
	Annual	1.4	< SIL	< SIL	1.0	0.7	1.0	< SIL	< SIL	4
NO_2	Annual	3.2	< SIL	< SIL	7.0	< SIL	< SIL	< SIL	< SIL	25

- **Class I Significant Impact Level (SILs) Analysis** – As with the Class II area analysis, the predicted impacts on the Class I Everglades receptors from AERMOD were compared to the Class I SILs. The results from the Class I SIL analyses for each of the proposed sites are presented in **Table ES-6**. Ground-level concentration values that are highlighted in **bolded** text show predicted impacts greater or equal to the pollutant specific SIL and will require a cumulative analysis to show compliance with the PSD Class I increments.

Table ES-6 Class I SILs Analysis

Site		Airport West			Existing RRF		Medley			SILs (µg/m³)
Criteria Pollutant	Averaging Period	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	250 ft Stacks[1] (µg/m³)	310 ft Stack (µg/m³)	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	
SO_2	3-hour	0.723	0.695	0.648	**1.15**	0.85	0.792	0.762	0.712	1.0
	24-hour	**0.243**	**0.215**	0.185	**0.40**	**0.29**	**0.296**	**0.280**	**0.257**	0.2
	Annual	0.015	0.014	0.012	0.03	0.02	0.02	0.020	0.02	0.1
PM_{10}	24-hour	0.114	0.101	0.087	0.19	0.14	0.139	0.131	0.121	0.3
	Annual	0.007	0.006	0.005	0.01	0.01	0.010	0.009	0.008	0.2
$PM_{2.5}$	24.hour	0.248	0.240	0.227	**0.35**	**0.30**	**0.277**	**0.267**	0.254	0.27
	Annual	0.014	0.013	0.012	0.02	0.02	0.016	0.015	0.014	0.05

Table ES-6 Class I SILs Analysis

Site		Airport West			Existing RRF		Medley			SILs (µg/m³)
Criteria Pollutant	Averaging Period	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	250 ft Stacks[1] (µg/m³)	310 ft Stack (µg/m³)	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	
NO_2	Annual	0.018	0.017	0.014	0.04	0.03	0.027	0.024	0.021	0.1

Notes:

1 The two existing stacks at the Existing RRF site were modeled.

2 No 410 ft stack analysis conducted due to concerns of getting approval from FAA.

- **Class I Increment Analysis** – If the proposed location and stack height option showed modeled impacts greater or equal to the Class I SILs, a Class I increment analysis was conducted using AERMOD for that pollutant and averaging period. The offsite source inventory used for the Class I cumulative analysis was based on the Class II NAAQS and increment source inventory. Arcadis combined the source inventory for all three site locations to ensure that the worst-case Class I impacts were captured in the analysis. The Class I increment analysis results for the three proposed sites are presented in **Table ES-7**.

  Based on the cumulative modeling using draft offsite source inventory in combination with the anticipated emissions from each of the proposed sites, no violations of the PSD Class I increment were identified at any of the Everglades NP receptors within 50 kilometers (km) of each source.

Table ES-7 Class I Increment Analysis

Site		Airport West			Existing RRF		Medley			Class I PSD Increment (µg/m³)
Criteria Pollutant	Averaging Period	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	250 ft Stacks[1] (µg/m³)	310 ft Stack (µg/m³)	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	
SO_2	3-hour	< SIL	< SIL	< SIL	12.0	< SIL	< SIL	< SIL	< SIL	25
	24-hour	2.3	2.3	< SIL	2.78	2.70	2.77	2.76	2.72	5
	Annual	< SIL	< SIL	< SIL	< SIL	< SIL	< SIL	< SIL	< SIL	2
PM_{10}	24-hour	< SIL	< SIL	< SIL	< SIL	< SIL	< SIL	< SIL	< SIL	8
	Annual	< SIL	< SIL	< SIL	< SIL	< SIL	< SIL	< SIL	< SIL	4
$PM_{2.5}$	24-hour	< SIL	< SIL	< SIL	1.52	1.52	1.52	1.52	< SIL	2
	Annual	< SIL	< SIL	< SIL	< SIL	< SIL	< SIL	< SIL	< SIL	1
NO_2	Annual	< SIL	< SIL	< SIL	< SIL	< SIL	< SIL	< SIL	< SIL	2.5

Notes:

1 The two existing stacks at the Existing RRF site were modeled.

2 No 410 ft stack analysis conducted due to concerns of getting approval from FAA.

- **Class I AQRV Analyses (Visibility & Deposition)**

  Visibility Impairment

  Visibility impairment analyses are required for the Everglades NP Class I area. In this analysis, the atmospheric light extinction due to emissions from the proposed site's MWC stack (merged flues) was determined relative to natural conditions at the Everglades NP. The unit of visibility is a deciview (dv) and this analysis determined the perceived 24-hour change in visibility (Delta deciview). Existing conditions are defined based upon measurements of haze-producing species the NP area of concern. The results of the analysis indicated that a new WTE facility at any of the three proposed sites is not expected to cause or contribute to an adverse impact on visibility at Everglades NP as long as the design and potential emissions are similar or less than the quantities evaluated in this study.

Sulfate and Nitrate Deposition Loadings

Sulfur and nitrogen deposition analyses were performed to determine if the proposed facility would have an adverse impact on the specific AQRVs for the Everglades NP. The total deposition (wet and dry fluxes) of SO_2 and sulfate (SO_4) were used to determine the project S loading for comparison to the air quality related sulfur threshold value. The total deposition (wet and dry fluxes) of nitrogen oxides (NO_X – dry deposition only), nitrate (NO_3), and nitric acid (HNO_3) was used to determine the project N loading for comparison to the air quality-related nitrogen threshold value.

For the modeling scenarios at 50 km or greater, the total modeled S & N loading are at or below the deposition analysis threshold (DAT) value of 0.01 kilograms per hectare per year (kg/ha/yr) established for sensitive areas, which includes the Everglades NP located in the eastern half of the United States. For the Everglades receptors within 50 km, the predicted loading concentrations for all three proposed sites are greater than the screening DAT of 0.01 kg/ha/yr for sulfate loading. Only the Airport West site showed predicted nitrate loading below the screening DAT. Additional analyses and further consultation with the FLM will be necessary to alleviate any potential concerns the agency may have with the construction and operation of a new WTE near the Everglades NP.

Conclusions

Preliminary air dispersion modeling analyses were completed for a conceptual WTE facility layout for all three potential sites. The modeling was performed in consultation with the FDEP and the FLM for Everglades NP, the two entities that will be primarily responsible for an air permit approval at any of the three potential sites. Meteorological datasets and offsite emissions source inventories were provided by FDEP, and modeling methodologies based on FDEP and FLM guidance were followed throughout the modeling effort.

Overall, based on this analysis, it is concluded that <u>each of the proposed sites could potentially obtain an air permit to construct a WTE facility. Restrictions on stack heights, potential WTE emissions</u>, extent of the proposed facility's significant impact areas, presence of other nearby emission sources, short distances to the Class I Everglades NP boundary, and more restrictive air quality standards and screening criteria are all factors that may affect overall air modeling conclusions. Also, each potential site will be affected by the new annual $PM_{2.5}$ NAAQS of 9 µg/m^3 since background monitoring concentrations for Miami-Dade and Broward County range from 7 to 10 µg/m^3.

The results of the preliminary air dispersion modeling analyses, as well as the screening-level HHRA and ERA conducted by Arcadis indicate that development of a new WTE facility within the County appears to be feasible for all the potential sites, provided the design and potential emissions are similar or less than the quantities evaluated in this study. However, because of the numerous existing emissions sources in Miami-Dade County, the County's proximity to the Everglades NP Class I Area, as well as the complex analyses required for permit approval, the <u>development of a new WTE facility anywhere in the County will be very challenging</u>. Based on these evaluations, we can conclude the following:

- The <u>Airport West site yielded slightly better results in the preliminary air dispersion modeling and appears to be relatively more favorable for air permitting than the other two sites</u>. However, the air permitting effort will be challenging for any of the three sites due to the proximity to existing emissions sources and the Everglades NP Class I Area.

- The Existing RRF site appears to be feasible with regards to air permitting and may offer some advantages during permitting, as the site is already fully developed and operated since the 1980s as a Power Plant Siting Act (PPSA) certified site. Further, the site could provide an opportunity to use historical emissions data to show an overall net-benefit on the nearby air quality when comparing to past site operations. Further discussions with FDEP would be needed to determine whether historical emissions can be used during the permitting process.
- The Medley site also appears to be feasible with regards to air permitting but will likely be the most complicated and challenging of the three sites due to nearby large emissions sources (i.e., Titan Pennsuco facility, Medley Landfill, etc.).
- The *Preliminary Qualitative Human Health and Ecological Screening Level Risk Assessment* found no clear trend that shows one potential site to pose the lowest estimated human health risk for all hypothetical human exposure scenarios, but one trend does stand out. The realistic chronic residential risk assessment exposure scenarios are those that are more relevant for assessing facility safety because they concern residents of the communities where the potential sites are located. Comparatively, the Airport West location has the lowest potential risk in these scenarios. However, all three sites have low risk with results within or below the regulatory established risk levels. The worst case preliminary estimated excess lifetime cancer risk for residential receptors from the conceptual Miami-Dade WTE facility ranged from a low of 2E-08 (0.02 in a million) to a high of 4E-07 (0.4 in a million). To put those risk figures in perspective, the estimated excess lifetime cancer risk level from breathing benzene from gasoline and car exhaust in Miami-Dade County is 1.5E-06 (1.5 in a million) according to the USEPA's Air Toxics Screening Assessment (USEPA 2017). 1.5 in a million is a cancer risk level higher than the preliminary risk estimates for residents from a conceptual Miami-Dade WTE facility at any of the three potential sites.

  From an ecological risk perspective, based on the conservative preliminary ERA, it is concluded that potential ecological risks associated with the three proposed locations are minimal and should not have an impact on the health of the surrounding ecological communities.

1 Introduction and Background

The Miami-Dade County (County) Department of Solid Waste Management (Department or DSWM) provides waste collection and recycling services for residents in the unincorporated areas of the County as well as several cities that have signed Interlocal Agreements (ILAs) with the Department. The Department owns and operates 13 Neighborhood Trash and Recycling Centers, three Regional Transfer Stations, two Home Chemical Collection Centers, three landfills and one Resource Recovery Facility (RRF). Chapter 15 of the County Code of Ordinances (Code) defines the sum of these facilities as the Solid Waste System (System).

A major component of the System is the existing RRF, which can accept up to 3,000 tons per day (tpd) of solid waste, processes approximately 1,000,000 tons of solid waste annually and produces approximately 77 megawatts of electricity annually. The existing RRF was constructed in the early 1980's, became operational in 1982 and due to its age and declining physical and operational condition the Department, the Miami-Dade County Board of County Commissioners (Commission) and the Miami-Dade County Mayor (Mayor) have been considering the development of a new mass burn waste-to-energy (WTE) facility to replace the existing RRF.

In April 2022, the Department was tasked with identifying and analyzing potential sites within the County that would be suitable for the development of a future WTE Facility, and to report findings within 60 days. Arcadis U.S., Inc., (Arcadis), as the Bond Engineer for DSWM, assisted the County with this preliminary analysis and prepared the Future Waste-to-Energy Facility Siting Alternatives Analysis Report ("Siting Report") that was completed in June 2022. The Siting Report identified four potential sites (Sites 1 – Medley, 16 – Ingraham Hwy. Site No. 1, 17 – Ingraham Hwy. Site No. 2, and the Existing RRF), and the Commission selected the existing RRF site for the development of a future WTE facility.

On February 12, 2023, a serious fire occurred at the RRF that heavily damaged the facility and, more importantly, destroyed both the processing equipment that converts incoming garbage to Refuse-Derived Fuel (RDF) and the conveyors that feed the RDF to the boilers. With no capacity to make RDF or feed it to the boilers, the fire rendered the RRF inoperable, and the facility has been offline since then. The RRF fire, and its effect on the Doral community, prompted the Commission to reconsider the siting of a future mass burn WTE facility. The selection of the existing RRF site was rescinded and the Department, per the Commission's motion dated March 7, 2023, was tasked to:

- Analyze and recommend siting alternatives for a new state-of-the-art mass burn WTE facility to replace the Existing RRF.
- Explore alternative technologies to a WTE facility; and
- Prepare a report regarding said analysis and recommendations, including costs and potential funding sources.

The intent of the BCC direction to the Department was to revisit the evaluations of the four potential sites (Sites 1 – Medley, 16 – Ingraham Hwy. Site No. 1, 17 – Ingraham Hwy. Site No. 2, and the Existing RRF) that were identified in the Siting Report completed in June 2022 as suitable for the development of a future Waste-to-Energy (WTE) facility. The report was to include additional analysis and information on the four potential sites including environmental, traffic, and public health effects, considering alternative technologies and facilities that may be needed to implement a Zero Waste management strategy within the County, and high-level cost implications, a discussion of potential funding sources, and potential Solid Waste System effects.

On May 16, 2023, the Commission amended the motion and directed the report be provided by September 13, 2023.

Over the course of the evaluation process, three additional sites (Sites A1 – Dolphin Expressway, A2 – Airport West and A3 – Okeechobee Road) were added to the original four potential sites at the request of the County and were included in the report (**Figure 1-1**), called the Preliminary Solid Waste System Siting Report (Report), which was delivered to the County on August 25, 2023.

After reviewing the Report, the Mayor issued a memorandum dated September 16, 2023, recommending (under Recommendation 2) that the Commission authorize the Administration to immediately take all actions necessary, including air quality impact analysis and modeling, to begin the pre-application process with the EPA and FDEP for a conceptual 4,000 tpd mass burn WTE facility at the Airport West site, plus the existing RRF site and the Medley site.

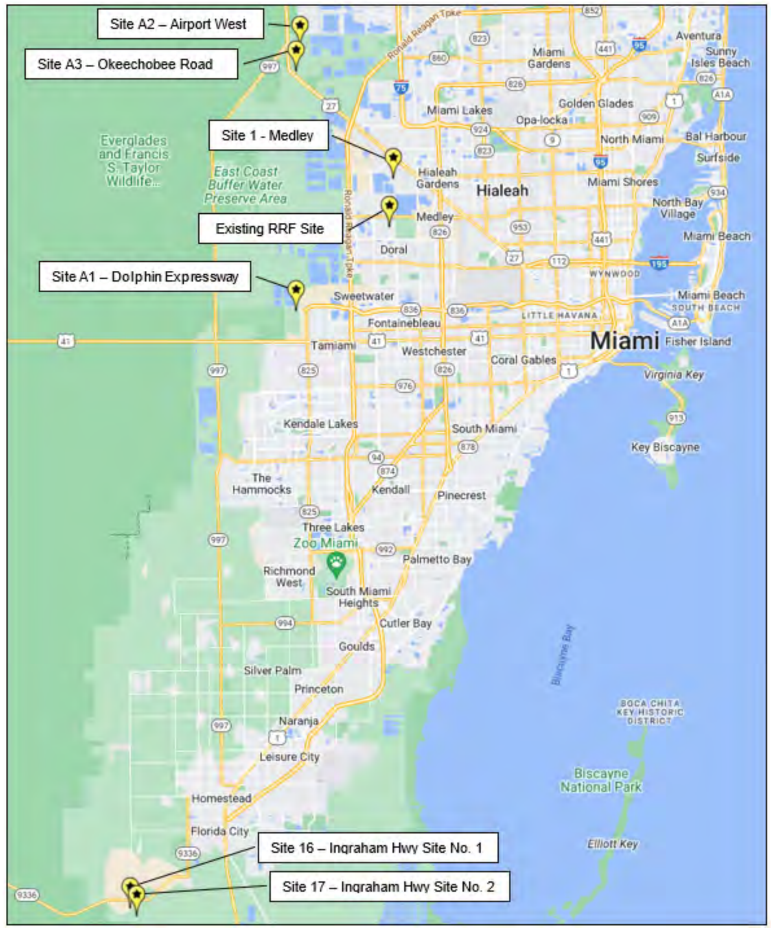

Figure 1-1 ***Seven Evaluated Potential WTE Sites***

At the Special Meeting of the Board of County Commissioners (BCC) on September 19, 2023, the Commission followed the Mayor's recommendation and rejected four of the seven sites included in the Report. The Commission then adopted Special Item No. 6, directing the County Mayor to present the three remaining sites (Airport West, Medley, and the Existing RRF sites) to the Florida Department of Environmental Protection (FDEP) as part of a preliminary review and provide a report.

One of the ultimate permitting requirements for any new WTE facility includes conducting air dispersion modeling to provide the regulatory agencies with information about potential site-specific environmental impacts of building a WTE facility. Preliminary, screening-level air dispersion modeling on all three sites will allow the County to determine the relative level of air permitting difficulty between the three potential sites, which may help the Commission during the site selection process. In addition, the Department will gain insight into potential future permitting issues (e.g., airport flight path concerns, Class I impacts and emission/stack height, other nearby large emission sources) and minimize the risk of having to start over if one site fails in the full permitting process. The Mayor's recommendation also includes conducting a health assessment of the modeling results, which would be important when engaging with the community.

2 Project Description

2.1 Potential Site Locations

The locations and a brief description of the three potential sites within Miami-Dade County are shown in **Figure 2-1**.

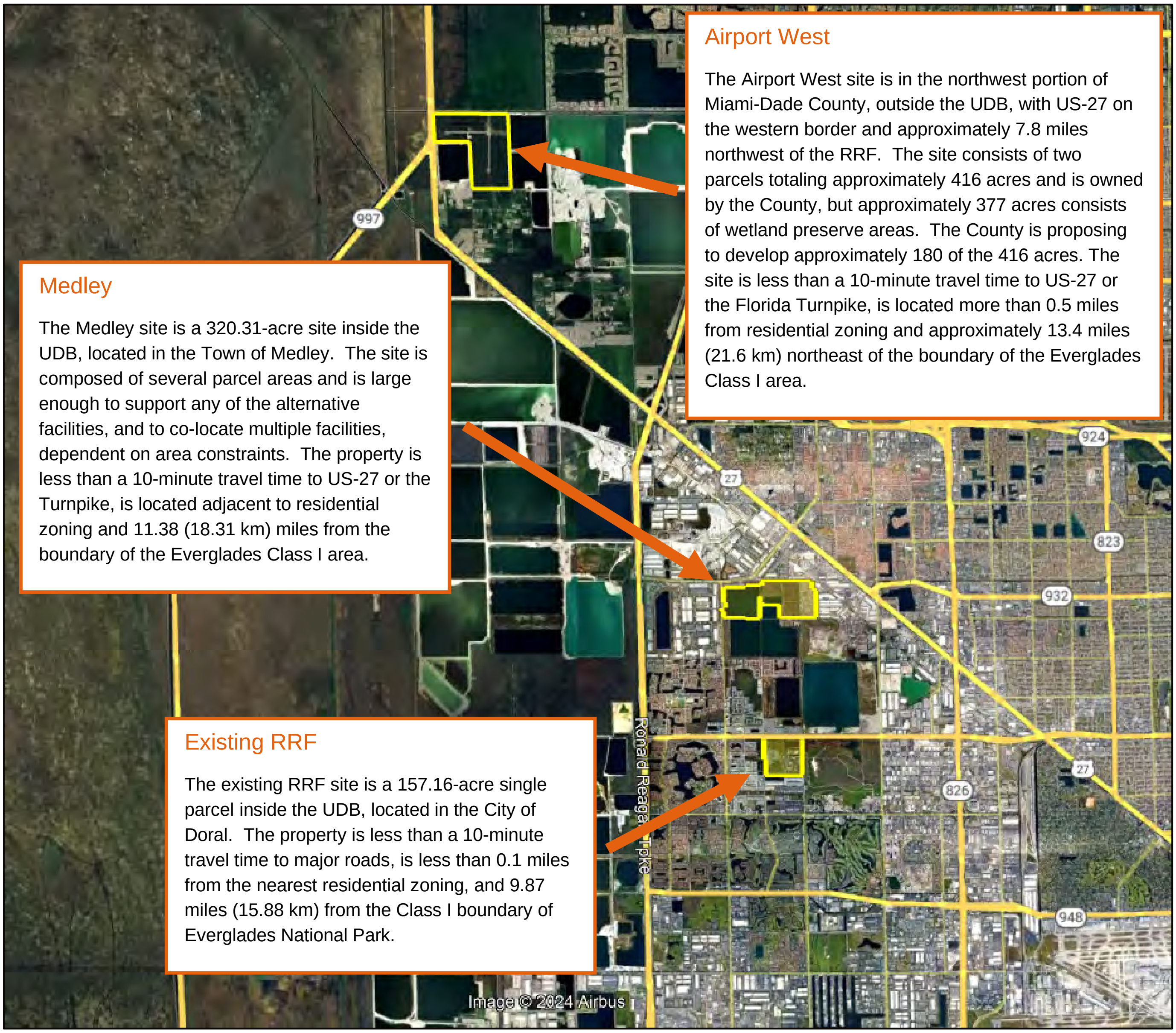

Figure 2-1 Remaining Three Potential WTE Sites

2.2 Conceptual Layouts

Arcadis developed conceptual site layouts for each of the proposed site locations. Information from the preliminary siting evaluation conducted in July 2022 was used as a basis for the orientation of each site. The conceptual layouts may differ from any future work in the design and permitting of the proposed facility. Per the recommendation of FDEP, the hypothetical fence line/property boundary in the model setup just covers the building and structure layout so that this modeling with be conservative and capture worst-case offsite ambient air impacts. The only exception, the Existing RRF fence line layout, includes the existing facility area that restricts public access. Three stack height options (250 ft, 310 ft, and 410 ft) were evaluated at each site, except at the Existing RRF location where the 410 ft option was not included due to potential concerns with FAA stack height restrictions. The model layout for each site is briefly described below.

2.2.1 Existing RRF Site

The model setup for Existing RRF covers the footprint of the existing facility. The stack location for the 250 feet/foot (ft) scenario assumes that the existing stacks could be used for the new facility. The 310 ft stack scenario location was placed in the middle of the two existing stacks. The footprint of conceptual buildings is based on the location of the existing stacks. The modeled fence line is depicted in the figure provided in Section 2.1. The modeled layout is shown in **Figure 2-2**.

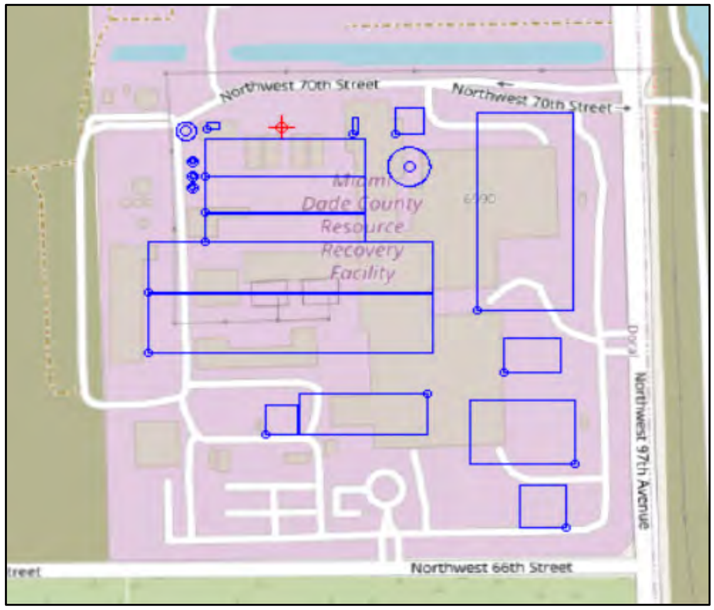

Figure 2-2 Existing RRF Site

2.2.2 Airport West Site

The Airport West site layout assumed the facility will be located in the southwest corner of the site, adjacent to the existing quarry bordering to the west. The proposed fence line was placed just outside the proposed source and structure layout and is shown in **Figure 2-3**.

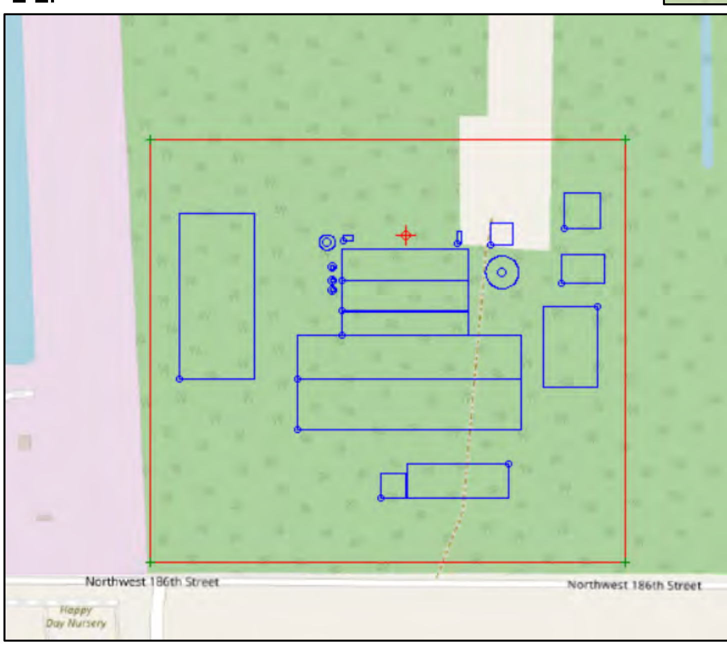

Figure 2-3 Airport West Site

2.2.3 Medley Site

The Medley site layout assumed that the facility will be located in the eastern portion of the proposed site based on preliminary information that Arcadis had in the initial siting evaluation process. The orientation of the modeled layout was rotated 90˚ clockwise with some building location adjustments to fit the initial property area. The modeled layout is shown in **Figure 2-4**.

Please note that any shift of the proposed facility layout within the larger identified area presented in Section 2.1 may affect any conclusions based on the cumulative impacts analyses presented in this report.

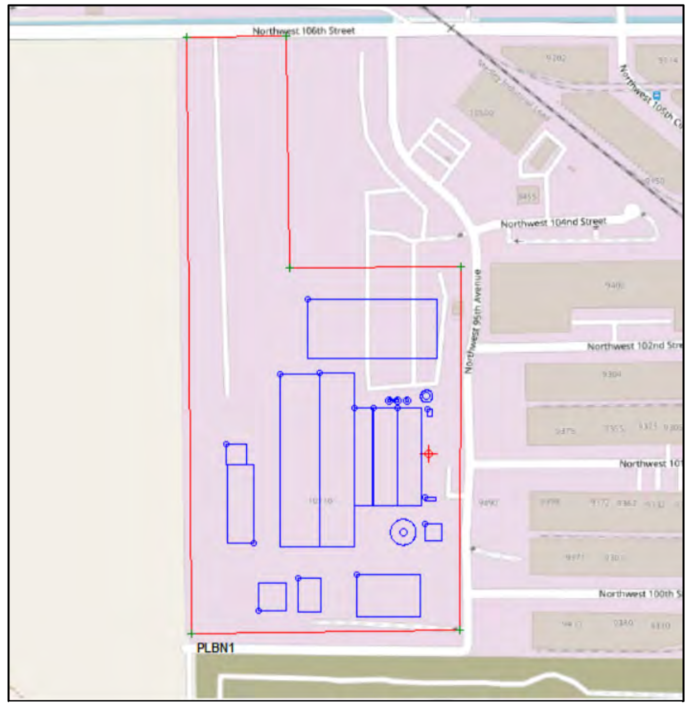

Figure 2-4 Medley Site

2.3 Assumptions and Limitations

2.3.1 Emissions Parameters and Estimated Quantities

To expedite the evaluation and in consideration of the preliminary air dispersion modeling for site selection purposes, the emissions parameters and estimated quantities were based on the results of the most recent and comparable air modeling performed in Florida for a permitted WTE facility, the Palm Beach County Renewable Energy Facility No. 2 (PBREF 2). The PBREF 2 air modeling was performed by Arcadis on behalf of the Solid Waste Authority of Palm Beach County as part of the Power Plant Site Certification Modification for the site.

For the anticipated emissions determination, Arcadis assumed that the new WTE facility would have similar processing equipment, air pollution controls and emissions as the most recently constructed mass burn WTE facility in the United States, which is the PBREF 2. Estimated emissions rates were based on three new 1,000 tpd mass burn combustors operating 8,760 hours per year. In addition, scaling of emissions rates for the conceptual Miami-Dade WTE was performed to account for anticipated differences in Municipal Solid Waste (MSW) feed rates compared to the Palm Beach site. Specifically, the Palm Beach air modeling assumed a total MSW processing capacity of 3,000 tpd for the three new mass burn combustors compared to the conceptual 4,000 tpd Miami-Dade WTE facility. Accordingly, emissions rates were scaled upward by a capacity factor of 1.33 (4,000/3,000) to estimate emissions for the conceptual Miami-Dade WTE facility.

Any air permit supporting modeling will need to reflect the planned design of the proposed facility. This information will include differences based on the proposed equipment manufacturer, facility layout, building sizes, emission guarantees, proposed control technologies and associated efficiencies, ancillary equipment, fence line to restrict public access, vehicle/truck traffic, support activities, etc. Any changes to the conceptual WTE facility layouts used in our modeling efforts will affect predicted model impacts and require modifications to all aspects of this analysis.

2.3.2 Load Analysis

The primary source of emissions at the proposed facilities are the MWC units. The MWC emissions will be exhausted from a tall stack which contains four identical flues (one for each of the four identical MWC units). The four identical flues will be adjacent to each other within an outer concrete shell; and were modeled as a single merged stack point source, with an equivalent diameter following regulatory guidance. The anticipated emissions and stack parameters are based on three load conditions (Normal, Maximum, and Low). **Table 2-1** presents the anticipated emissions from each scenario. See Section 5.1.10 for more information on load analysis.

Table 2-1 Emission Rates for MWC Units Stack per Load Scenario

Load Condition:	Normal	Maximum	Low
Scenario:	1a	3a	4
Emission Rate NOx (gram per second [g/s]) (Annual; 45 parts per million [ppm])	15.41	16.96	10.77
Emission Rate NOx (g/s) (1- hour; 50 ppm)	17.13	18.84	11.97
Emission Rate SO_2 (g/s)	11.46	12.6	8.0
Emission Rate H_2SO_4 (g/s)	3.65	4.02	2.55
Emission Rate PM_{10} (g/s)	5.38	5.92	3.76
Emission Rate $PM_{2.5}$ (g/s)	5.38	5.92	3.76
Emission Rate CO (g/s)	20.85	22.93	14.57

Notes:
Emission rates represent one 4,000 tons/day stack, except for the case at the existing RRF site where the two existing stacks are modeled. Emissions and flow rate were split between the two existing stacks.

2.3.3 Assumed Building Dimensions

In the air dispersion model setup, it is necessary to input the location of the emission points (i.e., MWC stacks) as well as any buildings that may influence the wind flow and stack plume. Arcadis based the dimensions of the conceptual site in model based on the PBREF No.2 buildings applying some building size increases based on the desired larger capacity of the proposed WTE facility. The horizontal and vertical dimensions for the buildings included in the conceptual layouts are presented in .

Table 2-2 Assumed Building Dimensions

Building ID	Description[1]	Length (ft)	Width (ft)	Height (ft)
TIPBLG	Tipping Building	708	160	112.0
REFUSE	Refuse Pit	708	140	164.2
APCBDGU	Air Pollution Control Building – Upper Bay	400	100	160
APCBDGL	APC Building – Lower Bay	400	100	130
ASHBDG	Ash Management Facility	240	535	100
TURGEN	Turbine Generator Building	138	93.7	72.8
SWGEAR	Switch Yard	115	115	18.7
WTBDG	Water Treatment Building	70	70	27
FWP	Firewater Pump	30	20	11
ACCBDG	Air Cooler Condenser	175	260	100
MAINBDG	Maintenance Building	320	110	50
BOILER	Boiler Building	400	75	164

Table 2-2 Assumed Building Dimensions

Building ID	Description[1]	Length (ft)	Width (ft)	Height (ft)
DGEN	Diesel Generator	13	42	15
ADMIN	Admin Building	80	80	32

Notes:

1 Additional buildings could potentially include a future carbon capture system, scale house building, or other small building(s). Additional buildings are not anticipated to affect modeling results from the proposed MWC stack(s).

2.3.4 Modeled Footprint

This preliminary site evaluation assumed specific areas within the proposed properties situate the footprint of each conceptual WTE facility in the model. The exact location of the designed facility footprint will likely be different than what was depicted in the model. In addition, the fence line for each site covers only this assumed footprint as recommended by FDEP. Any modifications to the layout, site or footprint orientation, fence line in relation to potential emissions, etc. could potentially affect the modeled offsite concentration values presented in the report.

2.3.5 Ancillary Emission Units

In addition to the MWC units, the facility is also expected to have emergency/standby equipment including fire water pumps and an emergency generator. Other supporting (ancillary) equipment is anticipated to include lime and carbon storage silos and ash handling equipment. At a mass-burn WTE facility, emissions from ancillary equipment occur intermittently and are vastly lower than emissions from the MWC units. They are not included in this analysis. Based on discussion with FDEP, emergency and intermittent sources may not be required in the modeling analysis for proposed new source air permitting modeling. In the permitting process any of the ancillary equipment with the potential to emit criteria or other air pollutants will need to be discussed with FDEP. The addition of other emission sources could increase any offsite concentrations presented in this analysis and require further analysis.

2.3.6 Regulatory Changes

The permitting process for a new facility of this nature can be a long and complex process. Due to the potential lengthy process of the air permit application development and the duration associated with the review and approval from several regulatory agency, there is the potential for new requirements and criteria being introduced. Recently, USEPA has revised the annual $PM_{2.5}$ NAAQS to 9 µg/m^3, lowered from 12 µg/m^3 while there was no change to the 24-hour $PM_{2.5}$ NAAQS. With this NAAQS revision, it is expected that the annual $PM_{2.5}$ SILs will also be lowered sometime in 2024 to account for the NAAQS revision. The new SIL value is not known but expected to drop from 0.2 µg/m^3 to between 0.1 and 0.15 µg/m^3, which will affect the distance size of the SIA, thus increasing the complexity and difficultly showing compliance.

Furthermore, USEPA is currently in the process of proposing new maximum achievable control technology (MACT) emission standards for MWCs. Meeting these new emissions standards will play a role in the proposed design of the future WTE facility and anticipated emissions in the permit supporting air quality analysis.

3 Anticipated Air Emissions

3.1 Emission Sources

A conceptual 4,000 tpd mass burn WTE facility is expected to have emissions from four MWC units. For the anticipated emissions determination, Arcadis assumed that the new WTE facility MWC would have similar air pollution controls and emissions as the most recently constructed, state of the art, mass burn WTE facility in the United States, which is the existing PBREF No. 2. A summary of anticipated emissions from the conceptual facility is provided in . For particulate matter (PM_{10} and $PM_{2.5}$), estimated emissions include both filterable and condensable emissions and reflect the emission limits established by FDEP in August 2022 for a new MWC unit to be constructed at the Pasco County Resource Recovery Facility. In recognition that the emission estimates were developed for use in a preliminary air dispersion modeling analysis, emissions associated with ancillary equipment were not included as they are very low in comparison to emissions from the MWCs. Only the emissions from the MWC units were evaluated in this study.

Table 3-1 Preliminary Emission Estimates for Municipal Waste Combustors

Pollutant	Maximum Concentration	Units[2]	Maximum Estimated Emissions (per MWC)[1]		Total for Four MWCs tons/yr[5]
			lbs/hr[3]	tons/yr[5]	
Nitrogen Oxides (NO_x), 24-hour basis	50	ppmvd	37.4	--	--
Nitrogen Oxides (NO_x), 12-month basis	45	ppmvd	--	133.9	536
Sulfur Dioxide (SO_2), 24-hour basis	24	ppmvd	25.0	99.5	398
Carbon Monoxide (CO)	100	ppmvd	45.5	181.2	725
Particulate Matter (PM_{10}, total)[4]	30	mg/dscm	11.7	46.7	187
Particulate Matter ($PM_{2.5}$, total)[4]	30	mg/dscm	11.7	46.7	187
VOCs (as propane)	7	ppmvd	5.0	19.9	80
Sulfuric Acid Mist (H_2SO_4)	5	ppmvd	8.0	31.7	127

Notes:

1 Maximum estimated emissions reflect a single MWC unit with a nominal rated MSW processing capacity of 1,000 tpd.

2 Limits shown reflect concentrations corrected to 7% oxygen.

3 Hourly emissions shown reflect maximum hourly values calculated at 110% of the maximum continuous rating (MCR) for the combustor.

4 Maximum estimated emissions for PM_{10} and $PM_{2.5}$ include both filterable and condensable PM emissions.

5 Annual emissions (tons/yr) are based on anticipated normal operating conditions.

4 Air Regulations

Siting a new WTE facility requires development of numerous permit applications and completion of many complex environmental analyses. Arcadis conducted a preliminary environmental regulatory review, focusing on air quality permitting programs and processes relevant to the implementation of a new 4,000 TPD WTE facility. The intent of the preliminary regulatory review was to identify significant air quality requirements that may constrain the development of a new WTE facility at the prospective site locations.

4.1 PSD Review Requirements

Based on preliminary estimates of potential emission levels, a 4,000 tpd WTE facility will constitute a new major emission source and will be subject to Prevention of Significant Deterioration (PSD) permitting requirements under the New Source Review (NSR) pre-construction permitting program. For newly proposed facilities, the PSD permitting regulation specifies that the following analyses be completed to address control technology requirements and to demonstrate that facility emissions will not adversely impact air quality:

- Control technology analyses are required on a pollutant-specific basis to define Best Available Control Technology (BACT) for the facility's emission units.
- An evaluation of ambient impacts is required regarding PSD increments and the NAAQS resulting from the emissions associated with the proposed facility. If results from dispersion modeling analyses demonstrate that the proposed facility's impacts are below established PSD significance levels, then "full impact" (multi-source) PSD increment and NAAQS analyses considering emissions from other sources in the vicinity of the project site are not required.
- An evaluation of the proposed facility's impacts regarding PSD increments and Air Quality Related Values (AQRVs) at any Class I area located close to the site is required.
- An assessment of the proposed facility's impacts on soils, vegetation, and visibility and an evaluation of air quality impacts relative to general growth associated with the proposed facility are required.

Under PSD permitting regulations, review is required for each regulated pollutant with a net emissions increase (for modified sources) or potential emissions (for new sources) equal to or exceeding the applicable significant emission rate (SER) thresholds. The SERs are defined in the federal PSD regulations under 40 CFR §52.21(b)(23)(i). SER thresholds have been established for both criteria and non-criteria pollutants. Annual emission estimates for a conceptual 4,000 tpd WTE facility are shown in **Table 4-1** and are compared to the PSD significant emission rates to indicate which pollutants are expected to be subject to PSD review.

Table 4-1 PSD Significant Emission Rate Thresholds and Preliminary Emission Estimates

Pollutant	Significant Emission Rate Threshold (tons/yr)	Estimated Emissions (tons/yr)	Subject to PSD Permitting?
Nitrogen Oxides (NO_x)	40	536	Yes
Carbon Monoxide (CO)	100	725	Yes
Sulfur Dioxide (SO_2)	40	398	Yes
Particulate Matter (PM)	25	187	Yes
Particulate Matter (PM_{10})	15	187	Yes
Particulate Matter ($PM_{2.5}$)	10	187	Yes

Table 4-1 PSD Significant Emission Rate Thresholds and Preliminary Emission Estimates

Pollutant	Significant Emission Rate Threshold (tons/yr)	Estimated Emissions (tons/yr)	Subject to PSD Permitting?
Volatile Organic Compounds (VOCs)[1]	40	80	Yes
Sulfuric Acid Mist (SAM), H_2SO_4[2]	7	127	Yes
Hydrogen Sulfide (H_2S)	10	Negligible	No
Total Reduced Sulfur	10	Negligible	No
Lead (Pb)	0.6	0.8	Yes
Fluorides	3	18	Yes
MWC Organics (as Dioxins/Furans)	3.5E-06	8.1E-05	Yes
MWC Metals (as PM)	15	187	Yes
MWC Acid Gases (as SO_2 & hydrogen chloride [HCl])	40	587	Yes

Notes:
1 Based on estimated normal operating conditions.
2 These pollutants are not directly modeled; however, VOC emissions are included in the secondary formation of ozone analysis and SAM emissions are included in the Class I Area AQRV and HHRA analyses.

4.2 National Ambient Air Quality Standards

The Clean Air Act Amendments (CAAA) direct the USEPA to set NAAQS (**Table 4-2**) for various pollutants emitted from numerous and diverse sources considered harmful to public health and the environment. There are currently NAAQS designated for six pollutants: sulfur dioxide (SO_2), nitrogen dioxide (NO_2), CO, Pb, ozone (O_3), PM_{10} and $PM_{2.5}$. The CAAA also established two types of national air quality standards. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against visibility impairment, damage to animals, crops, vegetation, and buildings. Florida has incorporated the NAAQS by reference into the state's air quality regulations.

Table 4-2 National Ambient Air Quality Standards

Pollutant	Averaging Time	NAAQS	
		Primary	Secondary
CO	8-hour	9 ppm	---
	1-hour	35 ppm	---
NO_2	Annual	100 µg/m³ (53 ppb)	Same as primary
	1-hour	188 µg/m³ (100 ppb)	---
SO_2	1-hour	196 µg/m³ (75 ppb)	Same as primary
	3-hour	---	1300 µg/m³ (0.5 ppm)
PM_{10}	24-hour	150 µg/m³	Same as primary
$PM_{2.5}$	Annual	9.0 µg/m³	15.0 µg/m³
	24-hour	35 µg/m³	Same as primary
Pb	3-month rolling	0.15 µg/m³	Same as primary
O_3	8-hour (2015)	0.070 ppm	Same as primary

The USEPA tracks compliance with the NAAQS for each criteria pollutant by designating each area of the country as either “attainment” if the area meets the NAAQS or “nonattainment” if the area does not meet the NAAQS. A separate determination of attainment status is made for each criteria pollutant. Currently, all three prospective sites in Miami-Dade County are within a NAAQS attainment area for each criteria pollutant.

USEPA has recently revised the annual $PM_{2.5}$ NAAQS to 9 µg/m^3, lowered from 12 µg/m^3. There was no change to the 24-hour $PM_{2.5}$ NAAQS. It is expected that the annual $PM_{2.5}$ SILs will also be lowered in 2024 to account for the NAAQS revision.

5 Air Dispersion Modeling Analysis

The objectives of the Air Dispersion Analysis (Analysis) are to estimate preliminary ambient air impacts associated with the implementation of a new WTE facility at each of the three potential sites and determine the relative level of air permitting difficulty based on modeling requirements and comparison air quality criteria that each site presents. The siting evaluation included the following analyses:

- Worst-Case Load Analysis
- Class II Area SILs Analysis
- NAAQS Analysis
- Class II Area PSD Increment Analysis
- Class I SILs Analysis (Everglades National Park [NP])
- Class I Increment Analysis (Everglades NP)
- Class I AQRV Analyses (Visibility & Deposition) Analysis (Everglades NP)

The following section discusses the modeling predicted concentration comparison criteria for the Class II analysis and modeling setup, inputs, and methodology. Subsequent sections will describe the model selection, inputs, and methodology for the Class I area evaluations. In addition, a screening-level HHRA and ERA assessment was completed using ambient air and deposition concentrations from the unitized emission rate AERMOD model runs. The screening-level HHRA and ERA assessment report is provided in **Appendix A**.

5.1 Class II Air Dispersion Model Setup and Methodology

5.1.1 Modeling Process Overview

Figure 5-1 provides an outline on the Air Dispersion Analysis modeling process for assessing potential ambient impacts in Class II areas.

The Class II area Air Dispersion Analysis consists of two distinct phases. The first phase represents the **preliminary modeling analysis** called the significance analysis, which determines if PSD regulations would require a full impacts analysis to demonstrate compliance. The project pollutants over the SER thresholds (shown in **Table 4-1**) will be evaluated via the preliminary modeling analysis to determine if impacts from the project are likely to cause a significant impact on existing air quality. The project related modeling results are compared to the appropriate Significant Impact Level (SIL). Each pollutant has specific SIL concentrations for each averaging period that either has an established NAAQS or PSD increment. **Table 5-1** shows thresholds for the Class II area SILs.

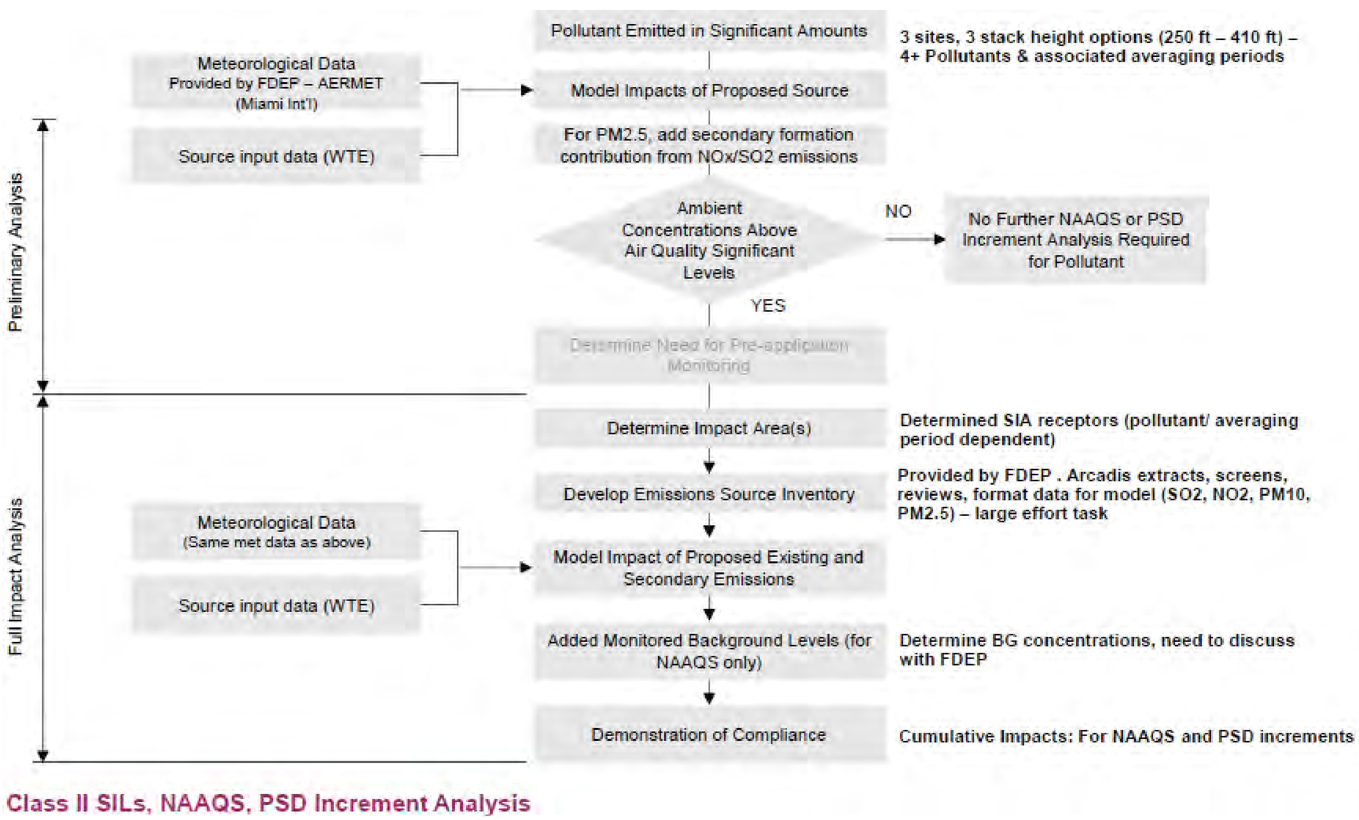

Figure 5-1 Class II Modeling Process Overview

Table 5-1 Class II Area SILs for Preliminary Modeling Analysis

Pollutant	Averaging Period	Class II SIL ($\mu g/m^3$)
SO_2	1-hour	7.86
	3-hour	25
	24-hour	5
	Annual	1
PM_{10}	24-hour	5
	Annual	1
$PM_{2.5}$	24.hour	1.2
	Annual	0.2
NO_2	1-hour	7.55
	Annual	1
CO	1-hour	2000
	8-hour	500

If the SILs analysis shows that the project's potential emissions could cause a significant impact, then the distance in which the SIL is exceeded is calculated. This distance is referred to as the Significant Impact Area (SIA). This SIA also determines the area of impact used in the full impacts analysis.

The second phase represents the **full impact analysis** (also referred to a cumulative impact analysis), i.e. the NAAQS and PSD Increment analyses. The NAAQS analysis demonstrates compliance with federal ambient air concentration standards, while the PSD Increment analysis demonstrates compliance with the federal limits on industrial growth and only allows for a small degradation of air quality due to the industrial growth in an area. The regulatory limits for the two types of full impact analyses are in **Table 5-2** and **Table 5-3**.

Table 5-2 National Ambient Air Quality Standards

Pollutant	Averaging Period	Regulatory Limit ($\mu g/m^3$)	Modeled Design Value Used
PM_{10}	24-hour	150	Maximum 6th highest
$PM_{2.5}$	24-hour	35	Avg. of maximum 8th highest
	Annual	9	Avg. of maximum 1st highest
CO	1-hour	40,000	Maximum 2nd highest
	8-hour	10,000	Maximum 2nd highest
SO_2	1-hour	75 ppb (196 $\mu g/m^3$)	Avg. of maximum 4th highest
	3-hour	1,300	Maximum 2nd highest
Nitrogen Dioxide (NO_2)	1-hour	100 ppb (188 $\mu g/m^3$)	Avg. of maximum 8th highest
	Annual	100	Maximum 1st highest
Ozone (O_3)	8-hour	70 ppb	3-yr Avg of annual 4th High

Table 5-3 Class II PSD Increment

Pollutant	Averaging Period	Class II PSD Increment ($\mu g/m^3$)	Modeled Design Value Used
SO_2	3-hour	512	High 2nd-High
	24-hour	91	High 2nd-High
	Annual	20	Max Annual
PM_{10}	24-hour	30	High 2nd-High
	Annual	17	Max Annual
$PM_{2.5}$	24.hour	9	High 2nd-High
	Annual	4	Max Annual
NO_2	Annual	25	Max Annual

5.1.2 Model Selection

For the Class II Area Analysis, AERMOD (23132, USEPA 2023a) was the primary air dispersion model used to assess source impacts at the three potential sites. The AERMOD (AMS [American Meteorological Society]/EPA Regulatory Model) modeling system is a refined steady-state Gaussian plume model that simulates pollutant concentrations from a variety of sources. AERMOD is EPA's preferred model for assessing impacts up to 50 kilometers (km) from proposed sources. The AERMOD model was designed to specifically support the USEPA regulatory modeling programs. The Guideline on Air Quality Models, 40 CFR Part 51, Appendix W ("Appendix W") (USEPA 2017) recommends the use of AERMOD for operating conditions such as those at the proposed multiple sources, rural area, building downwash, and 1-hour to annual averaging times. The AERMOD Modeling System includes preprocessor programs AERSURFACE [determines surface characteristic values required by the meteorological processor AERMET] (20060; USEPA 2020), AERMOD Meteorological Preprocessor [AERMET] (23132), and AERMOD Terrain Preprocessor [AERMAP] (18081) to create the required input files for meteorology and receptor terrain elevations. AERMET is used to process the necessary meteorological data per the methodology described in Figure 5-1.

5.1.3 Model Options

For the refined dispersion model setup in this analysis, several dispersion model options are available. The model options selected for this demonstration were based on the regulatory default selections, which include:

- Final plume rise;
- Stack-tip downwash;
- Buoyancy-induced dispersion;
- Default wind profile exponents;
- Default vertical potential temperature gradients; and,
- Calms (wind) processing.

Modeling for the 1-hour NO_2 SILs/NAAQS follows the recommended three tier screening approach provided in the latest version of Appendix W. Tier 1 is identified as full conversion of NO_X to NO_2. According to Appendix W, Tier 2 is when the "Ambient Ratio Method 2 (ARM2) is used, which provides estimates of representative equilibrium ratios of NO_2/NO_X value based on ambient levels of NO_2 and NO_X derived from a national dataset. With the use of ARM2 (default option), special attention is necessary for handling source grouping if different operational scenarios are evaluated. The Tier 2 method uses the national default values including a minimum ambient NO_2/NO_X of 0.5 and a maximum of 0.9. Tier 2 is used for this analysis. A Tier 3 method (default use of Ozone Limiting Method [OLM], Plume Volume Molar Ratio Method [PVMRM] or Beta option use of Generic Reaction Set Method [GRSM]) was not reviewed as part of this analysis but may be necessary to show compliance for full multisource modeling during the air permitting process.

5.1.4 Land Use Analysis – Urban vs. Rural Determination

A review of land use in the vicinity of each site was conducted to determine if an "urban" or "rural" dispersion option will be selected for model setup. The selection of rural or urban dispersion coefficients for use in a specific modeling exercise should follow either a land use procedure or a population density procedure. The land use procedure is considered more effective and recommended by FDEP. The land use classification scheme proposed by A.H. Auer in *Correlation of Land Use and Cover with Meteorological Anomalies, Journal of Applied Meteorology*, (Auer 1978), is the method recommended by the USEPA. It includes the following categories:

I1 – Heavy industrial (urban) – major chemical, steel, and fabrication industries;

I2 – Light (urban) – moderate industrial rail yards, truck depots, warehouses, minor fabrication;

C1 – Commercial (urban) – office and apartment buildings, hotels;

R1 – Common residential (rural) – single family dwellings with normal easements;

R2 – Compact residential (urban) – single, some multiple family dwellings with close spacing;

R3 – Compact residential (urban) – old multi-family dwellings with close spacing;

R4 – Estate residential (rural) – expansive family dwelling on multi-acre plots;

A1 – Metropolitan natural (rural) – major municipal, state or federal parks, golf courses, cemeteries, campuses;

A2 – Agricultural (rural) – crops;

A3 – Undeveloped (rural) – uncultivated, grasses/weeds;

A4 – Undeveloped (rural) – heavily wooded; and

A5 – Water surfaces (rural) – rivers, lakes.

If the land use types I1, I2, C1, R2, and R3 account for 50 percent or more of the total area inside a 3-km radius circle centered at the site, then urban coefficients should be used. Otherwise, a rural classification should be used.

Appendix B contain aerials showing the land use surrounding the three proposed sites with the 3-km radius circle marked (inner radius). The area inside the circle was evaluated through both aerial photo review and GIS information.

For the Airport West location, the surrounding area is classified as rural because it comprises open water, herbaceous wetlands, uncultivated fields and undeveloped (rural) parcels. Therefore, rural dispersion coefficients were applied in the Airport West dispersion modeling.

For Medley, the surrounding area is classified as Urban, with 66% of land classified as medium and high intensity developments.

For the Existing RRF location, the surrounding area is classified as Urban, with 51% medium and high intensity developed land. Therefore, Urban dispersion coefficients were applied to the Medley and Existing RRF dispersion modeling setup.

When evaluating the population size used in the Urban classified sites (USEPA 2023b), a modeling domain area of about 15 km by 40 km was identified as the part of the urban area that will contribute to the urban heat island plume affecting the source(s). A population of 850,000 was determined as the population count for the area and applied with the Urban option in AERMOD. **Figure 5-2** identifies the urban population boundary with respect to the three site locations.

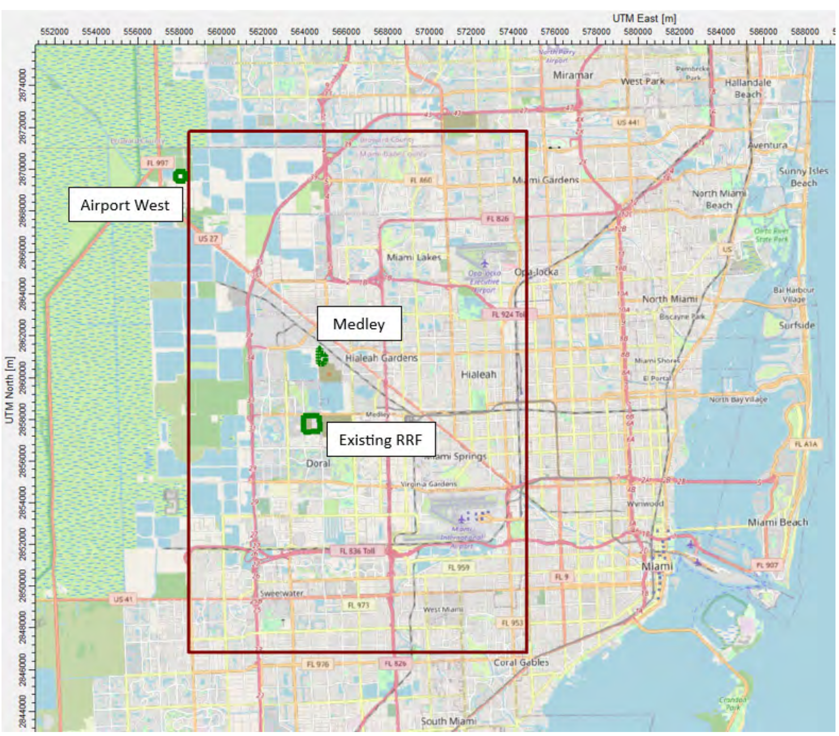

Figure 5-2 Urban Area Population Boundary

5.1.5 Meteorological Data

The AERMOD analyses were run with five years of AERMOD-ready meteorological data provided by the FDEP via email on September 21, 2023. These datasets include five consecutive years of surface and upper air data from nearest National Weather Service ASOS stations.

The 2017 through 2021 hourly surface data were measured at Miami International Airport (KMIA) and the upper air data were measured at Florida International University (FIU) in Miami. The nearest National Weather Service (NWS) station at KMIA is approximately 4 – 12 miles southeast of the sites. The five-year average wind rose (wind blowing from) based on these hourly data is presented in **Figure 5-3**. The data were processed by FDEP using the AERMOD input processor AERMET v22112.

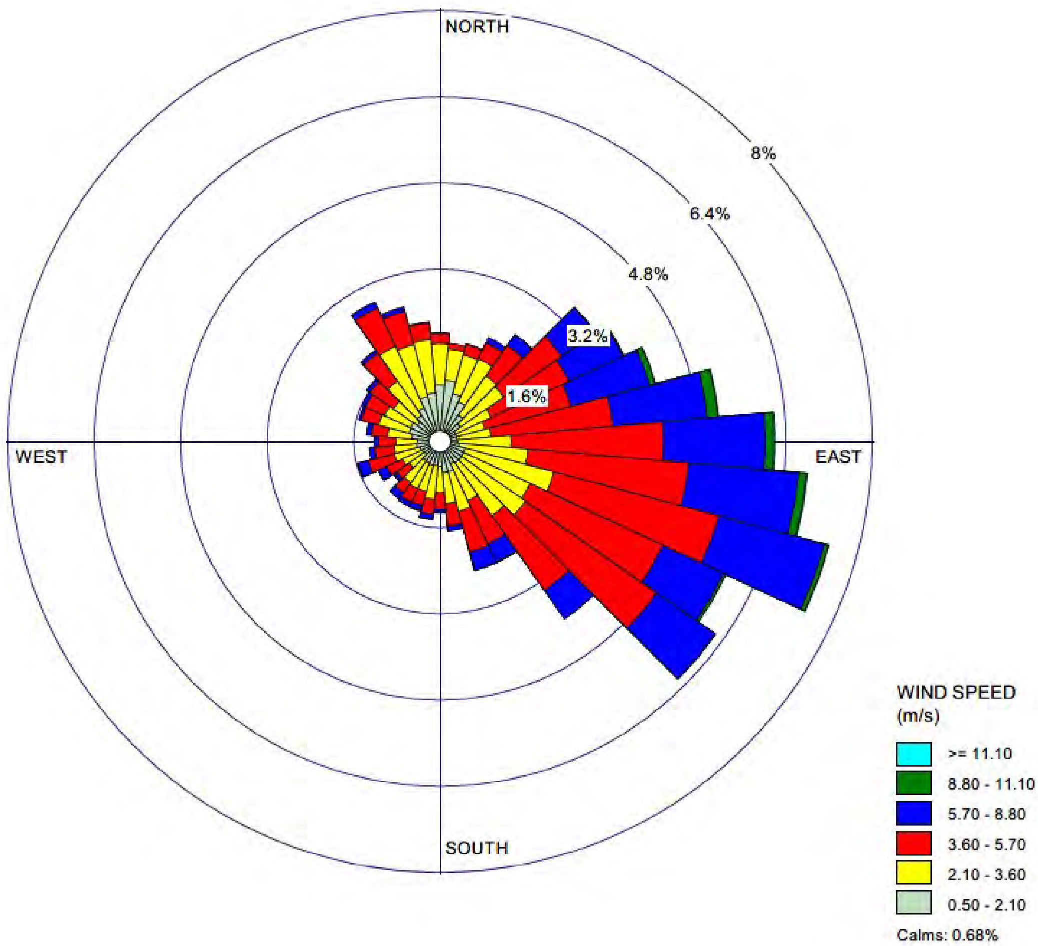

Figure 5-3 5-year Wind Rose of Miami International Airport (blowing from)

The five-year average wind rose provided by FDEP shows that the prevailing wind direction is from the east-to-east southeast off the Atlantic Ocean.

The Miami-Opa Locka Executive Airport (OPF) is located north of the Miami International Airport and east and northeast of the proposed sites. The wind rose also depicts the east-to-east southeast prevailing winds similar to the data set used in the air dispersion modeling analysis. The wind rose for the Miami-Opa Locka Executive airport is provided in **Appendix C**.

5.1.6 Ambient Air and Receptor Grids

For the Class II AERMOD analyses, a Cartesian receptor network was designed to identify the location of maximum off-site concentrations for each site location. The multi-tier grid receptors include fine, medium and course spaced receptors as follows:

- 25-meter spaced receptors along the proposed ambient air boundary (fence line)
- 50-meter spaced receptors extending out 1000 m from the boundary
- 100-meter spaced receptors extending out 3000 m from the boundary
- 500-meter spaced receptors extending out 6000 m from boundary
- 1000-meter spaced receptors extending out 50 km (receptors removed from eastern ocean for applicable sites)

5.1.7 Terrain Data

Digitalized terrain data (National Elevation Dataset [NED] developed by the U.S. Geological Survey [USGS]) was obtained for the areas covered by the receptor grids, as 1/3 arc-sec NED data and used to determine receptor heights. The proposed structures including buildings and stacks at each site location are based on a proposed site grades of 5 feet for the Existing RRF and Medley, and 7 feet for Airport West. Terrain data was downloaded using Lake's AERMOD View and processed using the AERMAP Terrain program.

The current version of the NED dataset did not include terrain elevations for the Medley Landfill area next to the proposed Medley site. Heights were estimated for the Landfill hill using elevation data from a Google Earth Pro and incorporated into the AERMOD receptor files.

Missing elevation data and any data depicted as negative values within the receptor grid was revised to 0-foot elevations. This included area at the edge of the NED grid files as well as over the Atlantic Ocean.

5.1.8 Building Downwash

The presence of structures results in zones of air turbulence referred to as wake effects (aka, downwash) that influence dispersive forces. The building wake is estimated to extend a distance of five times L downwind from the trailing edge of the structure, where L is the lesser of the building height or maximum projected building width. This wake effect influence can result in high-ground level air concentrations if the emission source plume is influenced by building wake effects. The direction-specific area of influence changes as the wind rotates full circle. A stack that is located within the 5L radius of influence is potentially affected by wake effects.

The Building Profile Input Program (BPIP) was designed by the USEPA to incorporate the concepts and procedures of building downwash into a program that calculates effective building heights (BH) and projected building widths for use by AERMOD. The BPIP incorporates the Huber-Snyder algorithm (stack height between 1.5 BH and 2.5 BH) or the Schulman-Scire algorithm (stack height less than 1.5 BH) when appropriate. The BPIP Program (USEPA 1995) is used to compute the model input parameters necessary for AERMOD to account for building wake effects. BPIP execution relies on the dimensions of buildings near the stacks. The "PRIME" version of BPIP (BPIPPRM, dated 04274) is used with AERMOD. BPIPPRM is designed to use a digitized representation of the facility's buildings and stacks as well as other nearby structures. The conceptual footprint position and height of buildings relative to the stack locations for the three proposed sites were evaluated in the building downwash analysis. Coordinates for each building/structure were from the proposed layout of each site. The downwash effects are considered by AERMOD for wind directions that place these structures upwind or downwind of the stacks and is applied in the predicted offsite concentration calculation from the model.

5.1.9 Analysis of Ozone and Secondary Formation of $PM_{2.5}$

Secondary $PM_{2.5}$ is formed within the atmosphere from precursor gases such as SO_2, NO_X and organics through gas-phase photochemical reactions or through liquid phase reactions in clouds and fog droplets. Secondary $PM_{2.5}$ and ozone formation were analyzed for the SIL, PSD increment, and NAAQS analyses.

USEPA has developed guidance that provides recommendations to conduct air quality modeling analyses to satisfy compliance demonstration requirements for ozone and secondary $PM_{2.5}$ under the PSD Permitting Program. The recommendations support the methodology to estimate single source impacts on secondary pollutants under the Tier 1 approach presented in the GAQM (Appendix W to 40 CFR 51, 2017). The project's potential emissions for VOC, NO_X, and $PM_{2.5}$ is greater than the SERs. Arcadis used the Tier 1 approach for assessing the project's impacts to ozone and secondary $PM_{2.5}$. The method is outlined in USEPA's guidance on MERPs, including EPA's interactive MERPs View Qlik webpage (https://www.epa.gov/scram/merps-view-qlik). The USEPA's guidance includes Revised DRAFT Guidance for Ozone and Fine Particulate Matter Permit Modeling (USEPA 2021) and Guidance on the Development of Modeled Emission Rates for Precursors (MERP) as a Tier 1 Demonstration Tool for Ozone and Fine Particulates in the PSD Permitting Program (USEPA 2019).

As part of this siting evaluation, Arcadis has outlined the methodology to account for the potential secondary formation of $PM_{2.5}$ and ozone from precursors in the following sections.

5.1.9.1 Ozone Impact Assessment

The impact on ozone formation is dependent on the contribution of ozone precursor emissions from single sources; the presence of precursor emissions in the airshed; and the transport of emissions and ozone from other areas. Ground-level ozone formation is the result of a complex cycle of chemical reactions, which require large increases in precursor emissions to influence short-term ozone concentrations. Based on FDEP data for background ozone concentrations from the following nearby ozone monitors: Daniela-Davie (ID: 12-011-0034) and Vista View (ID: 12-011-0033) which is representative of all three proposed sites. the ozone design value is approximately 58 – 60 ppb (2020-22). The current 8-hour ozone NAAQS is 0.07 ppm (70 ppb) and 8-hour SIL is 1 ppb.

Since the conceptual WTE facility will have proposed NO_X and VOC emissions greater than the 40 tpy SER and following USEPA and FDEP's PSD Air Quality Modeling Best Practices (FDEP 2024) guidance, a Tier 1 demonstration using the MERPs guidance and interactive MERPs View Qlik webpage to evaluate the project's impacts on the area's current ozone concentrations was necessary. Based on the evaluation of the regional MERPs data, the nearby hypothetical source located in Broward County, Florida was used for both NO_X and VOCs. Based on this analysis, the calculated regional ozone level may be greater than the 8-hour ozone SIL of 1 ppb (2.3 ppb). Therefore, Arcadis added the Project's estimated ozone contribution from the anticipated VOC and NO_X emissions to the current design value and concluded that the ozone NAAQS standard not expected to be exceeded, cumulative impact of 62.3 ppb.

5.1.9.2 Secondary $PM_{2.5}$ Formation

Secondary $PM_{2.5}$ can potentially occur as a result of atmospheric transformation of NO_X and SO_2 precursor emissions. Secondary formation of $PM_{2.5}$ occurs due to chemical reaction in the atmosphere downwind from the original emission source. The reactions occur gradually over a period of hours or days depending on atmospheric conditions and other variables. Following USEPA guidance and FDEP guidance, Arcadis conducted a quantitative analysis (Tier 1) to address precursors and their potential for increasing ambient levels of $PM_{2.5}$. The conceptual WTE facility is expected to have direct $PM_{2.5}$ emissions greater than the 10 tpy SER as well as having NO_X and SO_2 emissions greater than the 40 tpy SER, therefore a Tier 1 approach using the MERPs was used to calculate the secondary $PM_{2.5}$ formation.

The direct modeled $PM_{2.5}$ offsite concentration was used with the value of secondary formation of $PM_{2.5}$ to compare to the SILs, and the direct modeled concentration, secondary formation of $PM_{2.5}$ and background data to compare the cumulative results with the NAAQS.

Following the same methodology as ozone, a demonstration using the lowest (most conservative) MERP values were used for 24-hour and annual $PM_{2.5}$ precursors from all sources that the USEPA modeled for the Southeast climatic region and again the Broward County, Florida was determined to be the most representative NO_X and SO_2 hypothetical MERP source during the review.

The contribution attributed to the secondary formation of 24-hour and annual $PM_{2.5}$ is less than 0.162 $\mu g/m^3$ and 0.007 $\mu g/m^3$, respectively. The calculated secondary $PM_{2.5}$ values are included in the SILs, PSD increment, and NAAQS analyses.

The calculations for the potential formation of ozone and secondary $PM_{2.5}$ can be found in **Appendix D**.

5.1.10 Emissions and Stack Parameters for Conceptual WTE

The primary source of emissions at the proposed facilities are the MWC units. The MWC emissions will be exhausted from a tall stack which contains four identical flues (one for each of the four identical MWC units). The four identical flues will be adjacent to each other within an outer concrete shell; and were modeled as a single merged stack point source, with an equivalent diameter following regulatory guidance. For a point source, AERMOD requires stack coordinates, height, diameter, emission rates, exit temperature and exit flow rate. The anticipated emissions and stack parameters are based on three load conditions (Normal, Maximum, and Low). **Table 5-4** and **Table 5-5** present the anticipated emission from each scenario, and corresponding stack parameters that are influenced by each load condition.

Table 5-4 Stack Parameters for MWC Unit per Load Scenario

Load Condition:	Normal	Maximum	Low
Scenario:	1a	3a	4
Stack Height (ft)[1]	250, 310, 410	250, 310, 410	250, 310, 410
Effective Stack Diameter (m)[2]	4.73	4.73	4.73
Exhaust Flow Rate (actual cubic feet per minute [acfm])[3]	678,924	810,964	523,692
Exhaust Velocity (meters per second [m/s])	18.24	21.79	14.07
Exhaust Temperature (kelvin [K])	413.7	413.7	413.7

Notes:
1 Three stack height options were evaluated per site, except at the Existing RRF location the 410 ft option was removed due to potential concerns with FAA stack height restrictions.
2 Effective stack diameter reflects a “merged stack” based on a single flue with an area equivalent to the sum of the areas of the four identical flues.
3 Exhaust flow rate is the combined flow rate for all MWCs at 4,000 tons/day (four 1,000 ton/day MWC units).

Table 5-5 Emission Rates for MWC Units Stack per Load Scenario

Load Condition:	Design (Normal)	Maximum	Low
Scenario:	1a	3a	4
Emission Rate NOx (g/s) (Annual; 45 ppm)	15.41	16.96	10.77
Emission Rate NOx (g/s) (1- hour; 50 ppm)	17.13	18.84	11.97
Emission Rate SO_2 (g/s)	11.46	12.6	8.0
Emission Rate H_2SO_4 (g/s)	3.65	4.02	2.55
Emission Rate PM_{10} (g/s)	5.38	5.92	3.76
Emission Rate $PM_{2.5}$ (g/s)	5.38	5.92	3.76
Emission Rate CO (g/s)	20.85	22.93	14.57

* Emission rates represent one 4,000 tons/day stack, except for the case at the Existing RRF site where the two existing stacks are modeled. Emissions and flow rate were split between the two existing stacks.

5.1.11 Worst-Case Load Analysis

To determine which operating load scenario would result in highest predicted offsite ambient air impacts, the worst-case scenario, a preliminary impact analysis evaluating the three above mentioned load scenarios was performed.

For the worst-case load analysis, a unitized emission rate of 1 g/s was used to produce normalized concentrations (µg/m^3 per g/s). These normalized concentrations were then multiplied by the 1-hour emission rates for each pollutant to determine the highest five-year average 1-hour predicted impacts. The three scenario concentrations are compared to determine which scenario provided the highest predicted impacts. All of the listed stack height options were included in this analysis. This was conducted for both Class I and Class II receptor grids to determine the worst-case scenario for each. The results from this preliminary analysis are:

- For the Class II Area Analysis, Scenario 1a (Normal Load) resulted in highest predicted impacts for all three site locations. The associated emissions rates and stack exhaust parameters were used for Class II analyses going forward.
- For the Class I Area analysis, Scenario 3a (Maximum Load) resulted in highest predicted impacts at Class I receptors. The higher emission rates led to higher predicted ground-level impacts at the distant Class I area receptors. This scenario's emission rates, and stack exhaust parameters were used for Class I analyses going forward. Class I area analyses is presented in Section 5.3.

5.2 Class II Area Analysis

5.2.1 Significance Impact Level Analysis and Results

Following USEPA Guidance, a preliminary modeling analysis called the significant impact analysis was conducted to determine if each proposed site's anticipated emissions result in a significant impact on ambient air quality. The maximum modeled concentration per pollutant and averaging time is compared to their respective SIL.

The significance analysis results are shown in the **Table 5-6, Table 5-7,** and **Table 5-8**. **Bolded** concentrations are predicted impacts greater than current accepted SIL.

Table 5-6 Class II Area SIL Analysis – Airport West

Criteria Pollutant	Averaging Period	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	SILs (µg/m³)
SO_2	1-hour	**18.66**	**9.47**	4.44	7.86
	3-hour	17.82	10.19	3.82	25
	24-hour	**11.66**	3.68	1.47	5
	Annual	0.86	0.44	0.32	1
PM_{10}	24-hour	**5.47**	1.73	0.69	5
	Annual	0.40	0.21	0.15	1
$PM_{2.5}$	24-hour	**4.30**	**1.50**	0.94	1.2
	Annual	**0.35**	0.16	0.12	0.2
NO_2	1-hour	**25.10**	**12.74**	5.97	7.55
	Annual	**1.04**	0.53	0.39	1
CO	1-hour	36.50	20.05	10.10	2000
	8-hour	26.31	14.15	6.23	500

Table 5-7 Class II Area SIL Analysis – Existing RRF

Criteria Pollutant	Averaging Period	250 ft Stacks[1] (µg/m³)	310 ft Stack[2] (µg/m³)	SILs (µg/m³)
SO_2	1-hour	**22.22**	**11.66**	7.86
	3-hour	24.93	11.12	25
	24-hour	**14.81**	**7.42**	5
	Annual	**1.40**	0.58	1
PM_{10}	24-hour	**6.98**	3.50	5
	Annual	0.66	0.27	1
$PM_{2.5}$	24-hour	**5.96**	**2.92**	1.2
	Annual	**0.61**	**0.28**	0.2
NO_2	1-hour	**29.97**	**15.77**	7.55
	Annual	**1.7**	0.70	1
CO	1-hour	49.04	22.45	2000
	8-hour	35.54	16.21	500

Notes:

1 The two existing 250 ft stacks at the Existing RRF site were modeled for the 250 ft scenario.

2 A 410 ft stack analysis was not conducted at the Existing RRF site due to potential concerns with FAA stack height restrictions.

Table 5-8 Class II Area SIL Analysis – Medley

Criteria Pollutant	Averaging Period	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	SILs (µg/m³)
SO_2	1-hour	**28.72**	**11.38**	4.44	7.86
	3-hour	**26.99**	9.18	4.33	25
	24-hour	**10.46**	**5.01**	1.69	5
	Annual	0.73	0.45	0.32	1

Table 5-8 Class II Area SIL Analysis – Medley

Criteria Pollutant	Averaging Period	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	SILs (µg/m³)
PM_{10}	24-hour	4.92	2.77	0.79	5
	Annual	0.34	0.22	0.66	1
$PM_{2.5}$	24-hour	**3.85**	**2.03**	0.95	1.2
	Annual	**0.35**	0.19	0.12	0.2
NO_2	1-hour	**38.70**	**15.38**	5.97	7.55
	Annual	0.88	0.54	0.39	1
CO	1-hour	54.07	23.06	14.22	2000
	8-hour	31.26	14.26	7.40	500

In the Airport West significance results, for the 250 ft stack height scenario, SO_2, PM_{10}, $PM_{2.5}$, and NO_X had maximum modeled predicted impacts above the respective SIL. In the 310 ft stack height scenario, SO_2, $PM_{2.5}$, and NO_X had maximum impacts above the SIL. For the 410 ft stack height scenario, no pollutants were above their respective SILs.

For the Existing RRF site significance analysis, the 250 ft stack height scenario had SO_2, PM_{10}, $PM_{2.5}$, and NO_X maximum predicted impacts above the respective SILs. In the 310 ft stack height results, SO_2, $PM_{2.5}$, and NO_X had maximum impacts above the SIL. No 410 ft stacks scenarios were modeled for the Existing RRF site due to potential concerns with the Federal Aviation Administration (FAA) potentially having stack height restrictions for flight paths to and from the Miami International Airport.

Finally, from the Medley site significance analysis, the modeling showed for both the 250 ft stack and the 310 ft stack scenarios, SO_2, $PM_{2.5}$, and NO_X had maximum predicted impacts above the respective SILs. For the 410 ft stack height, no pollutants had predicted impacts above their respective SILs.

The pollutants with maximum modeled concentrations for any criteria pollutants above their respective SILs would require further analysis to show that the proposed emission source would not contribute to a NAAQS or PSD increment violation. Therefore, these specific scenarios proceeded to additional analysis steps as described in the following sections.

5.2.2 Significant Impact Areas

The Significant Impact Area (SIA) is made up of the specific receptors where the SIL modeling predicts impacts at or above the SIL. A SIA is defined for each pollutant and averaging period.

Appendix E shows the resulting receptor location plots developed for each site and stack height scenario with predicted ambient air impacts above SILs. A circular radius extending out to the farthest receptor above SIL is shown on each, indicating the distance of the SIA. The plots only present those receptors within the SIA, aka “amoeba” method, and not all the receptors located within the entire circle. [Note: FDEP and/or USEPA Region 4 may request an additional analysis using all receptors within the SIA radius for the multisource analysis instead of “amoeba” method used.]

The NAAQS and PSD Class II increment modeling analyses will evaluate cumulative ambient air impacts at receptors within the SIA.

5.2.3 Full Multisource NAAQS Analysis

If the Significance Analysis shows a pollutant exceeding its respective SIL, a NAAQS analysis is conducted to evaluate proposed facility's emissions along with contributions from other nearby emission sources with further detail. The potential emissions from other off-property emission sources are added to the modeling domain based on the SIA distances. Background ambient air concentrations are also added. Depending on air quality monitor locations used for background concentrations and their relationship with nearby emissions, the air quality background data may or may not capture the emissions contributions from the existing nearby sources. USEPA has recently distributed guidance, *Draft Guidance on Developing Background Concentrations for Use in Modeling Demonstrations* (USEPA 2023c), for developing appropriate background concentrations for modeling demonstration projects, like NAAQS analyses.

5.2.3.1 Inventory Development

After an initial call to discuss the site evaluations, FDEP provided three separate emission source inventories for review and use in the multisource cumulative impact analyses, one for each proposed site location. The offsite inventories contained source parameters and emissions information for all the criteria pollutants and more. The inventories for the Existing RRF site and the Medley site were combined due to the proximity (< 2 miles) between the two sites.

These source inventories include sources that reported emissions for the 2022 emissions inventory and were within 50 km of each facility, along with stack parameters and approximate locations of each stack to be used in modeling.

Arcadis conducted several steps to review, screen, and evaluate the information provided by FDEP. The first task is to screen the inventory for nearby sources. "Nearby" sources to be included in the full impact analysis are defined as those sources within a circular area with a radius equal to the furthest distance to the SIL (i.e., the SIA) plus 50 kilometers (USEPA 1990).

In addition, all operating facilities which were located within 10 km of each site (conservatively encompassing the area of the SIA) were included in the full impact analysis. Facilities located beyond 50 km were removed from further processing. Facilities beyond the SIA, but within the SIA plus 50 km, were evaluated for inclusion in the full impact analysis based on the 20D screening method developed by the North Carolina Department of Environment and Natural Resources (NCDNRCD 1985).

Following this method, facilities (based on facility common ID) with total facility emission rates (in tons per year) less than 20 times the distance (in km) from the emission source (project) to the edge of the SIA ("D") were considered to have insignificant impacts within the SIA and were removed from the full impact analysis.

The emission rates reviewed from the inventory for this 20D analysis were the worst-case or maximum rate between the potential, allowable rates, and the actual TPY emissions provided in the inventory.

The remaining facilities that did not screen out with the 20D analysis were further reviewed for type of operations, missing stack parameters and emission rates, and incorrect stack locations. Following FDEP guidance, intermittent sources (i.e. emergency equipment and equipment operating less than ~400 hours per year) are not required to be modeled and were screened out of the inventory. Best engineering judgement was applied when filling in missing source parameters. Generally, a similar type of source with complete stack parameters was identified from the existing inventory as a representative source for equipment that had missing stack parameters. All sources were treated as point sources unless the source description from inventory stated fugitive source and no point source parameters were provided. For facilities with multiple fugitive sources, an AREA source was created to represent collective fugitive sources and emissions from the facility, and dimensions were identified for the fugitive area source based on a visual review of recent aerials of the site using Google Earth Pro.

Several limitations were encountered when reviewing the emissions inventory. One large factor was missing data from inventory such as stack parameters, emission rates, and misrepresented source locations. A detailed review of inventory data and further investigation of permitting documents along with coordination with FDEP will be necessary when conducting an inventory analysis for PSD permitting efforts. In addition, additional clarification of sources classified as baseline, increment consumer, and increment expander will be needed.

5.2.3.2 Background Air Quality

Background air quality is established by ambient air monitoring stations maintained by FDEP and local agencies with stations located throughout the state to monitor ambient levels of criteria pollutants (NO_2, SO_2, O_3, PM_{10}, and $PM_{2.5}$). Published FDEP/EPA monitoring data from 2020 through 2023 reported at ambient monitoring stations in the vicinity of the project sites were reviewed to determine representative background air quality data; these data and are presented in **Table 5-9**. A more extensive review of monitors surrounding the project sites is included in **Appendix F**.

Table 5-9 Background Concentrations for Project Site Locations

Criteria Pollutant	Averaging Period	Airport West			Existing RRF / Medley[1]		
		Monitor ID	Monitoring Period	Background Conc.[2] (µg/m3)	Monitor	Monitoring Period	Background Conc.[2] (µg/m3)
SO_2	1-hour	12-086-0019	2020-2022	4.3	12-086-0019	2020-2022	4.3
	3-hour	12-086-0019	2020-2022	4.3	12-086-0019	2020-2022	4.3
PM_{10}	24-hour	12-011-0034	2020-2022	77.3	12-086-1016	2020-2022	76.3
$PM_{2.5}$	24.hour	12-086-0033	2021-2023[3]	17.0	12-086-0033	2021-2023[3]	17.0
	Annual	12-086-0033	2020-2022	6.5	12-086-0033	2020-2022	6.5
NO_2	1-hour	12-086-0035	2021-2023[3]	96.3	12-086-0019	2021-2023[3]	96.3
	Annual	12-086-0035	2021-2023[3]	24.3	12-086-0035	2021-2023[3]	24.3

Notes:

1 Existing RRF Site Location and Medley Site location combined due to proximity.

2 Data obtained from USEPA's Outdoor Air Quality Data - Monitor Values Report https://www.epa.gov/outdoor-air-quality-data/monitor-values-report

3 2023 monitoring data has not been finalized by EPA at the time of this report and is expected to be final in May of 2024. However, it was included in this potential future permitting review when data showed higher concentrations than previous three years as a conservative estimate.

Based on correspondence with FDEP, background monitor design values are expected to be affected by the recent USEPA $PM_{2.5}$ Annual NAAQS change from 12 µg/m^3 to 9 µg/m^3. EPA is in the process of conducting data corrections for all FEM monitors and design values may be lowered by as much as 15%. Values may also be adjusted based on "exceptional events" from past several years such as the effects of the Sahara dust and Canadian wildfires on these monitors.

5.2.3.3 NAAQS Results

The results from the Class II NAAQS cumulative modeling for each site and for each stack height scenario are shown in **Table 5-10, Table 5-11,** and **Table 5-12**. For a more detailed tables of NAAQS modeling results, with breakdowns for MERPs values, background values, and reported concentrations, see **Appendix F**.

Table 5-10 Airport West Class II NAAQS Modeling Results

Criteria Pollutant	Averaging Period	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	NAAQS (µg/m³)
SO_2	1-hour	22.8	19.5	< SIL	196
	3-hour	< SIL	< SIL	< SIL	1300
	24-hour	16.7	< SIL	< SIL	365
	Annual	< SIL	< SIL	< SIL	80
PM_{10}	24-hour	90.0	< SIL	< SIL	150
$PM_{2.5}$	24-hour	29.9	29.4	< SIL	35
	Annual	7.9	< SIL	< SIL	9
NO_2	1-hour	126.0	125.8	< SIL	188
	Annual	27.5	< SIL	< SIL	100

Table 5-11 Existing RRF Class II NAAQS Modeling Results

Criteria Pollutant	Averaging Period	250 ft Stacks (µg/m³)	310 ft Stack[1] (µg/m³)	NAAQS (µg/m³)
SO_2	1-hour	64.3	37.8	196
	3-hour	<SIL	<SIL	1300
	24-hour	17.5	11.7	365
	Annual	7.5	<SIL	80
PM_{10}	24-hour	82.4	<SIL	150
$PM_{2.5}$	24-hour	20.4	18.7	35
	Annual	7.4	6.8	9
NO_2	1-hour	**216.4**	**211.1**	188
	Annual	31.3	<SIL	100

Notes:

1 Existing RRF site does not include 410 ft stack height scenario due to potential concerns with FAA stack height restrictions.

Table 5-12 Medley Class II NAAQS Modeling Results

Criteria Pollutant	Averaging Period	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	NAAQS (µg/m³)
SO_2	1-hour	63.3	40.4	< SIL	196
	3-hour	29.6	< SIL	< SIL	1300
	24-hour	27.6	16.6	< SIL	365
	Annual	< SIL	< SIL	< SIL	80
PM_{10}	24-hour	< SIL	< SIL	< SIL	150
$PM_{2.5}$	24-hour	**45.7**	21.3	< SIL	35
	Annual	7.5	< SIL	< SIL	9
NO_2	1-hour	**207.5**	**206.1**	< SIL	188
	Annual	< SIL	< SIL	< SIL	100

The Airport West site modeled results showed each pollutant's predicted impacts for all three stack height scenarios under its respective NAAQS. The main contributing off-property sources with the highest impacts of $PM_{2.5}$ were from a nearby asphalt plant to west of the site, and a quarry to east.

The Existing RRF Site modeled results showed NO_2 1-HR predicted impacts above the NAAQS for both the 250 ft and 310 ft stack height scenarios. The main contributor to this overall predicted impact is from an off-property existing facility – a water treatment plant with several large non-emergency engines used for load sharing with utilities.

The Medley site results showed predicted impacts for NO_2 1-HR above the NAAQS for the 250ft and 310 ft stack height scenarios, and $PM_{2.5}$ 24-hr above its NAAQS for the 250 ft stack height scenario. The main off-property contributors to these overall predicted impacts are from a large industrial facility to the northwest and one to the southeast.

Further investigation of permitted sources surrounding the proposed site locations (especially sources with the largest contributions to the total impacts), and coordination with FDEP is likely needed to resolve any modeling issues.

5.2.4 Class II PSD Increment Analysis

To maintain air quality in areas that meet the NAAQS, the CAAA established maximum allowable increases over baseline concentrations, called PSD increments. PSD increments are promulgated for NO_2, SO_2, PM_{10}, and $PM_{2.5}$. For pollutants with a modeled concentration greater than the significance levels in **Table 5-6, Table 5-7,** and **Table 5-8** above, PSD regulations require a PSD Increment Analysis.

PSD Increment analysis modeling incorporates both facility-wide and off-property emission sources. The same emissions inventory sources that were developed and modeled for the Class II NAAQS Analysis is used in the Class II PSD Increment analysis.

The results from the Class II PSD Increment analysis for each site and for each stack height scenario are shown in **Table 5-13, Table 5-14,** and **Table 5-15**. If a pollutant and averaging time screened out of the PSD increment analysis during the Significance Impact Level Analysis (Section 5.2.1), the table shows "< SIL" for below the significant impact level.

Table 5-13 Airport West PSD Increment Results

Criteria Pollutant	Averaging Period	250 ft Stack ($\mu g/m^3$)	310 ft Stack ($\mu g/m^3$)	410 ft (GEP) Stack ($\mu g/m^3$)	Class II PSD Increments ($\mu g/m^3$)
SO_2	3-hour	< SIL	< SIL	< SIL	512
	24-hour	12.4	< SIL	< SIL	91
	Annual	< SIL	< SIL	< SIL	20
PM_{10}	24-hour	12.7	< SIL	< SIL	30
	Annual	< SIL	< SIL	< SIL	17
$PM_{2.5}$	24.hour	4.6	2.7	< SIL	9
	Annual	1.4	< SIL	< SIL	4
NO_2	Annual	3.2	< SIL	< SIL	25

Table 5-14 Existing RRF PSD Increment Results

Criteria Pollutant	Averaging Period	250 ft Stacks (µg/m³)	310 ft Stack (µg/m³)	Class II PSD Increments (µg/m³)
SO_2	3-hour	< SIL	< SIL	512
	24-hour	13.2	7.4	91
	Annual	4.2	< SIL	20
PM_{10}	24-hour	6.2	< SIL	30
	Annual	< SIL	< SIL	17
$PM_{2.5}$	24.hour	6.3	3.0	9
	Annual	1.0	0.7	4
NO_2	Annual	7.0	< SIL	25

Table 5-15 Medley PSD Increment Results

Criteria Pollutant	Averaging Period	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	Class II PSD Increments (µg/m³)
SO_2	3-hour	25.3	< SIL	< SIL	512
	24-hour	23.3	12.3	< SIL	91
	Annual	< SIL	< SIL	< SIL	20
PM_{10}	24-hour	< SIL	< SIL	< SIL	30
	Annual	< SIL	< SIL	< SIL	17
$PM_{2.5}$	24.hour	**34.8**	6.5	< SIL	9
	Annual	1.0	< SIL	< SIL	4
NO_2	Annual	< SIL	< SIL	< SIL	25

The impacts from both Airport West and the Existing RRF sites show results below the Class II PSD Increments for all pollutants.

The Medley site's $PM_{2.5}$ 24-hour predicted impacts were greater than the PSD increment. The largest contribution to this impact is due to nearby sources included in the modeling. The SIA receptors extend out and overlap with a major industrial source west of the site. Next steps for refining this modeling would be to remove SIA receptors on industrial source plant properties. Removing the SIA receptors on the industrial source's plant property resulted in a new maximum impact of 10.7 µg/m³ (high-second-high value with secondary $PM_{2.5}$ formation added). This value is still above the PSD Increment.

Further analyses should include refinement of nearby off-site sources within the SIA receptor area. Further review of increment consuming sources from the offsite source inventory, as well as individual source contribution impacts will need to be evaluated to show compliance with the $PM_{2.5}$ 24-hr PSD Increment

5.3 Class I Area Analyses

As part of the regulatory permitting process for a proposed project, air dispersion modeling is required to demonstrate that the air quality impacts of the proposed facility will comply with all applicable standards and criteria, including National Ambient Air Quality Standards (NAAQS) and PSD increments (40 CFR Part 51.166). Under the PSD program, an assessment of the potential impacts of a proposed major source or major modification on or nearby federal Class I area(s) may also be required. For all three sites in this evaluation, the National Park Service (NPS) will request a Class I analyses for Everglades NP. This report describes the modeling that was conducted to compare potential impacts with respect to PSD Class I SILs, established PSD increments, and AQRVs. The modeling followed prescribed methodologies for Class I area analyses and recommendations from Federal Land Managers (FLMs) from the NPS and US Fish & Wildlife Service (USFWS). The specific Class I area analyses for Everglades National Park needed to support any construction permit application for a similar designed and sized facility are described below:

- Comparison of maximum impacts at Everglades NP to the proposed Class I SILs;
- Comparison of impacts at Everglades NP to the Class I PSD increments; and
- AQRV analyses for visibility and total sulfate and nitrate deposition.

The following sections in this site evaluation report present the methodology and modeling results associated with the preliminary Class I area analyses for Everglades NP. The PSD SILs and increment analysis were conducted with AERMOD, and the AQRV analyses with VISCREEN (Plume Visible Impact Screening Model) and CALPUFF using Lakes CALPUFF View software.

5.3.1 Class I Area Significant Impact Analysis Methodology

Similar to the Class II analyses described above, SILs are used to determine if a proposed source has the potential for causing or contributing to an exceedance of an ambient air quality standard or a PSD increment within a Class I area. **Table 5-16** shows the Class I SILs that have been applied by the FLMs for Class I analyses. The maximum modeled concentrations of NO_2, SO_2, $PM_{2.5}$, and PM_{10} from the Class I area receptors at Everglades NP would be compared to these Class I SILs. Following regulatory guidance, if the impacts from the proposed source are below the SILs, then emissions from the facility are assumed to be insignificant at Everglades NP, and no further air quality impact analysis (multisource analysis) is needed. However, if the modeled concentration is greater than or equal to the SIL, then a full impact (i.e., cumulative, multisource) analysis may be required to demonstrate compliance with the PSD increments. The predicted impacts from the estimated direct $PM_{2.5}$ emissions were combined with the estimated portion associated with the formation of secondary fine particles prior to comparing to the Class I SILs and increments. The process for evaluating the Class I area SILs and PSD increment is shown in **Figure 5-4**.

Table 5-16 Class I Area Significant Impact Levels

Pollutant	Averaging Time	Class I Significant Impact Levels (µg/m^3)
Sulfur Dioxide (SO_2)	3-Hour 24-hour Annual	1.0 0.2 0.1
Particulate Matter (PM_{10})	24-hour Annual	0.3 0.2
Particulate Matter less than 2.5 microns ($PM_{2.5}$)	24-Hour Annual	0.27 0.05
Nitrogen Dioxide (NO_2)	Annual	0.1

Source: Federal Register, Vol. 61: 38250; July 23, 1996, and Table 2 from USEPA 2018

The significant impact analysis for Class I area will focus on receptors within 50 kilometers of the proposed WTE sites since this distance considered applicable for Gaussian dispersion models like AERMOD. If the analysis shows that the potential project emissions from the proposed source is significant at 50 km, then the project may need to go through the alternative models approval process to use one of the long-range transport models (i.e., CALPUFF, SCICHEM, etc.) to conduct the cumulative Class I increment analysis.

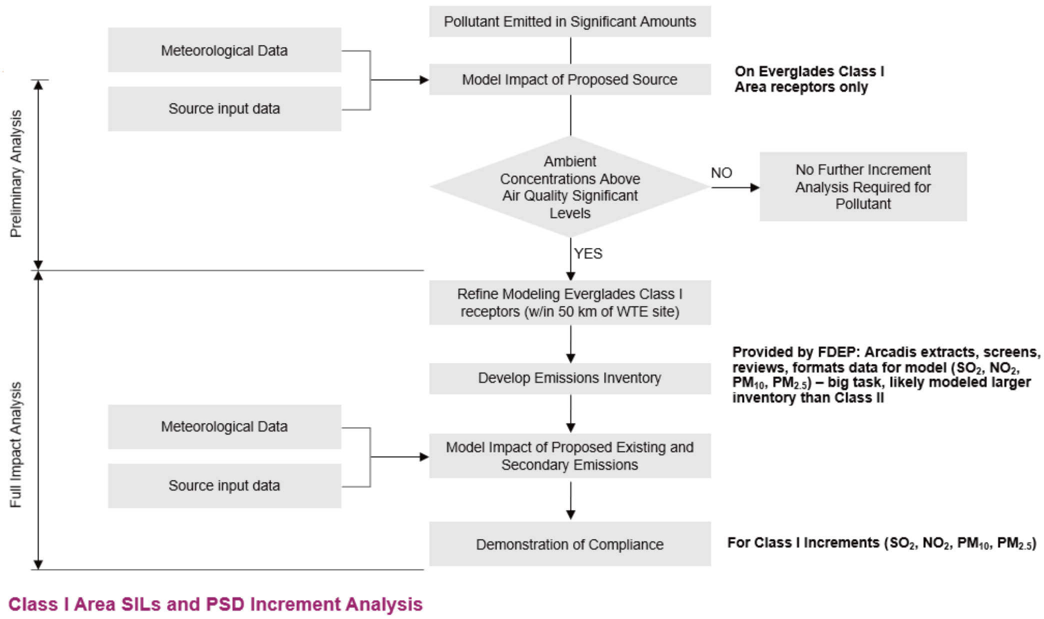

Figure 5-4 Class I Modeling Process Overview

5.3.2 Class I Area Increment Analysis Criteria

The model predicted impacts due to emissions from the proposed sites and anticipated emissions should be compared to the applicable PSD increments at Everglades NP (Class I increments). These PSD increments are shown in **Table 5-17**.

Table 5-17 Class I Area PSD Increments

Pollutant	Averaging Time	Class I Increments (µg/m³)
Sulfur Dioxide (SO_2)	3-Hour 24-hour Annual	25 5 2
Particulate Matter (PM_{10})	24-hour Annual	8 4
Particulate Matter less than 2.5 microns ($PM_{2.5}$)	24-Hour Annual	2 1
Nitrogen Dioxide (NO_2)	Annual	2.5

Notes:
Long-term (annual) increments are not to be exceeded. Short-term (3-hour and 24-hour) increments are not to be exceeded more than once a year.

Source: 40 CFR 52.21

5.3.3 AQRV Visibility and S-N Deposition Analysis Background

The methodology followed the most recent FLM Air Quality Related Values Workgroup (FLAG) Phase II Report (FLAG 2010). This document provides an initial screening criteria for proposed emission sources greater than 50 km from a Class I area. For the Everglades NP areas greater than 50 km, a visibility impairment analysis using the CALPFF modeling system will be conducted. In this case, the proposed WTE sites are within 50 km from the Everglades NP, but also includes area in the NP that are greater than 50 km. Therefore, an analysis for evaluating impacts within 50 km, specifically a plume blight analysis using VISCREEN is also required.

Figure 5-5 shows the location of the Everglades NP in relation to the proposed project locations being evaluated in this siting analysis.

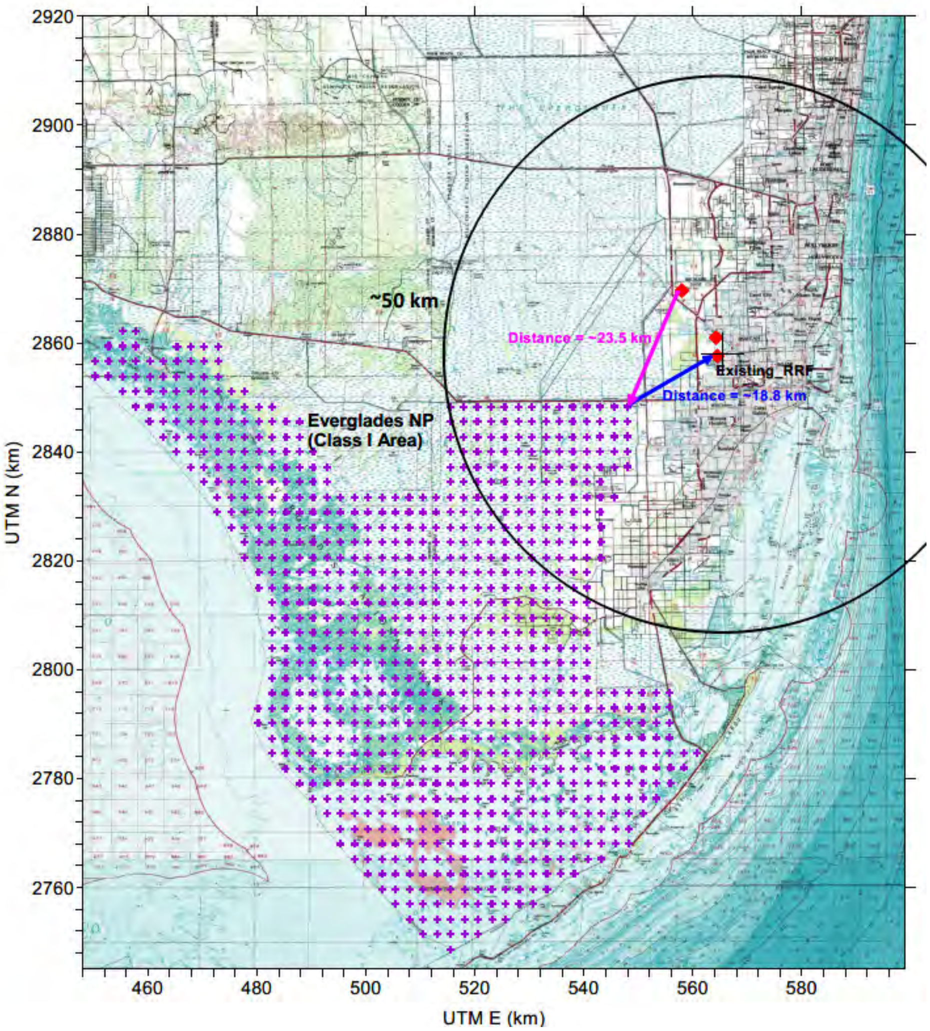

Figure 5-5 Location of the Everglades NP and 3 Proposed WTE Sites

The following sections in this modeling report present the methodology and modeling results for the analyses for Everglades NP within and greater than 50 km.

5.4 Class I Area Analyses Within 50 km

5.4.1 Class I Area SILs Analysis (using AERMOD)

As with the Class II area analysis, the predicted impacts on the Class I Everglades receptors from AERMOD were compared to the Class I SILs. The results from the Class I SIL analyses for each of the proposed sites are presented in **Table 5-18, Table 5-19,** and **Table 5-20**. Ground-level concentration values that are highlighted in **bolded** text show predicted impacts greater or equal to the pollutant specific SIL and will require a cumulative analysis to show compliance with the PSD Class I increments.

Table 5-18 Class I Area SILs Analysis – Airport West Site

Criteria Pollutant	Averaging Period	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	SILs (µg/m³)
SO_2	3-hour	0.723	0.695	0.648	1.0
	24-hour	**0.243**	**0.215**	0.185	0.2
	Annual	0.015	0.014	0.012	0.1
PM_{10}	24-hour	0.114	0.101	0.087	0.3
	Annual	0.007	0.006	0.005	0.2
$PM_{2.5}$	24.hour	0.248	0.240	0.227	0.27
	Annual	0.014	0.013	0.012	0.05
NO_2	Annual	0.018	0.017	0.014	0.1

Table 5-19 Class I Area SILs Analysis – Existing RRF Site

Criteria Pollutant	Averaging Period	250 ft Stacks[1] (µg/m³)	310 ft Stack (µg/m³)	SILs (µg/m³)
SO_2	3-hour	1.15	0.85	1.0
	24-hour	**0.40**	**0.29**	0.2
	Annual	0.03	0.02	0.1
PM_{10}	24-hour	0.19	0.14	0.3
	Annual	0.01	0.01	0.2
$PM_{2.5}$	24.hour	**0.35**	**0.30**	0.27
	Annual	0.02	0.02	0.05
NO_2	Annual	0.04	0.03	0.1

Notes:

1 The two existing stacks at the Existing RRF site were modeled.

2 No 410 ft stack analysis conducted due to concerns of getting approval from FAA.

Table 5-20 Class I Area SILs Analysis – Medley Site

Criteria Pollutant	Averaging Period	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	SILs (µg/m³)
SO_2	3-hour	0.792	0.762	0.712	1.0
	24-hour	**0.296**	**0.280**	**0.257**	0.2
	Annual	0.02	0.020	0.02	0.1

Table 5-20 Class I Area SILs Analysis – Medley Site

Criteria Pollutant	Averaging Period	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	SILs (µg/m³)
PM_{10}	24-hour	0.139	0.131	0.121	0.3
	Annual	0.010	0.009	0.008	0.2
$PM_{2.5}$	24.hour	**0.277**	**0.267**	0.254	0.27
	Annual	0.016	0.015	0.014	0.05
NO_2	Annual	0.027	0.024	0.021	0.1

In addition to the Everglades receptors within 50 km of each proposed source, Arcadis conducted an AERMOD run using a ring of receptors at radius of 50 km for the pollutants that showed exceedances of Class I SILs within 50 km (SO_2 and $PM_{2.5}$). This follows USEPA guidance to determine if a proposed source is potentially significant past the distance in which a steady-state Gaussian plume model like AERMOD is approved. For sources that are significant at a distance of 50 km, the applicant may need to request approval to use an alternative long-range transport model (approved for demonstrations beyond 50 km) for any cumulative increment evaluations. Results of maximum modeled impacts at 50 km are presented in **Table 5-21**. **Bolded** concentrations indicate impacts greater than the Class I area SIL and may require a USEPA approval for use of a long-range transport model to evaluate cumulative impacts at the estimated emission rates.

Table 5-21 Maximum AERMOD Impacts at 50 km Distance

Site	Stack Height (ft)	PM_{25}[1]		SO_2		
		24-hour	Annual	3-hour	24-hour	Annual
Airport West	250	0.216	0.009	0.249	0.108	0.012
	310	0.214	0.009	0.246	0.105	0.012
	410	0.212	0.008	0.241	0.100	0.011
Existing RRF	250	0.246	0.010	0.603	**0.203**	0.020
	310	0.237	0.009	0.576	0.179	0.018
Medley	250	0.246	0.010	0.603	**0.203**	0.020
	310	0.237	0.009	0.576	0.187	0.018
	410	0.226	0.007	0.510	0.175	0.014
Class I SIL		**0.27**	**0.05**	**1**	**0.2**	**0.1**

Notes:
1 Includes secondary formation of $PM_{2.5}$ contribution.

5.4.2 Class I Increment Analysis (within 50 km)

If the proposed location and stack height option showed modeled impacts greater or equal to the Class I SILs, a Class I increment analysis was conducted using AERMOD for that pollutant and averaging period. The offsite source inventory used for the Class I cumulative analysis was based on the Class II NAAQS and increment source inventory. Arcadis combined the source inventory for all three site locations to ensure that the worst-case Class I impacts were captured in the analysis. The Class I increment analysis results for the three proposed sites are presented in **Table 5-22, Table 5-23,** and **Table 5-24**.

Table 5-22 Class I Area Increment Analysis – Airport West Site

Criteria Pollutant	Averaging Period	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	Class I PSD Increment (µg/m³)
SO_2	3-hour	< SIL	< SIL	< SIL	25
	24-hour	2.3	2.3	< SIL	5
	Annual	< SIL	< SIL	< SIL	2
PM_{10}	24-hour	< SIL	< SIL	< SIL	8
	Annual	< SIL	< SIL	< SIL	4
$PM_{2.5}$	24-hour	< SIL	< SIL	< SIL	2
	Annual	< SIL	< SIL	< SIL	1
NO_2	Annual	< SIL	< SIL	< SIL	2.5

Table 5-23 Class I Area Increment Analysis – Existing RRF Site

Criteria Pollutant	Averaging Period	250 ft Stacks[1] (µg/m³)	310 ft Stack (µg/m³)	Class I PSD Increment (µg/m³)
SO_2	3-hour	12.0	< SIL	25
	24-hour	2.78	2.70	5
	Annual	< SIL	< SIL	2
PM_{10}	24-hour	< SIL	< SIL	8
	Annual	< SIL	< SIL	4
$PM_{2.5}$	24-hour	1.52	1.52	2
	Annual	< SIL	< SIL	1
NO_2	Annual	< SIL	< SIL	2.5

Notes:

1 The two existing stacks at the Existing RRF site were modeled.

2 No 410 ft stack analysis conducted due to concerns of getting approval from FAA.

Table 5-24 Class I Area Increment Analysis – Medley Site

Criteria Pollutant	Averaging Period	250 ft Stack (µg/m³)	310 ft Stack (µg/m³)	410 ft (GEP) Stack (µg/m³)	Class I PSD Increment (µg/m³)
SO_2	3-hour	< SIL	< SIL	< SIL	25
	24-hour	2.77	2.76	2.72	5
	Annual	< SIL	< SIL	< SIL	2
PM_{10}	24-hour	< SIL	< SIL	< SIL	8
	Annual	< SIL	< SIL	< SIL	4
$PM_{2.5}$	24-hour	1.52	1.52	< SIL	2
	Annual	< SIL	< SIL	< SIL	1
NO_2	Annual	< SIL	< SIL	< SIL	2.5

Based on the cumulative modeling using draft offsite source inventory in combination with the anticipated emissions from each of the proposed sites, no violations of the PSD Class I increment for the criteria pollutants were shown at any of the Everglades NP receptors within 50 km of each proposed source. Two facilities near the Everglades NP produced the largest contribution to the Class I $PM_{2.5}$ increment in the air dispersion modeling analysis. Arcadis refined the modeling analysis for $PM_{2.5}$ to incorporate more representative actual emissions data (0.876 pounds per hour [lb/hr]) for diesel engines at flood control pump station (potential to emit [PTE]: 9.9 tpy, 2.28 lb/hr) along the NP boundary. Arcadis used the maximum 2 years of actual emissions reported for the facility.

5.4.3 Visibility Analysis (Plume Blight) Within 50 km (VISCREEN)

A visibility analysis, also called plume blight analysis, of the potential plume from the stacks at the three proposed sites will be conducted, as necessary for specific vistas identified by USEPA, using VISCREEN. VISCREEN is an USEPA-approved atmospheric plume visibility model which calculates the potential impact of a plume of specified emissions for specific transport and dispersion conditions. VISCREEN will be used as a conservative tool for estimating visual impacts in accordance with the Workbook for Plume Visual Impact Screening and Analysis (Revised) (USEPA 1992).

The potential WTE site locations are all within 50 km of the Everglades National Park (the Everglades). For nearfield visibility analyses (< 50 km), the *Federal Land Managers' Air Quality Related Values Work Group (FLAG): Phase I Report – Revised 2010* (FLAG 2010) recommends the use of the U.S. EPA's VISCREEN model. The modeling examined emissions of NOx, direct particulate matter (PM), and primary sulfate emissions to determine the impacts to visibility in the Everglades. According to FLAG 2010, nearfield visibility modeling can be conducted using three different levels of conservatism. Level-1 screening provides the most conservative estimate of plume visual impacts using the worst-case meteorological conditions of extremely stable (F Stability Class) atmospheric conditions and a low wind speed (1 m/s) such that the plume is transported directly to an observer in the Class I area. Level-2 screening is less conservative, using more realistic meteorological data assumptions and can consider different particle size and density distributions for the plume and background conditions. Level-3 analyses, which was not performed for purposes of this siting analysis document, uses the more complex model PLUVUE-II.

5.4.3.1 VISCREEN Model Setup

The USEPA's VISCREEN model (Version 13190), a screening Gaussian plume model that treats primary pollutants and simulates secondary pollutant formation for near-field transport (< 50km), was utilized for the Level-1 screening analysis to assess potential visual plume impacts in the Everglades. VISCREEN calculates the change in color difference index (Delta E) and contrast between a coherent plume and the viewing background. The visual plume screening analysis compared visibility impacts from project emissions to visibility thresholds detailed in the *Prevention of Significant Deterioration Air Quality Modeling Best Practices* (FDEP Best Practices); the thresholds are hourly estimates of Delta E greater than or equal to 2.0, and the absolute value of plume contrast greater than or equal to 0.05. The analysis was performed for the three potential WTE locations; Airport West, Existing RRF, and Medley. Each location consisted of two VISCREEN runs; one where the source-observer distance was equivalent to the shortest distance to the Class I area, and another run where the observer is within the Everglades at the Shark Valley Observation tower. The State of Florida does not contain protected integral vistas, therefore the VISCREEN results comparing results for terrain backgrounds were excluded from this analysis as recommended by FDEP Best Practices.

5.4.3.2 Level-1 Analysis

Inputs for the conservative Level-1 screening analysis include the short-term (24-hour) maximum allowable emissions of PM_{10} (46.98 lb/hr), NO_x (149.52 lb/hr), and primary sulfate (31.25 lb/hr). Other inputs were maximum and minimum distances to the Class I area, the plume-observer angle, natural background visual range, default worst-case meteorological conditions, default background air quality levels, and the calculated distance to the closest Class I area observer. The natural background visual range for the region around the Class I area was set at 172 km, which is the most conservative (i.e., largest) monthly average natural conditions for the Everglades as presented in Table 10 of FLAG 2010. VISCREEN Level-1 inputs for the default plume-source-observer angle of +/- 11.25° are summarized in **Table 5-25**.

Table 5-25 VISCREEN Level-1 Inputs – Everglades Closest Observer

Default Background Characteristics			
Background Ozone	0.04 ppm		
Background Visual Range	172.0 km		
Plume-Source-Observer Angle	11.25°		
Worst-Case Meteorological Conditions (Level-1 Default)			
Stability Class	F		
Wind Speed	1.0 m/s		
Distance Input Data			
Scenario	**Source-Observer Distance (km)**	**Minimum Source to Class I Distance (km)**	**Maximum Source to Class I Distance (km)**
Airport West	23.5	23.5	128.2
Existing RRF	18.8	18.8	119.4
Medley	20.9	20.9	122.6
Shark Val Obs. Tower	45.0 - 46.0 (Site Specific)	45.0 - 46.0	Same as above

Notes:
Default particle size and density for the emitted plume and background atmosphere were utilized in the Level-1 screening analysis.

5.4.3.3 Level-2 Analysis

A VISCREEN Level-2 analysis was conducted to assess potential visual impacts from the project on the Everglades using less conservative meteorological inputs. The Level-2 screening analysis utilizes more realistic inputs, including more representative meteorological data, while still estimating worst-day plume visual impacts. The meteorological inputs for the Level 2 analysis were determined using methodologies outlined in U.S. *Environmental Protection Agency's (EPA) Workbook for Plume Visual Impact Screening and Analysis (Revised), October 1992* (the Workbook).

For the Level-2 analysis, a 5-year representative surface meteorological dataset (2017-2021) from Miami International Airport (WBAN 12839) was reviewed to determine the joint frequency distribution of wind speed, wind direction, and stability category that could result in worst-case visual plume impacts to a Class I observer at Everglades National Park. The stability category was calculated from the Monin-Obukhov length (MO) contained in the AERMET files.

The wind direction sector determined to transport the plume from each potential source location to the Everglades was 25-65 degrees, see **Figure 5-6**. The dispersion conditions, defined by the wind speed and stability class, were evaluated by calculating the product of σy, σz, and u, where σy and σz are the P-G horizontal and vertical diffusion coefficients for the given stability class and downwind distance, and u is the wind speed. Each dispersion condition was then ranked in ascending order based on the product of $\sigma y * \sigma z * u$. The data was further stratified by time of day: 0000-0600, 0600-1200, 1200-1800, and 1800-2400 hours.

The dispersion condition selected for input into the VISCREEN Level-2 analysis was then determined by identifying the worst-case dispersion condition for a given time-of-day range that had a cumulative probability of occurrence greater than 1%. Note that dispersion conditions with wind speeds of 0-1 m/s were discounted since the transport of the plume to the area of interest would be greater than 12 hours, as recommended in the Workbook. Additionally, the time periods of 0000-0600 and 1800-2400 were also discounted since they are not daylight time periods.

Since the distances from the potential WTE locations to the Everglades varied, values of σy and σz also varied for each location as those parameters are distance dependent. This resulted in differing worst-case stability conditions used for the Existing RRF location as compared to Airport West and Medley. For Airport West and Medley, the worst-case dispersion condition with a cumulative probability greater than 1% was E5, therefore a stability class E with a wind speed of 5 m/s was input into VISCREEN for the Level-2 analysis for those locations. For the Existing RRF location, the worst-case dispersion condition with a cumulative probability greater than 1% was D2, therefore a stability class D with a wind speed of 2 m/s was input into VISCREEN for the Level-2 analysis. Default VISCREEN values were used for particle densities and diameters. All other inputs remained identical to those used in the Level-1 analysis. The tables showing the calculations for the worst-case dispersion conditions are in **Appendix H**.

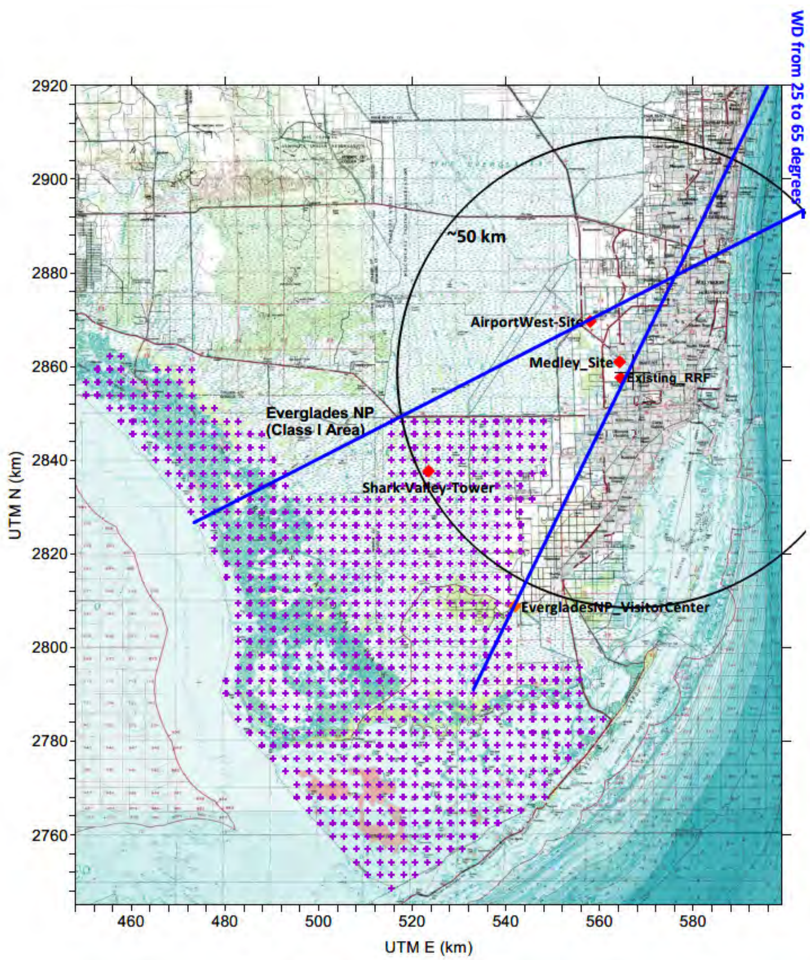

Figure 5-6 Wind Direction Analysis for Plume Transport to the Everglades NP

5.4.3.4 Results

The results of the Level-1 and Level-2 screening analysis are summarized in **Table 5-26, Table 5-27,** and **Table 5-28**. Level-1 analysis was conducted using the closest distance to the nearest Everglades NP receptor. The Level-2 analysis predicted potential impacts at the nearest receptor as well as the closest location where park visitors would observe the park, Shark Valley Observation Tower. The other closest scenic view location, the visitor center parking lot was over 50 km away. VISCREEN indicated that the predicted color difference parameter (Delta E) and plume contrast exceed the screening criteria at each WTE location.

Table 5-26 Level-1 VISCREEN Results (Closest Class I Receptor)

Location	Background	Scattering Angle	Line of Sight Angle (Source to Observer)	Distance (km)	Line of Sight Angle to Plume Centerline	Change in Color Index ΔE	Contrast
Airport West	SKY	10	155	41.8	14	**13.875**	**0.287**
	SKY	140	155	41.8	14	**6.76**	**-0.225**
Existing RRF	SKY	10	155	33.4	14	**15.721**	**0.327**
	SKY	140	155	33.4	14	**8.112**	**-0.257**
Medley	SKY	10	155	37.2	14	**14.835**	**0.308**
	SKY	140	155	37.2	14	**7.45**	**-0.242**

Notes:
Screening thresholds: Delta E greater than or equal to 2.0, and the absolute value of plume contrast greater than or equal to 0.05 (exceedances are bolded).

Table 5-27 Level-2 VISCREEN Results to Closest Class I Receptor

Location	Background	Scattering Angle	Line of Sight Angle (Source to Observer)	Distance (km)	Line of Sight Angle to Plume Centerline	Change in Color Index ΔE	Contrast
Airport West	SKY	10	155	41.8	14	**2.06**	0.039
	SKY	140	155	41.8	14	0.915	-0.03
Existing RRF	SKY	10	155	33.4	14	**3.095**	**0.057**
	SKY	140	155	33.4	14	1.434	-0.045
Medley	SKY	10	155	37.2	14	**2.276**	0.042
	SKY	140	155	37.2	14	1.031	-0.033

Notes:
Screening thresholds: Delta E greater than or equal to 2.0, and the absolute value of plume contrast greater than or equal to 0.05 (exceedances are **bolded**).

Table 5-28 Level-2 VISCREEN Results from Shark Valley Observation Tower

Location	Background	Scattering Angle	Line of Sight Angle (Source to Observer)	Distance (km)	Line of Sight Angle to Plume Centerline	Change in Color Index ΔE	Contrast
Airport West	SKY	10	11	23.5	157	1.431	0.027
	SKY	140	11	23.5	157	0.611	-0.021
Existing RRF	SKY	10	8	18.8	161	**2.268**	0.044
	SKY	140	8	18.8	161	0.95	-0.034
Medley	SKY	10	9	20.9	160	1.554	0.03
	SKY	140	9	20.9	160	0.652	-0.023

Notes:
Screening thresholds: Delta E greater than or equal to 2.0, and the absolute value of plume contrast greater than or equal to 0.05 (exceedances are **bolded**).

Based on the estimated potential emissions from the conceptual WTE facility used in the analysis, all three proposed sites exceed the screening criteria at the nearest Class I receptor distance even when applying the more refined Level-2 wind speed, wind direction and stability conditions. Only the Existing RRF results exceeded the screening criteria when using the Shark Valley Observation Tower location, the closest scenic vista viewing location. The VISCREEN model results (as .sum files) are provided in **Appendix G**.

The analysis used conservative emission rates for particulate matter and sulfates (as SO_4) in the analysis. Further refinements to the potential emission estimates and the particulate matter speciation (i.e., assuming particulates = permitted PM_{10} – SO_4) provided some reduction to the visual plume impacts for all three sites. If these screening thresholds are still exceeded after the emission reductions and refinements and using the Level-2 meteorological data inputs, a more complex plume model, PLUVUE-II, which requires extensive modeling effort, will likely need to be applied (Level-3 analysis) to show that the proposed project will not result in a perceptual plume in the Class I area.

5.5 Class I Areas Analyses Beyond 50 km

As mentioned above, any proposed source needs to determine whether they will or will not have a significant impact on the nearby Class I areas. The FLAG2010 guidance provides an initial screening criteria for proposed emission sources greater than 50 km from a Class I area. The screening analysis for a source greater than 50 km from a Class I area:

if **Q /d < 10**,

where:

Q is the *combined* annual emissions (in tons per year [tpy]), based on 24-hour maximum allowable emissions of sulfur dioxide (SO_2), oxides of nitrogen (NO_X), particulate matter less than 10 microns (PM_{10}), and sulfuric acid mist (SAM, as H_2SO_4), and

d is the nearest distance to a Class I area in kilometers (km),

then the impacts would be considered negligible, and no AQRV analysis (including visibility) would be required for that Class I area (**Table 5-29, Figure 5-7**).

Table 5-29 Q/D Screening Analysis (>=50 km) Using Estimated Miami-Dade WTE Emissions

Class I Area	Distance, D (km)	Annual NO_X Emissions (tpy)	Annual SO_2 Emissions (tpy)	Annual PM_{10} Emissions (tpy)	Annual SAM (H_2SO_4) Emissions (tpy)	Total Emissions (Q) (tpy)	Q/D Ratio	Potential for Adverse Impacts? (>=10)
Everglades (closest receptor)	16.5	595.5	398.4	10.67	126.88	1131.45	68.6	Yes
Everglades (middle or ~50 km)	50						**22.6**	Yes
Everglades (furthest receptor)	134.5						8.4	No

Abbreviations/Acronyms:
Q = total annual emissions in tpy based on maximum allowable 24-hr emissions
Q/D = annual emissions / distance

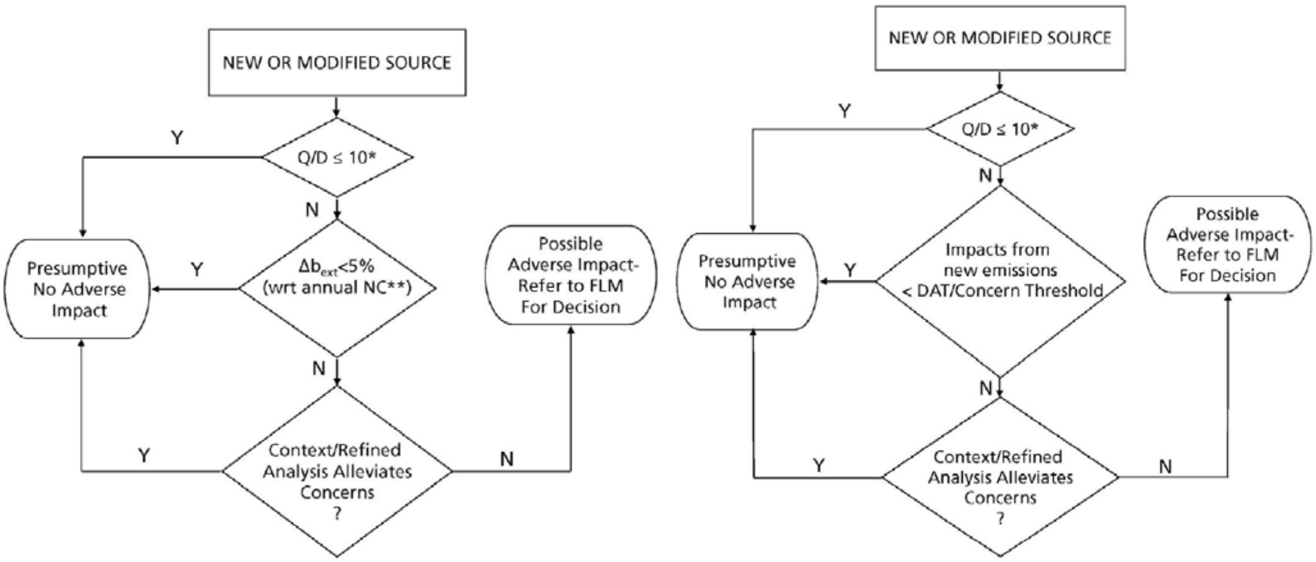

Figure 5-7 Assessment of Potential Visibility and Deposition Effects from New Emission Sources
Source: FLAG 2010

Table 5-29 provides the estimated annual emissions from the proposed hypothetical WTE facility. Based on the annual emissions estimates using the maximum 24-hour allowable emissions, the Q/D estimated ratio for Everglades NP, exceeds 10 for the nearest and 50 km receptor distances. Therefore, the estimated emissions and Q/D information show the need for a Class I AQRV analysis.

The AQRVs methodology follows the anticipated modeling guidance and FDEP and FLM recommendations that is expected to be required during the air permit application process for the proposed facility.

5.5.1 CALPUFF Modeling System Overview

The Class I analyses for receptors 50 km and further were conducted using the CALPUFF modeling system. The CALPUFF modeling system is a multi-layer, multi-species, non-steady state Lagrangian puff model that simulates the effects of time- and space-varying meteorological conditions on pollutant transport, transformation, and removal. The main components of the CALPUFF modeling system [advanced, integrated Lagrangian puff modeling system] are CALMET [Meteorological processor for CALPUFF] (Scire, J.S., F.R. Robe, M.E. Fernau, and R.J. Yamartino 2000a), CALPUFF (Scire, J.S., D.G. Strimaitis, and R.J. Yamartino 2000b), and CALPOST.

The CALMET component of the CALPUFF modeling system is a complex model that uses detailed geophysical and meteorological data to create three-dimensional wind fields. Geophysical data include terrain elevation, land use, and surface characteristics. Meteorological data contain surface and upper air data, and precipitation information.

CALPUFF is capable of creating sophisticated wind fields generated by terrain and by three-dimensional wind profiles to predict pollutant concentrations, pollutant deposition, and visibility impairment downwind of the source. The current USEPA-approved version of CALPUFF (version 5.8.5, level 151214) was run for the following pollutants:

- Sulfur dioxide (SO_2),
- Sulfate (SO_4),
- Oxides of nitrogen (NO_X),

- Nitrate (NO_3),
- Nitric acid (HNO_3),
- Particulates less than 2.5 microns ($PM_{2.5}$); and
- Particulates (PM_{10}).

The POSTUTIL program is used to transform the particle size species to any new species such as elemental carbon (EC), fine filterable particulate matter (SOIL), secondary organic aerosols (SOA), fine matter particulates (PMFs), and coarse particulate matter (PMC) to develop the concentration files accessed by the CALPOST input files. The CALPOST post-processing program (version 6.211, level 080724) is used to process the output data used to determine the concentrations of PM_{10}, SO_2, and NO_2, total sulfur (S) and nitrogen (N) loading, and the 24-hour extinction coefficients from the source and the existing background at the Class I area.

5.5.2 CALMET Inputs

The CALMET data set used for the analysis was originally developed through the Visibility Improvement State and Tribal Association of the Southeast (VISTAS) Best Available Retrofit Technology (BART) study for the Everglades NP. The CALMET inputs for Sub Domain 2 developed during the VISTAS study and reprocessed for PSD applications were used for the CALPUFF analysis. The VISTAS CALMET datasets (preprocessed output) processed using USEPA-approved version of CALMET (version 5.8, level 070623) were recommended and provided by the NPS for use in a previous analysis. Based on discussions and recommendations with the FLM in January 2024, since the previous VISTAS CALMET data based was available, Arcadis was to proceed with the AQRV evaluations using that dataset. The CALMET dataset covers the 2001, 2002, and 2003 model years, satisfying the 3-year data requirement for Class I Area analyses. An overview of the CALMET data grid inputs is presented in **Table 5-30**.

Table 5-30 VISTAS Sub-Domain 2 CALMET Inputs Overview

Parameter	Description
Modeling Period	3 Years (Jan 1, 2001 – December 31, 2003)
Meteorological Inputs	MM5 used as initial guess field; hourly surface observations, precipitation observations, overwater buoy data, and twice-daily upper air sounding data.
Grid Resolution	4 kilometers (in Lambert Conformal coordinate system)
PBREF2 Grid Extent	263 grid cells E-W, 206 grid cells N-S direction
LCC Origin	40.0 N, 97.0 W (NWS-84), Standard Parallels: 33.0 N, 45.0 W
Vertical Layers	10 levels (0, 20, 40, 80, 160, 320, 640, 1200, 2000, 3000, 4000 meters)

The CALMET output contained the hourly gridded meteorological data which was then used as an input into the CALPUFF model.

5.5.3 CALPUFF Input

The CALPUFF model input requires source-specific emission rates for each pollutant (i.e. NO_X, SO_X, PM_{10}, $PM_{2.5}$, and SO_4), source parameters (height, diameter, exit gas temperature, and exit gas velocity, area source length and width dimensions), receptor locations and elevations, and meteorological and geophysical data. The meteorological and geophysical data used in this analysis are from the CALMET output discussed above.

CALPUFF uses background ozone concentrations to simulate the photochemical conversion of SO_2 to SO_4 and NO_X to NO_3. Hourly ozone data from ozone monitoring stations in the region were used as an input. Available hourly ozone data from 2001, 2002, and 2003 provided through the VISTAS dataset were extracted through the preprocessor SUBDOMN (version 1.2) associated with the CALPUFF (version 5.8, level 070623) modeling system and used in this analysis. The extraction from this dataset included all ozone station data within Sub Domain 2 for each respective model year. The ozone monitoring data that were extracted for Sub Domain 2 and used in the CALPUFF analysis have been provided with the modeling files. The default value of 80 ppb was used if hourly ozone data were not available for a particular period.

Background ammonia data are used in the conversion of sulfur oxides to particulate sulfates and nitrous oxides to particulate nitrates. Used a background concentration of 0.5 ppb for the Everglades NP as recommended by NPS and the *IWAQM Phase 2 Report* (2009) as part of the previous WTE project. The 0.5 ppb concentration is consistent with background ammonia (NH_3) values that have been used for the recent Class I analyses in the region of the proposed project. Hygroscopic and Rayleigh scattering used in the analyses are those values recommended by the *Phase II Report Revised (2010)*.

CALPUFF utilizes all FLAG-recommended model settings and model control options including:

- Gaussian near-field distribution;
- Transitional plume rise;
- Stack tip downwash;
- PG dispersion coefficients for rural areas and McElroy-Pooler coefficients for urban areas;
- Partial plume path adjustment for terrain; and
- Wet deposition, dry deposition, and chemical transformation using the MESOPUFF II scheme.

CALPUFF combines CALMET gridded data with source data to determine hourly concentrations and deposition values at each receptor. The computation grid in CALPUFF was the same as developed in CALMET. The model options used in the CALPUFF analysis, along with the respective USEPA-recommended options, are identified in **Appendix H**.

5.5.3.1 Receptor Locations

Receptor data for the Everglades NP were obtained from the NPS website[1]. The Everglades NP receptor grid was previously converted into the Lambert Conformal coordinate system using the coordinate conversion program COORDS. For the visibility impairment analysis, only receptors equal or greater than a 50 km distance for each evaluated site were used. A total of 901 901 discrete receptor locations were used in the modeling analysis for the Everglades NP. **Figure 5-5** shows the locations of these receptors with respect to each proposed WTE site.

5.5.3.2 Source Parameter Data

The CALPUFF analysis evaluated potential impacts due to the MWC emissions from the proposed facility on the Everglades NP. Even though not included in the modeling, other potential ancillary equipment associated with a WTE facility will have significantly lower emission rates and have low stack heights, thus impacts from these ancillary sources are expected to be negligible at the more distant Everglades NP Class I area. Therefore, the ancillary equipment sources were not included in this long-range modeling analysis.

[1] NPS weblink: http://www2.nature.nps.gov/air/maps/receptors.

Due to the identical exhaust characteristics and closeness of the three individual flues, a merged flue was used in the modeling analysis. This is consistent with the Class II area modeling analysis. The MWC source data includes the following parameters:

- Location in Lambert conformal conic (LLC) coordinates (converted from UTM/Lat-Long);
- Base elevation above mean sea level (amsl);
- Release height(s) above base elevation;
- Exhaust temperature;
- Exhaust velocity; and
- Merged stack internal diameter (i.e., effective diameter of merged flues)

The stack information for the merged flue operating underestimated maximum load (3A) scenario is provided in **Table 5-31**.

Table 5-31 Stack Parameters for Proposed Sites

Site	Description	X	Y	Stack Height (m)	Effective Diameter (m)	Exit Temperature (K)	Exit Velocity (m/s)
		(km as LCC)					
Airport West	1 Stack (4 Flues)	1680.896	-1412.585	94.49	4.26	413.7	21.8
Existing RRF	Stack 1 (2 Flues)	1689.467	-1423.523	76.2	3.33	413.7	21.8
	Stack 2 (2 Flues)	1689.502	-1423.516	76.2	3.33	413.7	21.8
Existing RRF	1 Stack (4 Flues)	1689.486	-1423.528	94.49	4.26	413.7	21.8
Medley	1 Stack (4 Flues)	1689.403	-1420.291	94.49	4.26	413.7	21.8

Notes:
Estimates base grade elevations for the sites: Existing RRF (5 ft), Medley (5 ft) and Airport West (7 ft).

Building downwash characteristics based on the conceptual layout associated with each proposed site were incorporated in the CALPUFF modeling.

Maximum estimated short-term emission rates for SO_2, H_2SO_4 (as SO_4), NO_X, $PM_{2.5}$, and PM_{10} for the MWC emissions from the conceptual WTE facilities were based on the *maximum load* are presented in **Table 5-32**. The load analysis discussed in Section 5.1.11 showed that the wort-case ground-level impacts were predicted from the maximum load scenario.

The estimated short-term emission rates for the deposition and visibility impairment analyses were conservatively used for the annual averaging period for the SILs and increment analysis.

Table 5-32 Estimated Short-term Emission Rates

Averaging Period	SO_2 (g/s)	H_2SO_4 [1] (g/s)	NO_X (g/s)	$PM_{2.5}$ (g/s)	PM/PM_{10} (g/s)
Short-term	12.6	4.02	18.84	5.92	5.92

Notes:
1 Potential estimated H_2SO_4 emissions are modeled as SO_4.
2 Potential emission rates are the sum of all the flues (4 flues).

As suggested by the FLM, the estimated H_2SO_4 emissions were modeled as SO_4 in CALPUFF analysis. The H_2SO_4 emissions represent the potential condensable emissions to be used in the visibility analysis.

The particle size distribution was based on data from the Wurzburg WTE Facility data as presented in **Table 5-33**. The Wurzburg particle size distribution data have been used for WTE facilities with similar controls in numerous permitting projects throughout the United States. The mass fraction estimates were adjusted to account for only the PM_{10} and smaller portion of the size distribution table.

Table 5-33 Particle Size Distribution

<table>
<tr><th>Lower Range (µm)</th><th>Upper Range (µm)</th><th>Mean Particle Diameter (µm)</th><th>Fraction of Total Mass</th><th>Adjusted Mass Fraction [1]</th><th>CALPUFF PM Size Distribution</th><th>Adjusted Mass Fraction ($PM_{2.5}$ & PM_{10}) [1]</th></tr>
<tr><td>0</td><td><0.6</td><td>0.38</td><td>0.53</td><td>0.58</td><td>PM056</td><td rowspan="5">0.85</td></tr>
<tr><td>0.6</td><td>1</td><td>0.82</td><td>0.04</td><td>0.04</td><td>PM081</td></tr>
<tr><td>1</td><td>1.6</td><td>1.32</td><td>0.03</td><td>0.03</td><td>PM112</td></tr>
<tr><td>1.6</td><td>3.2</td><td>2.46</td><td>0.10</td><td>0.11</td><td>PM187</td></tr>
<tr><td>3.2</td><td>5</td><td>4.11</td><td>0.08</td><td>0.09</td><td>PM425</td></tr>
<tr><td>5</td><td>7.3</td><td>6.11</td><td>0.08</td><td rowspan="2">0.15</td><td rowspan="2">PM800</td><td rowspan="2">0.15</td></tr>
<tr><td>7.3</td><td>10.8</td><td>8.96</td><td>0.06</td></tr>
<tr><td>10.8</td><td>17.4</td><td>13.98</td><td>0.08</td><td>---</td><td></td><td></td></tr>
</table>

Notes:

1 The adjusted mass fraction value only accounts for the particle size distribution data measured as PM_{10} or less (upper range of 10.8 microns)

µm = micron/micrometer

Source: Hahn and Sussman, 1986. *Dioxin '86* poster presentation.

The PM800 and PM425 particle size categories (15%, as PM_{10}) were used to represent the PMC portion of the emissions. The particle size distribution range of 10.8 to 17.4 microns was factored out of the adjusted mass fraction values. The adjusted mass fraction values were used in the POSTUTIL files to estimate the emission rate for each size category.

The actual PM speciation breakdown accounted for the estimated sulfates, PMF and PMC for the visibility impairment analysis. The total PM is the sum of the three species and would represent the permitted allowable PM10 short-term emission rate. The estimated PM speciated breakdown in CALPUFF is shown in **Table 5-34**.

Table 5-34 Particle Speciation for Visibility Analysis

Species	Modeled Emission Rate (lb/hr)	Modeled Emission Rate (g/s)
Sulfates (as SO_4)	31.27	3.94
PMF	8.65	1.09
PMC	7.06	0.89
EC	0	0
SOA	0	0
Total (as PM_{10})	**46.98**	**5.92**

5.5.4 AQRVs – Visibility Impairment Analysis

Visibility impairment analyses are required for the Everglades NP Class I area. In this analysis, the atmospheric light extinction due to emissions from the proposed site's MWC stack (merged flues) was determined relative to natural conditions at the Everglades NP. The unit of visibility is a *deciview* (dv) and this analysis determined the perceived 24-hour change in visibility (Delta deciview). Existing conditions are defined based upon measurements of haze-producing species the NP area of concern.

Based on guidance from the FLM, visibility impairment was performed using the refined procedure (Method 8, Mode 5) using monthly f(RH) values as outlined in the FLAG 2010 document. Method 8 uses the new IMPROVE (2006) equation and thus divides the ammonium sulfate, ammonium nitrate and the organic carbon compounds into both small and large categories. A site-specific Raleigh scattering value of 11 Mm-1 for the Everglades NP was used in this analysis. This value is based on the annual average natural conditions for visibility. Monthly relative humidity factors for hygroscopic species (small/large/sea salt) for the Everglades NP and monthly background concentrations was used for computing background extinction coefficients. The default particle scattering and absorption coefficient relationship to the mass of the species in the New IMPROVE equation was used. Additional terms for sea salt and absorption of NO_2 have been added to this equation. The maximum predicted 24-hour concentrations from each of the proposed WTE sites emissions were converted to a light extinction value and then compared to a change in light extinction over the background associated with clean natural visibility conditions at Everglades NP. Using CALPUFF View, the FLAG 2010 settings for Relative Humidity Adjustment Factors f(RH) and the Background Concentration values are automatically populated based on the Class I Area. **Table 5-35** shows all the predicted 24-hour change-in-extinction values for applying Method 8 Mode 5 in CALPOST that are incorporated into the new IMPROVE equation.

Table 5-35 New IMPROVE Equation (Method 8) – Default Particle Scattering and Absorption Coefficients[1]

Species	Dry Extinction Efficiency (m^2/g)	Relationship
Small Sulfates	2.2	$2.2f_S(RH)$[small sulfates]
Large Sulfates	4.8	$4.8f_L(RH)$[large sulfates]
Small Nitrates	2.4	$2.4f_S(RH)$[small nitrates]
Large Nitrates	5.1	$5.1f_L(RH)$[large nitrates]
Small Organics	2.8	2.8[small organics]
Large Organics	6.1	6.1[large organics]
Elemental Carbon	10	10 [EC]
Soil	1	1 [fine soil]
Sea Salt	1.7	$1.7f_{SS}(RH)$[sea salt]
Coarse Matter	0.6	0.6 [Coarse matter]
Rayleigh Scattering	Site specific (11 Mm^{-1})	Rayleigh
BG Nitrogen Dioxide	0.33	0.33[NO_2(ppb)]

Notes:
1 Based on FLAG 2008 & Figure 5-7 FLAG 2010.
m^2/g = squared meter per gram

Based upon information and guidance provided by the FLMs for previous projects, if emissions from the proposed facility result in a visibility impact of less than 5%, the FLM should be notified and provided the analysis showing that no adverse impacts to visibility are anticipated due to the proposed emissions. If the daily maximum change in light extinction is between 5% and 10%, the frequency, magnitude, and duration of the visibility impacts will be used to formulate a significance determination. In addition to the proposed emissions control technology, FLM considers the magnitude, frequency, duration, location, geographic extent, timing of predicted impact, as well as other factors from the impact analyses, in determining whether an adverse impact is expected from the proposed project's emissions.

As part of this site evaluation, a visibility impairment analysis was conducted to determine if the proposed facility would have an adverse impact on visibility at the Everglades NP. The VISCREEN plume blight analysis discussed in previous sections evaluated the potential plume impacts within 50 kilometers of the three proposed sites. CALPUFF and CALPOST was used for evaluating the Everglades receptors equal or greater than 50 kilometers away. **Figure 5-8** depicts the Everglades receptors outside 50 kilometers for the proposed sites. CALPOST Method 8 (Mode 5) was used to determine the potential impacts on visibility. **Table 5-36** (Method 8) present the predicted worst-case 24-hour change in extinction values for NP area using the three years of the CALMET meteorological dataset (2001-2003). The 310 ft stack height option was evaluated for each of the proposed sites. Follow-up runs based on the worst-case impacts years were conducted to evaluate the visibility modelled changes for the 250 ft and 410 ft stack heights.

Table 5-36 AQRV Visibility Impairment Using Method 8 (Mode 5)

AQRV and Criteria	Meteorological Year and Maximum Change in Extinction (% and dv)			Change in Extinction Threshold Value (%, deciview (dv))
	2001	2002	2003	
Existing RRF				
Visibility, D_{bext}	4.14%	3.77%	*4.97%*	5%
Visibility, D_{dv}	0.406	0.370	*0.485*	0.5 dv
Airport West Site				
Visibility, D_{bext}	3.69%	3.73%	*3.98%*	5%
Visibility, D_{dv}	0.363	0.366	*0.390*	0.5 dv
Medley Site				
Visibility, D_{bext}	3.98%	3.33%	*4.64%*	5%
Visibility, D_{dv}	0.390	0.328	*0.453*	0.5 dv

Notes:
Maximum change in extinction in italics (model year 2003).

The predicted 24-hour change-in-extinction values for the 310 ft stack height option are below the 0.5 dv (5%) threshold. The Existing RRF site showed the highest 24-hour change in extinction, just below the 5% and 0.5 deciview screening criteria. The 250 ft stack height scenario using the estimated emission and particulate matter speciation showed model visibility extinction impact right at the screening level (5.04% and 0.492 dv). For the other two site evaluated in this study, the 250 ft stack height increased impacts approximately 20% (ranged from 19.6 – 22.6%) and the 410 ft stack scenario reduced impacts approximately 20% (down 18.7 – 19.2%). Therefore, a new WTE facility at any of the three proposed sites is not expected to cause or contribute to an adverse impact on visibility at Everglades NP as long as the design and potential emissions are similar or less than the quantities evaluated in this study.

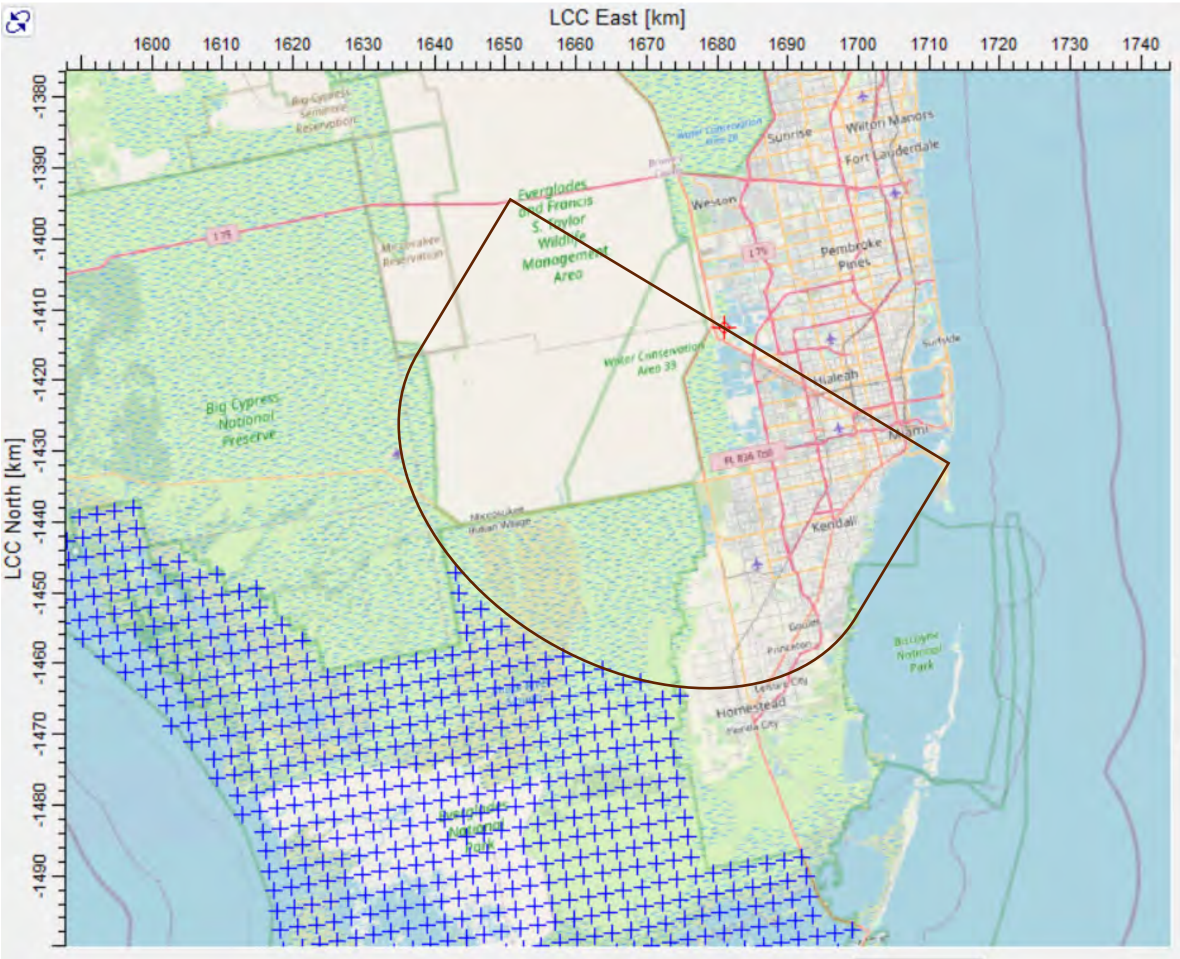

Figure 5-8 Everglades Receptor Grid Greater than 50 km

5.5.5 AQRVs – Sulfate and Nitrate Deposition Loadings

Deposition impacts of sulfur (as sulfate ion) and nitrogen (as nitrate and ammonium ions) were determined at the Everglades NP receptors. The calculated deposition fluxes (in kg/ha/year) were compared to the DATs for sulfur and nitrogen, as recommended in *Federal Land Manager's Interagency Guidance on Nitrogen and Sulfur Deposition Analysis Thresholds* (FLM 2011) and currently posted on the NPS Website. Initially, annual average deposition rates were determined based on the short-term emissions from the proposed facility according to methods specified in *IWAQM Phase II Report, FLAG Phase I Report* and *FLAG Phase I Report Revised*. If necessary, annual emissions rates are to be used to determine the annual average deposition rates. Annual average deposition rates of NO_X, NO_3, and particulate nitrate (as HNO_3) were calculated by CALPUFF, then converted to nitrogen and summed. Furthermore, the contribution to nitrogen deposition from the nitrogen in ammonium sulfate was included in the total nitrogen deposition. Likewise, annual average deposition rates of SO_2 and SO_4 were converted to sulfur and summed. The POSTUTIL program was used to sum the wet and dry deposition fluxes prior to the CALPOST post-processing and comparison to the deposition threshold values. The eastern DATs of 0.01 kg/hectare per year for nitrogen and 0.01 kg/hectare per year for sulfur were used for the Everglades NP per guidance from the NPS.

Sulfur and nitrogen deposition analyses were performed to determine if the proposed facility would have an adverse impact on the specific AQRVs for the Everglades National Park. The total deposition (wet and dry fluxes) of SO_2 and SO_4 were used to determine the project S loading for comparison to the air quality related sulfur threshold value. The total deposition (wet and dry fluxes) of nitrogen oxides (NO_X – dry deposition only), NO_3, and HNO_3 was used to determine the project N loading for comparison to the air quality-related nitrogen threshold value. Using the hourly CALPUFF flux model output for SO_2, SO_4, NO_X, NO_3, and HNO_3 and the POSTUTIL program to sum the wet and dry deposition values, the total S and N deposition flux ("loading"), in terms of kg/ha/yr was calculated through the CALPOST post-processing program. The maximum S and N loading from the proposed WTE sites are presented in **Table 5-37** and **Table 5-38**.

Table 5-37 AQRV S-N Deposition (Receptors >= 50 km)

Sulfate Deposition			Nitrate Deposition		
Compound	Modeled Flux Impact ($g/m^2/s$)	Modeled Deposition Impact (kg/ha/yr)	Compound	Modeled Flux Impact ($g/m^2/s$)	Modeled Deposition Impact (kg/ha/yr)
Existing RRF			**Existing RRF**		
Total S	3.43E-11	**0.0108**	**Total N**	3.07E-11	0.0097
Airport West			**Airport West**		
Total S	2.88E-11	0.0091	**Total N**	1.62E-11	0.0051
Medley			**Medley**		
Total S	3.30E-11	**0.0104**	**Total N**	1.83E-11	0.0058
Sulfate DAT Value[1] (Screening Value)		**0.01**	**Nitrate DAT Value[1] (Screening Value)**		**0.01**

Notes:

1 The eastern DATs of 0.01 kg/hectare per year for nitrogen (as nitrate and ammonium ions) and 0.01 kg/hectare per year for sulfur (as sulfate ion) were used for the Everglades NP.

Table 5-38 AQRV S-N Deposition (All 901 Everglades NP Receptors)

Sulfate Deposition			Nitrate Deposition		
Compound	Modeled Flux Impact ($g/m^2/s$)	Modeled Deposition Impact (kg/ha/yr)	Compound	Modeled Flux Impact ($g/m^2/s$)	Modeled Deposition Impact (kg/ha/yr)
Existing RRF			**Existing RRF**		
Total S	9.12E-11	**0.0287**	**Total N**	4.75E-11	**0.0150**
Airport West			**Airport West**		
Total S	4.38E-11	**0.0138**	**Total N**	2.48E-11	0.0078
Medley			**Medley**		
Total S	7.12E-11	**0.0224**	**Total N**	3.91E-11	**0.0123**
Sulfate DAT Value[1] (Screening Value)		**0.01**	**Nitrate DAT Value[1] (Screening Value)**		**0.01**

Notes:

1 The eastern DATs of 0.01 kg/hectare per year for nitrogen (as nitrate and ammonium ions) and 0.01 kg/hectare per year for sulfur (as sulfate ion) were used for the Everglades NP.

For the modeling scenarios at 50 km or greater, the total modeled S & N loading are at or below the DAT value of 0.01 kg/ha/yr established for sensitive areas, which includes the Everglades National Park located in the eastern half of the United States. For the Everglades receptors within 50 km, the predicted loading concentrations for all three proposed sites are greater than the screening DAT of 0.01 kg/ha/yr for sulfate loading. Only the Airport West site show predicted nitrate loading below the screening DAT. Additional analyses and further consultation with the FLM will be necessary to alleviate any potential concerns the agency may have with the construction and operation of a new WTE near the Everglades NP.

6 Conclusions

The Department tasked Arcadis to conduct a siting analysis and review alternative sites for a new WTE facility. Arcadis completed that analysis in June 2022. Since then, the Department tasked Arcadis to conduct preliminary air dispersion modeling and preliminary qualitative human health and ecological screening level risk assessments on three proposed sites. Air dispersion modeling is one of the most important and challenging aspects in supporting the air permitting process for a new WTE facility. The air dispersion modeling evaluates the potential release and transport of air pollutants from emission sources and predicts ground-level ambient air concentrations that can be compared to USEPA screening criteria as well as federal regulated standards, NAAQS, and PSD increments.

Based on estimated emissions from the proposed conceptual facility and nearby representative meteorological data, the AERMOD model was used to predict ambient air concentrations of criteria pollutants at offsite receptor locations. These offsite concentrations were compared to the screening levels, NAAQS, and PSD Class II area increments.

Additional analyses were conducted to assess impacts to receptor locations within the Everglades NP. These analyses include predicting ambient air concentrations to compare to the Class I area SILs and increments, visual plume blight, visibility impairment, and sulfate and nitrate deposition. VISCREEN was used for assessing plume blight impacts on Everglades NP, and CALPUFF was used to evaluate impacts with respect to the AQRVs.

Based on the close proximity of the proposed sites to the Everglades NP, permitting of a new WTE facility will require an extensive effort and have challenges to overcome during the air permitting process. This evaluation only assessed the potential challenges associated with predicted air impacts. There are numerous other environmental and technical assessments that may affect the successful permitting and construction of a new WTE in Miami-Dade County.

Overall, based on this analysis, it is concluded that each of the proposed sites could potentially obtain an air permit to construct a facility. Restrictions on stack heights, potential WTE emissions, extent of the proposed facility's significant impact areas, presence of other nearby emission sources, short distances to the Class I Everglades NP boundary, and more restrictive air quality standards and screening criteria are all factors that may affect overall air modeling conclusions. Also, each potential site will be affected by the new annual $PM_{2.5}$ NAAQS of 9 $\mu g/m^3$ since background monitoring concentrations for Miami-Dade and Broward County range from 7 to 10 $\mu g/m^3$.

Based on this air modeling evaluation, below are important considerations for each proposed site. The challenges will likely require further effort to satisfy any concerns from the air permitting regulatory agencies (i.e., FDEP, USEPA, FLMs) during the process of reviewing, approving, and issuing the air construction permit.

6.1 Existing RRF Site

- This site could provide an opportunity to use historical emissions data to show an overall net-benefit on the nearby air quality when comparing to past site operations. Further discussions with FDEP would be needed to determine whether historical emissions can be used during the permitting process.
- Site is located closest to the Class I Everglades NP area which could potentially affect the site's ability to show no adverse impacts on the Class I area in the formal modeling analyses required for permitting (SILs, AQRVs).
  - Visual plume impacts using VISCREEN were the largest at this site. A Level-3 visibility analysis using PLUVUE-II may be necessary to show no adverse impacts.

  - o Visibility impairment and sulfate/nitrate deposition impacts were also the highest of the three sites. Deposition impacts were at a level where the FLM may have concerns, but the use of best available control technologies will be crucial to their overall acceptance determination of the proposed project.
- The potential NO_2 impacts from a water treatment plant to the southeast may require the use of a more complex Tier 3 NO_x-NO_2 conversion option in the cumulative modeling to show compliance with the 1-hour NAAQS.
- Consultation with the FAA will be required to determine whether stack heights taller than the existing 250 ft stacks would be allowed due to flight path interferences with the Miami International Airport. Taller stacks may be challenging and would likely require extensive analyses to obtain approval from FAA.

6.2 Airport West Site

- Site is located farthest from the Class I Everglades NP area which could potentially aid in the site's ability to show no adverse impacts on the Class I area in the modeling analyses (SILs, AQRVs).
- This site location had fewer large emission source emitters nearby than the other site locations, which could lead to lower overall cumulative impacts in the Class II analysis.
- Even though the site is the furthest from the Class I Everglades NP area, visual plume impacts and AQRV analyses will be challenging.
  - o Sulfate/nitrate deposition impacts at the Everglades NP boundary were high and at a level where the FLM may have concerns. Again, the use of best available emission control technologies will be crucial in the FLM's overall acceptance determination of the proposed project.
  - o A Level-3 visibility analysis using PLUVUE-II may be necessary to meet visual plume screening criteria.
- No large emission sources observed nearby. However, an asphalt plant and a quarry are located close enough to pose modeling challenges in the cumulative impact analysis to show compliance with the $PM_{2.5}$ NAAQS and PSD increments.

6.3 Medley Site

- The site is the second closest to the Class I Everglades NP area which could potentially affect the site's ability to show no adverse impacts on the Class I area in the modeling analyses (SILs, AQRVs).
  - o Visual plume impacts using VISCREEN were large at this site. A Level-3 visibility analysis using PLUVUE-II may be necessary to show no adverse impacts.
  - o Visibility impairment results were close to the screening criteria and sulfate/nitrate deposition predicted impacts were well above the screening criteria at the nearest receptors. Deposition impacts were at a level where the FLM may have concerns, but the use of best available control technologies will be crucial in their overall acceptance determination of the proposed project.
- Potential NO_2 impacts from the existing flare at the nearby landfill to the southeast may require the use of a more complex Tier 3 NO_x-NO_2 conversion option in the cumulative modeling to show compliance with the 1-hour NAAQS.
- Potential cumulative $PM_{2.5}$ impacts including other existing emission sources to the northwest of site will provide challenges in complying with $PM_{2.5}$ NAAQS and PSD increments.

- Any shifting of the facility footprint to the west or northwest will potentially increase the modeling challenges to show compliance with the current air quality standards. A facility footprint shift to the northwest could extend the SIA (for $PM_{2.5}$, SO_2, NO_2) further northwest and thus over other industrial sites in the area adding to the complexity of the modeling analysis in order to show compliance with the air quality criteria.

The results of the air dispersion modeling analyses are preliminary in nature, and only intended to give the County additional information for consideration in final WTE site selection. The air dispersion modeling conducted for this report are preliminary analyses to determine the relative difficulty and potential challenges that may be associated with the air permitting process for any of the three potential sites and identify any differences that stand out between the sites. Before completing permit-level modeling, a formal modeling protocol will have to be developed and submitted to the FDEP, USEPA, and the FLM (NPS) to obtain concurrence on the models, inputs, options, etc. prior to submitting the supporting modeling analysis as part of an air permit application. Finally, additional analyses may be required and/or requested by the regulatory agencies during the air permit application and approval process.

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Appendix A

Preliminary Human Health Risk Assessment

Miami-Dade County Department of Solid Waste Management

Preliminary Qualitative Human Health and Ecological Screening Level Risk Assessment

Future Waste-to-Energy Facility Siting Assessment

Appendix A

Aprill 11, 2024

Preliminary Qualitative Human Health and Ecological Screening Level Risk Assessment

Future Waste-to-Energy Facility Siting Assessment

Aprill 11, 2024

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Contents

Tables

Figures

Attachments

Acronyms and Abbreviations

1E-06	1 in a million
1E-09	1 in a billion
1E-12	1 in a trillion
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
As	arsenic
Be	beryllium
C	cancer
Cd	cadmium
CO	carbon monoxide
COPC	constituent of potential concern
ELCR	excess lifetime cancer risk
ERA	ecological risk assessment
ESV	ecological screening value
FNAI	Florida Natural Areas Inventory
g/sec	gram per second
g/m^2 per g/sec	gram per square meter per gram per second
HI	hazard index
HHRA	human health risk assessment
HHRAP	Human Health Risk Assessment Protocol
Hg	mercury
HQ	hazard quotient
IPaC	Information for Planning and Consultation
IRIS	Integrated Risk Information System
Kg	kilogram
L/day	liter per day
MSW	municipal solid waste
NAAQS	National Ambient Air Quality Standards
NAS	National Academy of Sciences
NC	noncancer
NOAA	National Oceanic and Atmospheric Administration

NOx	nitrogen oxides
NRC	National Research Council
Pb	lead
PCDD/CDFs	polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans
pg	picogram
pg/kg-day	picogram per kilogram per day
PM10	particulate matter with diameter 10 micrometers and smaller
RDF	refused derived fuel
RfD	reference dose
RRF	resource recovery facility
SERAFM	Spreadsheet-based Ecological Risk Assessment for the Fate of Mercury
SO_2	sulfur dioxide
2,3,7,8-TCDD	2,3,7,8- tetrachlorodibenzo-p-dioxin
tpd	ton per day
TRGIS	Terrestrial Resource Geographic Information System
USEPA	U.S. Environmental Protection Agency
USFWS	United States Fish and Wildlife
WTE	waste-to-energy

Executive Summary

Human Health Risk Assessments (HHRAs) are detailed modeling tools used by governmental regulatory agencies to conservatively estimate the risks to human health posed by exposures to chemical substances from different sources, which include industrial facilities, waste disposal sites, consumer products, pharmaceuticals, food additives, and others. They are specifically designed to overestimate the risks posed to average people by focusing on people who could have higher than average exposures, however unlikely. An assessment that intentionally overestimates risks to average people is called a *conservative* assessment.

In the context of municipal solid waste management, HHRAs are performed to answer questions raised by regulators and members of the community about an existing or planned facility's safety. Such HHRAs estimate the cancer and noncancer (e.g., cardiovascular disease) risks to potentially exposed populations. They are particularly useful at the planning stage because the results can be used to make informed siting and facility design decisions. For instance, if a planned facility were predicted to have population risks that exceed regulatory levels of concern, design engineers could plan changes that would result in lower risks long before the facility was built.

Ecological Risk Assessments (ERAs) are similar conservative tools that predict the impacts of a facility on terrestrial and aquatic ecological receptors, such as birds, mammals, fish, sediment invertebrates, and plants. To ensure adequate conservatism, ERAs focus on the most sensitive known species and pay particular attention to threatened and endangered species.

In Miami-Dade County, a mass burn waste-to-energy (WTE) facility is being planned, but a site has not been chosen and the facility has not yet been designed. HHRAs and ERAs are not required by the Florida Department of Environmental Protection (FDEP) to obtain a permit for a WTE as they are in some other localities. However, such assessments are helpful tools in the planning stage to compare potential site locations and essential design features, such as stack location and height.

A preliminary qualitative assessment of human health and ecological risks was performed for a conceptual 4,000 ton per day (tpd) mass burn WTE facility assuming that it was located at one of three potential sites. To expedite the evaluation and in consideration of the preliminary nature of the proposed new WTE project at this time, the assessment of risks was based on the results of the most recent and comparable quantitative HHRA and ERA performed in Florida for a permitted WTE facility, the Palm Beach County Renewable Energy Facility. The Palm Beach County assessment was performed by Arcadis U.S., Inc. (Arcadis) and CPF Associates, Inc. (CPF) on behalf of the Solid Waste Authority of Palm Beach County prior to the facility's construction in 2015 (Arcadis/CPF 2010).

Because the Palm Beach WTE facility and the three potential locations for the conceptual Miami-Dade WTE facility (Existing RRF, Medley, and Airport West) are all situated in coastal southern Florida near the Everglades, it is expected that their site-specific characteristics of soils, watersheds, and surface water bodies are similar. This similarity allowed a preliminary qualitative screening level assessment to be performed for the conceptual Miami-Dade WTE facility by scaling the results of the Palm Beach HHRA and ERA. The scaling was performed taking into account the differences in the daily throughput of municipal solid waste (tpd) and the differences in the preliminary air dispersion and deposition modeling results for several stack height scenarios.

The preliminary air dispersion modeling was performed using the most stringent emissions limits permitted for a mass burn WTE facility in the US. If more stringent emissions limits are applied for certain pollutants (i.e., new

MACT standards proposed by USEPA), then predicted impacts for those pollutants would be lower. Accordingly, the estimated risks presented here are biased high to provide a conservative assessment.

On the basis of the conservative preliminary HHRA, which assumes worst case locations for human exposures and emission factors based on existing regulations, no one potential site for the conceptual Miami-Dade WTE facility gives higher or lower risk results for all human receptors assessed. Furthermore, all were within USEPA's acceptable cancer risk range of 1E-06 (1 in a million) to 1E-04 (1 in a hundred thousand or 100 in a million) and below the regulatory Hazard Index (HI) criterion of 1 for noncarcinogenic effects.

Acute HHRA risk assessment calculations were also performed at the worst-case off-site location for each potential site/stack height scenario. HIs were all less than the level of concern of 1. In addition, a breast milk assessment was performed per the Palm Beach HHRA. All HIs were less than the regulatory level of concern of 1.

Although there is no clear trend that shows one potential site to pose the lowest estimated human health risk for all hypothetical human exposure scenarios, one trend does stand out. The realistic chronic residential risk assessment exposure scenarios are those that are more relevant for assessing facility safety, because they concern residents of the communities where the potential sites are located. Comparatively, the Airport West location has the lowest potential risk in these scenarios. However, as stated, all three locations have low risk with results within or below the regulatory established risk levels.

The worst case preliminary estimated excess lifetime cancer risk for residential receptors from the conceptual Miami-Dade WTE facility ranged from a low of 2E-08 (0.02 in a million) to a high of 4E-07 (0.4 in a million). To put those risk figures in perspective, the estimated excess lifetime cancer risk level from breathing benzene from gasoline and car exhaust in Miami-Dade County is 1.5E-06 (1.5 in a million) according to the USEPA's Air Toxics Screening Assessment (USEPA 2017). 1.5 in a million is a cancer risk level higher than the preliminary risk estimates for residents from a conceptual Miami-Dade WTE facility at any of the three potential sites.

In addition, some concerns have been raised that emissions from the conceptual Miami-Dade WTE facility might adversely affect surface water that is connected to groundwater that serves as a drinking water supply. In consideration of this concern, potential effects of WTE emissions on surface water quality were assessed.

Drinking water in all south Florida counties is treated before distribution into homes and businesses whether the source is surface water or groundwater. To provide an estimate of the risks to drinking water from the conceptual Miami-Dade WTE, surface water concentrations around the Palm Beach WTE were reviewed, given that chemical deposition rates onto water bodies were similar in both counties. A worst-case analysis was performed by assuming that people consumed water directly from canals for a lifetime without treatment. The estimated lifetime cancer rates were over one million times less than the low end of USEPA's acceptable cancer risk range of 1E-06 (1 in a million). Similarly, worst case estimates of noncancer Hazard Indices (HIs) were calculated. They were over 500,000 times less than the USEPA's decision criterion for noncancer risks of 1. Given that the estimated deposition rates on and around the C-9 canal north of the Airport West location are very similar to the estimated deposition rates on canals near the Palm Beach County WTE location, it is concluded that future emissions from the conceptual Miami-Dade WTE facility would not be detrimental to drinking water sources north of that location and other locations that might recharge groundwater. The potential impacts on groundwater quality would likely be immeasurable. However, FDEP and all applicable state/local regulatory agencies will assess the impacts of any future WTE on drinking water sources during the permitting process to ensure that drinking water sources are not adversely affected.

From an ecological risk perspective, based on the conservative preliminary ERA, it is concluded that potential ecological risks associated with the three proposed locations are minimal and should not have an impact on the health of the surrounding ecological communities.

1 Introduction

At the Special Meeting of the Miami-Dade County (County) Board of County Commissioners (Commission) on September 19, 2023, the Commission adopted Special Item No. 6, directing the County Mayor to present all three alternate sites (Airport West, the existing Resource Recovery Facility (RRF) and the Medley sites) to the Florida Department of Environmental Protection (FDEP) as part of a preliminary review and provide a report.

This work is further detailed in the Mayor's memorandum dated September 16, 2023 under Recommendation 2, in which the Mayor recommended that the Commission authorize the Administration to immediately take all actions necessary, including air quality impact analysis and modeling, to begin the pre-application process with the EPA and FDEP for a conceptual 4,000 ton per day (tpd) mass burn Waste-to-Energy (WTE) facility at the Airport West site, plus the existing RRF site and the Medley site.

One of the ultimate permitting requirements includes conducting air modeling to provide the regulatory agencies with information about potential site-specific environmental impacts of building a WTE facility. Preliminary air modeling on all three sites will allow the Miami-Dade Department of Solid Waste Management (Department or DSWM) to gain insight into future permitting issues (e.g., airport flight path concerns, Class I impacts and emission/stack height, other nearby large emission sources) and avoid the risk of having to start over if one site fails in the full permitting process. The Mayor's recommendation also included retaining expert services to conduct a health assessment of the modeling results, which would be important when engaging with the community.

In response to the Commission's direction and the Mayor's memorandum, the Department tasked Arcadis U.S., Inc. (Arcadis) with conducting the preliminary screening level air modeling and health risk assessment.

As requested, a preliminary qualitative assessment of human health and ecological risks was performed for a conceptual 4,000 ton per day (tpd) mass burn waste-to-energy (WTE) facility that could be constructed at one of three potential sites previously identified within the County (see Figure A-1) – referred to herein as the Existing RRF, Medley, and Airport West sites, respectively. To expedite the evaluation and in consideration of the preliminary nature of

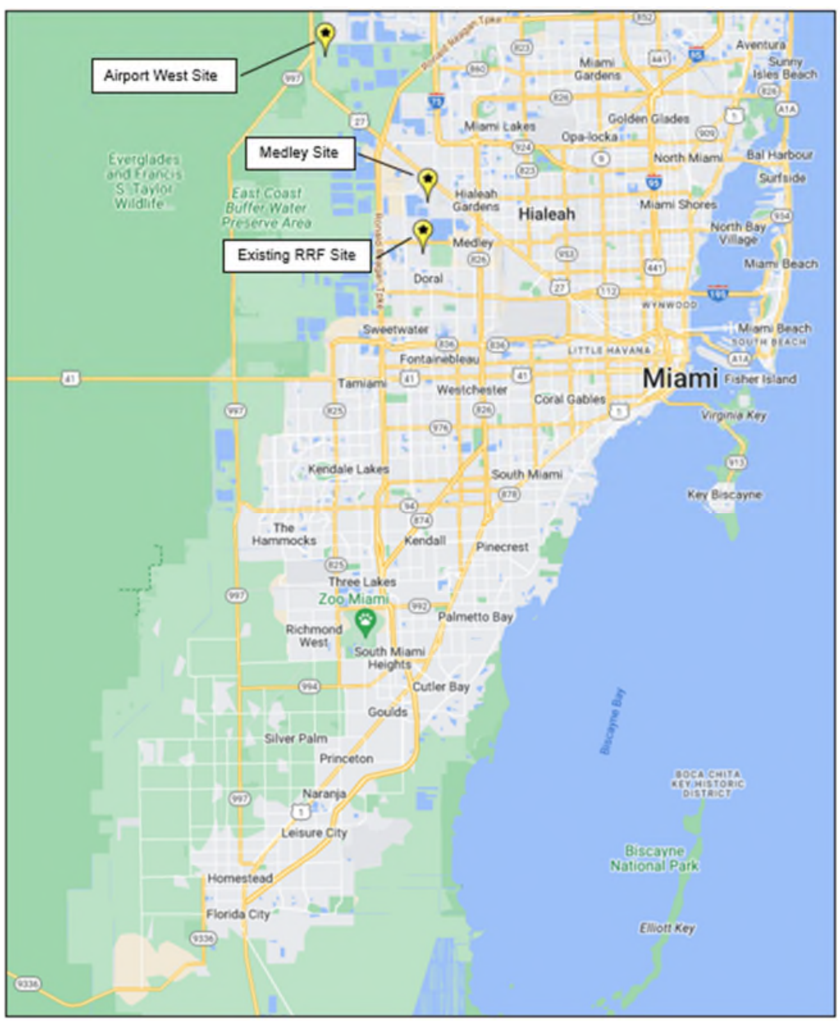


Figure A-1. Potential WTE Site Locations

the proposed new WTE project at this time, the assessment of risks was based on the results of the most recent and comparable quantitative human health risk assessment (HHRA) and ecological risk assessment (ERA) performed in Florida for a permitted WTE facility, the Palm Beach County Renewable Energy Facility The Palm Beach County assessment was performed by Arcadis and CPF Associates, Inc. on behalf of the Solid Waste Authority of Palm Beach County prior to its construction in 2015 (Arcadis/CPF 2010).

In the Palm Beach County assessment, risks were assessed in accordance with United States Environmental Protection Agency (USEPA) guidance (2005) for two refurbished 900 tpd Refuse Derived Fuel (RDF) combustors and three new 1,000 tpd mass burn combustors. The Palm Beach County risk assessment (Arcadis/CPF 2010) has served as a comparative resource, with adjustments considering differences with respect to proximity to residential, farming, and fishing areas and sensitive ecological areas for the conceptual Miami-Dade WTE facility. In addition, scaling of risks was performed to account for anticipated differences in Municipal Solid Waste (MSW) feed rates. Specifically, the Palm Beach risk assessment assumed a total MSW processing capacity of 4,800 tpd for the combination new mass burn combustors and refurbished RDF combustors compared to the conceptual 4,000 tpd Miami-Dade WTE facility. Accordingly, risks were scaled downward by a capacity factor of 0.83 (4,000/4,800) to estimate risks for the conceptual Miami-Dade WTE facility.

For this preliminary assessment of risks, it has been assumed that emissions on a tpd basis for the conceptual Miami-Dade facility would be the same as the combined emissions on a tpd basis for the existing Palm Beach facility, which is a reasonable and conservative assumption because the Palm Beach facility was constructed using state-of-the-art control equipment and has the lowest permitted emissions currently in Florida. It is assumed the Miami-Dade facility would include similar if not more advanced technology.

Also, both human health and ecological risks are dependent on the site location, the weather patterns, and the local setting. To take these site-specific factors into account, preliminary air dispersion and deposition modeling was performed assuming the conceptual facility was placed at each of the three potential sites. In addition, modeling of vapor phase dioxins/furans and divalent vapor phase mercury was performed, because dioxins/furans and mercury are risk-drivers for all WTE facilities, including the Palm Beach combustor risk assessment.

The conceptual Miami-Dade WTE risks were then estimated by scaling the appropriate air modeling and deposition results. For instance, the human health inhalation risks for metals, such as cadmium, were estimated by comparing the annual average particle phase unit air concentrations for Palm Beach County and potential Miami-Dade County locations. Similarly, human health ingestion risks for dioxin/furan congeners were estimated by comparing the sum of the average annual total unit deposition rates for surface area bound particles (particle-bound) and the average annual total unit deposition rates for dioxin vapor.

The magnitude of potential human health risk estimates for the conceptual Miami-Dade WTE facility was then put into the context of every day risks experienced by the general public to communicate the scale of health risks posed by the conceptual facility.

As described in detail below, the depositional information and risk estimates from the Palm Beach County HHRA and ERA were used to estimate potential risks for the conceptual Miami-Dade WTE facility at the three potential locations to determine if any of the three locations posed significantly lower human health and ecological risks. These results will be used to inform the County’s site selection process.

2 Palm Beach Risk Assessment Methodology

2.1 Human Health Risk Assessment

The Palm Beach County HHRA is the basis for the Preliminary Screening Risk Assessment of the Miami-Dade conceptual WTE, because Miami-Dade results are scaled from the Palm Beach results. Accordingly, this report describes the steps used in that previous assessment to demonstrate that it was done properly in accordance with USEPA guidance. The approach adopted was consistent with the approach recommended by the National Research Council (NRC; NAS, 1983) and adopted by USEPA, as well as many federal and state regulatory agencies. In accordance with the NRC recommendations, the risk assessment was performed using the following four steps:

- Hazard Identification
- Toxicity Assessment
- Exposure Assessment
- Risk Characterization

The sections below detail each of the four steps.

2.1.1 Hazard Identification

The chemicals of potential concern (COPCs) are the substances with proposed permit limits. They are typically assessed in WTE risk assessments because they are the chemicals that pose the highest risk. They include ammonia, hydrochloric acid, sulfuric acid, arsenic (As), beryllium (Be), cadmium (Cd), lead (Pb), mercury (Hg) and dioxins & furans (dioxins/furans). In previous WTE risk assessments, dioxins/furans dominated the cancer risk and mercury dominated the noncancer risk.

Operating permits for WTE facilities typically set emission limits for criteria pollutants under the Clean Air Act. Particulate matter with diameter 10 micrometers and smaller (PM10), nitrogen oxides (NOx), sulfur dioxide (SO_2) and carbon monoxide (CO) all have risk-based National Ambient Air Quality Standards (NAAQS). These criteria pollutants are not included in this or any other WTE HHRAs because risk is managed by their NAAQS and also because USEPA has not issued cancer slope factors and/or reference doses that would allow their inclusion. However, preliminary Clean Air Act compliance modeling has been performed and is presented in the separate Preliminary Air Modeling Evaluation Report.

2.1.2 Toxicity Assessment

Acute, chronic, and carcinogenic toxicity criteria were those recommended by USEPA's Integrated Risk Information System (IRIS) database for the HHRA.

2.1.3 Exposure Assessment

Emission rates are based on measurements from existing WTE facilities, proposed permit limits, and permit limits for other similar facilities. Air dispersion and deposition modeling was performed using the USEPA approved model, AERMOD, in the manner recommended by USEPA's Human Health Risk Assessment Protocol (HHRAP) (USEPA 2005) guidance (Arcadis/CPF 2010).

To determine COPC concentrations in environmental media, such as soil, sediment, surface water, vegetables, beef, and fish, the risk assessment adhered to the HHRAP guidance, which utilized uptake and depositional equations which incorporate chemical-specific inputs, such as:

- Soil-water partitioning rate
- Plant-soil bioconcentration factor
- Henry's Law Constant
- Root concentration factor
- Bioconcentration factor for beef
- Air-to-plant biotransfer factor

Also, to calculate uptake through the waterbodies, site-specific physical properties of soils, watersheds, and water bodies are required, such as:

- Surface areas
- Fractions pervious
- Temperature, wind speed
- Precipitation, irrigation, surface runoff, evapotranspiration
- Universal Soil Loss inputs: soil erodibility, rainfall erosivity, slope length & gradient, etc.
- Depth of water body, flow rate, suspended solids, etc.

For human health risk, the risk assessment (Arcadis/CPF 2010) followed USEPA's HHRAP guidance and evaluated acute and chronic risks for six receptors:

1. Adult residents
2. Child residents
3. Adult farmers
4. Child farmers
5. Adult fishers
6. Child fishers

Breast-fed infants were also assessed for exposure to dioxin and furan congeners. Annual average unit air concentrations, unit particle phase total deposition rates, unit particle bound total deposition rates, dioxin vapor total deposition rates, and divalent mercury vapor deposition rates were estimated at worst-case residential, farming, and fishing locations for each of the three potential sites in Miami-Dade County. These unit concentrations and unit deposition rates were then compared to Palm Beach results so that the risks at these locations could be estimated. As such, the worst-case locations where critical human receptors are or could be present were identified for residences as well as farming and fishing locations.

The risk assessment assumed that residents could be exposed to chemicals in the air by direct inhalation, by dermal contact and incidental ingestion of soil, and by ingestion of home-grown produce. USEPA guidance is highly protective in that it assumes consumption rates of home-grown produce of 50 and 26 pounds per year for adults and children, respectively. It is unlikely that many, if any, backyard gardens exist in high density residential neighborhoods that could support such consumption levels.

For the farming scenario, it additionally assumed ingestion of home-raised beef, chicken, eggs, and pork. Homegrown beef ingestion was the risk driver, assuming consumption of 66 and 9 pounds per year for adults and children, respectively, from the worst-case farmable location. For the fishing scenario, it was assumed in accordance with USEPA guidance that adults and children consumed 67 and 10 pounds per year, respectively, of fish from the worst-case fishable location.

2.1.4 Risk Characterization

In accordance with NRC (1983) and HHRAP (USEPA 2005), HHRA risks are estimated separately for carcinogenic effects and noncarcinogenic effects. For carcinogenic effects, Estimated Lifetime Cancer Risk (ELCR) levels are calculated. They are unitless estimates of probability. For instance, an ELCR of 1E-05 (10 in a million) means that an adult exposed daily over a 30-year period to the dose levels specified in the guidance may have an extra lifetime risk 0.00001 compared to the background lifetime risk of contracting cancer of 0.4 (ACS 2024). Thus, with the addition of the exposures due to the operation of the facility being assessed, their lifetime risk could be increased from 0.4 to 0.40001. This small level of additional cancer risk is not measurable, but regulatory decisions are made using such stringent criteria.

For noncancer risk, estimated average daily doses calculated from HHRAP equations are compared to USEPA reference doses (RfD). The RfD is the dose that one can have every day for an entire lifetime and not experience any adverse effects. According to USEPA, these doses are calculated with numerous safety factors, so that the actual level that might cause harm is typically 100-1,000 times higher than the RfD. When the estimated dose is compared to the RfD, the ratio is called the hazard quotient (HQ). The sum of HQs for substances that have similar toxic endpoints is called the hazard index (HI). USEPA and other regulatory agencies regulate non-carcinogens using a regulatory criterion of 1, which is highly protective.

2.2 Ecological Risk Assessment

The potential for ecological risks was evaluated in the Palm Beach County screening level risk assessment (ERA) (Arcadis/CPF 2010) following USEPA's ecological risk assessment principles (USEPA 1997a; 1998). The ERA focused on the same set of chemicals considered for the HHRA (i.e., arsenic, beryllium, cadmium, lead, mercury PCDD/CDFs, hydrogen chloride, hydrogen fluoride, sulfuric acid and ammonia). It was assumed that these compounds, once released into the air, would be dispersed and deposited onto land or water surfaces. In water it was assumed that they could be dispersed in the water column or sorbed to suspended particulate matter and sediment and potentially accumulated in biota tissue such as fish or snails. Concentrations in water, sediment, soil, and fish were calculated as described for the HHRA.

Specifically, they were based on annual average concentration outputs from USEPA's HHRAP equations for all compounds except mercury for which concentrations in the water column, sediment and fish were based on USEPA's Spreadsheet-based Ecological Risk Assessment for the Fate of Mercury (SERAFM) model. The unitized preliminary air modeling results used to calculate concentrations in soil to assess plants were based on the maximum combined annual average impacts from both evaluated facilities. Concentrations in fish were obtained from the HHRAP or SERAFM model results while the snail concentrations were calculated using invertebrate bioconcentrations factors applied to the sediment concentrations obtained from the HHRAP or SERAFM models.

For three compounds, concentrations in surface water were not based on either HHRAP or SERAFM modeling: hydrogen chloride, fluoride, and ammonia. These compounds were modeled differently for consistency with their surface water quality standards. Hydrogen chloride and hydrogen fluoride were modeled by calculating the amounts of each deposited directly on each evaluated water body and entering the water body due to gaseous diffusion from air. The water body concentrations were then converted to total chlorides and total fluorides to compare to the water quality standards. Ammonia was modeled similarly but its water body concentrations were used as a basis for calculating concentrations on un-ionized ammonia based on water temperature and pH for comparison to its water quality standards.

Several marshes and swamps, a rookery and a lake were identified as the primary wildlife habitats following review of local and regional data sources. Based on the ecological communities present in these areas, the following representative species were selected for evaluation in the Palm Beach County ERA (Arcadis/CPF 2010) (Table A-1).

Table A-1. Summary of Receptors and Exposure Pathways Evaluated in Palm Beach County ERA

Receptor Category	Aquatic Life		Birds		Mammal	Plants
Receptor	Aquatic Life		Wood Stork	Snail Kite	River Otter	Plants
Exposure Pathway	Contact with Surface Water	Contact with Sediment	Dietary Intake of Fish	Dietary intake of snails	Dietary intake of fish	Deposition, gas exchange, root uptake
Exposure Locations						
Typical Roadside Canal	x	x	x			
Iron Horse Lake	x	x				
Wetland	x	x	x			
Middle Lake	x	x		x		
Rookery	x	x	x			
M Canal	x	x			x	
Portion of WCA Wetland	x	x	x			
Land in vicinity of facility						x

Risk estimates were developed for each receptor, based on the specific exposure scenario. For example, exposures to aquatic life were evaluated by comparing the calculated concentrations in the water column and sediment of each identified water body to surface water and sediment ecological screening values (ESVs). The ESVs for surface water were the Florida water quality standards (FAC 62-302.530) where available, otherwise they were selected from other relevant sources (USEPA 1999, USEPA 2009a, USEPA 2009b). Sediment ESVs were based on information presented in MacDonald (1994) when available, otherwise information from USEPA (1999) and NOAA (2008) was evaluated.

Similarly, exposures to plants were evaluated based on calculated concentrations in soil which were compared to soil ESVs for plants, derived from USEPA (1999), Efromyson et al (1997), or USEPA Soil Screening Levels (USEPA 2003).

Dietary exposures for the birds and mammals were expressed as dosages (mg/kg body weight per day) consistent with food chain model methods outlined in USEPA (1999). These dosages were compared to ESVs derived from the following sources in order of preference:

- Mercury Report to Congress (USEPA 1997b)
- USEPA (1999)
- CalTox database (CEPA 2002)

- Sample et al (1996)
- Schafer et al. (1983), Schafer and Bowles (1985)

By comparing these exposure concentrations and dosages to the ESVs, an HQ was generated, providing an estimate of potential risk. In this approach, an HQ less than 1 indicates that adverse effects from chemical-specific exposures are unlikely to occur. A HQ greater than 1 does not necessarily mean that adverse ecological effects will occur, given the conservatism built into the assumptions. Rather it means that additional evaluation may be necessary.

The results of the Palm Beach County ERA (Arcadis/CPF 2010) indicated that potential ecological risks associated with the proposed facilities were very low. All estimated HQs were below 1.

3 Potential Locations and Stack Assumptions

Three potential site locations were included in the Miami-Dade County assessment. Human health and ecological risks were estimated for the conceptual 4,000 tpd units assuming air dispersion and deposition modeling for the three potential sites and several potential stack heights at each location. The siting scenarios included in the analysis are listed below:

1. Existing RRF Location
    a. assuming a stack height of 250 feet
    b. assuming a stack height of 310 feet
2. Medley Location
    a. assuming a stack height of 250 feet
    b. assuming a stack height of 310 feet
    c. assuming a stack height of 410 feet
3. Airport West Location
    a. assuming a stack height of 250 feet
    b. assuming a stack height of 310 feet
    c. assuming a stack height of 410 feet

4 Scaling Methodology

Three assumptions were made to calculate preliminary estimates of the risks from the conceptual Miami-Dade WTE facility using the results of the Palm Beach County HHRA and ERA (Arcadis/CPF 2010). First, stack emissions on a ton per day combustion basis are assumed to be roughly equal (i.e., emissions are similar per ton of MSW combusted and air pollution control efficiencies are assumed to be roughly equal). Second, the conceptual Miami-Dade WTE facility is assumed to combust 4,000 tpd versus Palm Beach's throughput of 4,800 tpd. Accordingly, estimated Miami-Dade WTE risks are scaled downward by a factor of 0.83 (4000/4800). Third, it is assumed that human health risk assessment results are roughly proportional to COPC air concentrations for inhalation risks and COPC deposition rates for ingestion risks. Similarly, it is assumed that ecological risks are roughly proportional to COPC deposition rates. HHRAP risk estimates are, in fact, directly proportional to estimated air concentrations and deposition rates, but there are many factors that affect the overall results that can differ from site to site, such as soil type, rainfall, topography, water body depths and flow rates, etc. Given that the Palm Beach facility and the three potential locations for the conceptual Miami-Dade WTE facility, are all in close proximity and have similar land characteristics and water body characteristics, it is reasonable for this screening level risk assessment to assume a rough proportionality between deposition rates and estimated risk results. The risk scaling method was executed using the following steps:

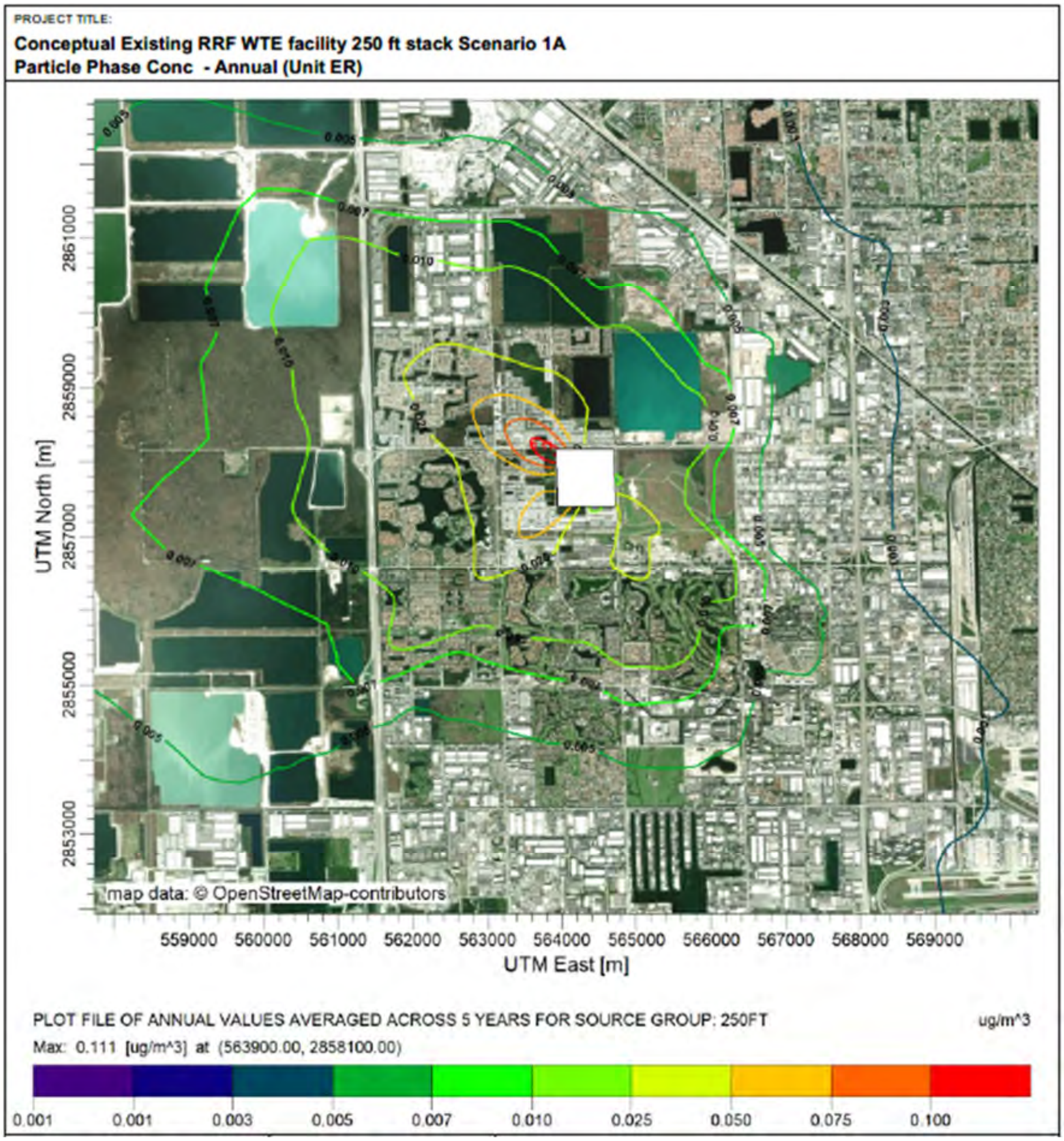
1. Dominant air dispersion and deposition modeling results that are proportional to human health and ecological risks were determined.
2. Air dispersion and deposition modeling was performed for three potential sites in Miami-Dade County and assumed differing stack heights. Miami-Dade WTE unit air concentration (in micrograms per cubic meter per gram per second (ug/m^3 per g/sec)) and unit deposition rate (in gram per square meter per gram per second (g/m^2 per g/sec)) isopleths were created showing modeling results around potential sites. A sample isopleth for the Existing RRF site is shown below for reference and all isopleths for each site are included in Attachment A-1.
3. Isopleths for all three potential Miami-Dade WTE locations were compared with land use maps to identify worst-case locations for human health as noted below:
    - Actual or Potential Residential Locations
    - Actual or Potential Farming Locations
    - Actual or Potential Fishing Locations
4. For ecological risk assessment, the locations of worst-case deposition rates were identified. These worst-case rates were at or very close to the site boundary in all cases.
5. Critical air dispersion and deposition modeling results for specific Miami-Dade locations of interest were estimated from isopleth figures (Attachment A-1).
6. Critical air dispersion and deposition modeling results for specific Palm Beach County locations of interest having reported risk estimates were determined from Palm Beach County report (Arcadis/CPF 2010).
7. Combined Palm Beach County critical air dispersion and deposition modeling results were calculated from results for proposed mass burn combustors and existing (refurbished) RDF combustors.
8. Palm Beach County risk results were determined from the Palm Beach County report (Arcadis/CPF 2010).
9. Miami-Dade WTE risks were estimated by scaling Palm Beach results, in accordance with the following equation:

    Initial Estimated Miami-Dade risk results = Palm Beach risk results x [(Miami-Dade critical air dispersion or deposition results) / (Palm Beach critical air dispersion or deposition results)]
10. A MSW tonnage scalar was applied to initial estimated Miami-Dade WTE results according to the following equation:

    Final Estimated Miami-Dade risk results = (Initial estimated Miami-Dade results) x (4,000 tpd/4,800 tpd)

Each of these steps is discussed further in the respective human health risk methodology and ecological risk methodology sections below.

Figure A-2. Example Isopleth – Existing RRF: Particle Phase Concentration for 250 ft Stack Height



5 Human Health Risk Methodology

For the Palm Beach County HHRA (Arcadis/CPF 2010), annual average unit air concentrations, unit particle phase total deposition rates, unit particle bound total deposition rates, dioxin vapor total deposition rates, and divalent mercury vapor deposition rates were estimated at worst-case residential, farming, and fishing locations. These unit concentrations and unit deposition rates from the Palm Beach County HHRA are summarized in Table A-2.

Table A-2. Deposition Rates Presented in Palm Beach County Risk Assessment

Unitized Air Modeling Results	Units	Proposed Units: Residential Location 1	Proposed Units: Farmer	Proposed Units: Iron Horse Lake	Proposed Units: Iron Horse Lake Watershed	Existing Units: Residential Location 1	Existing Units: Farmer	Existing Units: Iron Horse Lake	Existing Units: Iron Horse Lake Watershed
Deposition Type									
Wet deposition - Particle bound	$(g/m^2\text{-}y) / (g/s)$	1.45E-04	1.04E-05	1.40E-04	1.33E-04	1.03E-04	1.10E-05	9.20E-05	9.30E-05
Wet deposition - Particle phase	$(g/m^2\text{-}y) / (g/s)$	2.08E-03	1.32E-04	2.01E-03	1.92E-03	1.46E-03	1.35E-04	1.30E-03	1.31E-03
Dry deposition - Particle bound	$(g/m^2\text{-}y) / (g/s)$	7.13E-04	1.09E-04	3.31E-04	3.06E-04	4.60E-04	1.32E-04	2.60E-04	2.40E-04
Dry deposition - Particle phase	$(g/m^2\text{-}y) / (g/s)$	6.31E-03	1.01E-03	2.72E-03	2.50E-03	3.95E-03	1.25E-03	2.08E-03	1.90E-03
Air concentration - Particle bound	$(ug/m^3) / (g/s)$	1.80E-02	3.59E-03	9.21E-03	8.59E-03	1.22E-02	4.96E-03	7.51E-03	6.96E-03
Air concentration - Particle phase	$(ug/m^3) / (g/s)$	1.80E-02	3.55E-03	9.19E-03	8.57E-03	1.21E-02	4.91E-03	7.47E-03	6.93E-03
Wet deposition - Vapors	$(g/m^2\text{-}y) / (g/s)$	8.66E-06	2.31E-06	1.11E-05	1.15E-05	7.39E-06	3.23E-06	6.76E-06	8.36E-06
Dry deposition - Vapors	$(g/m^2\text{-}y) / (g/s)$	1.82E-03	6.41E-04	8.12E-04	7.58E-04	1.14E-03	8.61E-04	6.72E-04	6.23E-04
Air concentration - Vapors	$(ug/m^3) / (g/s)$	1.80E-02	3.56E-03	9.20E-03	8.58E-03	1.21E-02	4.92E-03	7.50E-03	6.95E-03
Air concentration - HgII	$(ug/m^3) / (g/s)$	1.79E-02	3.54E-03	9.18E-03	8.56E-03	1.21E-02	4.89E-03	7.47E-03	6.93E-03
Dry deposition - HgII	$(g/m^2\text{-}y) / (g/s)$	5.41E-03	8.78E-04	2.78E-03	2.58E-03	3.63E-03	1.16E-03	2.22E-03	2.05E-03
Wet deposition - HgII	$(g/m^2\text{-}y) / (g/s)$	9.14E-04	1.16E-04	8.73E-04	8.39E-04	6.95E-04	1.28E-04	6.12E-04	6.21E-04
Air concentration - Hg0	$(ug/m^3) / (g/s)$	1.80E-02	3.58E-03	9.21E-03	8.59E-03	1.22E-02	4.95E-03	7.51E-03	6.96E-03
Dry deposition - Hg0	$(g/m^2\text{-}y) / (g/s)$	3.36E-04	3.20E-04	7.10E-05	6.70E-05	1.47E-04	4.30E-04	5.90E-05	5.50E-05
Wet deposition - Hg0	$(g/m^2\text{-}y) / (g/s)$	4.02E-08	1.08E-08	5.15E-08	5.36E-08	3.43E-08	1.51E-08	3.14E-08	3.88E-08

Notes:
HgII = divalent mercury
Hg0 = elemental mercury
$(g/m^2\text{-}y) / (g/s)$ = grams per square meter per year per gram per second
$(ug/m^3) / (g/s)$ = microgram per cubic meter per gram per second

Because deposition rates and air concentrations are presented in the Palm Beach County Report for the proposed units and existing (refurbished) units separately, but the HHRA risk estimates are for the combined proposed and existing (refurbished) units, an assumption was made in combining deposition rates for the proposed and existing (refurbished) units. Because the deposition rates are unitized, in grams per second of emissions, a simple addition of the deposition for the proposed and existing (refurbished) units would assume that the emissions for each are equal. However, the units are emitting COPCs at different rates. Therefore, emission rates are assumed to be proportional to tonnage throughput. The throughputs for the proposed units are 3,000 tpd and for the existing (refurbished) units are 1,800 tpd. Therefore, the unitized deposition for the existing (refurbished) units are assumed to be 60% (1,800/3,000) that of the unitized proposed units. The combined deposition rate is therefore:

Total deposition on the receptor location = proposed units' deposition + [(0.6) * existing units' deposition]

The combined deposition rates for receptor locations are presented in Table A-3.

Table A-3. Combined Palm Beach County Deposition Rates

Unitized Air Modeling Results	Units	Combined Proposed & Existing Units			
		Residential Location 1	Farmer	Iron Horse Lake	Iron Horse Lake Watershed
Deposition Type					
Wet deposition - Particle bound	$(g/m^2\text{-}y) / (g/s)$	2.07E-04	1.70E-05	1.95E-04	1.89E-04
Wet deposition - Particle phase	$(g/m^2\text{-}y) / (g/s)$	2.96E-03	2.13E-04	2.79E-03	2.71E-03
Dry deposition - Particle bound	$(g/m^2\text{-}y) / (g/s)$	9.89E-04	1.88E-04	4.87E-04	4.50E-04
Dry deposition - Particle phase	$(g/m^2\text{-}y) / (g/s)$	8.68E-03	1.76E-03	3.97E-03	3.64E-03
Air concentration - Particle bound	$(ug/m^3) / (g/s)$	2.53E-02	6.57E-03	1.37E-02	1.28E-02
Air concentration - Particle phase	$(ug/m^3) / (g/s)$	2.53E-02	6.50E-03	1.37E-02	1.27E-02
Wet deposition - Vapors	$(g/m^2\text{-}y) / (g/s)$	1.31E-05	4.25E-06	1.52E-05	1.65E-05
Dry deposition - Vapors	$(g/m^2\text{-}y) / (g/s)$	2.50E-03	1.16E-03	1.22E-03	1.13E-03
Air concentration - Vapors	$(ug/m^3) / (g/s)$	2.53E-02	6.51E-03	1.37E-02	1.28E-02
Air concentration - HgII	$(ug/m^3) / (g/s)$	2.52E-02	6.47E-03	1.37E-02	1.27E-02
Dry deposition - HgII	$(g/m^2\text{-}y) / (g/s)$	7.59E-03	1.57E-03	4.11E-03	3.81E-03
Wet deposition - HgII	$(g/m^2\text{-}y) / (g/s)$	1.33E-03	1.93E-04	1.24E-03	1.21E-03
Air concentration - Hg0	$(ug/m^3) / (g/s)$	2.53E-02	6.55E-03	1.37E-02	1.28E-02
Dry deposition - Hg0	$(g/m^2\text{-}y) / (g/s)$	4.24E-04	5.78E-04	1.06E-04	1.00E-04
Wet deposition - Hg0	$(g/m^2\text{-}y) / (g/s)$	6.08E-08	1.99E-08	7.03E-08	7.69E-08

Notes:
The combined rate assumes that emissions from the existing units is 60% that of the proposed units.
Combined = Proposed Deposition Rate + 60% * Existing Deposition Rate
HgII = divalent mercury
Hg0 = elemental mercury
$(g/m^2\text{-}y) / (g/s)$ = grams per square meter per year per gram per second
$(ug/m^3) / (g/s)$ = microgram per cubic meter per gram per second

5.1 Palm Beach Risk Results

Palm Beach County chronic and carcinogenic human health risk results are found in Appendix H of the Palm Beach County report (Arcadis/CPF 2010). The Palm Beach County HHRA risk results are summarized in Table A-4. Because the COPCs which dominated the risk results were different for air inhalation and ingestion pathways, the pathway totals are also presented in Table A-4.

Table A-4. Summary of Palm Beach County HHRA Results

Receptor	Pathway	Cancer Risks	Noncancer Risks
Resident 1 Child	air inhalation	1.93E-08	9.06E-03
	above ground vegetables	1.49E-08	4.39E-04
	soil	2.70E-09	1.07E-04
	total ingestion	1.76E-08	5.46E-04
Resident 1 Adult	air inhalation	9.63E-08	9.06E-03
	above ground vegetables	3.10E-08	1.84E-04
	soil	1.45E-09	1.15E-05
	total ingestion	3.25E-08	1.96E-04
Farmer Child	air inhalation	5.06E-09	2.30E-03
	above ground vegetables	4.51E-09	1.26E-04
	beef	1.28E-08	1.50E-05
	chicken	1.38E-11	3.19E-07
	eggs	9.50E-12	3.83E-07
	pork	8.88E-10	1.46E-08
	soil	8.62E-10	1.87E-05
	total ingestion	1.91E-08	1.60E-04
Farmer Adult	air inhalation	3.37E-08	2.30E-03
	above ground vegetables	1.26E-08	5.30E-05
	beef	1.40E-07	2.44E-05
	chicken	1.52E-10	4.68E-07
	eggs	9.84E-11	5.32E-07
	pork	8.13E-09	1.91E-08
	soil	6.89E-10	2.01E-06
	total ingestion	1.62E-07	8.04E-05
Fisher 1 Child	fish	1.25E-07	9.25E-04
Fisher 1 Adult	fish	8.85E-07	1.32E-03

5.2 Dominant Exposure Pathways

The Palm Beach County HHRA (Arcadis/CPF 2010) did not present risk results for each COPC separately. Therefore, COPCs that dominated the total risks and certain exposure pathways were the focus of the scaling exercise. The COPC risk drivers for each receptor and pathway are presented in Table A-5 below.

Table A-5. Critical Modeling Results		
Human Health	**Risk Drivers**	**Critical Modeling Result**
Inhalation C & NC*	As, Be, Cd	Particle phase unit air concentration
Residential Ingestion C & NC*	As, Be, Cd	Particle phase unit total deposition rate
Farmer Ingestion C*	Dioxins/furans	Particle bound unit total deposition rate + dioxin vapor unit total deposition rate
Farmer Ingestion NC*	As, Be, Cd	Particle phase unit total deposition rate
Fisher Ingestion C*	Dioxins/furans	Particle bound unit total deposition rate + dioxin vapor total unit deposition rate
Fisher Ingestion NC*	Hg	Particle bound unit total deposition rate + divalent mercury (Hg++) vapor total unit deposition rate

Notes :
* C= Cancer risk (ELCR); NC = non-cancer risk (Hazard Index)
As = arsenic
Be = beryllium
Cd = cadmium

5.3 Air Dispersion and Deposition Modeling

Based on the dominant exposure pathways presented above, the following air dispersion and depositional modeling was performed, and isopleth figures (Attachment A-1) were created to show results at different locations around the subject sites. All results were annual average values based on five years of hour-by-hour meteorological data (2017-2021) provided by the FDEP.

- Particle phase unit air concentration (metals)
- Particle phase unit total deposition rate (metals except Hg)
- Particle bound unit total deposition rate (dioxins/furans & Hg++ as mercuric chloride ($HgCl_2$))
- Dioxin/furan vapor unit total deposition rate
- Hg++ vapor unit total deposition rate

In addition, for the acute inhalation risk assessment, the maximum 1-hour vapor unit concentration was modeled to allow risk assessment scaling of acute risks for ammonia and acid gases. Sulfuric acid was the risk driver for the Palm Beach County acute risk assessment (Arcadis/CPF 2010).

Isopleths for the three potential locations for the conceptual Miami-Dade WTE are presented in Attachment 1.

5.4 Worst-Case Locations for Human Health Receptors

For this preliminary risk assessment, worst case locations where potential facility impacts are highest were selected to ensure that risk estimates were overly protective. If a more formal comprehensive risk assessment were to be performed in the future, more realistic locations would be chosen to assess risks posed by ingesting home-grown produce and home-raised beef, as well as locations that could support routine fish consumption.

The human health receptor locations for the potential Existing RRF, Medley, and Airport West locations are shown on Figures A-3, A-4, and A-5, respectively. The distance from the conceptual stack at the proposed facilities to the residential receptors are estimated at 0.41 miles for the Existing RRF location, 0.95 miles for the Medley location, and 0.57 miles for the Airport West location.

Figure A-3. Existing RRF Human Receptor Locations

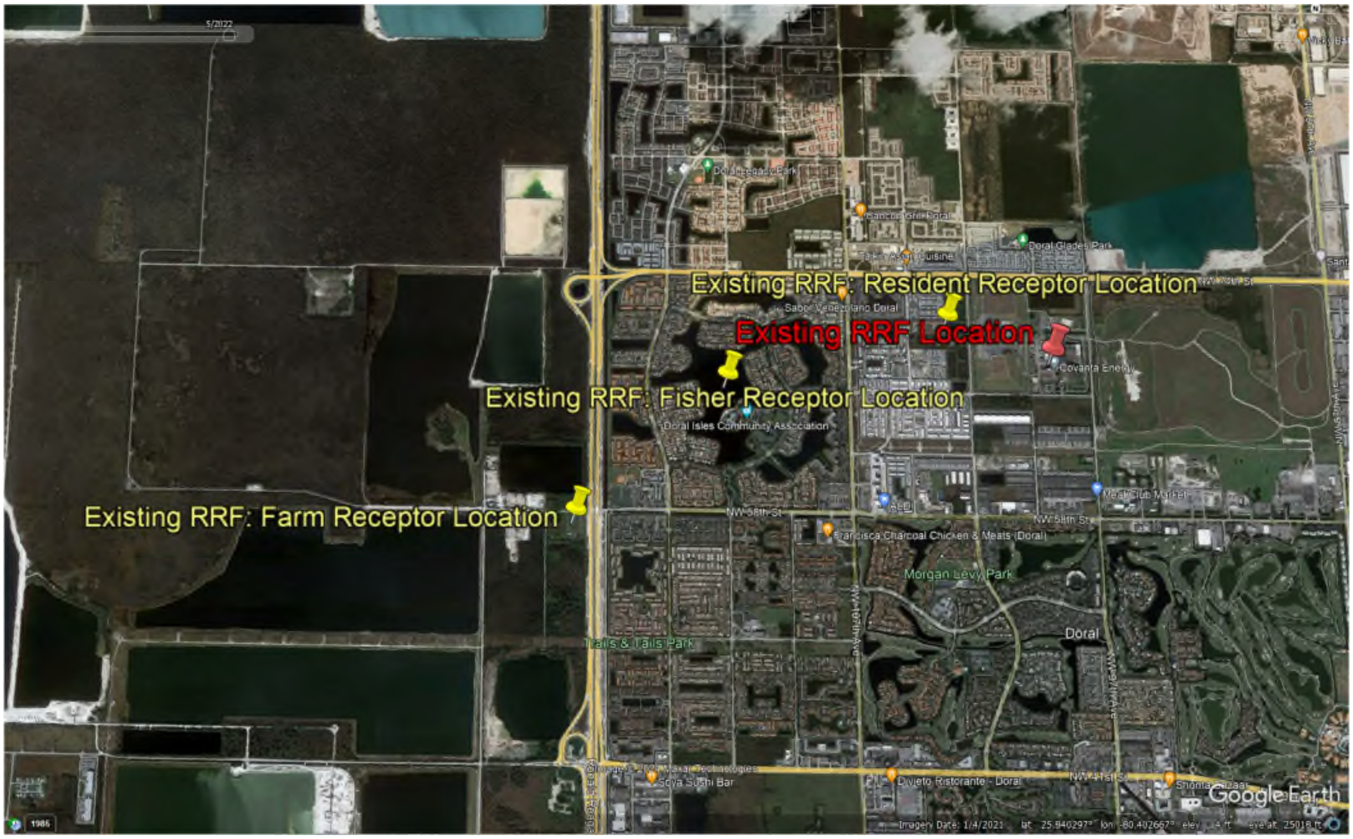


Figure A-4. Medley Human Receptor Locations

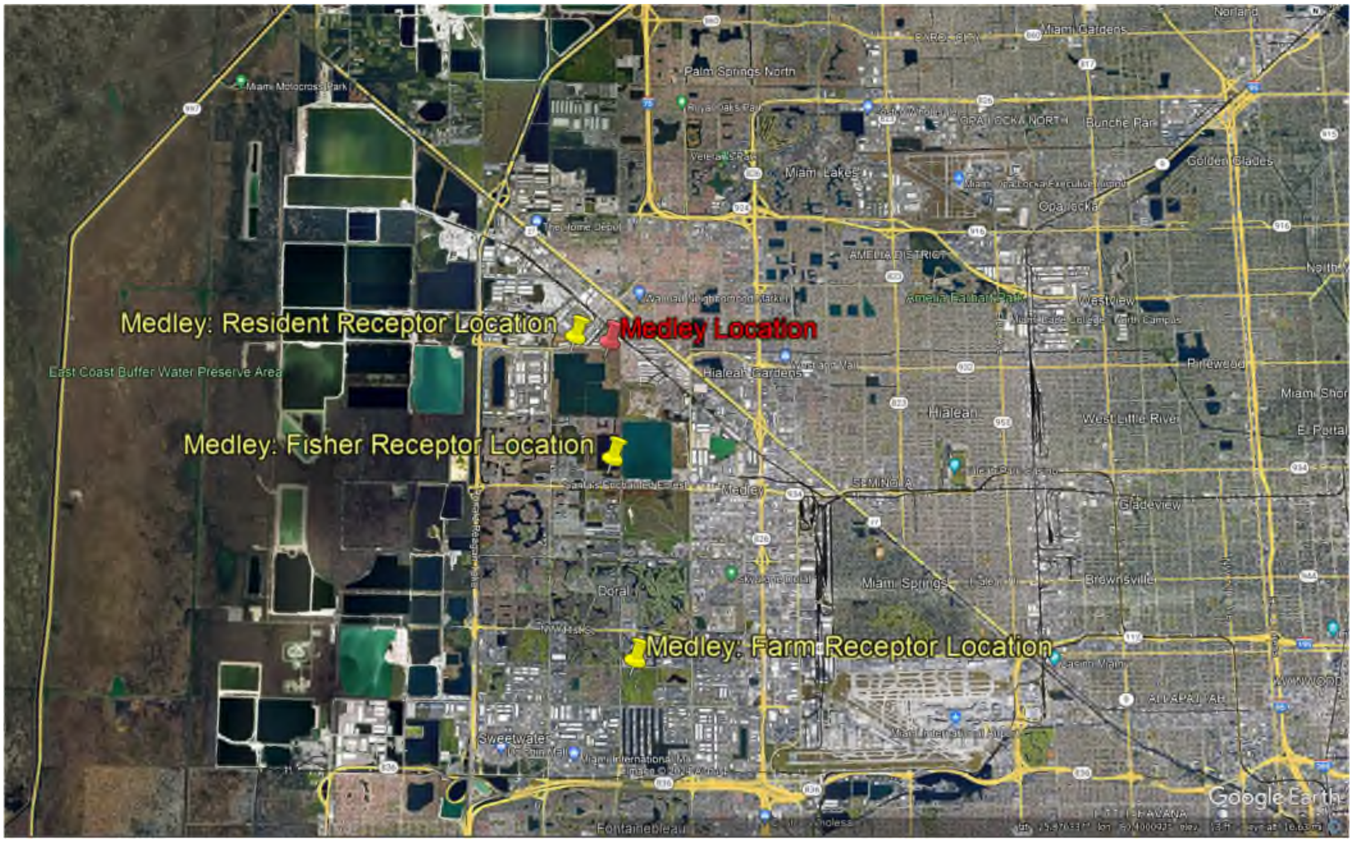
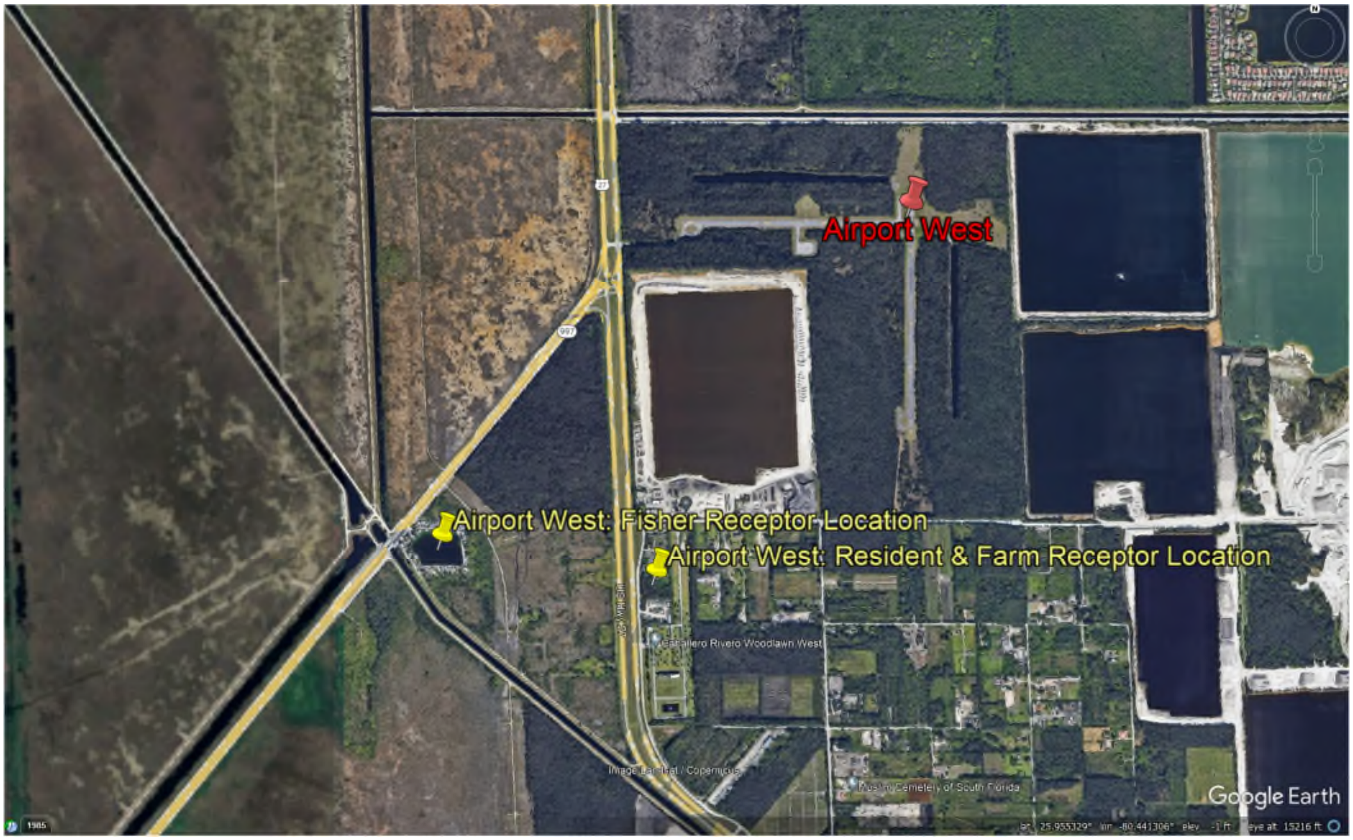


Figure A-5. Airport West Human Receptor Locations



5.5 Air Dispersion and Deposition Modeling Results

The air dispersion and deposition modeling results for the Existing RRF, Medley, and Airport West receptor locations are summarized in Tables A-6, A-7, and A-8, respectively.

Table A-6. Estimated Deposition Rates for Proposed Existing RRF Location

Location		Resident Location	Farmer Location	Fisher Location	Resident Location	Farmer Location	Fisher Location
Unitized Air Modeling Results	**Units**	**250-foot stack height**			**310-foot stack height**		
Deposition Type							
Air concentration - Particle phase	(ug/m^3) / (g/s)	1.00E-01	1.00E-02	not relevant	5.00E-02	6.25E-03	not relevant
Wet+Dry deposition - Particle bound	(g/m^2-y) / (g/s)	3.23E-03	5.00E-04	1.00E-03	1.52E-03	5.00E-04	1.00E-03
Wet+Dry deposition - Particle phase	(g/m^2-y) / (g/s)	2.50E-02	5.00E-03	1.00E-02	1.80E-02	3.75E-03	8.75E-03
Wet+Dry deposition - Vapors	(g/m^2-y) / (g/s)	1.00E-02	7.50E-05	1.00E-02	2.50E-03	5.00E-05	2.50E-03
Wet+Dry deposition - HgII	(g/m^2-y) / (g/s)	2.50E-02	3.75E-03	1.00E-02	1.00E-02	3.75E-03	5.00E-03

Notes:
HgII = divalent mercury
(g/m^2-y) / (g/s) = grams per square meter per year per gram per second
(ug/m^3) / (g/s) = microgram per cubic meter per gram per second

Table A-7. Estimated Deposition Rates for Proposed Medley Location

Location		Resident Location	Farmer Location	Fisher Location	Resident Location	Farmer Location	Fisher Location
Unitized Air Modeling Results	**Units**	**250-foot stack height**			**310-foot stack height**		
Deposition Type							
Air concentration - Particle phase	(ug/m^3) / (g/s)	4.00E-02	6.25E-03	not relevant	3.00E-02	6.25E-03	not relevant
Wet+Dry deposition - Particle bound	(g/m^2-y) / (g/s)	1.50E-03	1.00E-04	2.25E-04	1.25E-03	1.00E-04	2.25E-04
Wet+Dry deposition - Particle phase	(g/m^2-y) / (g/s)	2.00E-02	6.25E-04	2.00E-03	1.00E-02	6.25E-04	2.00E-03
Wet+Dry deposition - Vapors	(g/m^2-y) / (g/s)	2.00E-04	2.50E-03	1.75E-03	2.00E-04	2.50E-03	1.00E-03
Wet+Dry deposition - HgII	(g/m^2-y) / (g/s)	1.10E-02	2.25E-03	2.75E-03	8.75E-03	2.25E-03	2.75E-03

Notes:
HgII = divalent mercury
(g/m^2-y) / (g/s) = grams per square meter per year per gram per second
(ug/m^3) / (g/s) = microgram per cubic meter per gram per second

Table A-8. Estimated Deposition Rates for Proposed Airport West Location							
	Location	Resident Location	Farmer Location	Fisher Location	Resident Location	Farmer Location	Fisher Location
Unitized Air Modeling Results	**Units**	**250-foot stack height**			**310-foot stack height**		
Deposition Type							
Air concentration - Particle phase	(ug/m^3) / (g/s)	2.50E-02	2.50E-02	not relevant	1.80E-02	1.00E-02	not relevant
Wet+Dry deposition - Particle bound	$(g/m^2$-y) / (g/s)	1.50E-03	1.50E-03	1.00E-03	1.25E-03	1.25E-03	1.00E-03
Wet+Dry deposition - Particle phase	$(g/m^2$-y) / (g/s)	1.50E-02	1.50E-02	1.25E-02	1.25E-02	1.25E-02	1.00E-02
Wet+Dry deposition - Vapors	$(g/m^2$-y) / (g/s)	6.20E-03	6.20E-03	4.50E-03	4.00E-03	1.50E-03	3.50E-03
Wet+Dry deposition - HgII	$(g/m^2$-y) / (g/s)	1.00E-02	1.00E-02	7.00E-03	7.50E-03	7.50E-03	6.00E-03

Notes:
HgII = divalent mercury
$(g/m^2$-y) / (g/s) = grams per square meter per year per gram per second
(ug/m^3) / (g/s) = microgram per cubic meter per gram per second

5.6 Estimated Miami-Dade Risks

The Miami-Dade risks were estimated by scaling Palm Beach risk results in accordance with the following equation:

> Initial Estimated Miami-Dade risk results = Palm Beach risk results x [(Miami-Dade critical air dispersion or deposition results) / (Palm Beach critical air dispersion or deposition results)]

A MSW tonnage scalar was applied to Initial Estimated Miami-Dade results according to the following equation:

> Final Estimated Miami-Dade risk results = (Initial estimated Miami-Dade results) x (4,000 tpd/4,800 tpd).

The estimated receptor-specific and pathway-specific HHRA risks for the potential Existing RRF, Medley, and Airport West locations are presented in Tables A-9 through A-11.

Table A-9. Summary of Proposed Existing RRF Location HHRA Results

Receptor	Pathway	Estimated Cancer Risks	Estimated Noncancer Risks	Estimated Cancer Risks	Estimated Noncancer Risks
		250-Foot Stack Height		310-Foot Stack Height	
Resident Child	air inhalation	6.37E-08	2.99E-02	3.18E-08	1.49E-02
	total ingestion	3.15E-08	9.78E-04	2.27E-08	7.04E-04
	Total	9.52E-08	3.09E-02	5.45E-08	1.56E-02
Resident Adult	air inhalation	3.18E-07	2.99E-02	1.59E-07	1.49E-02
	total ingestion	5.81E-08	3.50E-04	4.18E-08	2.52E-04
	Total	3.76E-07	3.02E-02	2.01E-07	1.52E-02
Farmer Child	air inhalation	6.49E-09	2.95E-03	4.06E-09	1.84E-03
	total ingestion	5.11E-09	7.27E-05	4.89E-09	5.45E-05
	Total	1.16E-08	3.02E-03	8.94E-09	1.90E-03
Farmer Adult	air inhalation	4.32E-08	2.95E-03	2.70E-08	1.84E-03
	total ingestion	5.67E-08	1.70E-04	5.42E-08	1.27E-04
	Total	9.99E-08	3.12E-03	8.12E-08	1.97E-03
Fisher Child	fish ingestion	5.99E-07	1.41E-03	1.91E-07	7.66E-04
Fisher Adult	fish ingestion	4.24E-06	2.01E-03	1.35E-06	1.09E-03

Table A-10. Summary of Proposed Medley Location HHRA Results

Receptor	Pathway	Estimated Cancer Risks	Estimated Noncancer Risks	Estimated Cancer Risks	Estimated Noncancer Risks	Estimated Cancer Risks	Estimated Noncancer Risks
		250-Foot Stack Height		310-Foot Stack Height		410-Foot Stack Height	
Resident Child	air inhalation	2.55E-08	1.20E-02	1.91E-08	8.97E-03	1.27E-08	5.98E-03
	total ingestion	2.52E-08	7.82E-04	1.26E-08	3.91E-04	1.10E-08	3.42E-04
	Total	5.07E-08	1.27E-02	3.17E-08	9.36E-03	2.38E-08	6.32E-03
Resident Adult	air inhalation	1.27E-07	1.20E-02	9.53E-08	8.97E-03	6.35E-08	5.98E-03
	total ingestion	4.65E-08	2.80E-04	2.32E-08	1.40E-04	2.03E-08	1.23E-04
	Total	1.74E-07	1.22E-02	1.19E-07	9.11E-03	8.39E-08	6.10E-03
Farmer Child	air inhalation	4.06E-09	1.84E-03	4.06E-09	1.84E-03	3.65E-09	1.66E-03
	total ingestion	2.31E-08	9.09E-06	2.31E-08	9.09E-06	1.98E-08	9.09E-06
	Total	2.72E-08	1.85E-03	2.72E-08	1.85E-03	2.34E-08	1.67E-03
Farmer Adult	air inhalation	2.70E-08	1.84E-03	2.70E-08	1.84E-03	2.43E-08	1.66E-03
	total ingestion	2.56E-07	2.12E-05	2.56E-07	2.12E-05	2.19E-07	2.12E-05
	Total	2.83E-07	1.87E-03	2.83E-07	1.87E-03	2.44E-07	1.68E-03
Fisher Child	fish ingestion	1.08E-07	3.80E-04	6.67E-08	3.80E-04	6.54E-08	3.45E-04
Fisher Adult	fish ingestion	7.62E-07	5.42E-04	4.72E-07	5.42E-04	4.63E-07	4.92E-04

Table A-11. Summary of Proposed Airport West Location HHRA Results							
		Estimated Cancer Risks	Estimated Noncancer Risks	Estimated Cancer Risks	Estimated Noncancer Risks	Estimated Cancer Risks	Estimated Noncancer Risks
Receptor	Pathway	250-Foot Stack Height		310-Foot Stack Height		410-Foot Stack Height	
Resident Child	air inhalation	1.59E-08	7.47E-03	1.15E-08	5.38E-03	8.91E-09	4.18E-03
	total ingestion	1.89E-08	5.87E-04	1.58E-08	4.89E-04	1.10E-08	3.42E-04
	Total	3.48E-08	8.06E-03	2.72E-08	5.87E-03	1.99E-08	4.53E-03
Resident Adult	air inhalation	7.94E-08	7.47E-03	5.72E-08	5.38E-03	4.45E-08	4.18E-03
	total ingestion	3.49E-08	2.10E-04	2.90E-08	1.75E-04	2.03E-08	1.23E-04
	Total	1.14E-07	7.68E-03	8.62E-08	5.56E-03	6.48E-08	4.31E-03
Farmer Child	air inhalation	1.62E-08	7.38E-03	6.49E-09	2.95E-03	4.87E-09	2.21E-03
	total ingestion	6.84E-08	2.18E-04	2.44E-08	1.82E-04	2.22E-08	1.09E-04
	Total	8.46E-08	7.59E-03	3.09E-08	3.13E-03	2.71E-08	2.32E-03
Farmer Adult	air inhalation	1.08E-07	7.38E-03	4.32E-08	2.95E-03	3.24E-08	2.21E-03
	total ingestion	7.59E-07	5.10E-04	2.71E-07	4.25E-04	2.46E-07	2.55E-04
	Total	8.67E-07	7.89E-03	3.14E-07	3.38E-03	2.79E-07	2.47E-03
Fisher Child	fish ingestion	3.00E-07	1.02E-03	2.45E-07	8.94E-04	2.16E-07	8.14E-04
Fisher Adult	fish ingestion	2.12E-06	1.46E-03	1.74E-06	1.28E-03	1.53E-06	1.16E-03

5.7 Breast Milk Evaluation

The Palm Beach risk assessment (Arcadis/CPF 2010) also assessed the potential uptake of dioxins and furans into nursing mothers and potential transfer to babies via breast milk ingestion. The HHRAP target exposure level is 60 picograms (pg) of 2,3,7,8-TCDD Toxic Equivalents per kg body weight per day. On page 67 of the Palm Beach risk assessment report, it was reported that the estimated breast milk ingestion rate of 2,3,7,8-TCDD Toxic Equivalents was 0.003 to 0.4 picograms per kilogram per day (pg/kg-day), which was more than 150 times less than the regulatory criterion. That resulted in an HI of 0.007 for the worst-case exposure route.

For the Miami-Dade WTE, the scaled HI values ranged from 0.01 to 0.03 for the Airport West site, 0.002 to 0.03 for the Existing RRF, and 0.003 to 0.01 for the Medley site. The worst-case HI was 0.03 for Airport West, 0.03 for the Existing RRF site, and 0.01 for the Medley site. All are less than the regulatory level of concern of 1.

6 Estimated Ecological Risk Methodology

6.1 Identifying Miami-Dade Receptors and Exposure Pathways

To ensure that comparison to the Palm Beach County assessment (Arcadis/CPF 2010) would provide appropriate results for evaluating the proposed facilities, an evaluation of the potentially impacted resources was conducted in addition to previous siting surveys (Arcadis 2022, 2023). In the absence of site-specific habitat field surveys, desk top evaluations were conducted to identify sensitive habitat features and threatened and endangered species habitat in the vicinity of the proposed locations using online databases including: the Florida Natural Areas Inventory (FNAI), the Terrestrial Resource Geographic Information System (TRGIS), the National Wetland

Inventory (NWI), and the United States Fish and Wildlife (USFWS) Information for Planning and Consultation (IPaC). The habitat layers and species recorded in these resources confirmed that the receptor species and exposure pathways evaluated in the Palm Beach County assessment were appropriate and applicable to the locations of the proposed facilities.

6.2 Identifying Risk Drivers and Baseline Deposition Rates

The Palm Beach County ERA (Arcadis/CPF 2010) was reviewed to identify the risk drivers, both chemical and location, by identifying the highest HQ for each of the receptors. In instances where there was not one obvious risk driver, the two highest HQs were selected (Table A-12). For most receptors, mercury and/or dioxin were the risk drivers, however ammonia was also a risk driver for the aquatic exposures to aquatic life. For dioxin, the unit deposition rates (g/m^2 per g/sec) were calculated as the sum of the maximum 5-yr Total Vapor Phase Unit Deposition and Total Particle Bound Unit Deposition. Mercury was estimated as the sum of the maximum 5-yr Total Divalent Phase Unit Deposition and Total Elemental Phase Unit Deposition. Ammonia was only identified as a risk driver in one water body (Middle Lake) and was assumed to be equal to the Total Vapor Phase Unit Deposition. For all waterbodies identified as having a watershed, the unit deposition rates for the waterbody and watershed were summed. Finally, as described for the HHRA, the unitized deposition for the existing (refurbished) units are assumed to be 60% (1,800/3,000) that of the unitized proposed units. The combined deposition rate is therefore:

Total deposition on the receptor location = proposed units' deposition + [(0.6) * existing units' deposition]

The combined deposition rates for receptor locations are presented in Table A-12.

Table A-12. Summary of Ecological Risk Drivers and Associated Maximum Unit Deposition Rates for Palm Beach Risk Assessment

Receptor	Risk Driver	Exposure Area	Palm Beach Hazard Quotient[a]	Total Proposed Dioxin Unit Deposition[b] (g/m^2 per g/sec)	Total Proposed Mercury Unit Deposition[c] (g/m^2 per g/sec)	Total Refurbished Dioxin Unit Deposition[b] (g/m^2 per g/sec)	Total Refurbished Mercury Unit Deposition[c] (g/m^2 per g/sec)	Maximum 5-year Average Unit Deposition Rates[d]		
								Ammonia (g/m^2 per g/sec)	Dioxin (g/m^2 per g/sec)	Mercury (g/m^2 per g/sec)
Aquatic	Ammonia	Middle Lake	0.06	--	--	--	--	0.00273[e]	--	--
	Mercury	Portion of WCA Wetland[f]	0.01	--	6.81E-03	--	1.12E-02	--	--	1.35E-02
Sediment	Mercury	Typical Roadside Canal	0.40	--	3.59E-03	--	5.31E-03	--	--	6.78E-03
	Dioxin	Portion of WCA Wetland[f]	0.001	4.24E-03	--	7.17E-03	--	--	8.54E-03	--
Wood Stork	Mercury	Typical Roadside Canal	0.001	--	3.59E-03	--	5.31E-03	--	--	6.78E-03
	Dioxin	Small Wetland[f]	0.001	4.24E-03	--	7.17E-03	--	--	8.54E-03	--
Snail Kite	Dioxin	Middle Lake	0.07	3.55E-03	--	4.20E-03	--	--	6.07E-03	--
River Otter	Dioxin	M Canal	0.00004	2.14E-03	--	3.36E-03	--	--	4.15E-03	--
Plants	Mercury	Maximum[g]	0.01	--	0.004	--	0.004	--	--	6.40E-03

Notes:

a. Hazard quotient presented is the maximum hazard quotient reported for the indicated receptor group (Arcadis/CPF 2010).
b. Dioxin Unit Deposition calculated as the sum of Total Vapor Phase Unit Deposition and Total Particle Bound Unit Deposition as presented for the indicated waterbody in Appendix G
(Arcadis/CPF 2010). For waterbodies with a watershed, the Unit Deposition rates for the waterbody and watershed were summed.
c. Mercury Unit Deposition calculated as the sum of Total Divalent Phase Unit Deposition and Total Elemental Phase Unit Deposition as presented for the indicated waterbody in Appendix G
(Arcadis/CPF 2010). For waterbodies with a watershed, the Unit Deposition rates for the waterbody and watershed were summed.
d. Assumed Unit Deposition rates for dioxin and mercury were defined as the Total Proposed + 0.6 x Total Refurbished.
e. The total Unit Deposition for ammonia was defined as the Total Vapor Phase Unit Deposition (both facilities combined) for Middle Lake as presented in Appendix I (Arcadis/CPF 2010).
f. The AERMOD data presented in Appendix G (Arcadis/CPF 2010) for Waterbody #7 (Localized Area of Grassy Waters Wetland) was used to represent this area.
g. It was assumed that plants could be exposed at any location, therefore risks were calculated based on the maximum estimated Unit Deposition rates for divalent mercury presented in Appendix D of Arcadis/CPF 2010.

6.3 Miami-Dade Exposure Estimates

As previously described, the Palm Beach County ERA was based on soil, sediment, water, and fish concentrations calculated from the unit deposition rates using the USEPA's HHRAP model. Those calculations require site-specific information that was not available for the habitat areas identified in the vicinity of the proposed facility at Airport West, Medley, or the Existing RRF. Therefore, in the absence of site-specific information, it was conservatively assumed that ecological receptors would be exposed to the maximum modeled 5-yr average annual unit deposition rates for each potential site location. This approach overestimates the potential exposures because there are unlikely to be appropriate habitat areas that close to the proposed facilities. A summary of the assumed deposition rates for each risk driver for each potential stack height at each of the potential locations is provided in Table A-13.

Table A-13. Maximum Estimated Unit Deposition Rates for Conceptual Miami-Dade WTE

Stack Height (ft)	Modeled Maximum 5-yr Average Annual Unit Deposition Rates (g/m^2 per g/sec)					
	Total Vapor Phase Deposition	Total Particle Bound Deposition	Total Divalent Mercury Vapor Phase Deposition	Maximum Dioxin Deposition[a]	Maximum Mercury Deposition[b]	Maximum Ammonia Deposition[c]
Airport						
250	1.20E-02	3.50E-03	1.80E-02	1.55E-02	2.15E-02	1.20E-02
310	5.70E-03	3.30E-03	1.70E-02	9.00E-03	2.03E-02	5.70E-03
410	4.00E-03	3.20E-03	1.60E-02	7.20E-03	1.92E-02	4.00E-03
Medley						
250	5.50E-03	3.80E-03	1.90E-02	9.30E-03	2.28E-02	5.50E-03
310	4.60E-03	4.70E-03	2.30E-02	9.30E-03	2.77E-02	4.60E-03
410	4.10E-03	5.60E-03	2.80E-02	9.70E-03	3.36E-02	4.10E-03
Existing RRF						
250	1.30E-02	4.00E-03	2.70E-02	1.70E-02	3.10E-02	1.30E-02
310	4.10E-03	2.03E-03	1.30E-02	6.13E-03	1.50E-02	4.10E-03

Notes:
a. Total dioxin unit deposition calculated as the sum of the Total Vapor Phase Deposition and Total Particle Bound Deposition.
b. Total mercury unit deposition calculated as the sum of the Total Divalent Mercury Vapor Phase Deposition and Total Particle Bound Deposition.
c. Total ammonia unit deposition assumed to be equivalent to the Total Vapor Phase Deposition.

6.4 Risk Characterization

To calculate risks for the conceptual Miami-Dade WTE facility, the maximum deposition rates for mercury, dioxin and ammonia estimated for each potential location were compared to the deposition rates associated with the highest HQs presented in the Palm Beach County ERA (Arcadis/CPF 2010). As noted above, for the purpose of this qualitative assessment, it was assumed that there is a linear relationship between HQ and deposition rate such that HQs can be estimated for Miami-Dade WTE by scaling the HQ for Palm Beach County by the relative difference in the deposition rates. In addition, the conceptual Miami-Dade WTE facility is assumed to combust 4,000 tpd versus Palm Beach's throughput of 4,800 tpd. Accordingly, estimated Miami-Dade risks are scaled downward by a factor of 0.83 (4000/4800). Therefore, the assumed HQ for the Miami-Dade locations were calculated as:

Predicted HQ = 0.83 x (Palm Beach HQ) x (Miami-Dade Rate/Palm Beach Deposition Rate)

As indicated in Table A-14, all risk estimates were associated with HQs well below 1 except for sediment exposures to mercury. For that receptor, HQs were just above 1, ranging from 1.05 for the worst case location for Airport West to 1.64 for the worst case location at Medley. Given the conservative nature of this assessment, HQs this low are not likely to be associated with significant risk. Estimated HQs based on sediment mercury concentrations in other waterbodies are all well below 1.

Generally, the HQs associated with the Medley location tended to be the lowest, with the exception of mercury in sediment, which was lowest at the Airport West location. Regardless, all of the HQs are so low that the differences between the potential locations are not meaningful from a comparative risk standpoint.

Table A-14. Scaling of Predicted Ecological Hazard Quotients Based on Modeled Unit Deposition Rates

Receptor	Risk Driver	Exposure Area	Palm Beach Hazard Quotient[a]	Maximum 5-Yr Unit Deposition Rates[b] (g/m² per g/sec)	Maximum of the Modeled 5-yr Average Annual Unit Deposition Rates[c] (g/m² per g/sec)			Predicted Hazard Quotient[d]		
				West Palm	Airport West	Medley	Existing RRF	Airport West	Medley	Existing RRF
Aquatic	Ammonia	Middle Lake	0.06	2.73E-03	1.20E-02	5.50E-03	1.30E-02	0.2	0.1	0.2
	Mercury	Portion of WCA Wetland[e]	0.01	1.35E-02	2.15E-02	3.36E-02	3.10E-02	0.03	0.01	0.05
Sediment	Mercury	Typical Roadside Canal	0.40	6.78E-03	2.15E-02	3.36E-02	3.10E-02	**1.05**	**1.64**	**1.52**
	Dioxin	Portion of WCA Wetland	0.001	8.54E-03	1.55E-02	9.70E-03	1.70E-02	0.001	0.0007	0.001
Wood Stork	Mercury	Typical Roadside Canal	0.001	6.78E-03	2.15E-02	3.36E-02	3.10E-02	0.001	0.002	0.002
	Dioxin	Small Wetland[e]	0.001	8.54E-03	1.55E-02	9.70E-03	1.70E-02	0.002	0.0009	0.002
Snail Kite	Dioxin	Middle Lake	0.07	6.07E-03	1.55E-02	9.70E-03	1.70E-02	0.1	0.09	0.2
River Otter	Dioxin	Middle Canal	0.00004	4.15E-03	1.55E-02	9.70E-03	1.70E-02	0.0001	0.00008	0.0001
Plants	Mercury	Maximum[f]	0.01	6.40E-03	2.15E-02	3.36E-02	3.10E-02	0.03	0.04	0.04

Notes:

a. Hazard quotient presented is the maximum hazard quotient reported for the indicated receptor group (Arcadis/CPF 2010).

b. Maximum 5-yr deposition rates calculated for the risk drivers as described in Table 1.

c. Maximum of the Modeled 5-yr Average Annual Deposition Rates as described in Table 2.

d. Predicted HQ = 0.83 x (Palm Beach HQ X Miami-Dade Rate/Palm Beach Deposition Rate). Adjusted Hazard Quotient calculated assuming a linear relationship between HQ and deposition rate. In addition, it was assumed that the facilities at Airport West, Medley and Existing RRF would only be 83% as productive.

e. The AERMOD data presented in Appendix G (Arcadis/CPF 2010) for Waterbody #7 (Localized Area of Grassy Waters Wetland) was used to represent this area.

f. It was assumed that plants could be exposed at any location, therefore risks were calculated based on the maximum estimated deposition rates for divalent mercury presented in Appendix D of Arcadis/CPF 2010.

7 Drinking Water Assessment

In addition to the assessment presented above, some concerns have been raised that emissions from the conceptual Miami-Dade WTE facility might adversely affect the groundwater that serves as a drinking water supply. The concern is that emissions might affect the surface water quality in the C-9 Canal just north of the potential Airport West location. In consideration of this concern, the estimated surface water concentrations of arsenic, beryllium, cadmium, lead, mercury, and dioxins/furans in two similar canals in the Palm Beach County HHRA report (Arcadis/CPF 2010) were reviewed.

To provide a worst-case estimate of risks posed by drinking water from the Palm Beach County canals, it was assumed that people directly consumed the canal water as drinking water. Using standard assumptions of 2 liters per day (L/day) consumption by an adult weighing 80 kilograms (kg), which are default residential exposure assumptions from USEPA (2014). The ELCR for daily consumption assuming 30 years of exposure was 4E-13 (4 in a trillion) for one canal (Roadside Canal) and 7E-14 (0.07 in a trillion) for another canal (M Canal). These risks are over one million times less than the low end of USEPA’s acceptable cancer risk range of 1E-06 (1 in a million). Similarly, worst case estimates of noncancer risks (HIs) were calculated. The HI was 0.000002 for the Roadside Canal and 0.0000001 for the M Canal. These HIs are over 500,000 times less than the USEPA’s decision criterion for noncancer risks of 1.

It is concluded that consumption of drinking water obtained from an aquifer within Palm Beach County beneath nearby canals would not be compromised by emissions from a WTE in Palm Beach County. Given that the estimated deposition rates on and around the C-9 canal north of the Airport West location are very similar to the estimated deposition rates on canals near the Palm Beach County WTE location, it is concluded that future emissions from the conceptual Miami-Dade WTE facility would not be detrimental to drinking water sources north of that location and other locations that might recharge groundwater. The potential impacts on groundwater quality would likely be immeasurable. However, FDEP and all applicable state/local regulatory agencies will assess the impacts of any future WTE on drinking water sources during the permitting process to ensure that drinking water sources are not adversely affected.

8 Results and Conclusions

HHRAs and ERAs provide conservative estimates of risks posed by combustor emissions to answer regulator and community questions. Arcadis has performed a Preliminary Qualitative Screening Level HHRA and ERA for the conceptual Miami-Dade WTE to provide risk-based information to assist in site selection decision making.

8.1 Human Health Risk Assessment

On the basis of the conservative preliminary risk assessment, which assumes worst case locations for human exposures, no one potential site gives higher or lower risk results for all human receptors assessed. All potential locations assessed were within USEPA’s acceptable risk range of 1E-06 (1 in a million) to 1E-04 (1 in ten thousand or 100 in a million). Cancer risk estimates are summarized in Table A-15. In some cases, one site’s risks might be slightly higher than another, but the results are not significantly higher. For instance, an excess lifetime cancer risk level of 1.5E-07 (0.15 in a million) is higher than 1.4E-07 (0.14 in a million), but both risk estimates are extremely low. For all intents and purposes, they are essentially the same, especially acknowledging the conservative assumptions used to estimate these risks.

Of the exposure scenarios, the resident child and adult scenarios are the most relevant and realistic scenarios, because there are many people living near the three potential sites that would in reality be exposed on a daily basis to emissions from a WTE operating in Miami-Dade County. On the other hand, the adult and child farmer and the adult and child fisher scenarios are hypothetical scenarios, because it is unlikely that there are any people who would consume large quantities of home-grown produce, beef, chicken, and eggs or fish from the worst-case locations.

For the cancer risk assessment of the realistic exposure scenarios, the resident's estimated excess lifetime cancer risk levels are below the low end of the USEPA's acceptable risk range of 1E-06 (1 in a million) for all potential sites and assumed stack heights. Airport West has the lowest estimated risk, but all risks are *de minimis.*

For the hypothetical exposure scenarios, the estimated excess lifetime cancer risks exceed the low end of the USEPA's acceptable risk range of 1E-06 (1 in a million) only for the adult fish ingestion scenario, which assumes adult consumption of 67 pounds per year of fish caught solely from the small, worst case water body for the Existing RRF or Airport West sites. In a formal quantitative risk assessment, one would identify larger water bodies that could realistically support high levels of fish consumption and/or document and use more realistic fish consumption rates. Cancer risks would be less than 1E-06 (1 in a million) in a comprehensive risk assessment.

Table A-15. Summary of Human Health Cancer Risk Estimates

Stack Height (ft)	250			310			410	
Location	Existing RRF	Medley	Airport West	Existing RRF	Medley	Airport West	Medley	Airport West
Receptor								
Realistic Exposure Scenarios								
Resident Child	1.E-07	5.E-08	3.E-08	5.E-08	3.E-08	3.E-08	2.E-08	2.E-08
Resident Adult	4.E-07	2.E-07	1.E-07	2.E-07	1.E-07	9.E-08	8.E-08	6.E-08
Hypothetical Exposure Scenarios								
Farmer Child	1.E-08	3.E-08	8.E-08	9.E-09	3.E-08	3.E-08	2.E-08	3.E-08
Farmer Adult	1.E-07	3.E-07	9.E-07	8.E-08	3.E-07	3.E-07	2.E-07	3.E-07
Fisher Child	6.E-07	1.E-07	3.E-07	2.E-07	7.E-08	2.E-07	7.E-08	2.E-07
Fisher Adult	4.E-06	8.E-07	2.E-06	1.E-06	5.E-07	2.E-06	5.E-07	2.E-06

Notes:
For comparison purposes, USEPA's acceptable cancer risk range for CERLA sites is 1E-06 (1 in a million) to 1E-04 (1 in ten thousand or 100 in a million). Cancer risk estimates below 1E-06 (1 in a million) do not warrant further investigation.

For the non-cancer risk assessment of the realistic exposure scenarios, the resident's estimated HIs are below the regulatory level of concern of 1 for all potential sites and assumed stack heights. Airport West has the lowest estimated HI. All HIs are *de minimis.* Noncancer risk estimates are summarized in Table A-16.

For the hypothetical exposure scenarios, the estimated HIs are below the regulatory level of concern of 1 for the farmer and fisher receptors for all potential sites and assumed stack heights.

Table A-16. Summary of Human Health Noncancer Risk Estimates

Stack Height (ft)	250			310			410	
Location	Existing RRF	Medley	Airport West	Existing RRF	Medley	Airport West	Medley	Airport West
Receptor								
Realistic Exposure Scenarios								
Resident Child	3.E-02	1.E-02	8.E-03	2.E-02	9.E-03	6.E-03	6.E-03	5.E-03
Resident Adult	3.E-02	1.E-02	8.E-03	2.E-02	9.E-03	6.E-03	6.E-03	4.E-03
Hypothetical Exposure Scenarios								
Farmer Child	3.E-03	2.E-03	8.E-03	2.E-03	2.E-03	3.E-03	2.E-03	2.E-03
Farmer Adult	3.E-03	2.E-03	8.E-03	2.E-03	2.E-03	3.E-03	2.E-03	2.E-03
Fisher Child	1.E-03	4.E-04	1.E-03	8.E-04	4.E-04	9.E-04	3.E-04	8.E-04
Fisher Adult	2.E-03	5.E-04	1.E-03	1.E-03	5.E-04	1.E-03	5.E-04	1.E-03

Notes:
For comparison purposes, USEPA's acceptable non-cancer benchmark for CERLA sites is 1. Non-cancer risk estimates below 1 do not warrant further investigation.

Acute risk assessment calculations were also performed at the worst-case off-site location for each potential site/stack height scenario. HIs were all less than the level of concern, which is 1. Acute risk estimates are summarized in Table A-17. Airport West has the lowest HI for all potential stack heights, but all HIs are *de minimis.*

Table A-17. Summary of Human Health Acute Risk Estimates

Stack Height (ft)	250			310			410	
Location	Existing RRF	Medley	Airport West	Existing RRF	Medley	Airport West	Medley	Airport West
Receptor								
1-Hour Acute Maximum Impact	8.E-02	9.E-02	6.E-02	4.E-02	4.E-02	3.E-02	2.E-02	2.E-02

Notes:
For comparison purposes, USEPA's acceptable non-cancer benchmark for CERLA sites is 1. Non-cancer risk estimates below 1 do not warrant further investigation.

In addition, a breast milk assessment was performed. All HIs are less than the regulatory level of concern of 1 and are *de minimis.*

Although there is no clear trend that shows one potential site to pose the lowest estimated human health risk for all hypothetical human exposure scenarios, one trend does stand out. The realistic chronic residential risk assessment exposure scenarios are those that are more relevant for assessing facility safety, because they concern residents of the communities where the potential sites are located. Comparatively, the Airport West location has the lowest potential risk in these scenarios. However, as stated, all three locations have low risk with results within or below the regulatory established risk levels. **The worst case preliminary estimated excess lifetime cancer risk from the conceptual Miami-Dade WTE ranged from 9E-09 (9 in a billion) to 4E-06 (4 in a million) overall and 2E-08 (20 in a billion) to 4E-07 (0.4 in a million) for the realistic residential receptor.**

8.1.1 Human Health Risks in Perspective

Human health risks are presented in terms of probability for potential carcinogenic effects. An ELCR is a probability that a person exposed to site COPCs daily for 30 years may contract cancer in their lifetime. The American Cancer Society (ACS) summarizes the lifetime risk of contracting cancer in the U.S. population as 0.4 (ACS 2024). That means that 4 out of every 10 Americans will contract cancer from all causes combined. This statistic excludes common skin cancers which have higher background rates.

This health-protective preliminary risk assessment estimates cancer rates, such as 1E-07 (0.1 in a million) or 1E-06 (1 in a million.) Compared to the background cancer rate, such estimates are so low that they would not be measurable. For instance, in an area with one million people all exposed to the maximum estimated doses, the background rate of cancer is 0.4 and the rate of cancer with the addition of the emission source, such as a WTE facility, would rise to 0.4000001 or 0.400001. Such risk estimates have no practical effects on human health, but the mission of government agencies, such as the USEPA, is to reduce controllable risks to the maximum extent practicable. USEPA's cancer risk target for environmental decision making is a range of additional risk of 1E-06 (1 in a million) to 1E-04 (1 in ten thousand or 100 in a million).

In application, USEPA almost always requires action to reduce cancer risks when they exceed 1E-04 (100 in a million). They do not require actions to reduce risks if they are 1E-06 (1 in a million) or less. When the estimated risks are in the middle of the range, >1E-06 (greater than 1 in a million) but <1E-04 (less than 1 in ten thousand or 100 in a million), decisions are made on a case-by-case basis considering costs, technical feasibility, and benefits. For instance, in the Superfund program that focuses on the cleanup of waste disposal sites, remedial action is not typically required unless estimated excess lifetime risks exceed 1E-05 (10 in a million). Similarly, for permitting waste combustors, USEPA typically permits a facility when risks do not exceed 1E-05 (10 in a million).

Risk levels such as one in a million to one hundred in a million are commonly accepted by us all on a daily basis. **The worst case preliminary estimated excess lifetime cancer risk from the conceptual Miami-Dade WTE for the residential receptors ranged from 2E-08 (20 in a billion) to 4E-07 (0.4 in a million).** The following compares these risk estimates to common, everyday risks (National Safety Council 2021).

Table A-18. Odds of Dying

Cause of Death	Risk of Death	Number per million	Year
Vehicle accident	1 in 100	10,753	2021
Fall	1 in 100	10,204	2021
Pedestrian accident	2 in 1,000	2,062	2021
Drowning	1 in 1,000	994	2021
Fire, smoke	8 in 10,000	777	2021
Sunstroke	2 in 10,000	215	2021
Storm	5 in 100,000	50	2021
Dog attack	2 in 100,000	19	2021
Hornet, wasp, bee	2 in 100,000	18	2021
Lightning strike	6 in 1,000,000	6	2018
Airplane crash	5 in 1,000,000	5	2017

Source: NSC (2021)

Most people also accept lifetime excess cancer risks far in excess of 1E-06 (1 in a million) on a daily basis. For instance, arsenic is a carcinogen, but it is naturally occurring in our food and drinking water throughout the country. The average dose across the U.S. is 0.12 ug/kg-day. This equates to an estimated excess lifetime cancer risk of 1.7E-04 (170 in a million). Some people may be restricting their intake of specific foods that are known to have higher than average arsenic levels, but, by and large, most people accept this small risk of cancer.

Similarly, gasoline contains benzene, a known human carcinogen, but people fuel and drive their cars routinely without concern about the cancer risk. **The estimated excess lifetime cancer risk level from breathing benzene from gasoline and car exhaust in Miami-Dade County is 1.5E-6 (1.5 in a million) according to** the USEPA's Air Toxics Screening Assessment (USEPA 2017). 1.5 in a million is a cancer risk level higher than the preliminary risk estimates for residents from a conceptual Miami-Dade WTE facility at any of the three potential sites.

8.2 Ecological Risk Assessment

For the purpose of the ERA, it was assumed that the potential receptors were exposed to the maximum deposition rates predicted for the potential risk drivers. This is an overly conservative assumption as it assumes that all applicable habitats exist in close proximity to the proposed facilities and are of sufficient size and quality to support all receptors of concern.

These maximum predicted deposition rates were used to derive risk estimates for each of the key receptor groups identified including aquatic receptors (i.e., fish), sediment receptors (i.e., benthic invertebrates), birds, mammals, and plants. For each receptor group, representative habitats were evaluated based on the maximum risk estimates reported for the Palm Beach County ERA.

All risk estimates were associated with HQs well below 1 except for sediment exposures to mercury. For that receptor, HQs were just above 1, ranging from 1.05 at Airport West to 1.64 at Medley. Given the conservative nature of this assessment, HQs this low are not likely to be associated with significant risk. Estimated HQs based on mercury concentrations in other waterbodies are all well below 1.

Based on this conservative assessment, it is concluded that potential ecological risks associated with the three proposed locations are minimal and should not have an impact on the heath of the surrounding ecological communities. Generally, the HQs associated with the Medley location tended to be the lowest, with the exception of mercury in sediment, which was lowest at the Airport West location. Regardless, all of the HQs are so low that the differences between the potential locations are not meaningful from a comparative risk standpoint.

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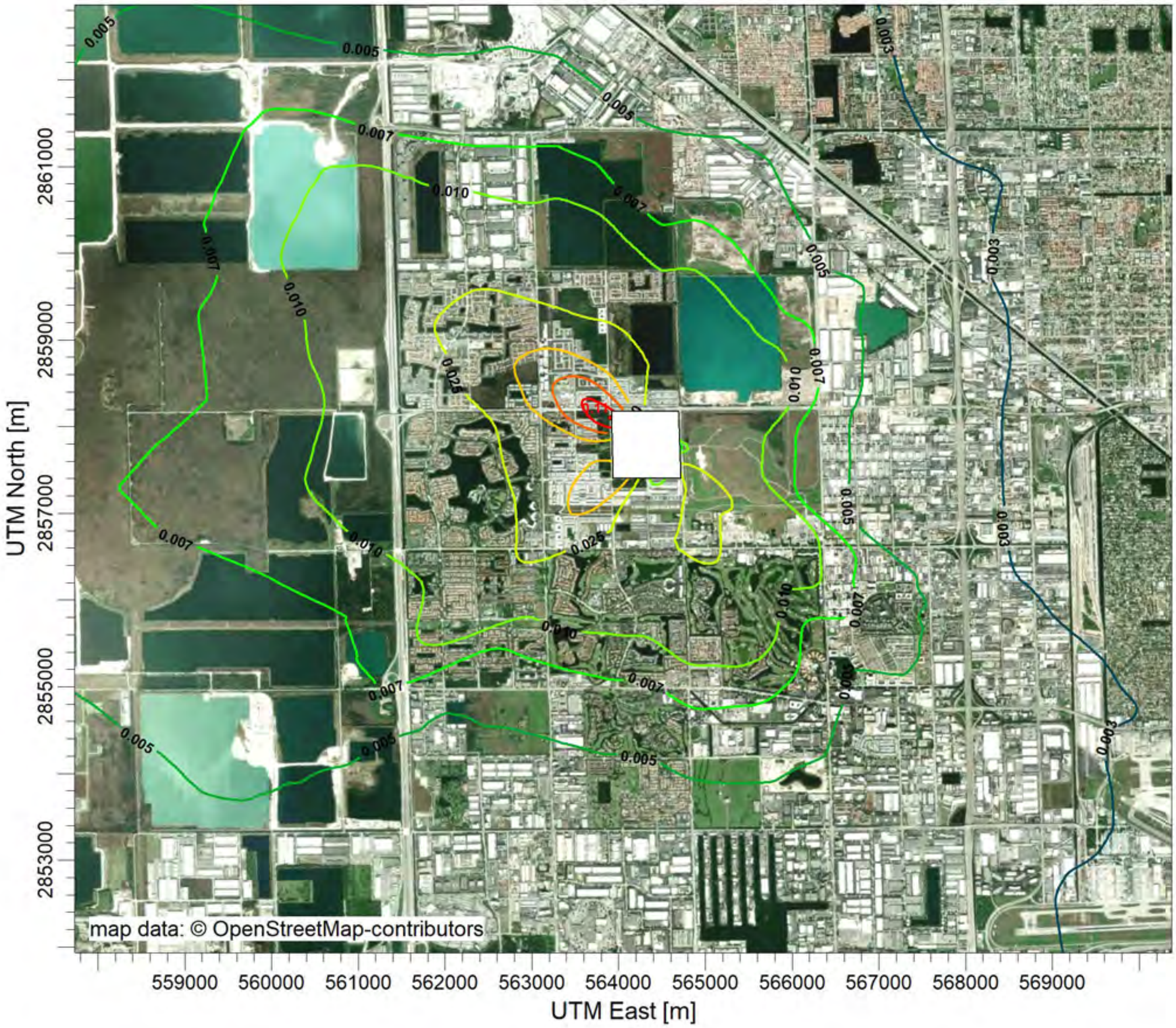
Attachment A-1

Isopleths

Existing RRF: 250 foot stack height

PROJECT TITLE:

Conceptual Existing RRF WTE facility 250 ft stack Scenario 1A
Particle Phase Conc - Annual (Unit ER)



PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 5 YEARS FOR SOURCE GROUP: 250FT ug/m^3

Max: 0.111 [ug/m^3] at (563900.00, 2858100.00)

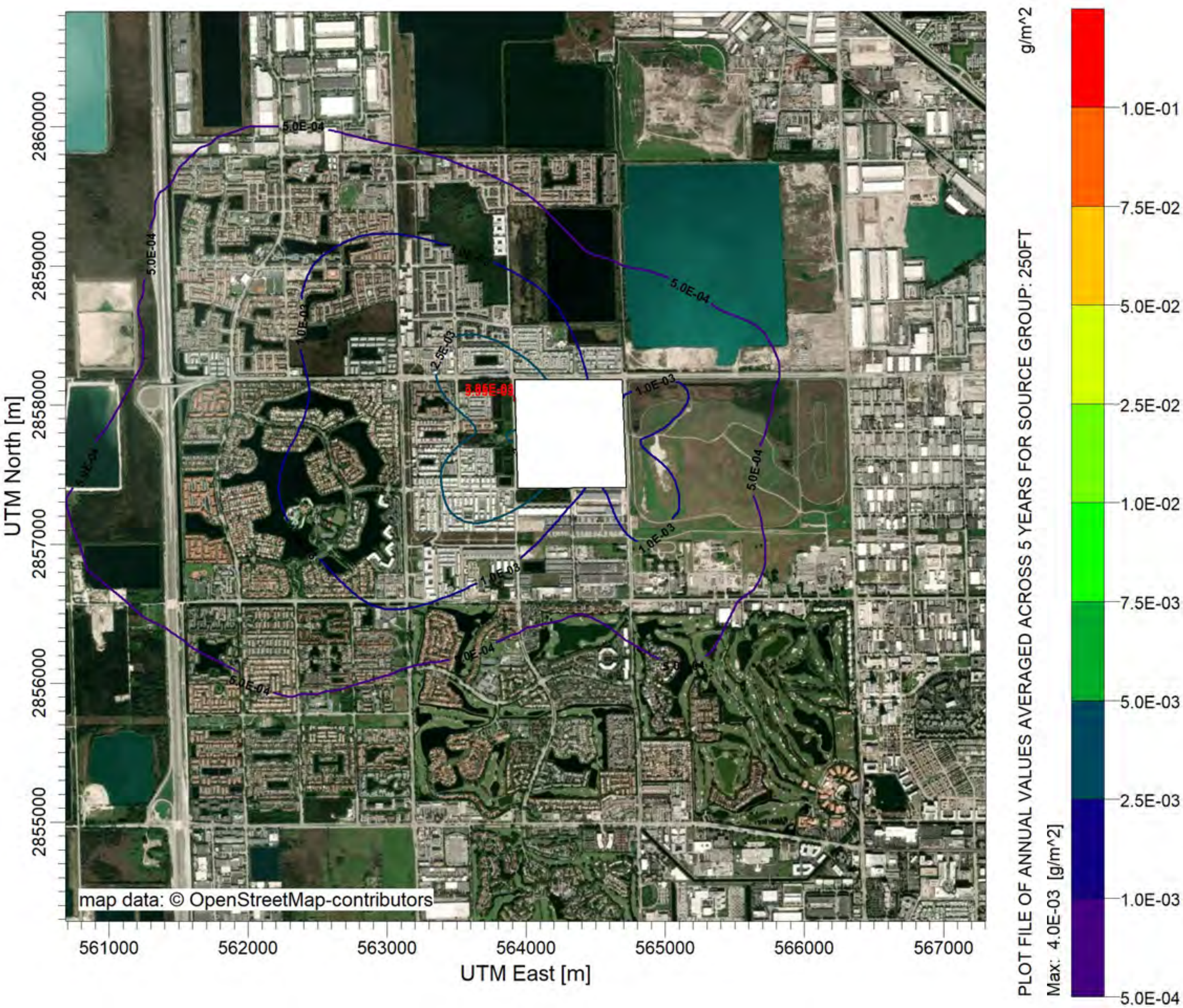
0.001 0.001 0.003 0.005 0.007 0.010 0.025 0.050 0.075 0.100

COMMENTS: 250 Stack Concentration - Annual Scenario 1A	SOURCES: **3**		
	RECEPTORS: **13825**		
	OUTPUT TYPE: **Concentration**	SCALE: 1:79,497 0 3 km	
	MAX: **0.111 ug/m^3**		PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Existing RRF WTE facility 250 ft stack Scenario 1A
Particle Bound Depo Annual



COMMENTS:

250ft Stack
Scenario 1A

SOURCES:

3

RECEPTORS:

1 3825

OUTPUT TYPE:

Total Depos.

MAX:

4.0E-03 g/m^2

SCALE: 1:44,536

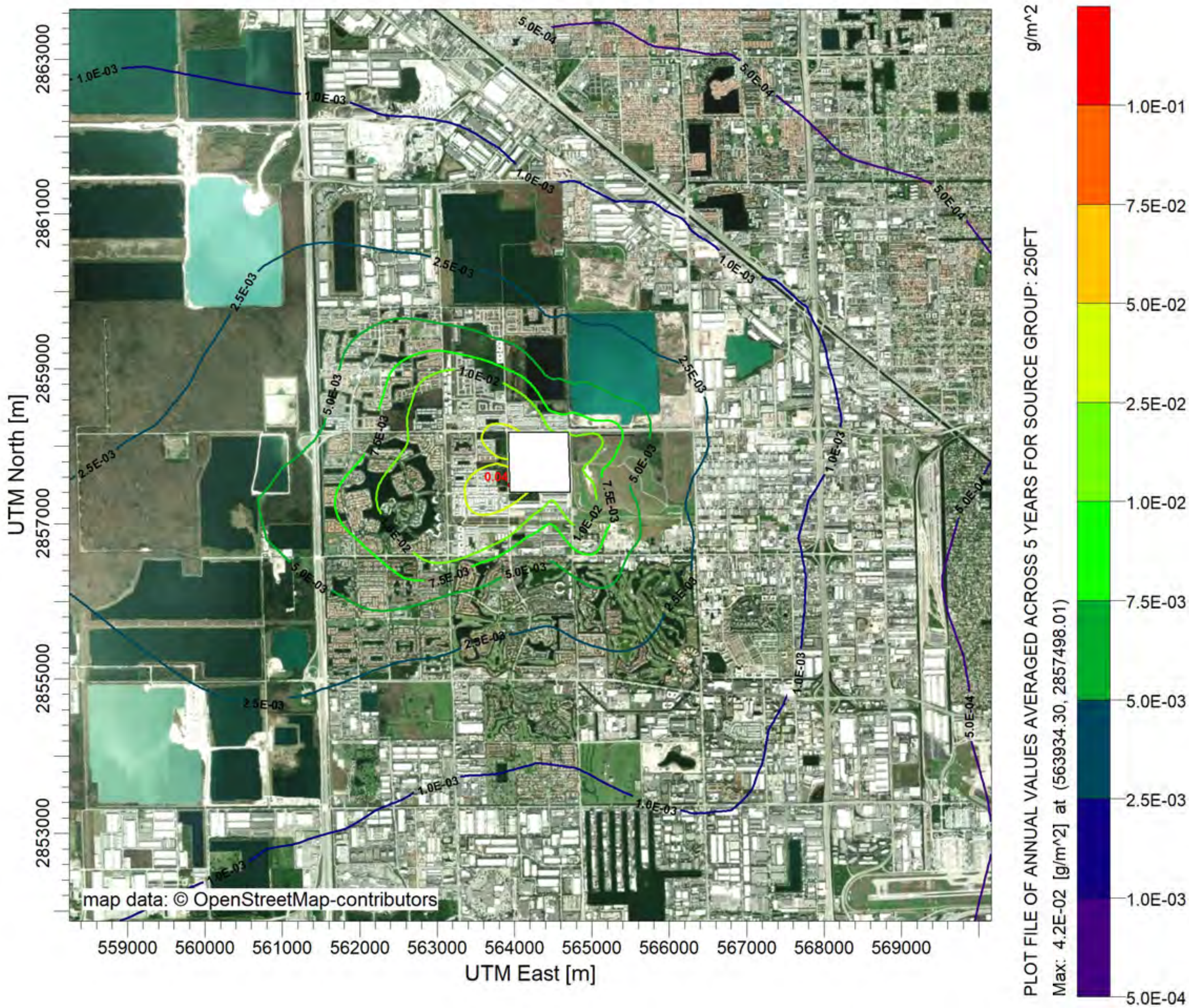
0 1 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Existing RRF WTE Facility, 250ft stack Scenario 1A
Particle Phase Depos- 5yr avg Annual (Unit ER)



COMMENTS:

250Stack
Depo - Annual
Scenario 1A

SOURCES:

3

RECEPTORS:

13825

OUTPUT TYPE:

Total Depos.

MAX:

4.2E-02 g/m^2

SCALE: 1:80,188

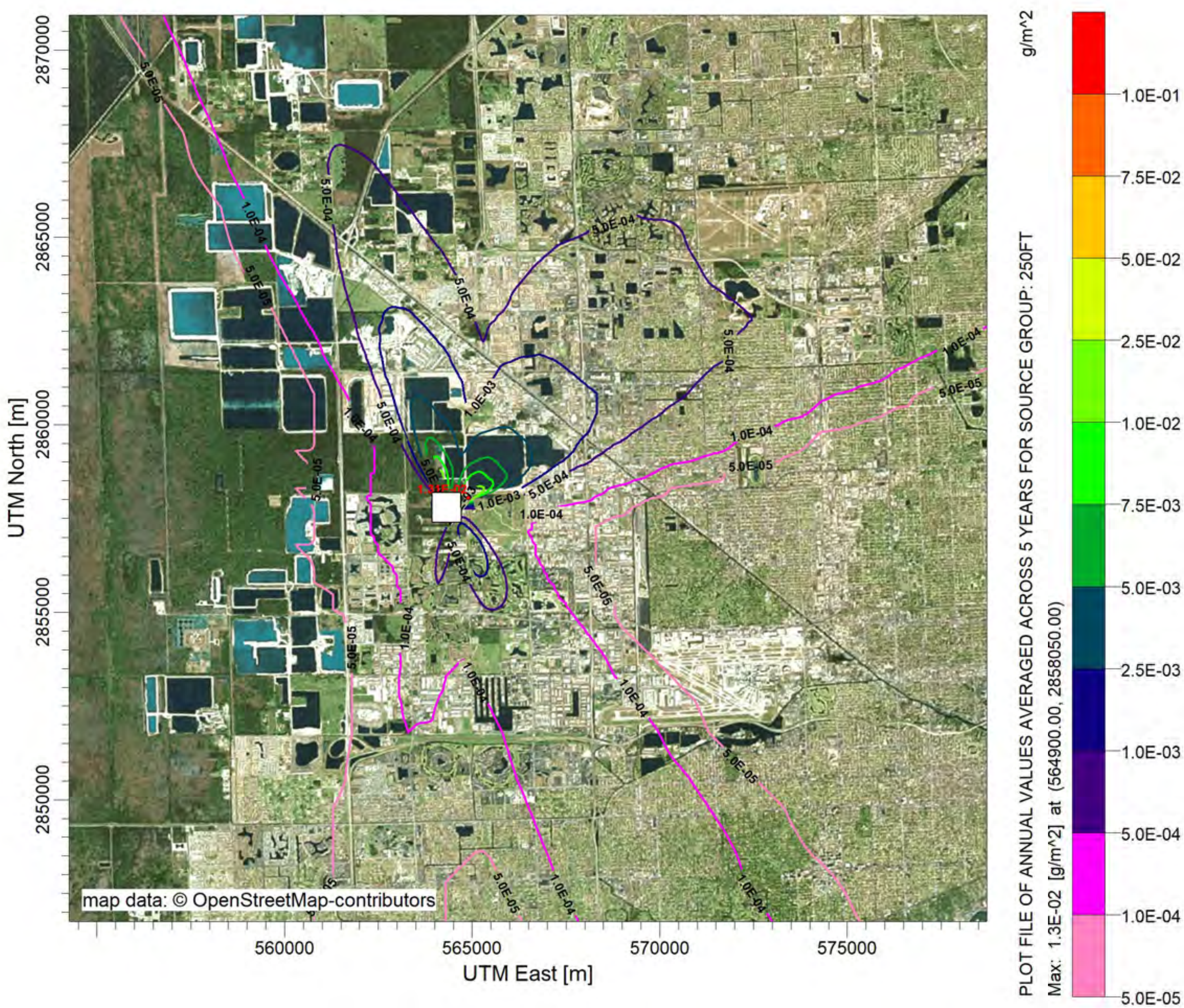
0 2 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Existing RRF WTE Facility 250ft stack Scenario 1A
2,3,7,8-TCDD D-F Vapor Phase - Annual Total Depo (Unit ER)



COMMENTS:

250 ft Stack
Scenario 1A
5 yr avg

SOURCES:

3

RECEPTORS:

13825

OUTPUT TYPE:

Total Depos.

MAX:

1.3E-02 g/m^2

SCALE: 1:164,673

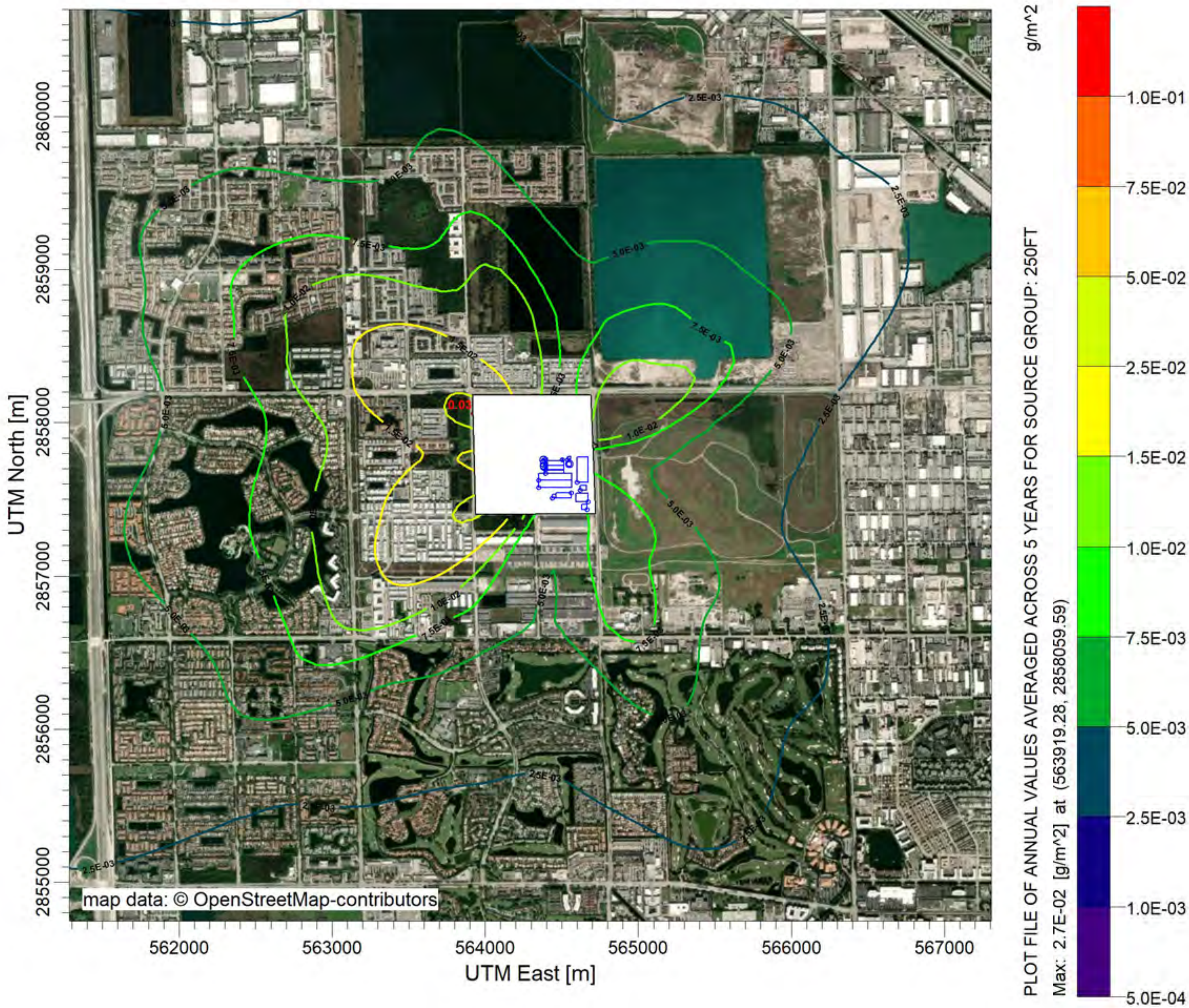
0 5 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Existing RRF WTE facility 250 ft stack Scenario 1A
DiValent Mercury Vapor Phase - Annual Total (W&D) Depo (Unit ER)



COMMENTS:

250 ft Stack
Scenario 1A
Total Deposition

SOURCES:

3

RECEPTORS:

13825

OUTPUT TYPE:

Total Depos.

MAX:

2.7E-02 g/m^2

SCALE: 1:40,543

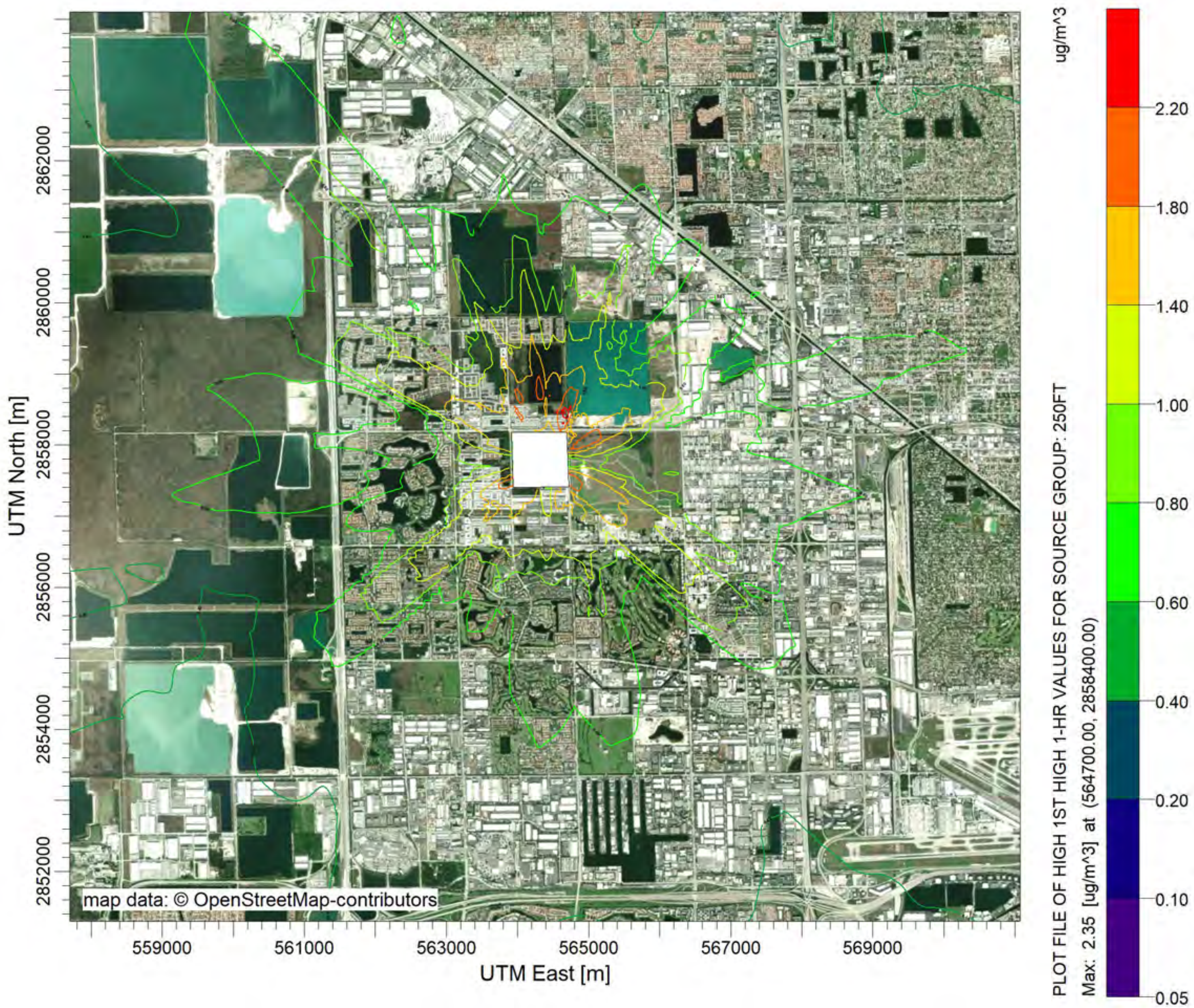
0 1 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Existing RRF WTE facility 250 ft stack Scenario 1A
Acid Gases H2SO4 Vapor Phase Concentration - 1 HR (Unit ER)



COMMENTS:

250 ft Stack
Scenario 1A

SOURCES:

3

RECEPTORS:

1 3825

OUTPUT TYPE:

Concentration

MAX:

2.35 ug/m^3

SCALE: 1:87,171

0 2 km

PROJECT NO.:

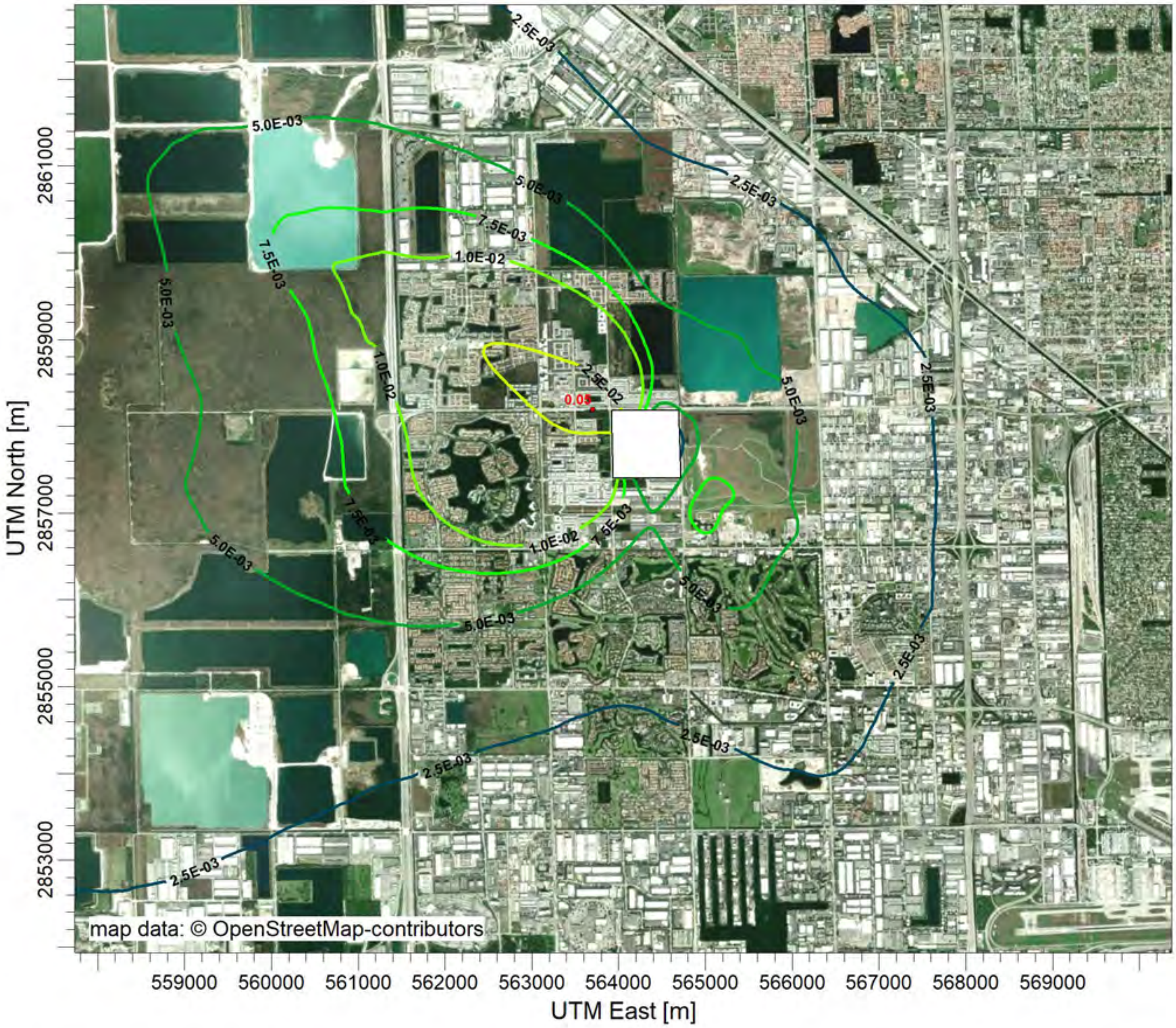
Attachment A-1

Isopleths

Existing RRF: 310 foot stack height

PROJECT TITLE:

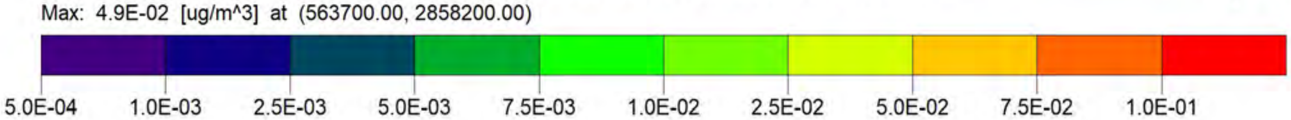
Conceptual Existing RRF WTE facility 310 ft stack Scenario 1A
Particle Phase Conc - Annual (Unit ER)



PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 5 YEARS FOR SOURCE GROUP: 310FT

ug/m^3

Max: 4.9E-02 [ug/m^3] at (563700.00, 2858200.00)

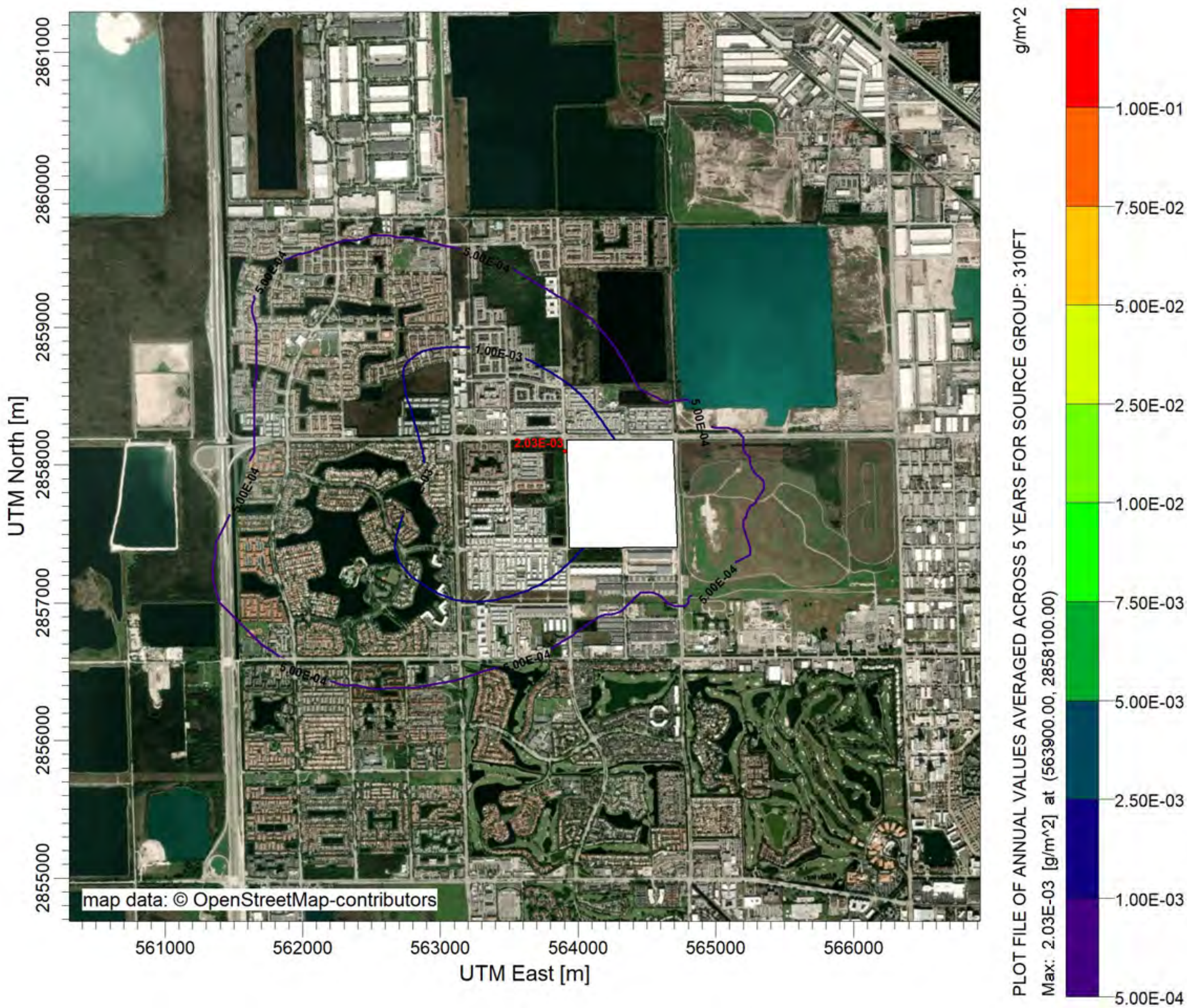


COMMENTS: 310 Stack Concentration - Annua lScenario 1A	SOURCES: **3**		
	RECEPTORS: **13825**		
	OUTPUT TYPE: **Concentration**	SCALE: 1:79,474 0 — 3 km	
	MAX: **4.9E-02 ug/m^3**		PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Existing RRF WTE facility 310 ft stack Scenario 1A
Particle Bound Depo Annual



COMMENTS:

310ft Stack
Scenario 1A

SOURCES:

3

RECEPTORS:

1 3825

OUTPUT TYPE:

Total Depos.

MAX:

2.03E-03 g/m^2

SCALE: 1:44,992

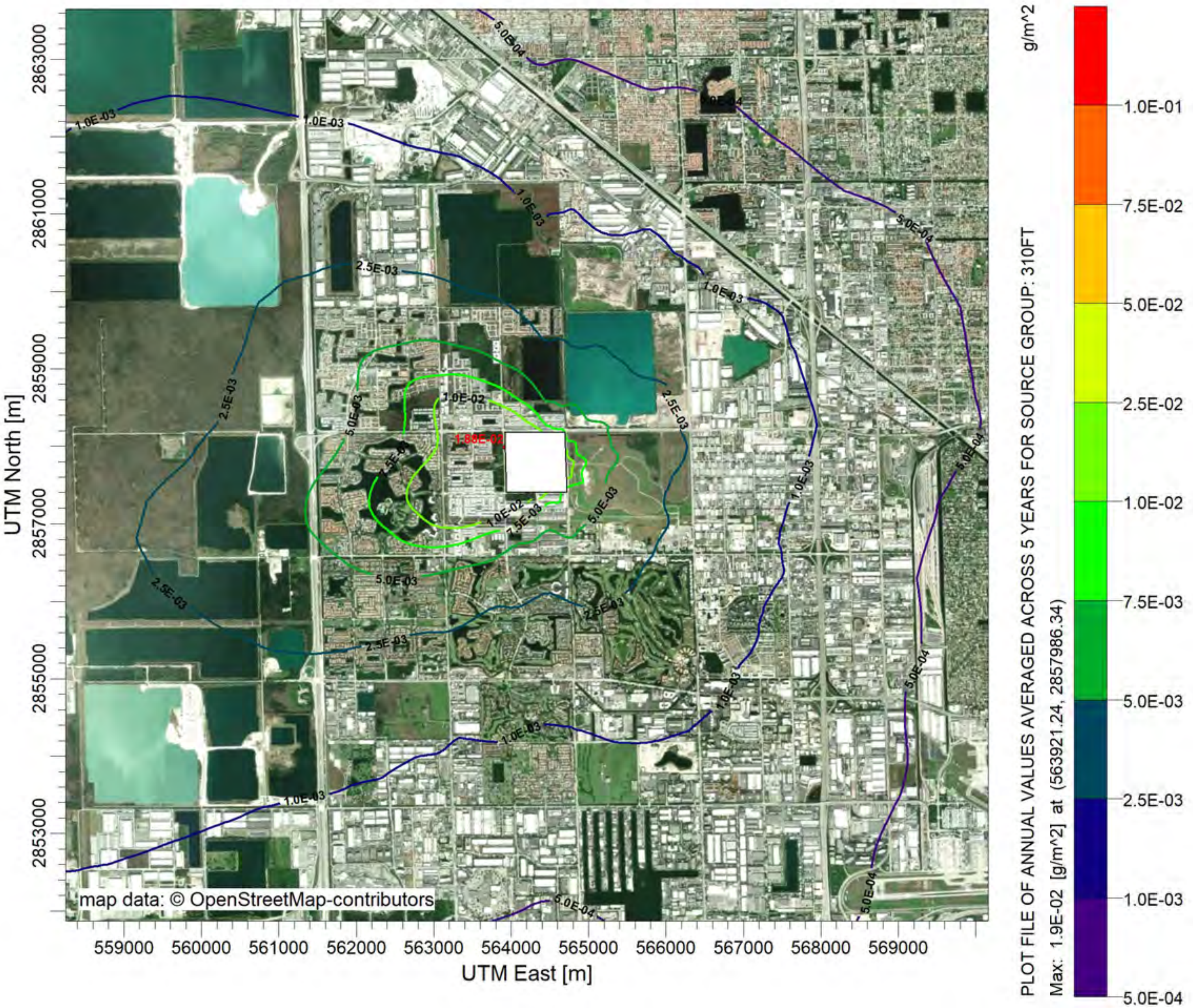
0 1 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Existing RRF WTE Facility, 310ft stack Scenario 1A
Particle Phase Depos- 5yr avg Annual (Unit ER)



COMMENTS:

310 Stack
Depo - Annual
Scenario 1A

SOURCES:

3

RECEPTORS:

13825

OUTPUT TYPE:

Total Depos.

MAX:

1.9E-02 g/m^2

SCALE: 1:80,188

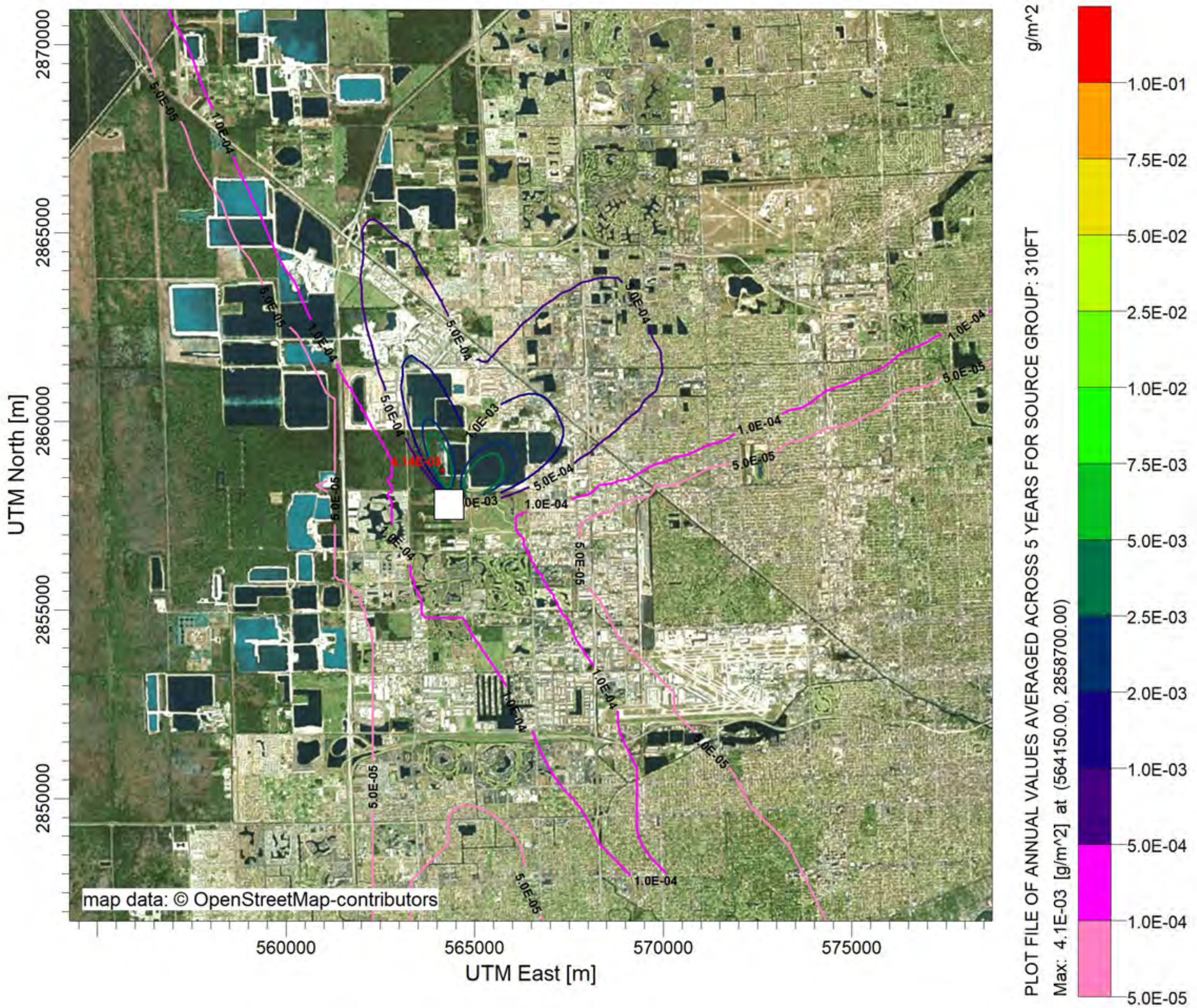
0 2 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Existing RRF WTE Facility 310ft stack Scenario 1A
2,3,7,8-TCDD D-F Vapor Phase - Annual Total Depo (Unit ER)



COMMENTS:

310 ft Stack
Scenario 1A
5 yr avg

SOURCES:

3

RECEPTORS:

1 3825

OUTPUT TYPE:

Total Depos.

MAX:

4.1E-03 g/m^2

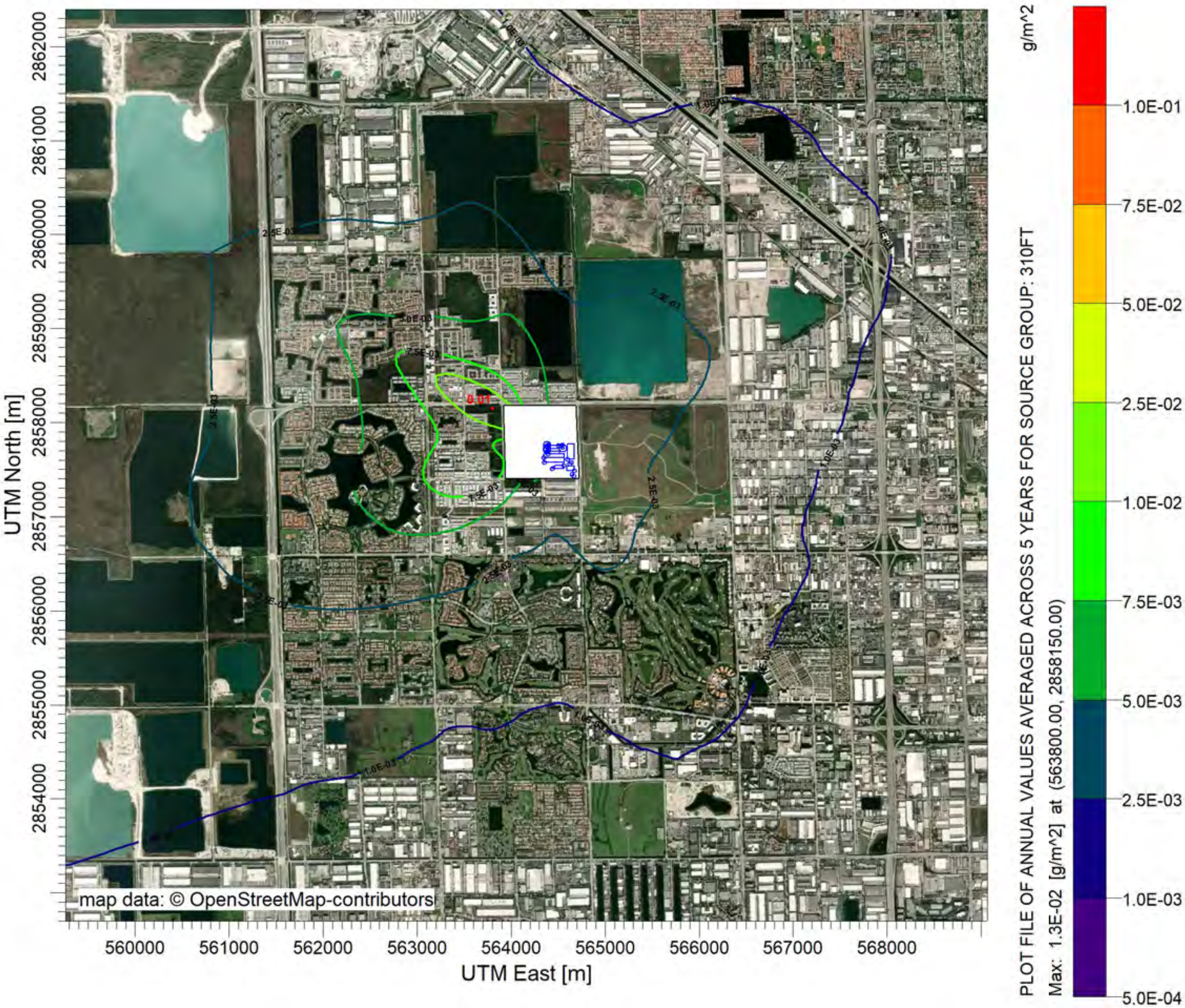
SCALE: 1:164,673

0 5 km

PROJECT NO.:

PROJECT TITLE:

Conceptual Existing RRF WTE facility 310 ft stack Scenario 1A
DiValent Mercury Vapor Phase - Annual Total (W&D) Depo (Unit ER)



COMMENTS:

310 ft Stack
Scenario 1A
Total Deposition

SOURCES:

3

RECEPTORS:

13825

OUTPUT TYPE:

Total Depos.

MAX:

1.3E-02 g/m^2

SCALE: 1:66,014

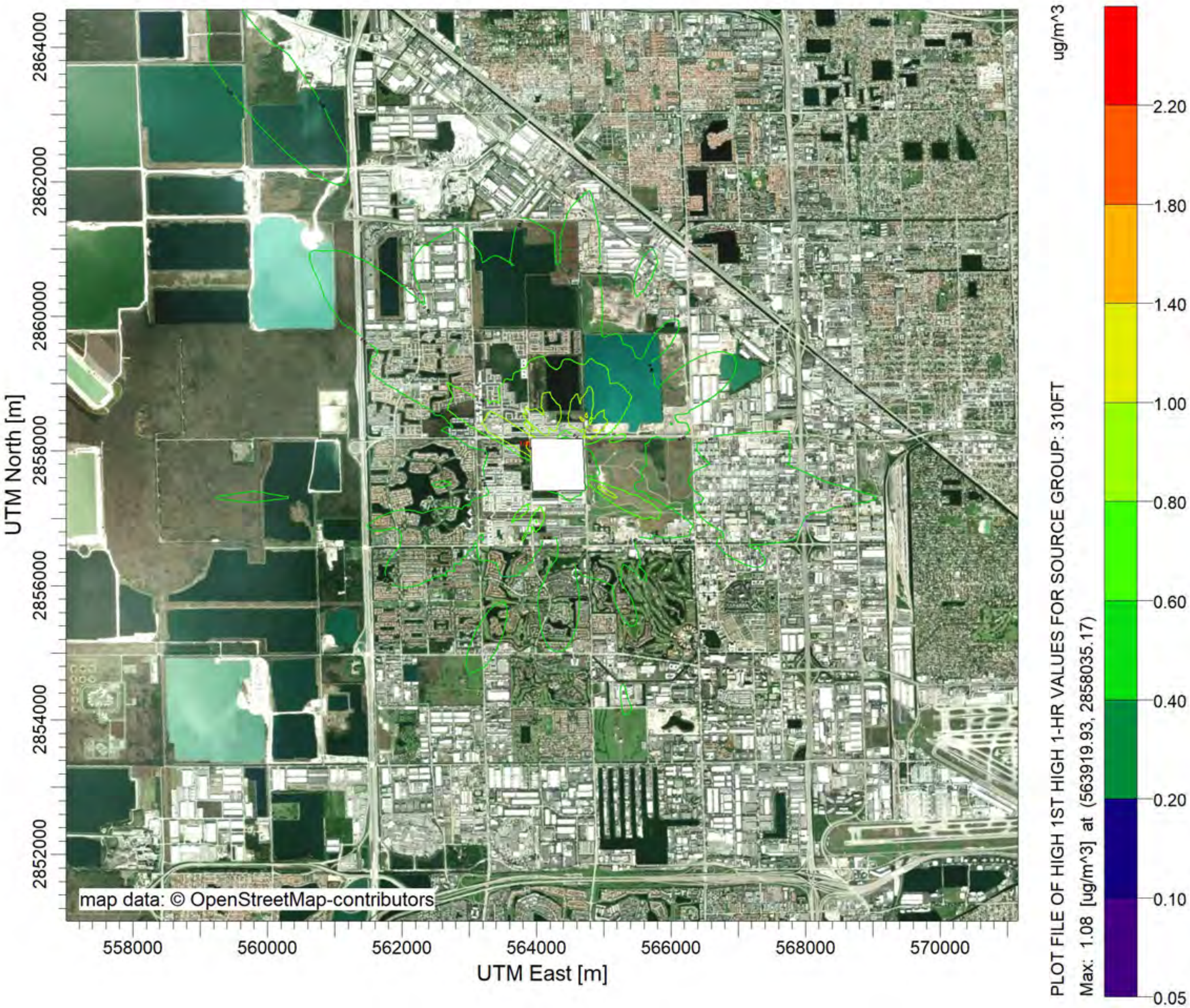
0 ——— 2 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Existing RRF WTE facility 310 ft stack Scenario 1A
Acid Gases H2SO4 Vapor Phase Concentration - 1 HR (Unit ER)



COMMENTS:

310 ft Stack
Scenario 1A

SOURCES:

3

RECEPTORS:

13825

OUTPUT TYPE:

Concentration

MAX:

1.08 ug/m^3

SCALE: 1:92,249

0 3 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

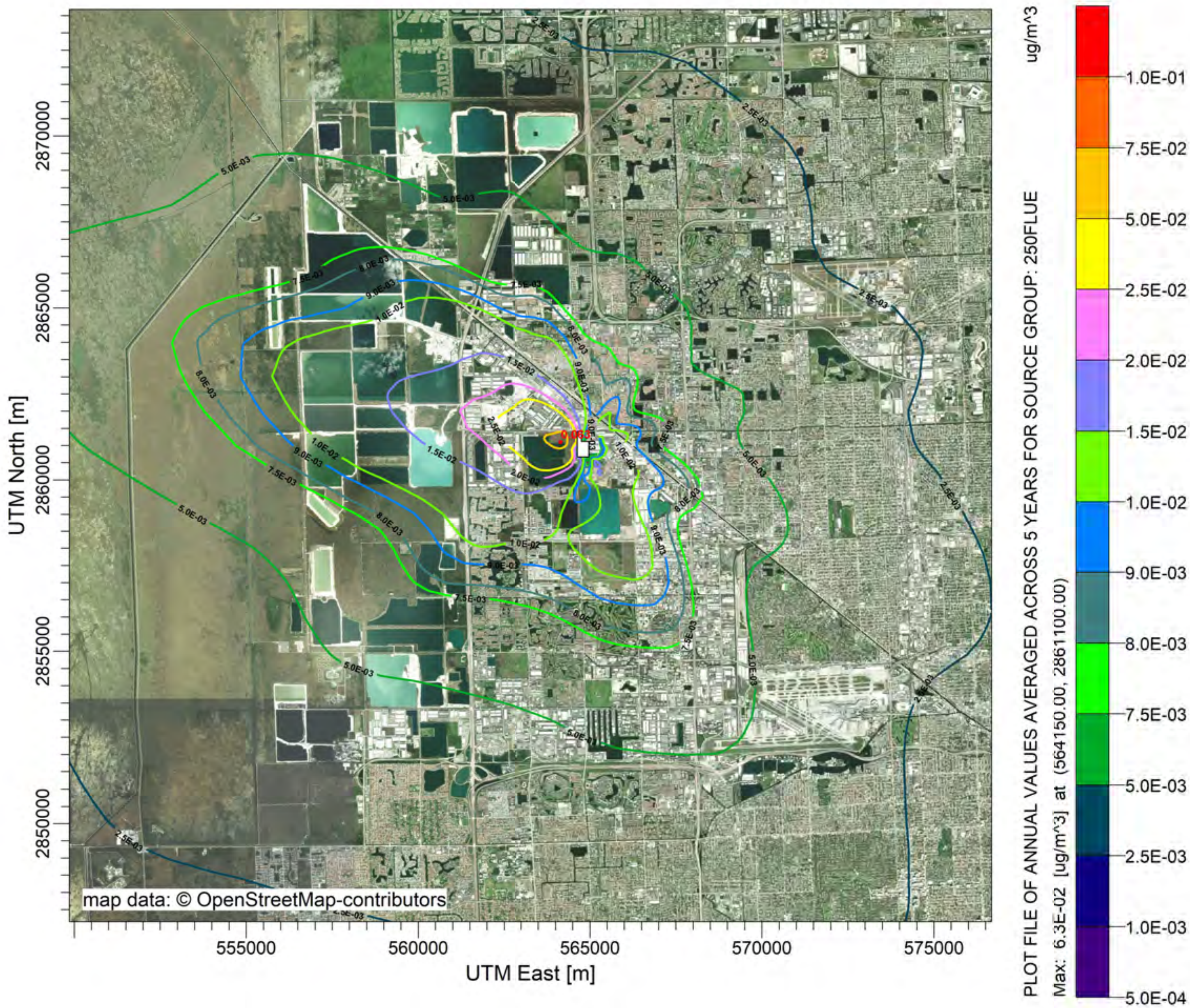
Attachment A-1

Isopleths

Medley: 250 foot stack height

PROJECT TITLE:

Conceptual Medley WTE Site
Metals Particle Phase Conc - Annual (ug/m3 per 1 g/s)



COMMENTS:

250 ft Stack
5-Year Annual Average
Scenario 1A
Urban pop. est. 850K

SOURCES:

3

RECEPTORS:

13980

OUTPUT TYPE:

Concentration

MAX:

6.3E-02 ug/m^3

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

1/29/2024

SCALE: 1:180,609

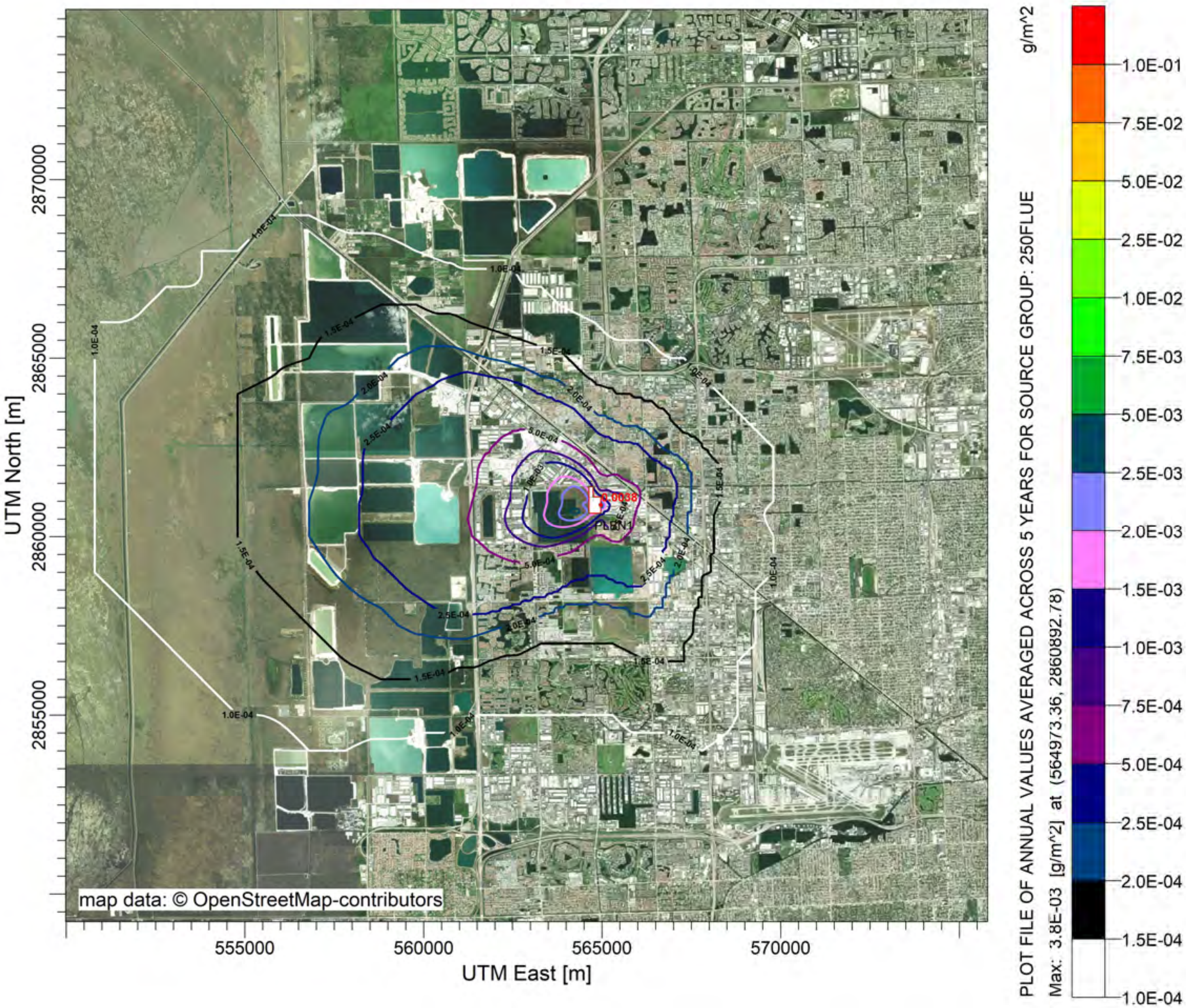
0 5 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Medley WTE Site
Particle Bound and Hg++ Total Annual Depo (g/m2 per 1 g/s)



COMMENTS:

250 ft Stack
5-Year Annual Average
Scenario 1A

SOURCES:

3

RECEPTORS:

13980

OUTPUT TYPE:

Total Depos.

MAX:

3.8E-03 g/m^2

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

1/29/2024

SCALE: 1:173,797

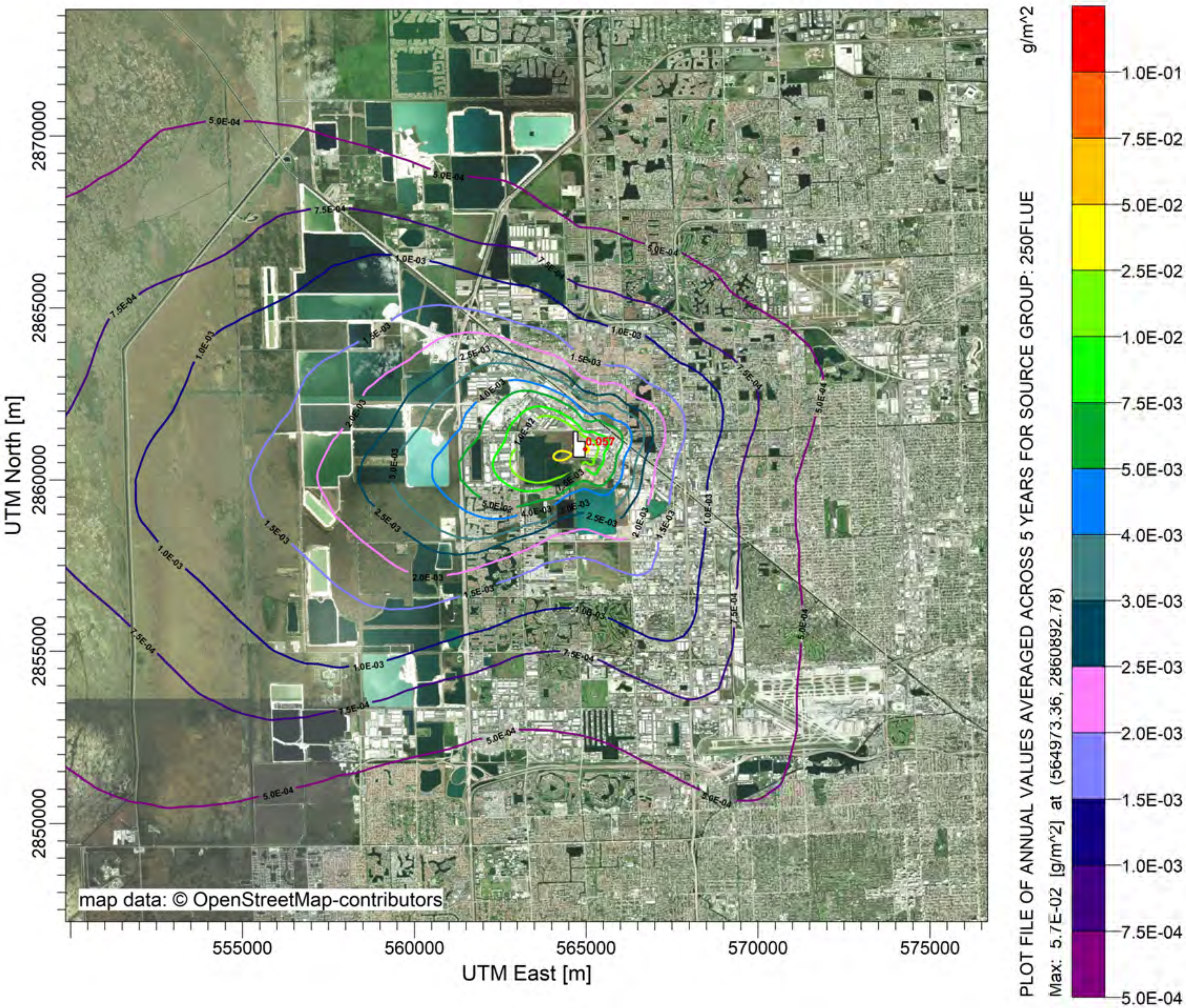
0 5 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Medley WTE Site
Metals Particle Phase Total Depo - Annual (g/m2 per 1 g/s)



COMMENTS:

250 ft Stack
5-Year Annual Average
Scenario 1A
Urban pop. est. 850K

SOURCES:

3

RECEPTORS:

13980

OUTPUT TYPE:

Total Depos.

MAX:

5.7E-02 g/m^2

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

1/29/2024

SCALE: 1:180,608

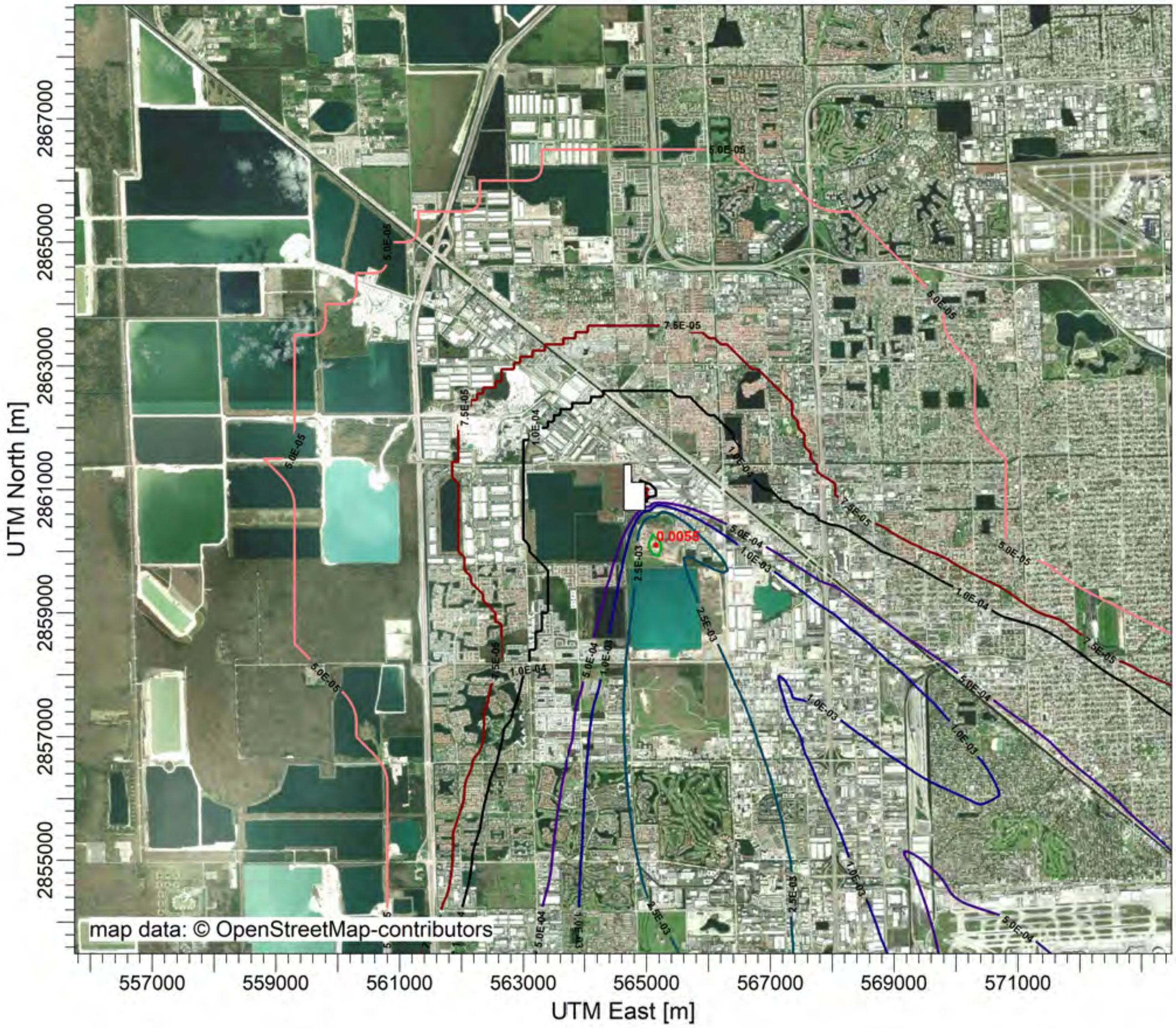
0 5 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Medley WTE Site
Acid Gases - Dioxin (TCDD) Vapor Phase Depo - Annual (g/m2 per 1 g/s)



PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 5 YEARS FOR SOURCE GROUP: 250FLUE g/m^2

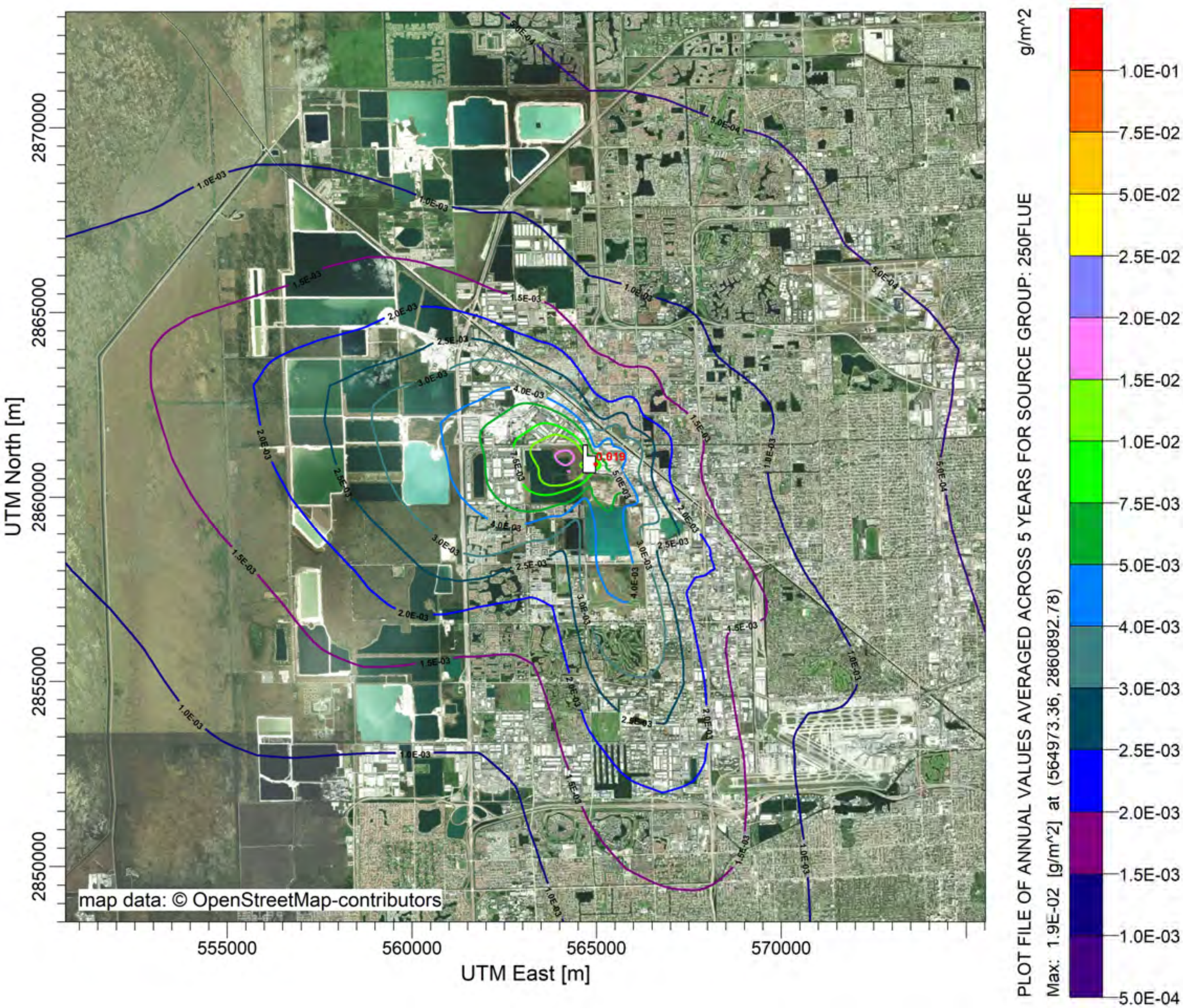
Max: 5.5E-03 [g/m^2] at (565150.00, 2860100.00)

COMMENTS:	SOURCES:	COMPANY NAME:	
250 ft Stack 5-Year Annual Average Scenario 1A Urban pop. est. 850K	**3**	**Arcadis, Inc**	
	RECEPTORS: **13980**	MODELER:	
	OUTPUT TYPE: **Total Depos.**	SCALE: 1:111,534 0 — 4 km	
	MAX: **5.5E-03 g/m^2**	DATE: **1/30/2024**	PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Medley WTE Site
Divalent Mecury Vapor Phase Total Depo - Annual (g/m2 per 1 g/s)



COMMENTS:

250 ft Stack
5-year Annual Average
Scenario 1A
Urban est. pop. 850K

SOURCES:

3

RECEPTORS:

13980

OUTPUT TYPE:

Total Depos.

MAX:

1.9E-02 g/m^2

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

1/29/2024

SCALE: 1:167,680

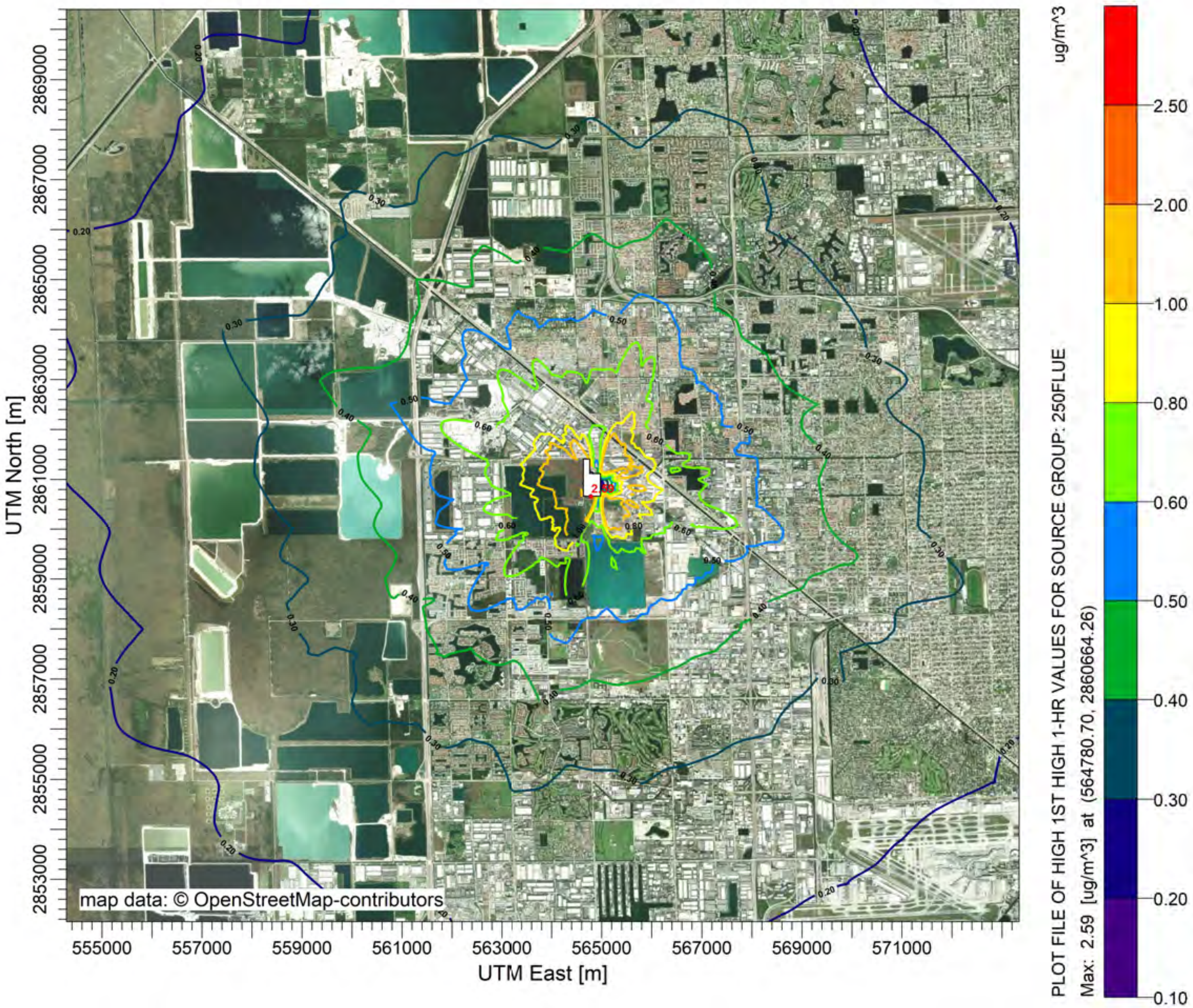
0 5 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Medley WTE Site
H_2SO_4 Acid Gases 1-hour Concentration (ug/m3 per 1 g/s)



COMMENTS:

250ft Stack
1-Hour Conc
Scenario 1A
Urban est. pop. 850K

SOURCES:

3

RECEPTORS:

13980

OUTPUT TYPE:

Concentration

MAX:

2.59 ug/m^3

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

1/29/2024

SCALE: 1:124,220

0 — 4 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

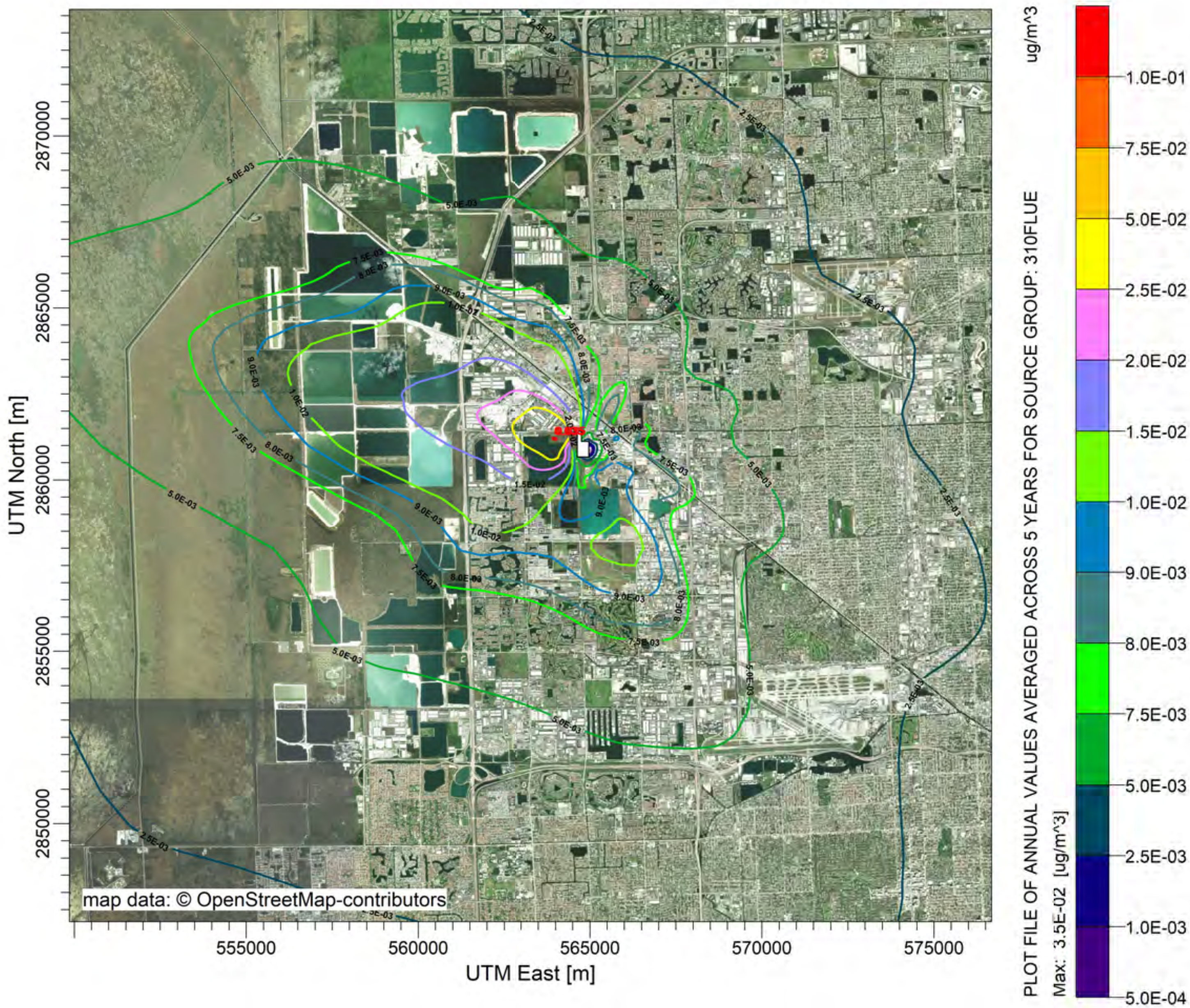
Attachment A-1

Isopleths

Medley: 310 foot stack height

PROJECT TITLE:

Conceptual Medley WTE Site
Metals Particle Phase Conc - Annual (ug/m3 per 1 g/s)



COMMENTS:

310 ft Stack
5-Year Annual Average
Scenario 1A
Urban pop. est. 850K

SOURCES:

3

RECEPTORS:

13980

OUTPUT TYPE:

Concentration

MAX:

3.5E-02 ug/m^3

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

1/29/2024

SCALE: 1:180,609

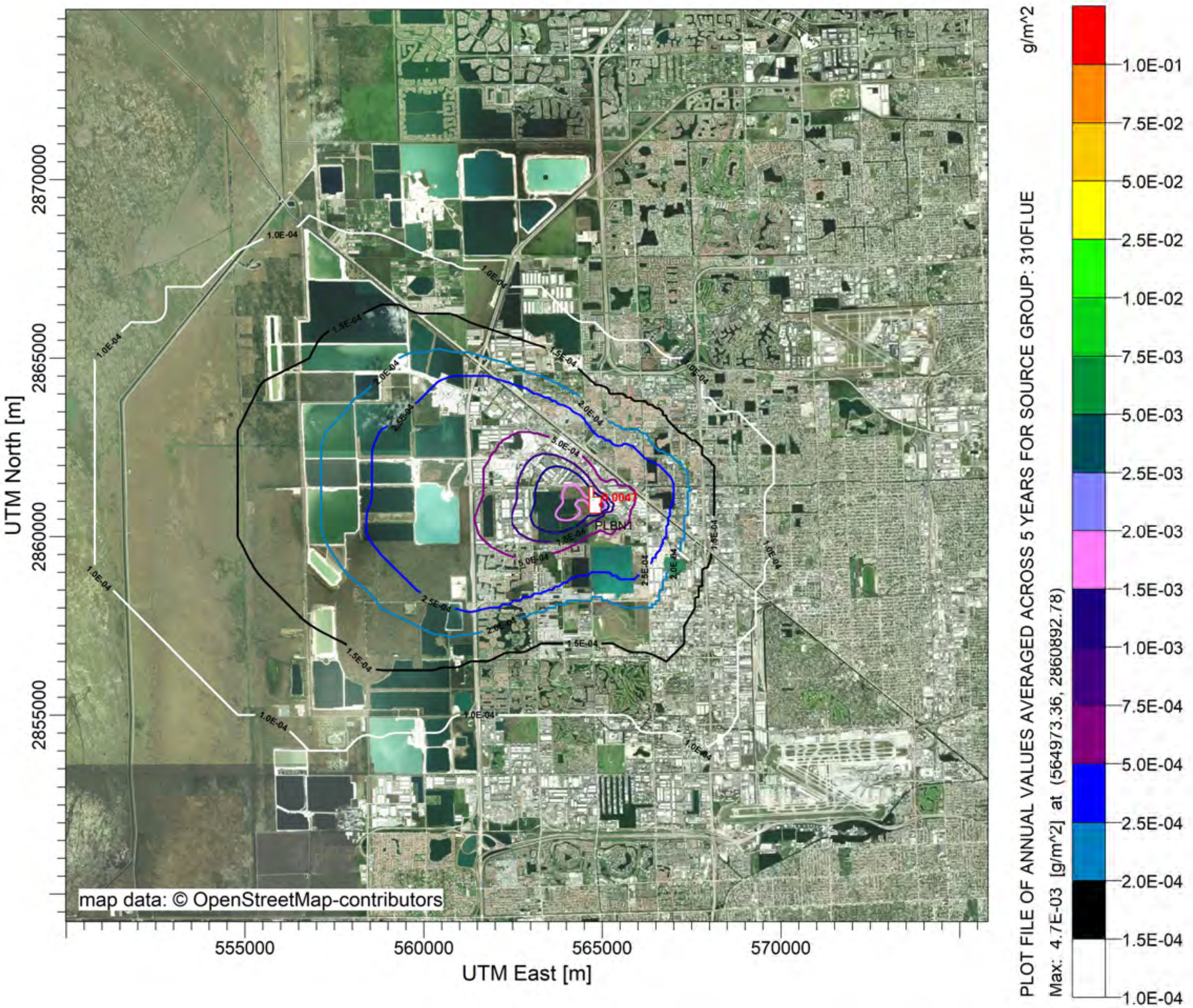
0 5 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Medley WTE Site
Particle Bound and Hg++ Total Annual Depo (g/m2 per 1 g/s)



COMMENTS:

310 ft Stack
5-Year Annual Average
Scenario 1A

SOURCES:

3

RECEPTORS:

13980

OUTPUT TYPE:

Total Depos.

MAX:

4.7E-03 g/m^2

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

1/29/2024

SCALE: 1:173,797

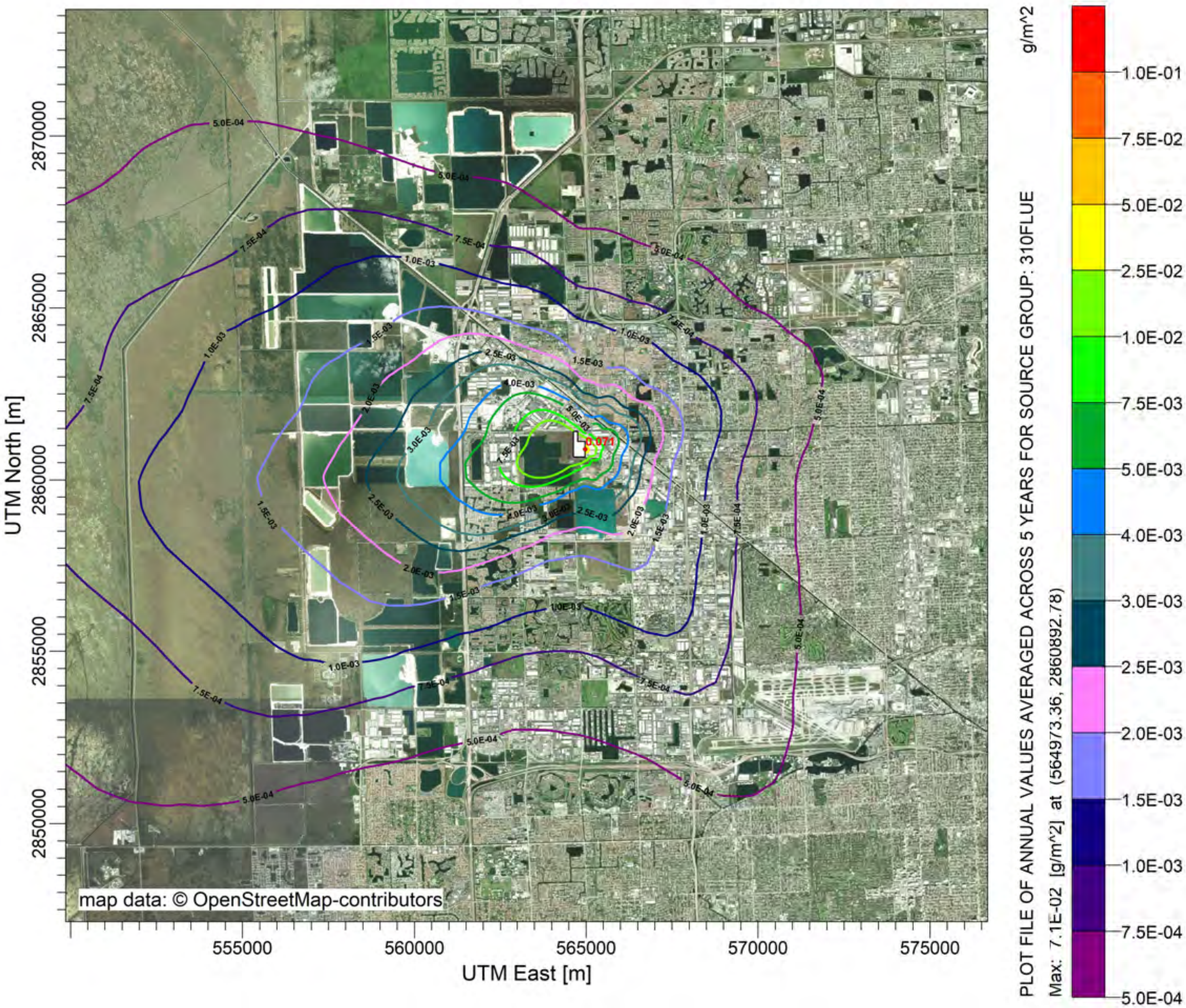
0 5 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Medley WTE Site
Metals Particle Phase Total Depo - Annual (g/m2 per 1 g/s)



COMMENTS:

310 ft Stack
5-Year Annual Average
Scenario 1A
Urban pop. est. 850K

SOURCES:

3

RECEPTORS:

13980

OUTPUT TYPE:

Total Depos.

MAX:

7.1E-02 g/m^2

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

1/29/2024

SCALE: 1:180,608

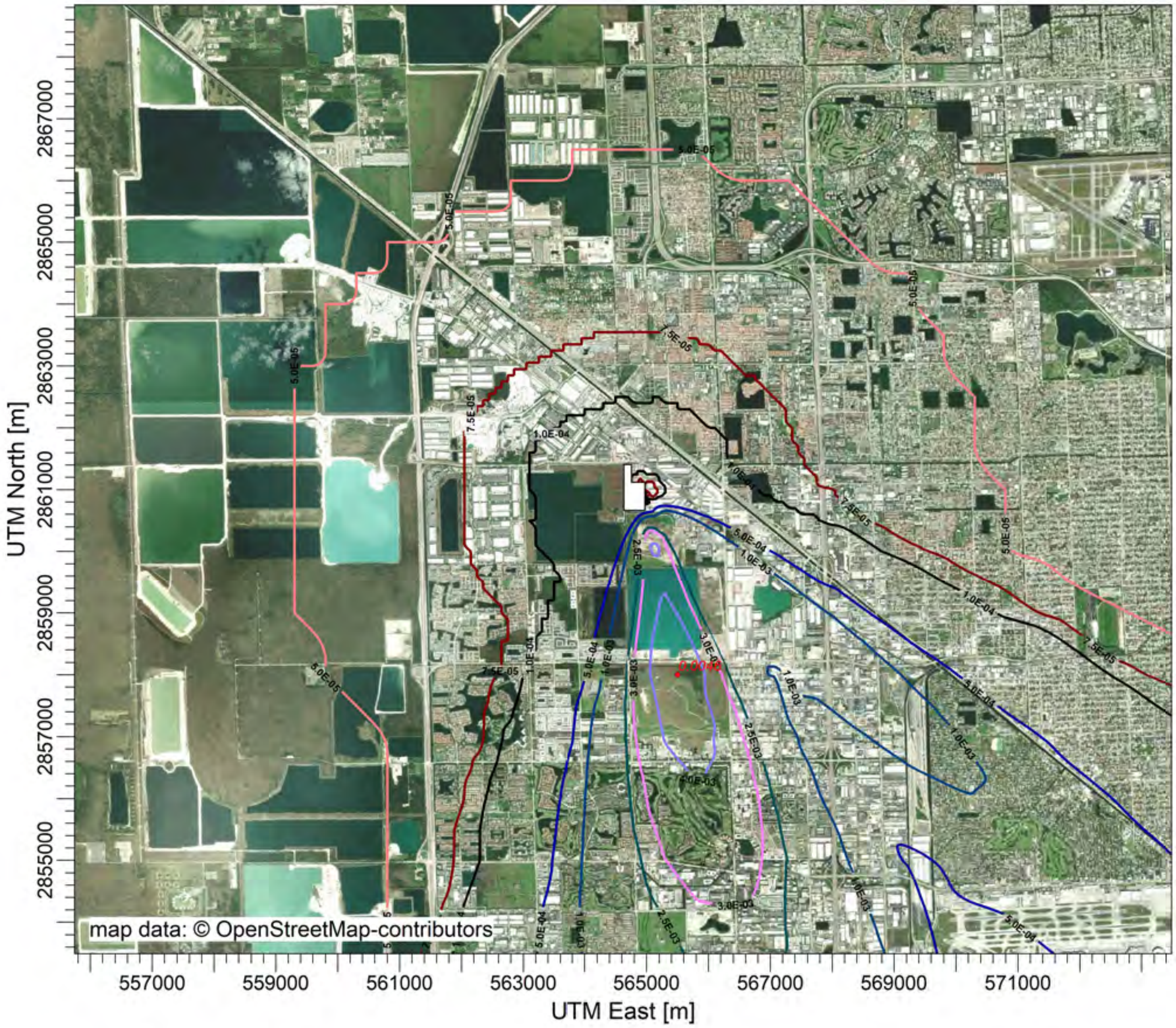
0 5 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Medley WTE Site
Acid Gases - Dioxin (TCDD) Vapor Phase Depo - Annual (g/m2 per 1 g/s)



PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 5 YEARS FOR SOURCE GROUP: 310FLUE g/m^2

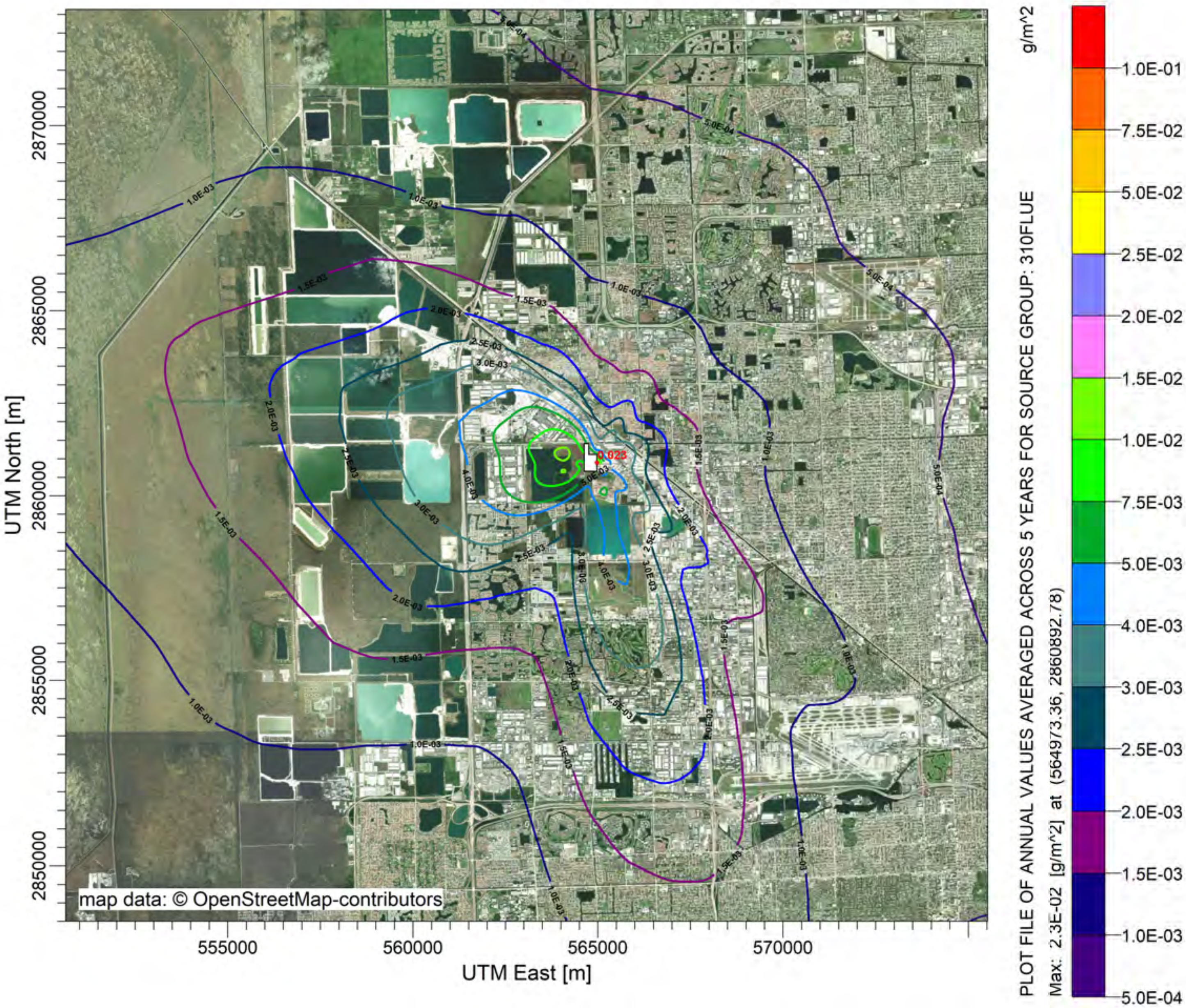
Max: 4.6E-03 [g/m^2] at (565500.00, 2858000.00)

5.0E-05 7.5E-05 1.0E-04 5.0E-04 1.0E-03 2.5E-03 3.0E-03 4.0E-03 5.0E-03 7.5E-03 1.0E-02 2.5E-02 5.0E-02 7.5E-02 1.0E-01

COMMENTS:	SOURCES:	COMPANY NAME:	
310 ft Stack 5-Year Annual Average Scenario 1A Urban pop. est. 850K	**3**	**Arcadis, Inc**	
	RECEPTORS: **13980**	MODELER:	
	OUTPUT TYPE: **Total Depos.**	SCALE: 1:111,534 0 — 4 km	
	MAX: **4.6E-03 g/m^2**	DATE: **1/30/2024**	PROJECT NO.:

PROJECT TITLE:

Conceptual Medley WTE Site
Divalent Mecury Vapor Phase Total Depo - Annual (g/m2 per 1 g/s)



COMMENTS:

310 ft Stack
5-year Annual Average
Scenario 1A
Urban est. pop. 850K

SOURCES:

3

RECEPTORS:

13980

OUTPUT TYPE:

Total Depos.

MAX:

2.3E-02 g/m^2

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

1/29/2024

SCALE: 1:167,680

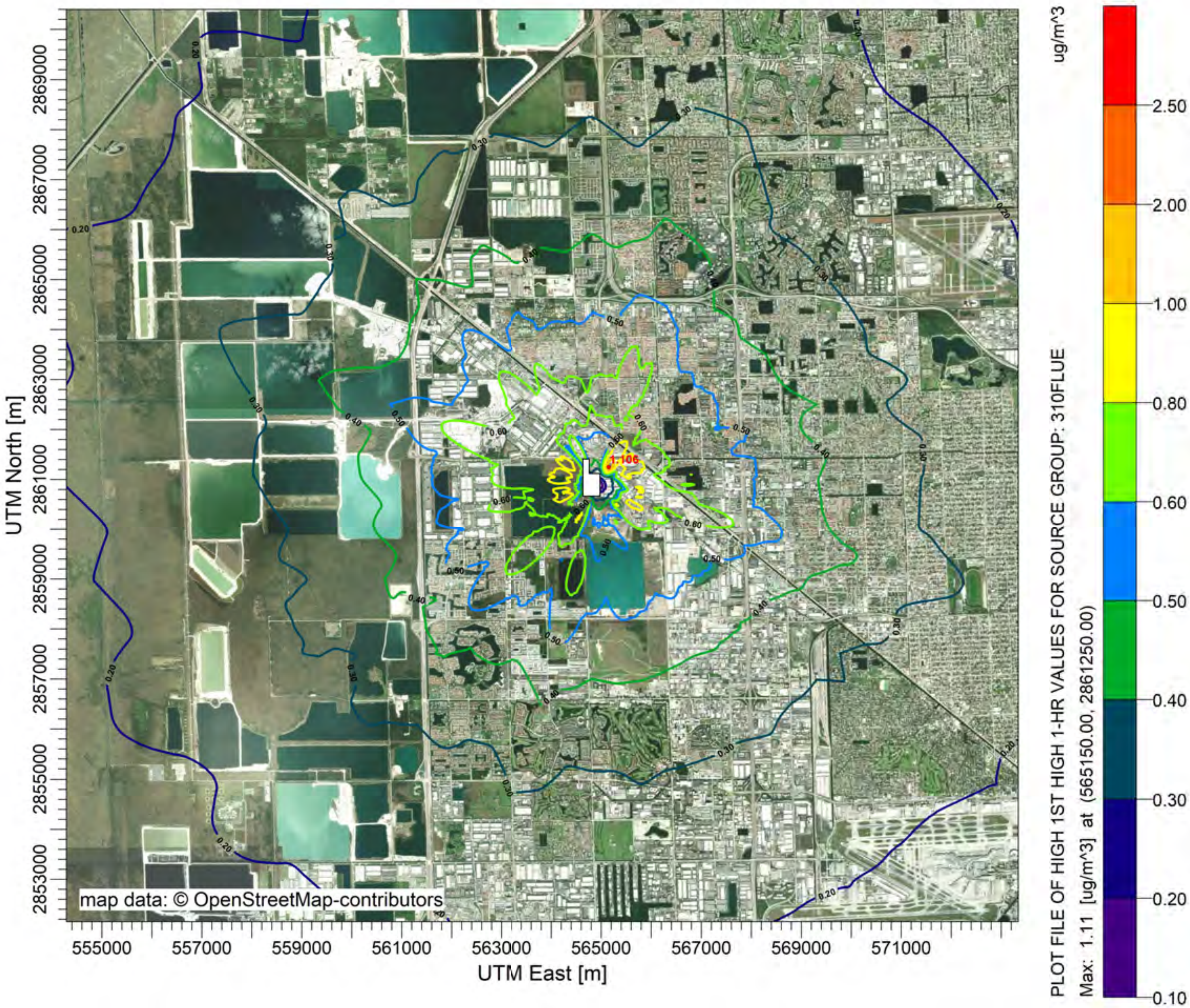
0 5 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Medley WTE Site
H2SO4 Acid Gases 1-hour Concentration (ug/m3 per 1 g/s)



COMMENTS:

310ft Stack
1-Hour Conc
Scenario 1A
Urban est. pop. 850K

SOURCES:

3

RECEPTORS:

13980

OUTPUT TYPE:

Concentration

MAX:

1.11 ug/m^3

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

1/29/2024

SCALE: 1:124,220

0 — 4 km

PROJECT NO.:

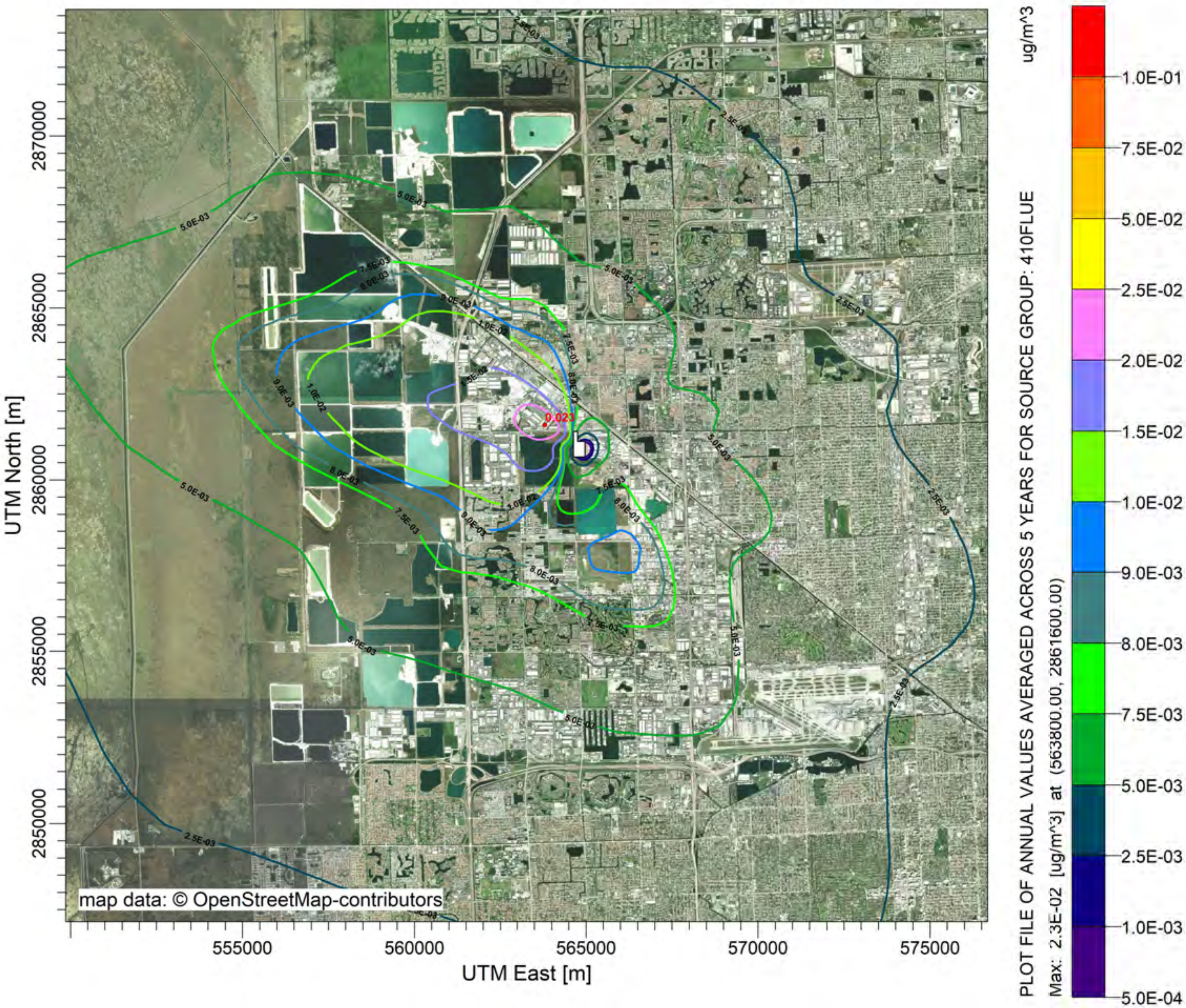
Attachment A-1

Isopleths

Medley: 410 foot stack height

PROJECT TITLE:

Conceptual Medley WTE Site
Metals Particle Phase Conc - Annual (ug/m3 per 1 g/s)



COMMENTS:

410 ft Stack
5-Year Annual Average
Scenario 1A
Urban pop. est. 850K

SOURCES:

3

RECEPTORS:

13980

OUTPUT TYPE:

Concentration

MAX:

2.3E-02 ug/m^3

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

1/29/2024

SCALE: 1:180,609

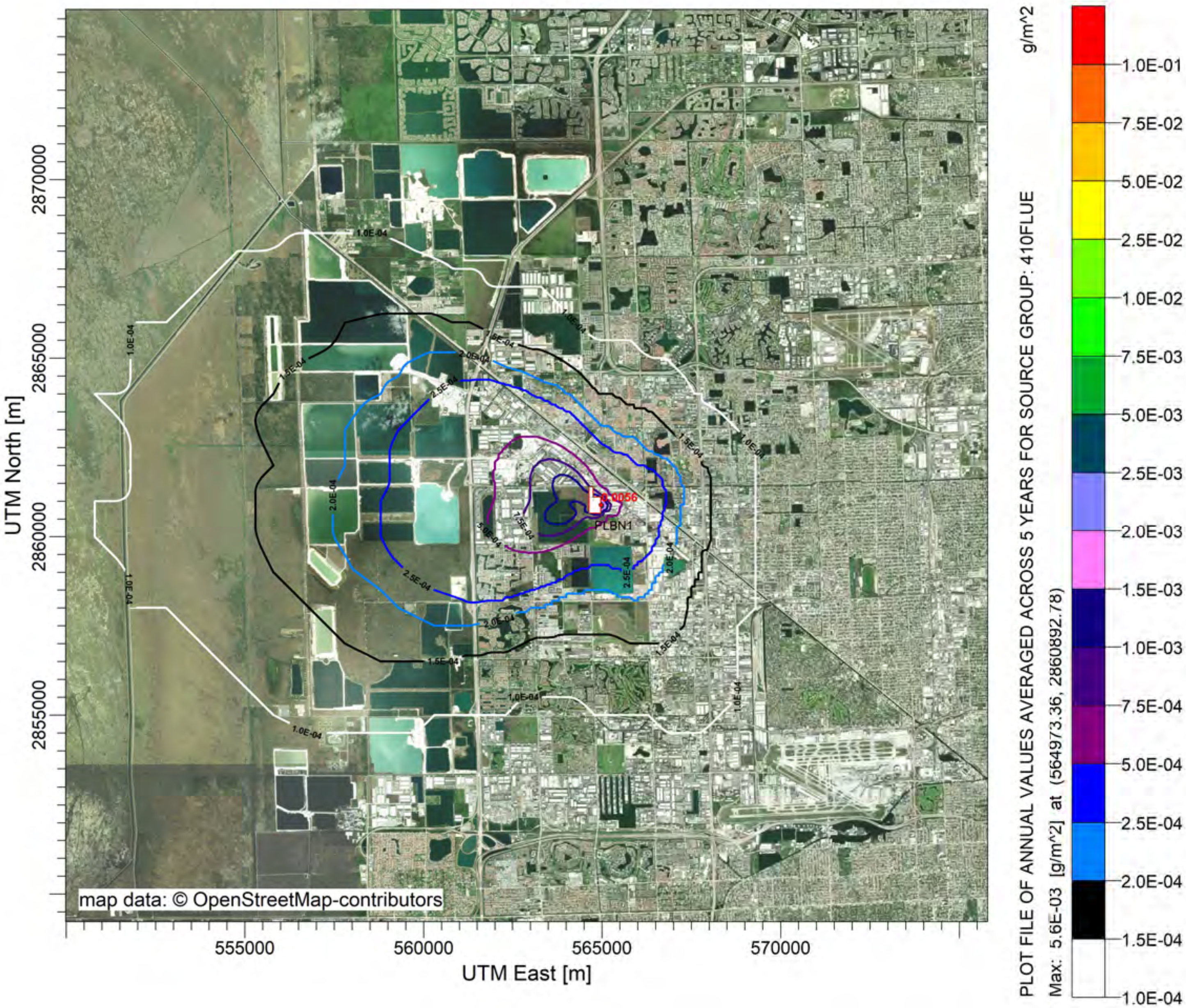
0 5 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Medley WTE Site
Particle Bound and Hg++ Total Annual Depo (g/m2 per 1 g/s)



COMMENTS:

410 ft Stack
5-Year Annual Average
Scenario 1A

SOURCES:

3

RECEPTORS:

13980

OUTPUT TYPE:

Total Depos.

MAX:

5.6E-03 g/m^2

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

1/29/2024

SCALE: 1:173,797

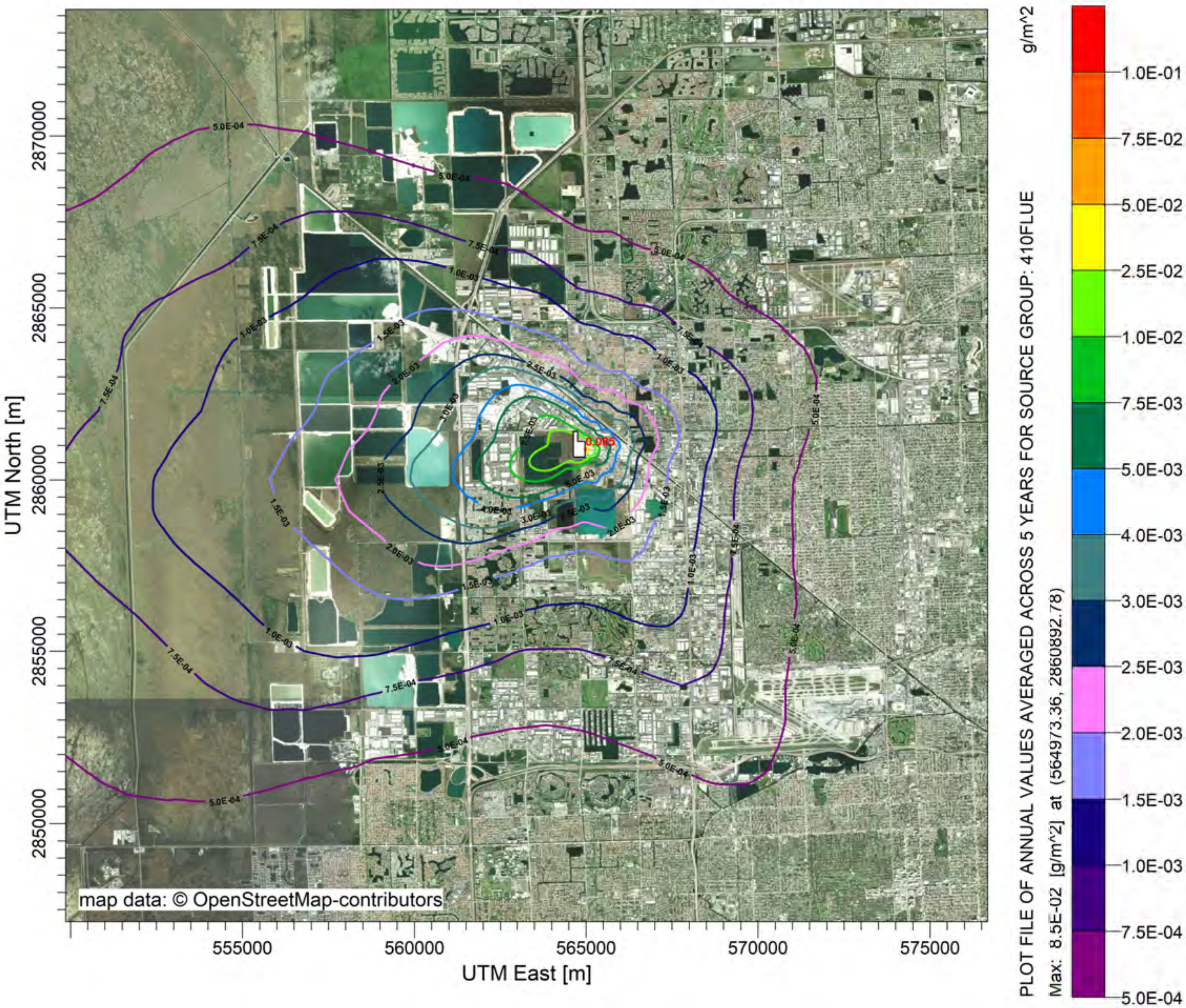
0 5 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Medley WTE Site
Metals Particle Phase Total Depo - Annual (g/m2 per 1 g/s)



COMMENTS:

410 ft Stack
5-Year Annual Average
Scenario 1A
Urban pop. est. 850K

SOURCES:

3

RECEPTORS:

13980

OUTPUT TYPE:

Total Depos.

MAX:

8.5E-02 g/m^2

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

1/29/2024

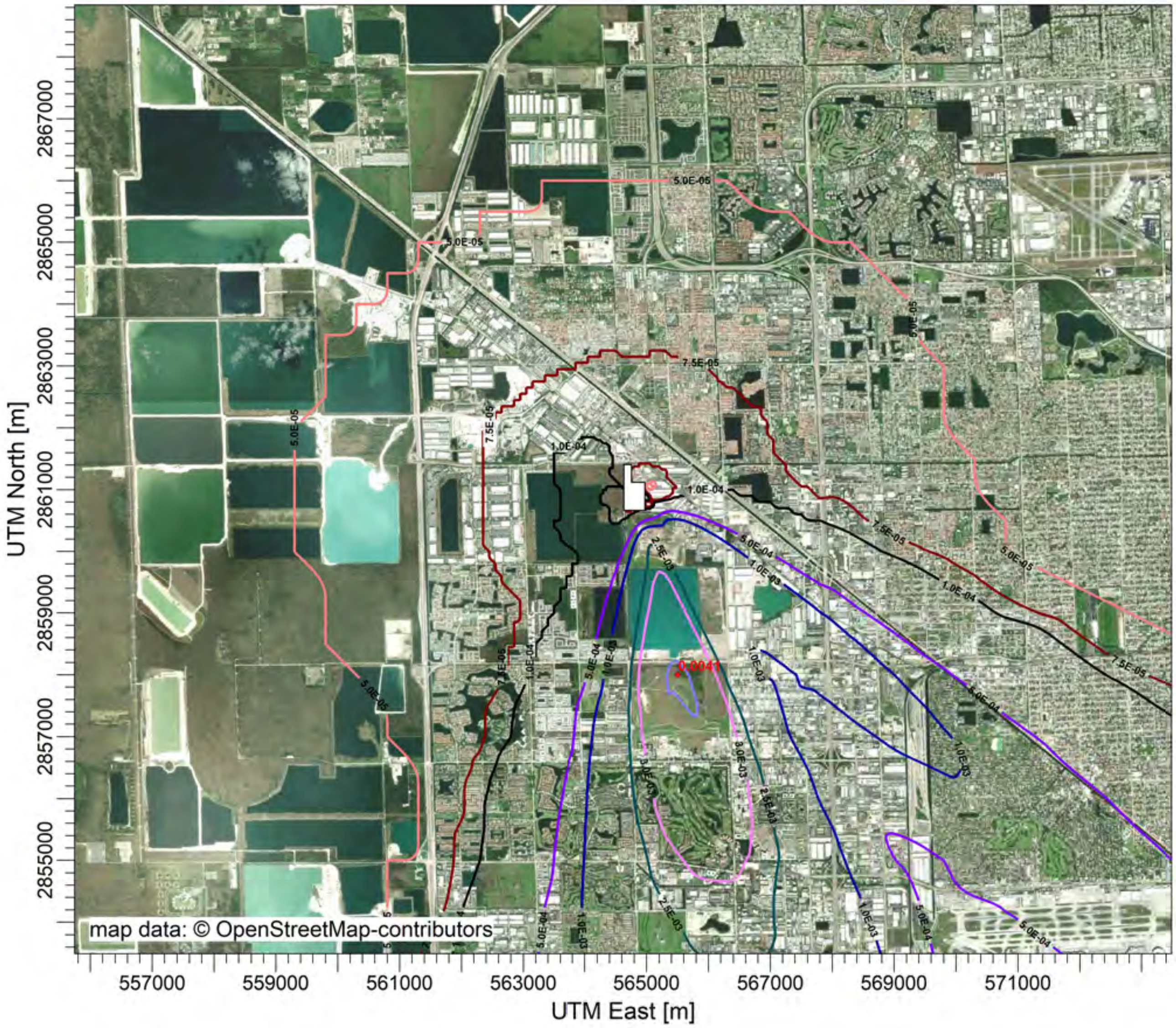
SCALE: 1:180,608

0 5 km

PROJECT NO.:

PROJECT TITLE:

Conceptual Medley WTE Site
Acid Gases - Dioxin (TCDD) Vapor Phase Depo - Annual (g/m2 per 1 g/s)



PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 5 YEARS FOR SOURCE GROUP: 410FLUE

g/m^2

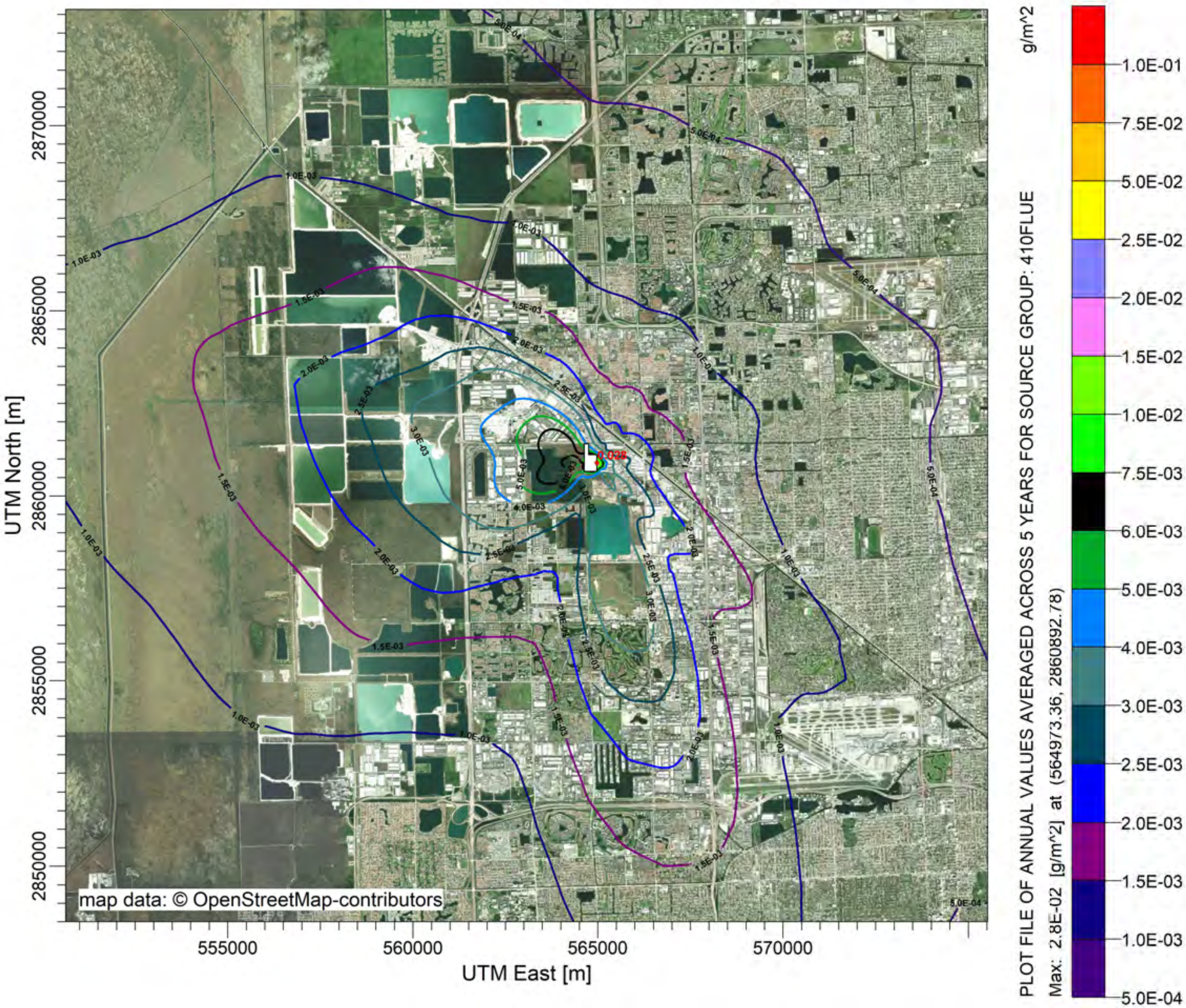
Max: 4.1E-03 [g/m^2] at (565500.00, 2858000.00)

5.0E-05 7.5E-05 1.0E-04 5.0E-04 1.0E-03 2.5E-03 3.0E-03 4.0E-03 5.0E-03 7.5E-03 1.0E-02 2.5E-02 5.0E-02 7.5E-02 1.0E-01

COMMENTS:	SOURCES:	COMPANY NAME:	
410 ft Stack 5-Year Annual Average Scenario 1A Urban pop. est. 850K	**3**	**Arcadis, Inc**	
	RECEPTORS: **13980**	MODELER:	
	OUTPUT TYPE: **Total Depos.**	SCALE: 1:111,534 0 — 4 km	
	MAX: **4.1E-03 g/m^2**	DATE: **1/30/2024**	PROJECT NO.:

PROJECT TITLE:

Conceptual Medley WTE Site
Divalent Mecury Vapor Phase Total Depo - Annual (g/m2 per 1 g/s)



COMMENTS:

410 ft Stack
5-year Annual Average
Scenario 1A
Urban est. pop. 850K

SOURCES:

3

RECEPTORS:

13980

OUTPUT TYPE:

Total Depos.

MAX:

2.8E-02 g/m^2

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

1/29/2024

SCALE: 1:167,680

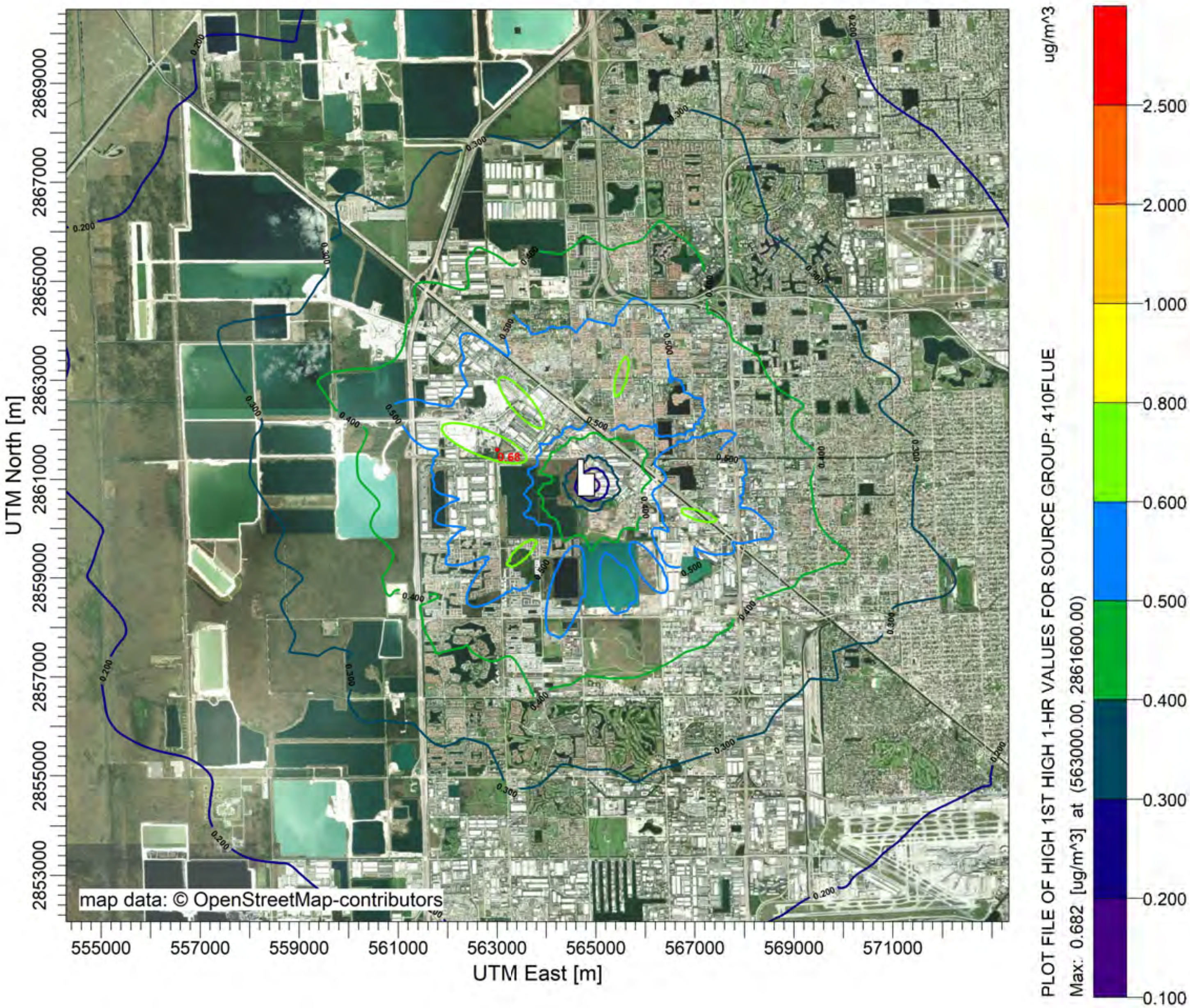
0 5 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Medley WTE Site
H2SO4 Acid Gases 1-hour Concentration (ug/m3 per 1 g/s)



COMMENTS:

410ft Stack
1-Hour Conc
Scenario 1A
Urban est. pop. 850K

SOURCES:

3

RECEPTORS:

13980

OUTPUT TYPE:

Concentration

MAX:

0.682 ug/m^3

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

1/29/2024

SCALE: 1:125,415

0 4 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

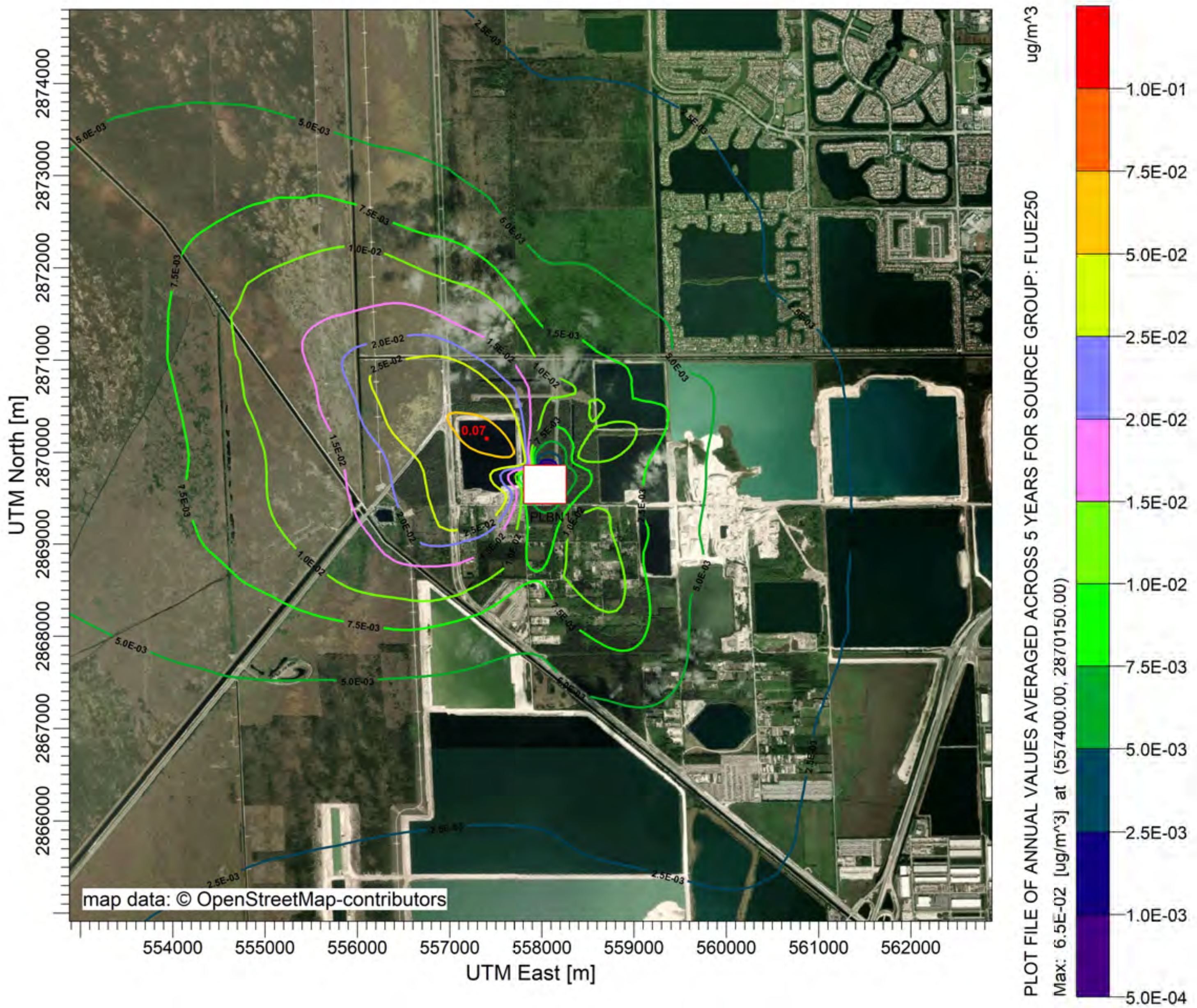
Attachment A-1

Isopleths

Airport West: 250 foot stack height

PROJECT TITLE:

Conceptual Airport West WTE Facility
Metals Particle Phase 5 yr Avg Annual Concentration (ug/m3 per 1 g/s)



COMMENTS:

250 ft Stack
5-Year Annual Average
Scenario 1A
Worst-case Year: 2021

SOURCES:

3

RECEPTORS:

9041

OUTPUT TYPE:

Concentration

MAX:

6.5E-02 ug/m^3

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

12/28/2023

SCALE: 1:67,330

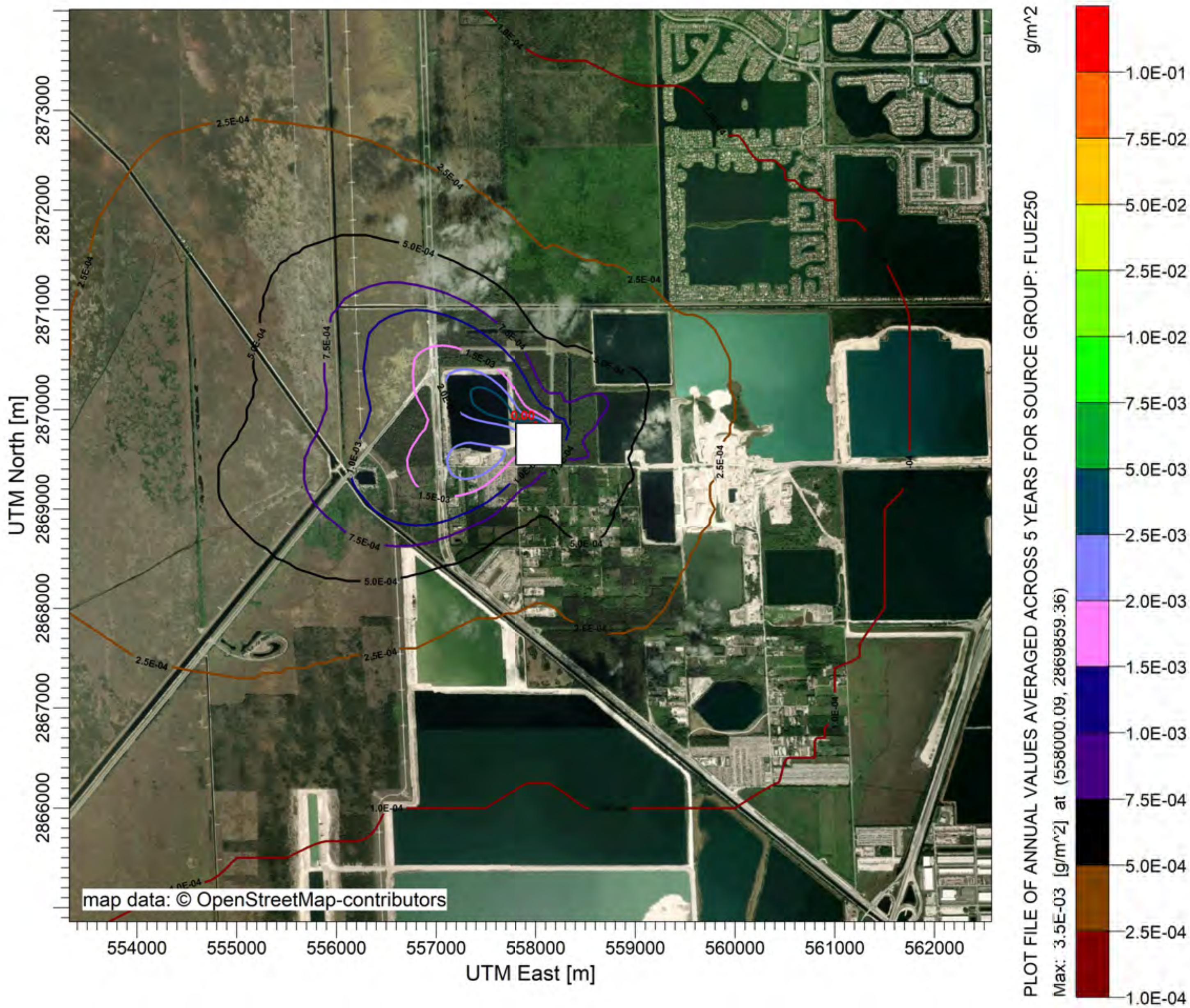
0 2 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Airport West WTE Facility
Particle Bound and Hg++ Total Annual Depo (g/m2 per 1 g/s)



COMMENTS:

250 ft Stack
5-Year Annual Average
Scenario 1A
Worst-case year: 2018

SOURCES:

3

RECEPTORS:

9041

OUTPUT TYPE:

Total Depos.

MAX:

3.5E-03 g/m^2

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

12/28/2023

SCALE: 1:62,311

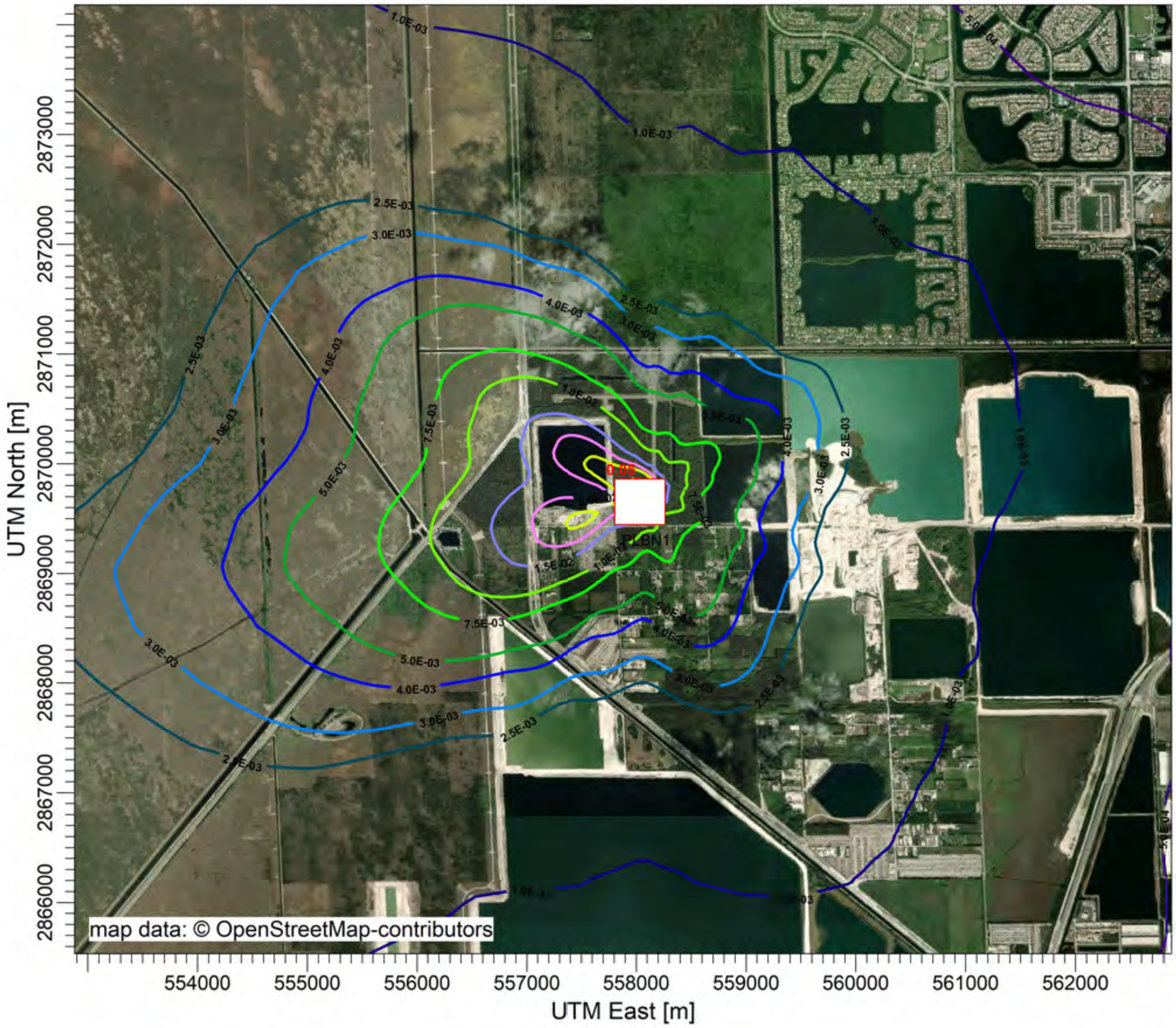
0 2 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Airport West WTE Facility
Metals Particle Phase Annual Total Depo (g/m2 per 1 g/s)



PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 5 YEARS FOR SOURCE GROUP: FLUE250 g/m^2

Max: 5.3E-02 [g/m^2] at (558000.09, 2869859.36)

5.0E-04 1.0E-03 2.5E-03 3.0E-03 4.0E-03 5.0E-03 7.5E-03 1.0E-02 1.5E-02 2.0E-02 2.5E-02 5.0E-02 7.5E-02 1.0E-01

COMMENTS:

250 ft Stack
5-Year Annual Average
Scenario 1A
Worst-case Year: 2018

SOURCES:

3

COMPANY NAME:

Arcadis, Inc

RECEPTORS:

9041

MODELER:

OUTPUT TYPE:

Total Depos.

SCALE: 1:62,841

0 2 km

MAX:

5.3E-02 g/m^2

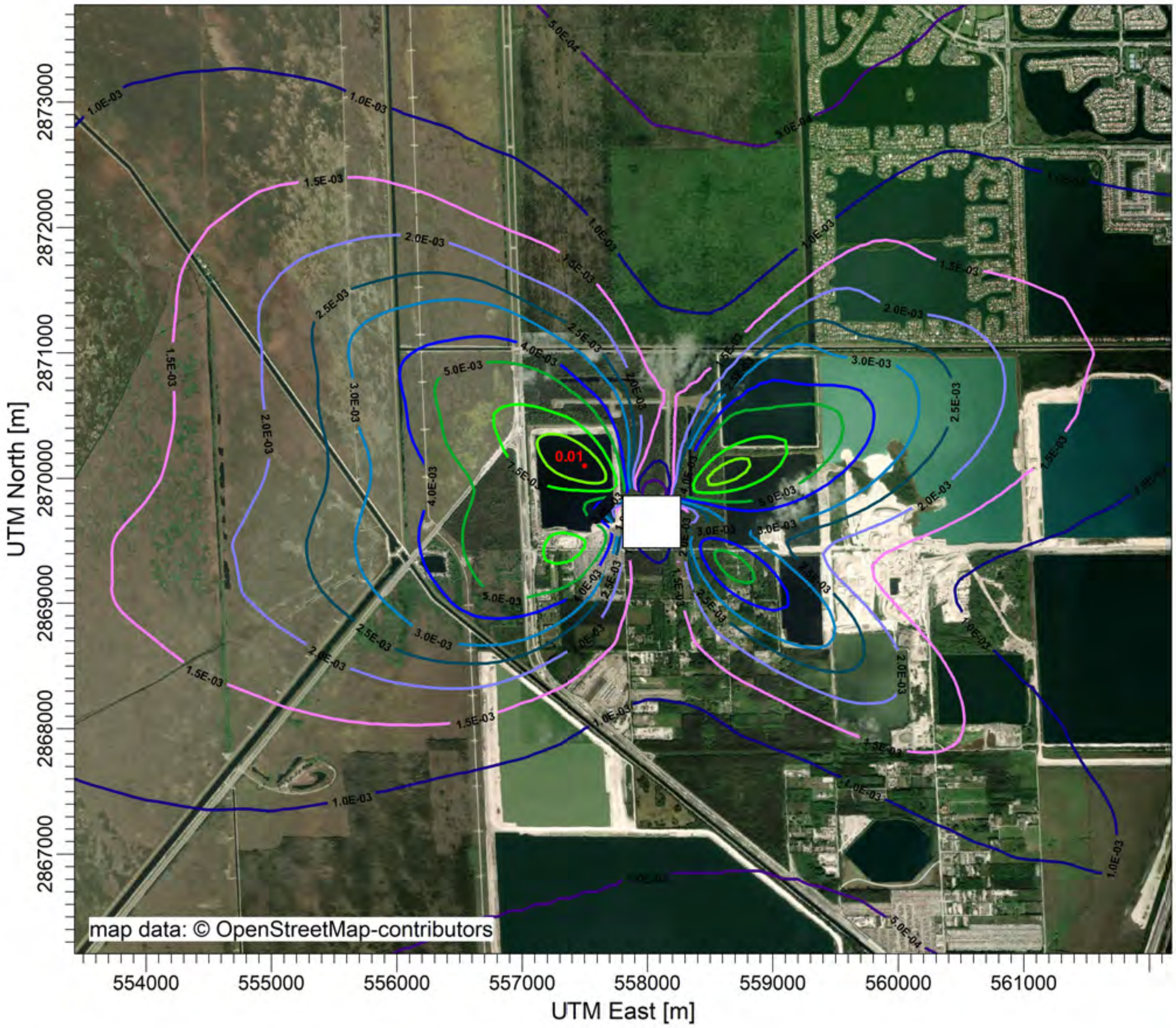
DATE:

12/29/2023

PROJECT NO.:

PROJECT TITLE:

Conceptual Airport West WTE Facility
Dioxin (TCDD) Vapor Phase Total Depo - Annual (g/m2 per 1 g/s)



PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 5 YEARS FOR SOURCE GROUP: FLUE250 g/m^2

Max: 1.2E-02 [g/m^2] at (557500.00, 2870100.00)

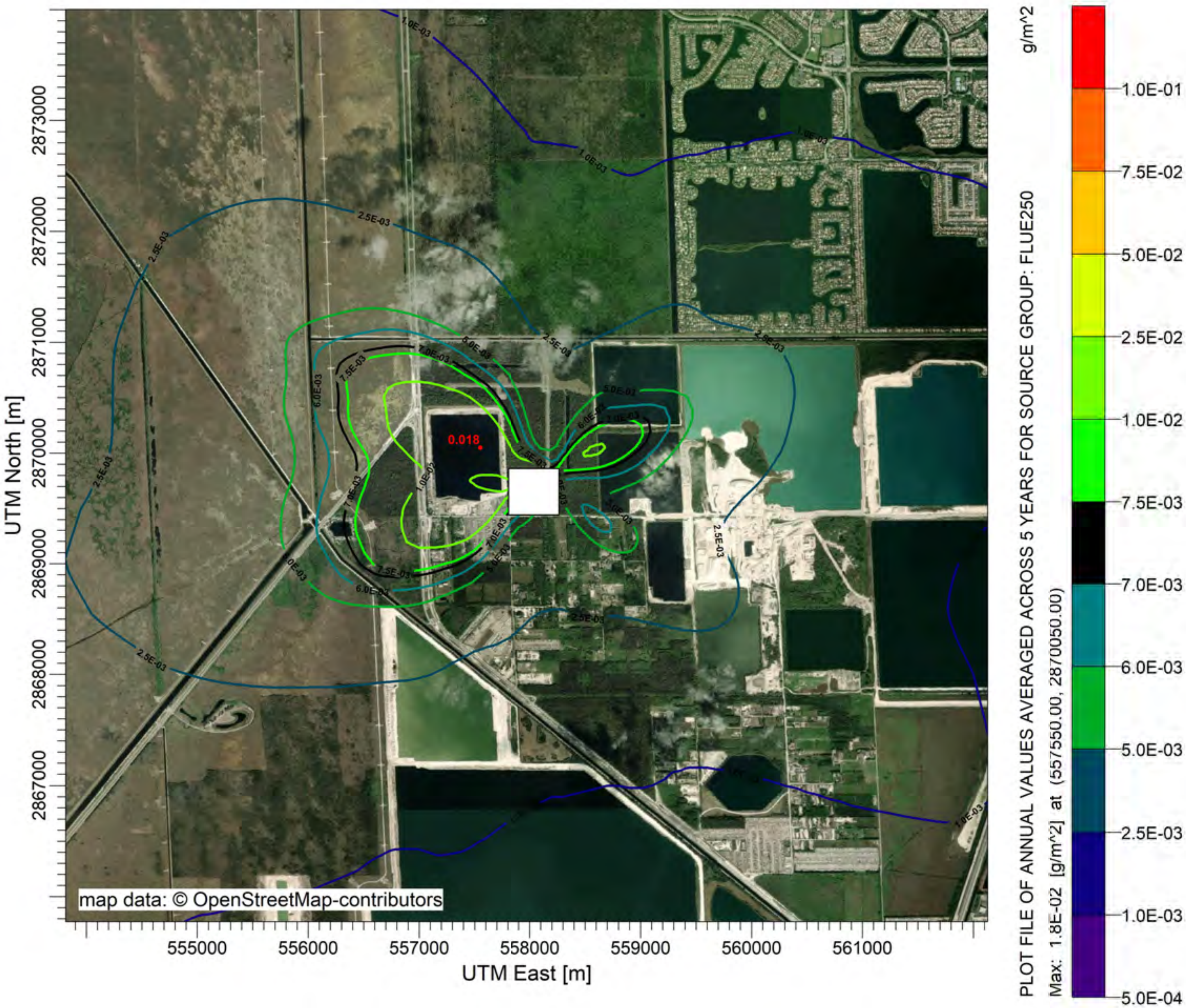
5.0E-04 1.0E-03 1.5E-03 2.0E-03 2.5E-03 3.0E-03 4.0E-03 5.0E-03 7.5E-03 1.0E-02 2.5E-02 5.0E-02 7.5E-02 1.0E-01

COMMENTS:	SOURCES:	COMPANY NAME:	
250 ft Stack 5-Year Annual Average Scenario 1A Worst-case Year: 2018	**3**	**Arcadis, Inc**	
	RECEPTORS: **9041**	MODELER:	
	OUTPUT TYPE: **Total Depos.**	SCALE: 1:55,000 0 ——— 2 km	
	MAX: **1.2E-02 g/m^2**	DATE: **12/29/2023**	PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Airport West WTE Facility
Divalent Mercury Vapor Phase Total Depo - Annual (g/m2 per 1 g/s)



COMMENTS:

250 ft Stack
5-Year Annual Average
Scenario 1A
Worst-case Year: 2018

SOURCES:

3

RECEPTORS:

9041

OUTPUT TYPE:

Total Depos.

MAX:

1.8E-02 g/m^2

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

12/28/2023

SCALE: 1:56,003

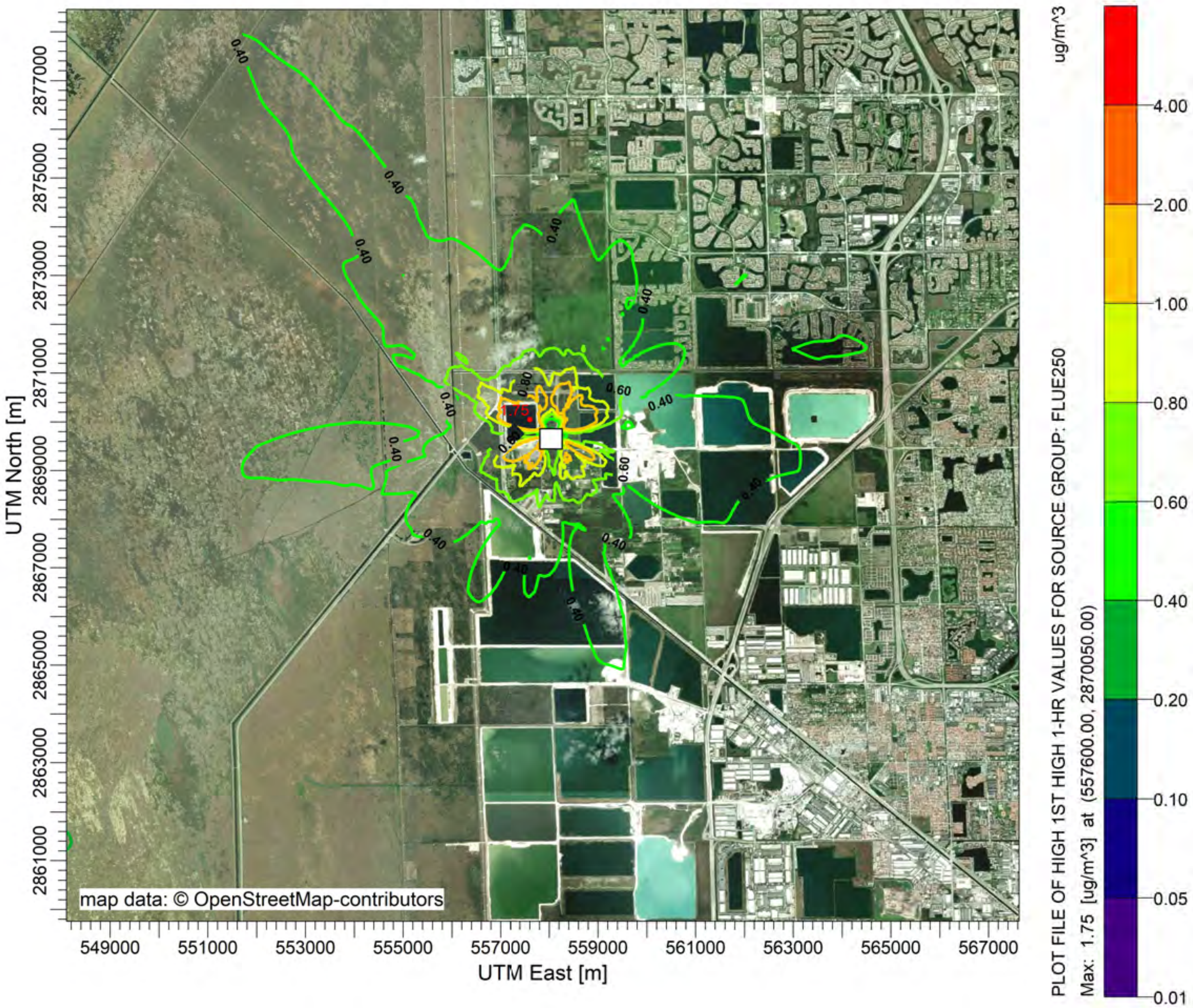
0 1 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Airport West WTE Facility
1-Hour H2SO4 Concentration (ug/m3 per 1 g/s)



COMMENTS:

250 ft Stack
Scenario 1A
Worst-case Conc

SOURCES:

3

RECEPTORS:

9041

OUTPUT TYPE:

Concentration

MAX:

1.75 ug/m^3

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

12/11/2023

SCALE: 1:127,293

0 ▬ 4 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

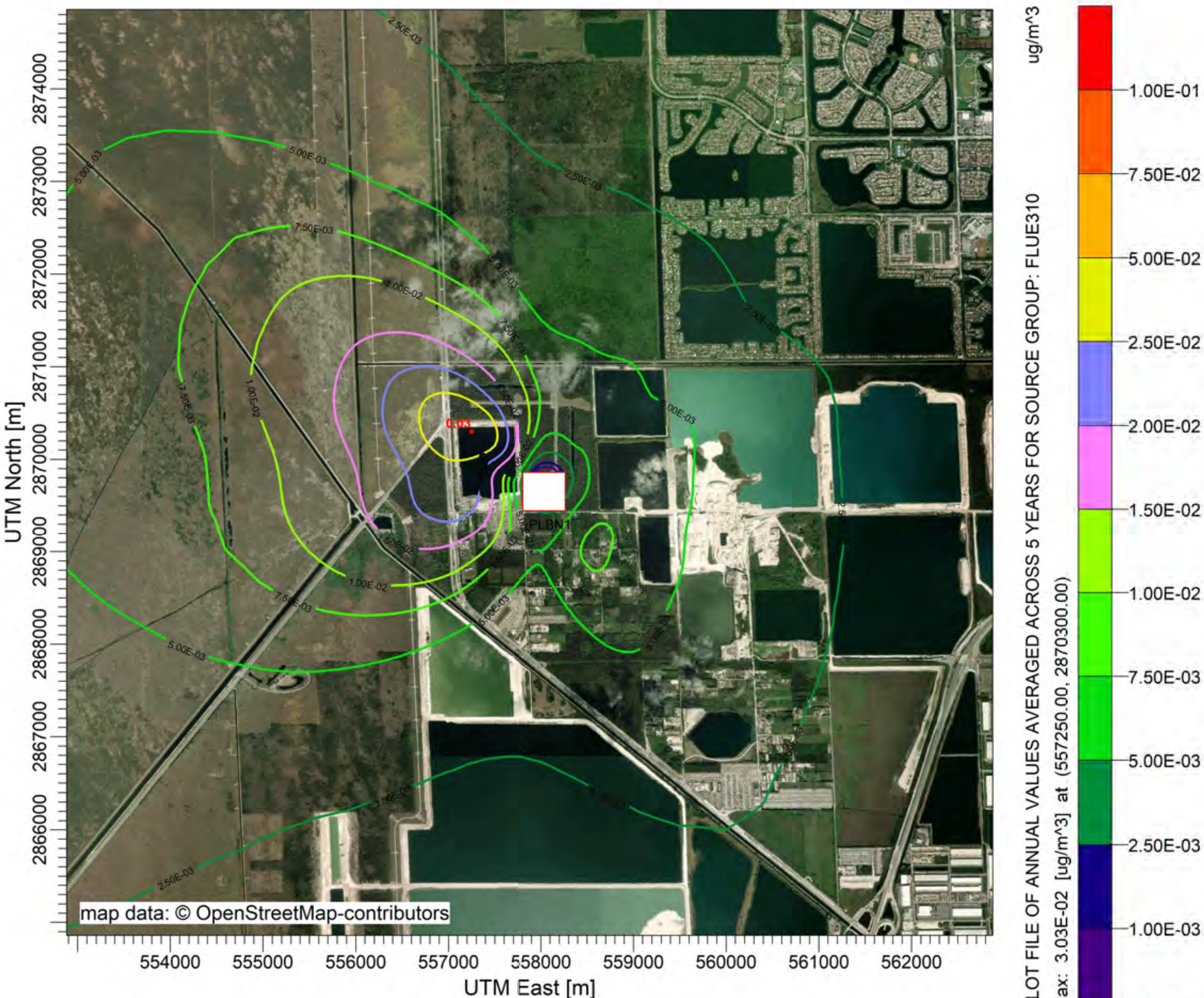
Attachment A-1

Isopleths

Airport West: 310 foot stack height

PROJECT TITLE:

Conceptual Airport West WTE Facility
Metals Particle Phase 5 yr Avg Annual Concentration (ug/m3 per 1 g/s)



COMMENTS:

310 ft Stack
5-Year Annual Average
Scenario 1A
Worst-case Year: 2021

SOURCES:

3

RECEPTORS:

9041

OUTPUT TYPE:

Concentration

MAX:

3.03E-02 ug/m^3

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

12/28/2023

SCALE: 1:68,036

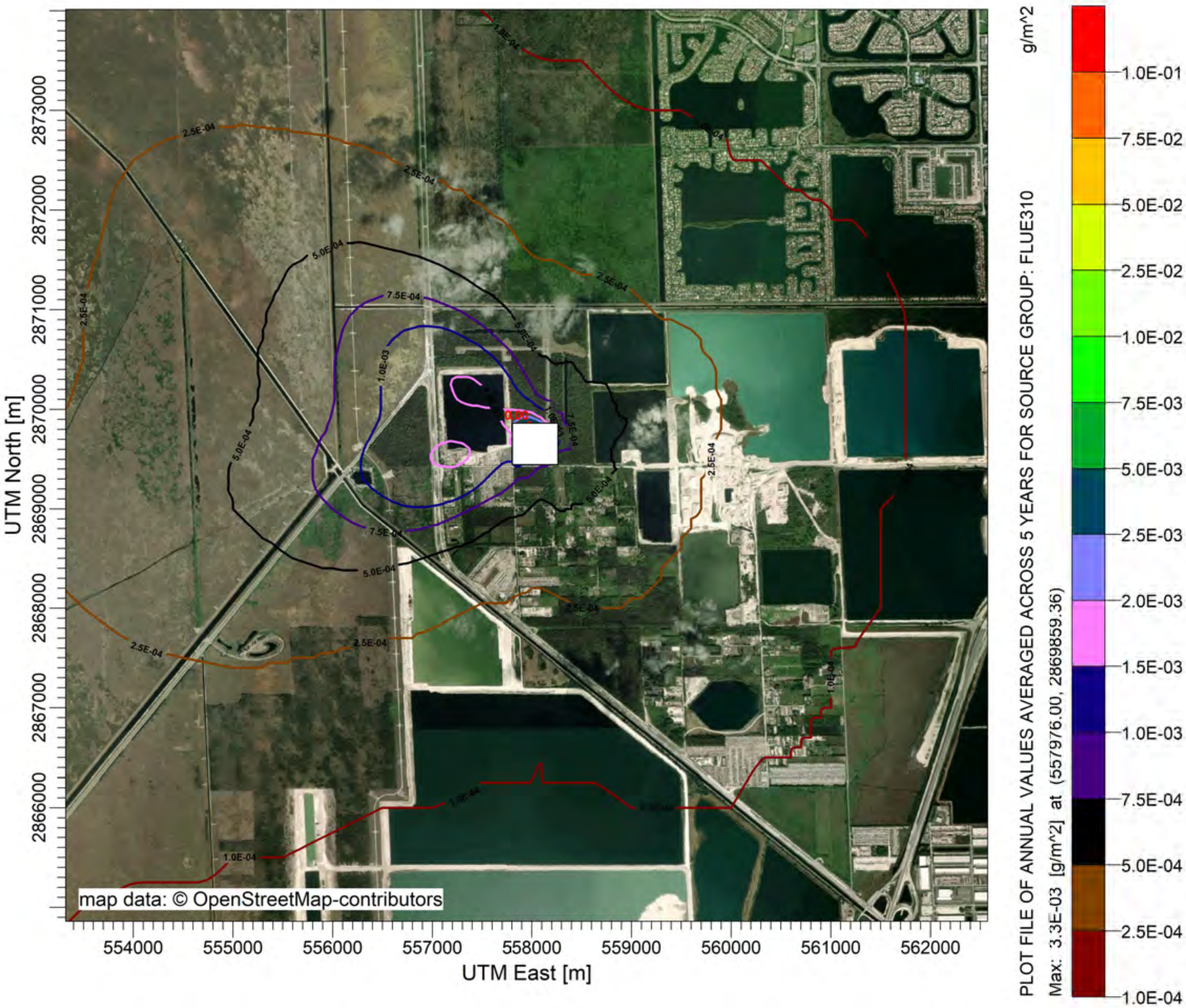
0 2 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Airport West WTE Facility
Particle Bound and Hg++ Total Annual Depo (g/m2 per 1 g/s)



COMMENTS:

310 ft Stack
5-Year Annual Average
Scenario 1A
Worst-case year: 2018

SOURCES:

3

RECEPTORS:

9041

OUTPUT TYPE:

Total Depos.

MAX:

3.3E-03 g/m^2

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

12/28/2023

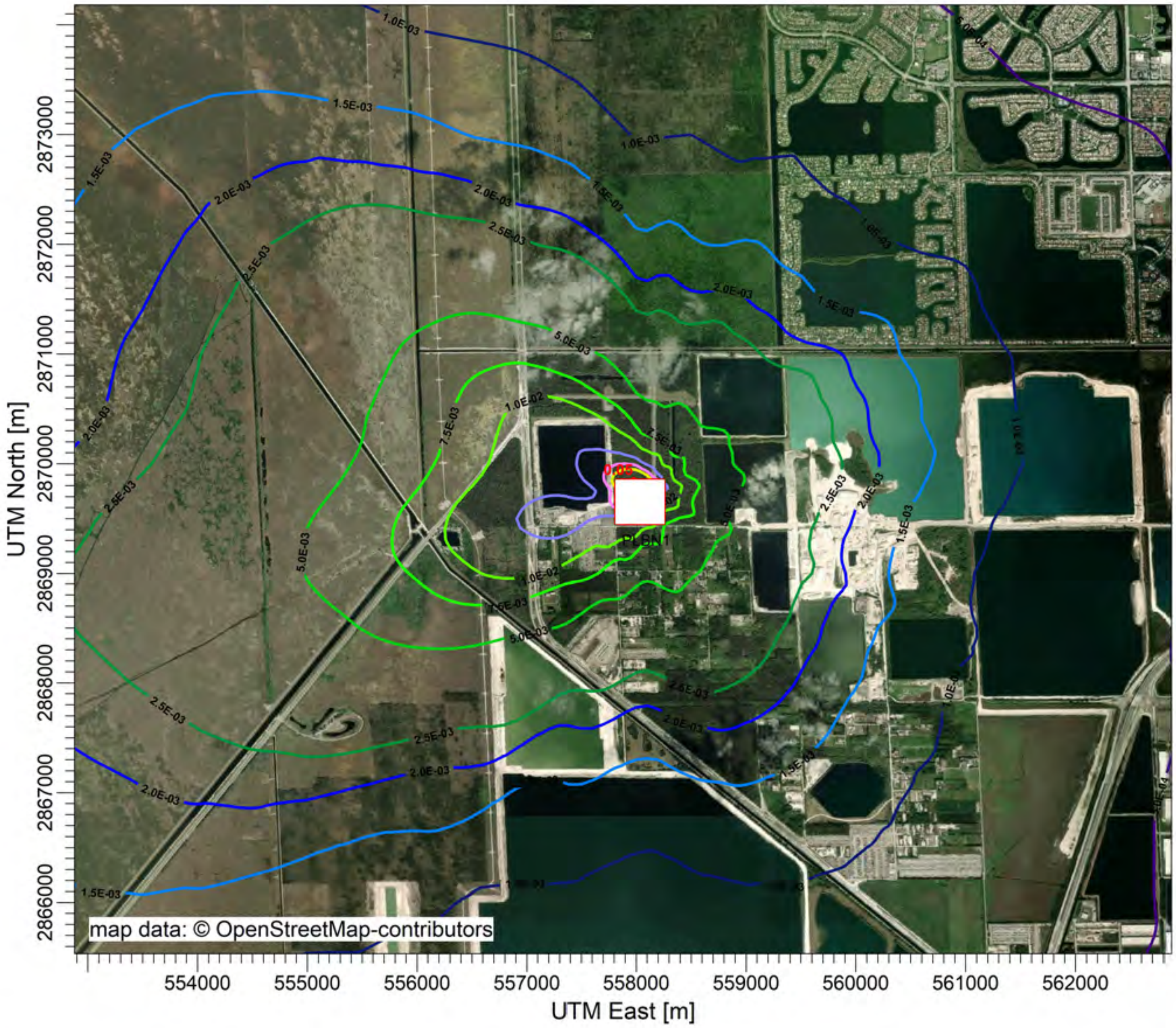
SCALE: 1:62,311

0 2 km

PROJECT NO.:

PROJECT TITLE:

Conceptual Airport West WTE Facility
Metals Particle Phase Annual Total Depo (g/m2 per 1 g/s)



PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 5 YEARS FOR SOURCE GROUP: FLUE310 g/m^2

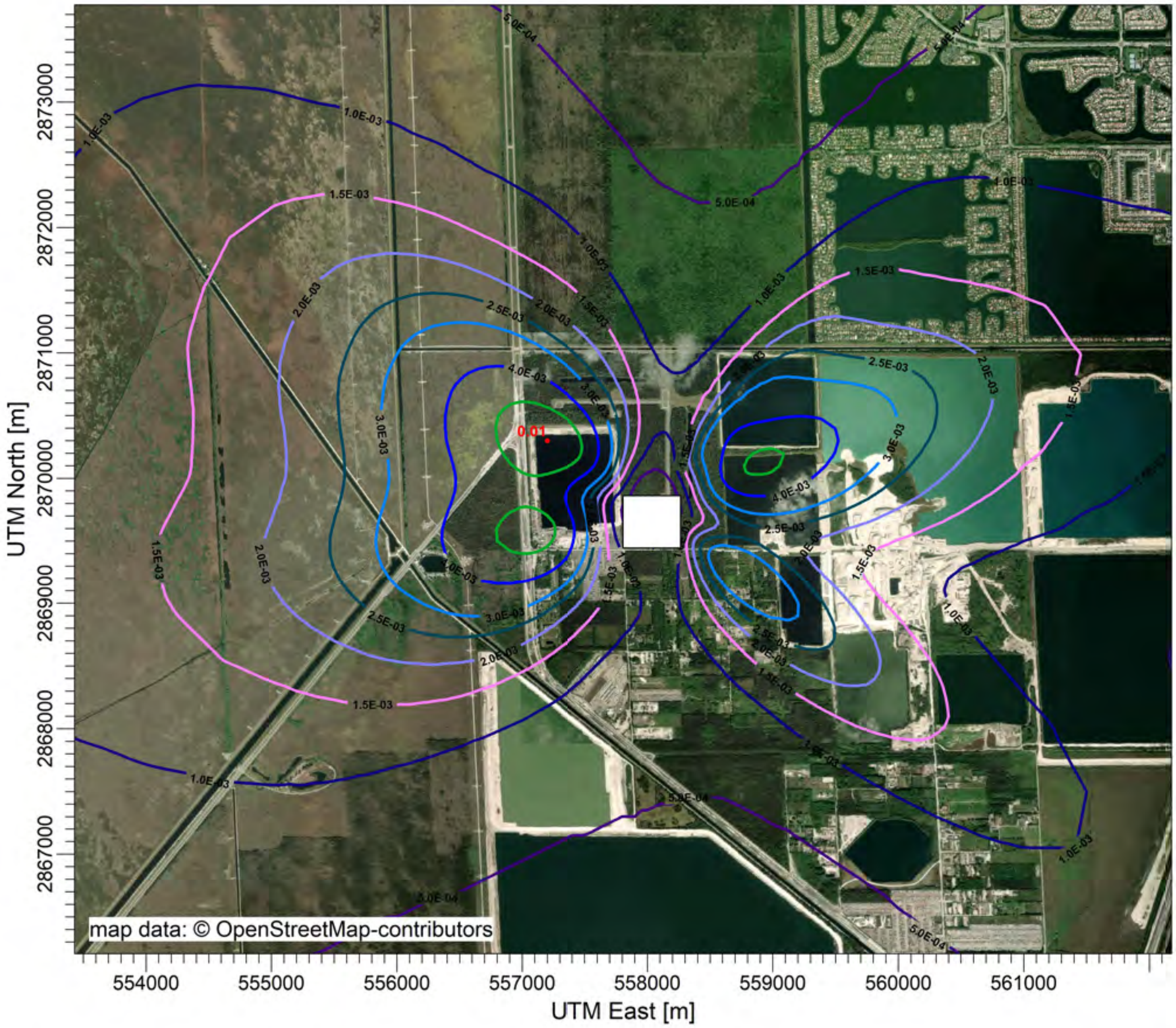
Max: 4.9E-02 [g/m^2] at (557976.00, 2869859.36)

5.0E-04 1.0E-03 1.5E-03 2.0E-03 2.5E-03 5.0E-03 7.5E-03 1.0E-02 1.5E-02 2.0E-02 2.5E-02 5.0E-02 7.5E-02 1.0E-01

COMMENTS:	SOURCES:	COMPANY NAME:	
310 ft Stack 5-Year Annual Average Scenario 1A Worst-case Year: 2018	**3**	**Arcadis, Inc**	
	RECEPTORS: **9041**	MODELER:	
	OUTPUT TYPE: **Total Depos.**	SCALE: 1:62,841 0 — 2 km	
	MAX: **4.9E-02 g/m^2**	DATE: **12/29/2023**	PROJECT NO.:

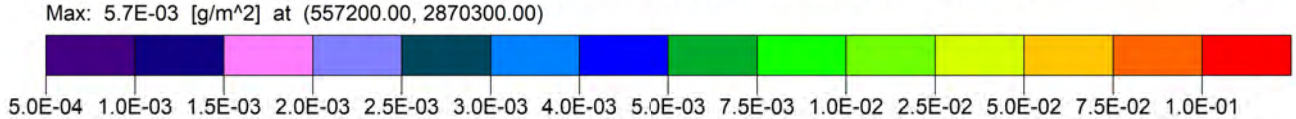
PROJECT TITLE:

Conceptual Airport West WTE Facility
Dioxin (TCDD) Vapor Phase Total Depo - Annual (g/m2 per 1 g/s)



PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 5 YEARS FOR SOURCE GROUP: FLUE310 g/m^2

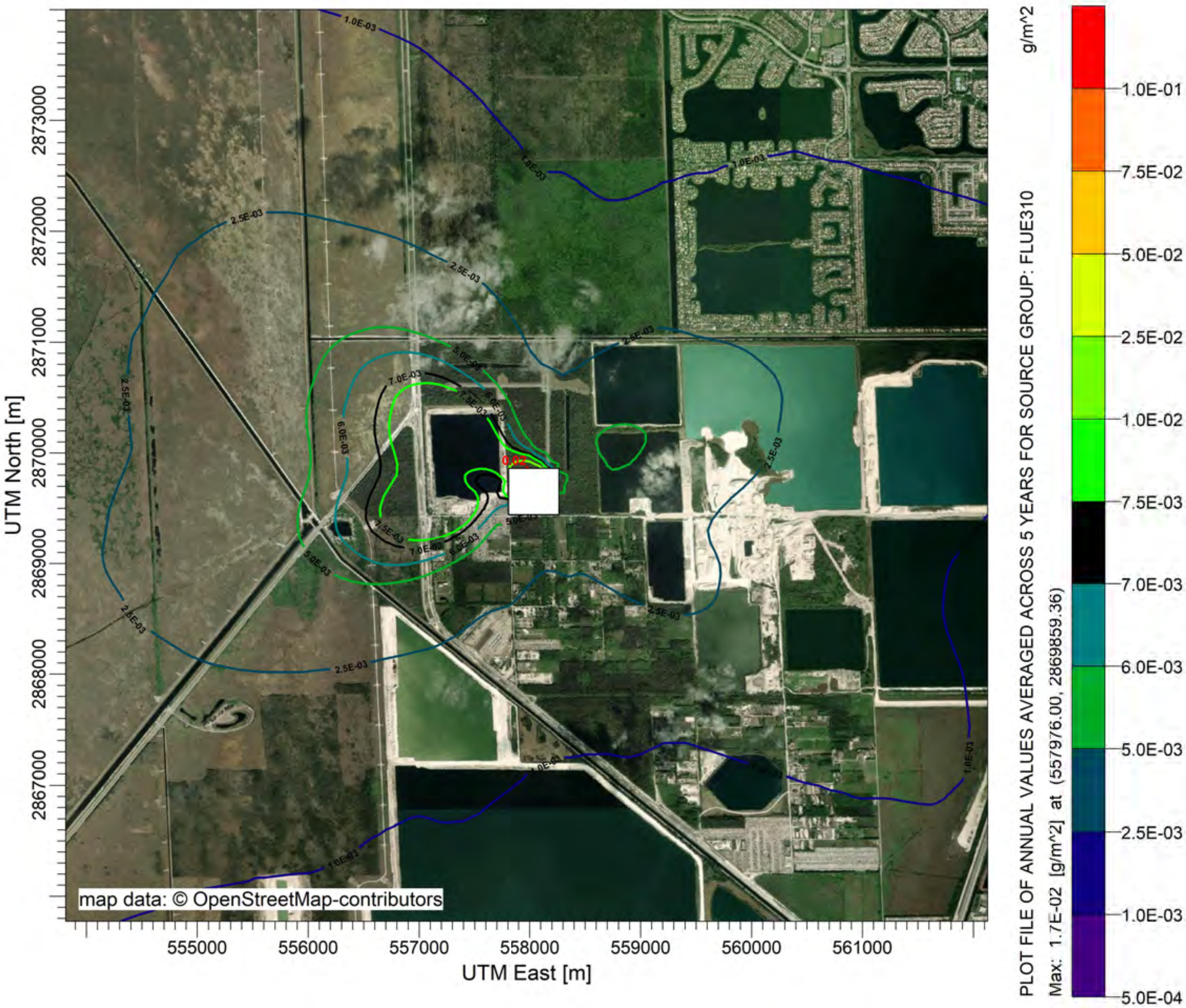
Max: 5.7E-03 [g/m^2] at (557200.00, 2870300.00)



COMMENTS:	SOURCES:	COMPANY NAME:	
310 ft Stack 5-Year Annual Average Scenario 1A Worst-case Year: 2018	**3**	**Arcadis, Inc**	
	RECEPTORS: **9041**	MODELER:	
	OUTPUT TYPE: **Total Depos.**	SCALE: 1:55,000 0 ▬▬ 2 km	
	MAX: **5.7E-03 g/m^2**	DATE: **12/29/2023**	PROJECT NO.:

PROJECT TITLE:

Conceptual Airport West WTE Facility
Divalent Mercury Vapor Phase Total Depo - Annual (g/m2 per 1 g/s)



COMMENTS:

310 ft Stack
5-Year Annual Average
Scenaio 1A
Worst-case Year: 2018

SOURCES:

3

RECEPTORS:

9041

OUTPUT TYPE:

Total Depos.

MAX:

1.7E-02 g/m^2

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

12/28/2023

SCALE: 1:56,003

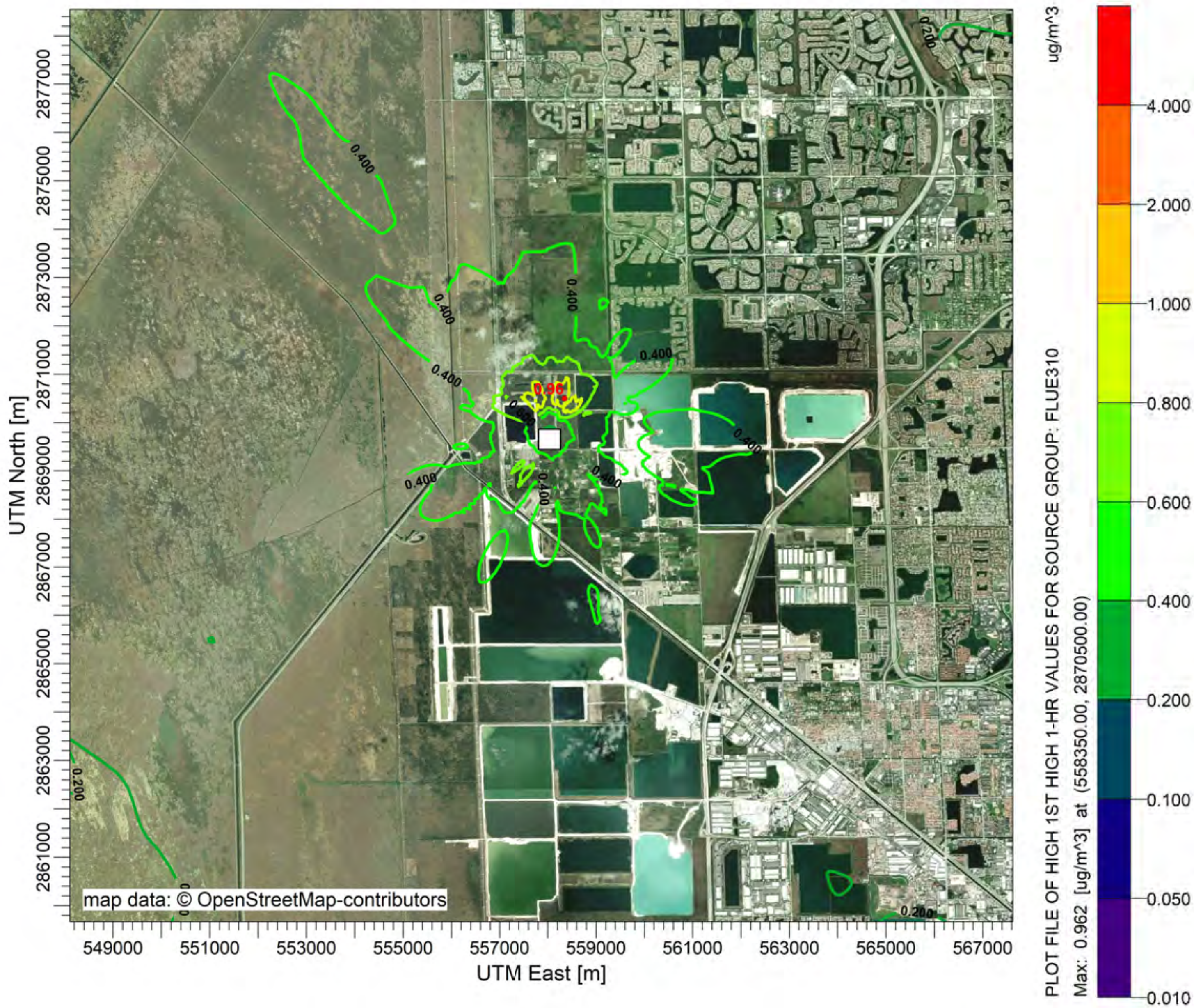
0 1 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Airport West WTE Facility
1-Hour H2SO4 Concentration (ug/m3 per 1 g/s)



COMMENTS:

310 ft Stack
Scenario 1A
Worst-case Conc

SOURCES:

3

RECEPTORS:

9041

OUTPUT TYPE:

Concentration

MAX:

0.962 ug/m^3

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

12/11/2023

SCALE: 1:128,506

0 4 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

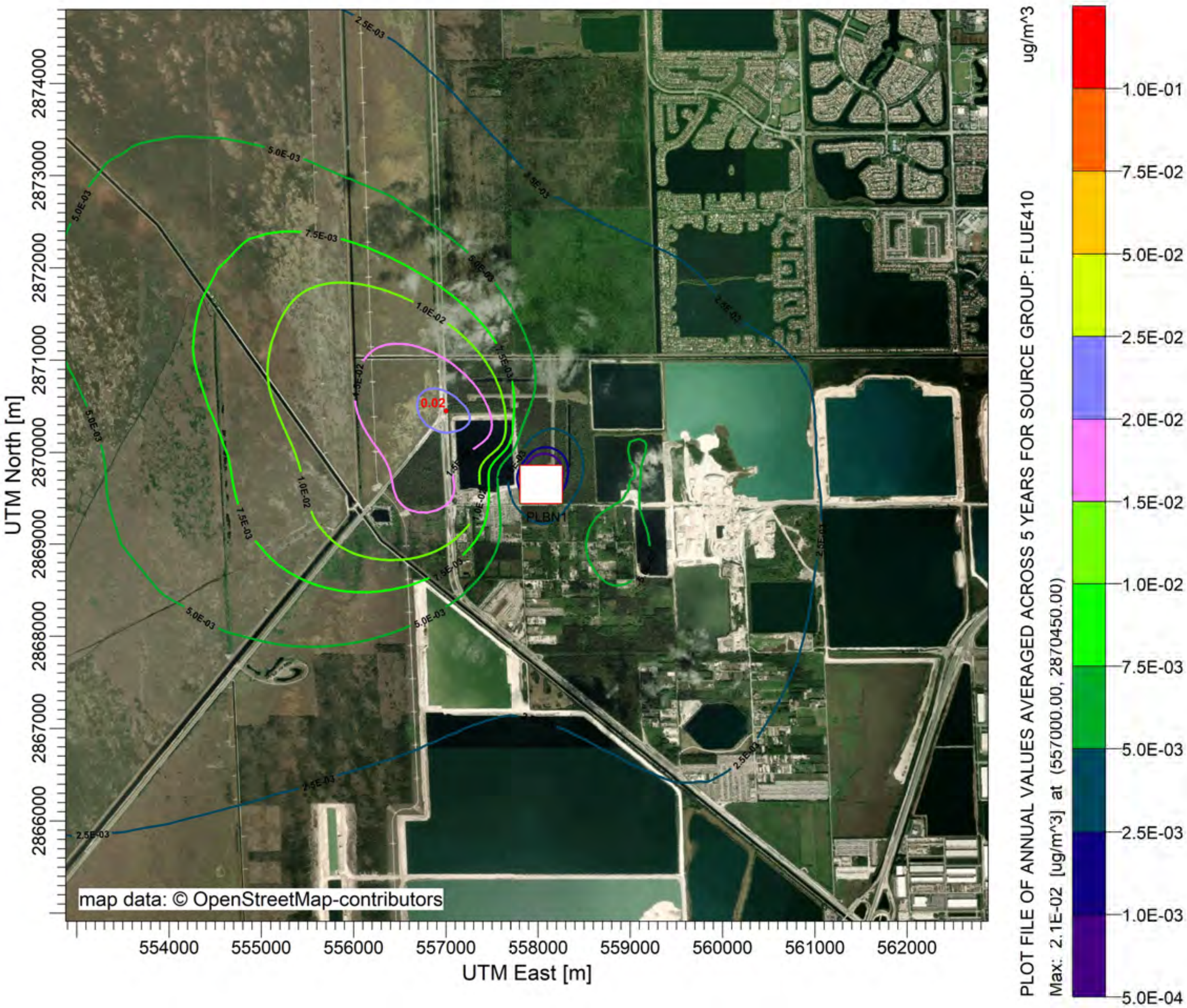
Attachment A-1

Isopleths

Airport West: 410 foot stack height

PROJECT TITLE:

Conceptual Airport West WTE Facility
Metals Particle Phase 5 yr Avg Annual Concentration (ug/m3 per 1 g/s)



COMMENTS:

410 ft Stack
5-Year Annual Average
Scenario 1A
Worst-case Year: 2021

SOURCES:

3

RECEPTORS:

9041

OUTPUT TYPE:

Concentration

MAX:

2.1E-02 ug/m^3

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

12/28/2023

SCALE: 1:67,330

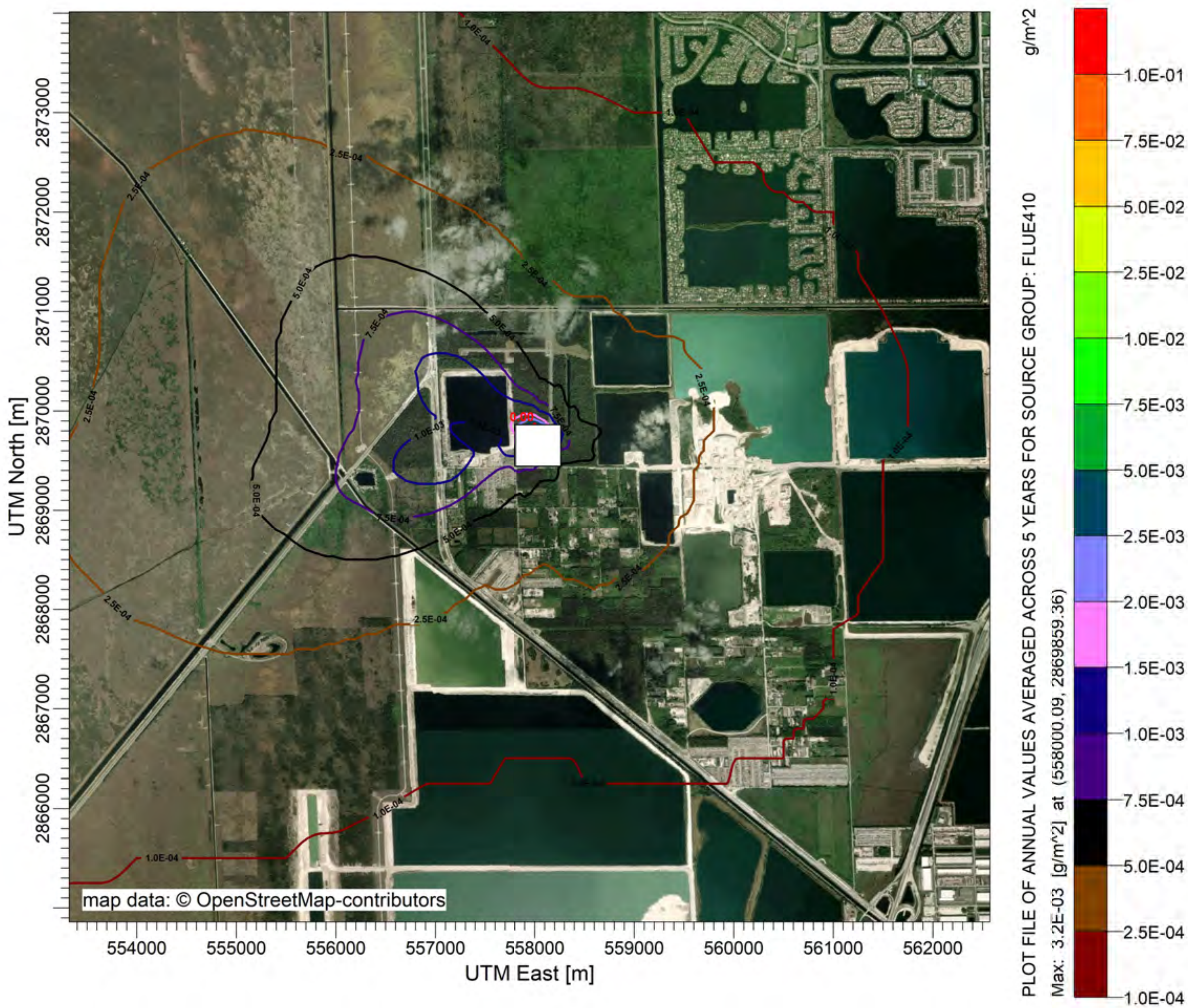
0 2 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Airport West WTE Facility
Particle Bound and Hg++ Total Annual Depo (g/m2 per 1 g/s)



COMMENTS:

410 ft Stack
5-Year Annual Average
Scenario 1A
Worst-case year: 2018

SOURCES:

3

RECEPTORS:

9041

OUTPUT TYPE:

Total Depos.

MAX:

3.2E-03 g/m^2

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

12/28/2023

SCALE: 1:62,311

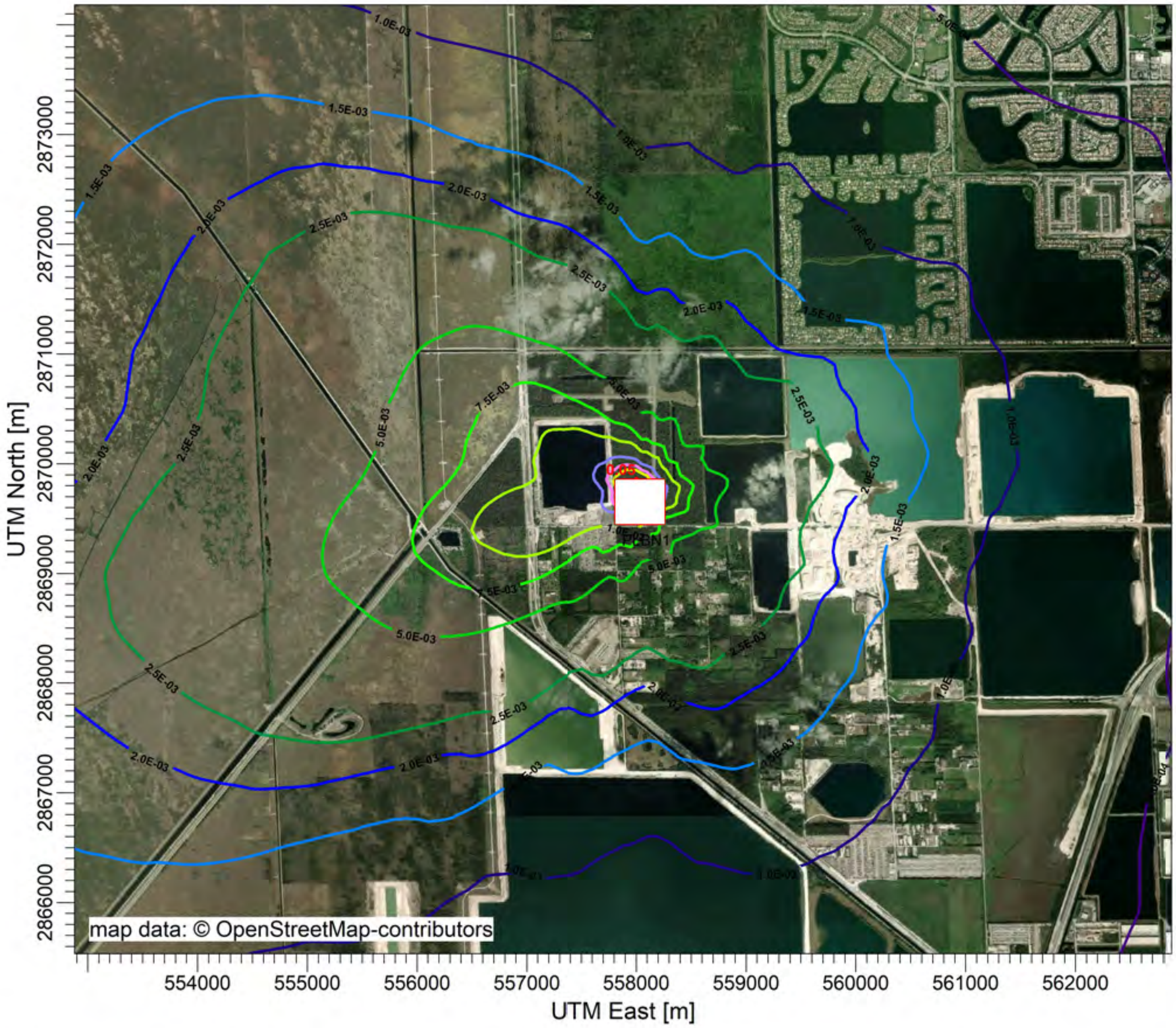
0 — 2 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Airport West WTE Facility
Metals Particle Phase Annual Total Depo (g/m2 per 1 g/s)



PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 5 YEARS FOR SOURCE GROUP: FLUE410 g/m^2

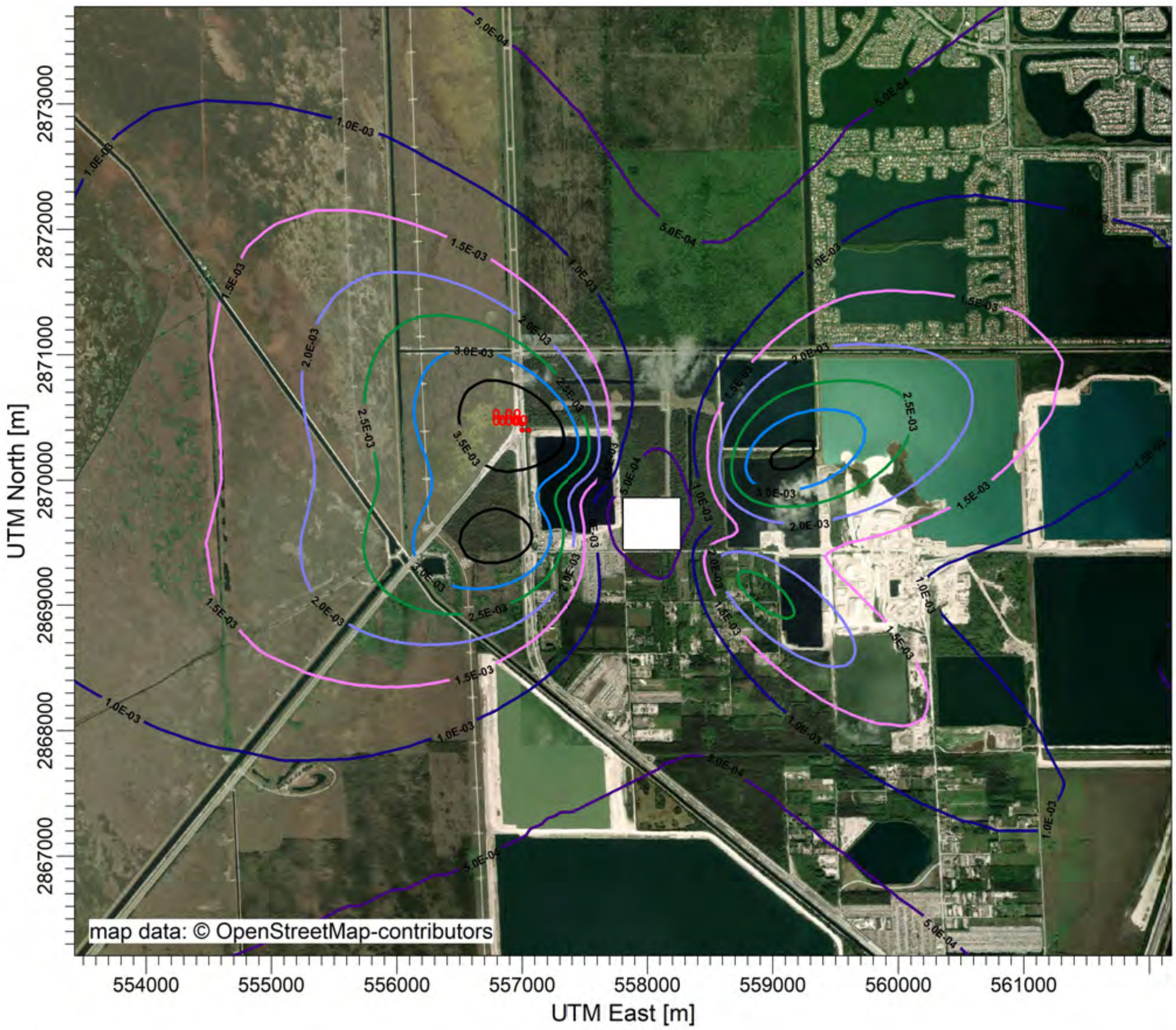
Max: 4.8E-02 [g/m^2] at (558000.09, 2869859.36)

5.0E-04 1.0E-03 1.5E-03 2.0E-03 2.5E-03 5.0E-03 7.5E-03 1.0E-02 1.5E-02 2.0E-02 2.5E-02 5.0E-02 7.5E-02 1.0E-01

COMMENTS:	SOURCES:	COMPANY NAME:	
410 ft Stack 5-Year Annual Average Scenario 1A Worst-case Year: 2018	**3**	**Arcadis, Inc**	
	RECEPTORS: **9041**	MODELER:	
	OUTPUT TYPE: **Total Depos.**	SCALE: 1:62,841 0 — 2 km	
	MAX: **4.8E-02 g/m^2**	DATE: **12/29/2023**	PROJECT NO.:

PROJECT TITLE:

Conceptual Airport West WTE Facility
Dioxin (TCDD) Vapor Phase Total Depo - Annual (g/m2 per 1 g/s)



PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 5 YEARS FOR SOURCE GROUP: FLUE410 g/m^2

Max: 4.0E-03 [g/m^2]

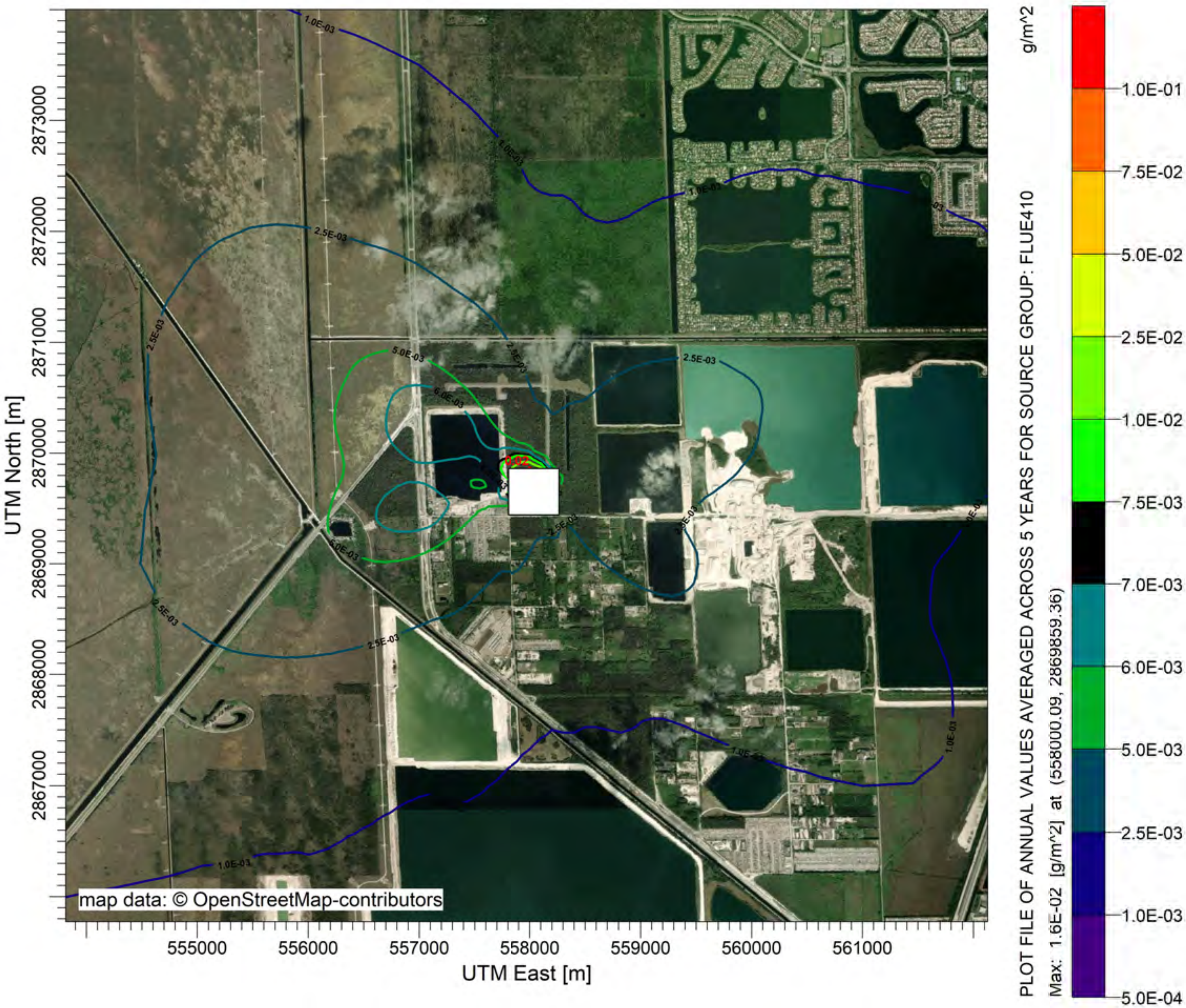
5.0E-04 1.0E-03 1.5E-03 2.0E-03 2.5E-03 3.0E-03 3.5E-03 4.0E-03 5.0E-03 7.5E-03 1.0E-02 2.5E-02 5.0E-02 7.5E-02 1.0E-01

COMMENTS:	SOURCES:	COMPANY NAME:	
410 ft Stack 5-Year Annual Average Scenario 1A Worst-case Year: 2018	**3**	**Arcadis, Inc**	
	RECEPTORS: **9041**	MODELER:	
	OUTPUT TYPE: **Total Depos.**	SCALE: 1:55,000 0 — 2 km	
	MAX: **4.0E-03 g/m^2**	DATE: **12/29/2023**	PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Airport West WTE Facility
Divalent Mercury Vapor Phase Total Depo - Annual (g/m2 per 1 g/s)



COMMENTS:

410 ft Stack
5-Year Annual Average
Scenaio 1A
Worst-case Year: 2018

SOURCES:

3

RECEPTORS:

9041

OUTPUT TYPE:

Total Depos.

MAX:

1.6E-02 g/m^2

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

12/28/2023

SCALE: 1:56,003

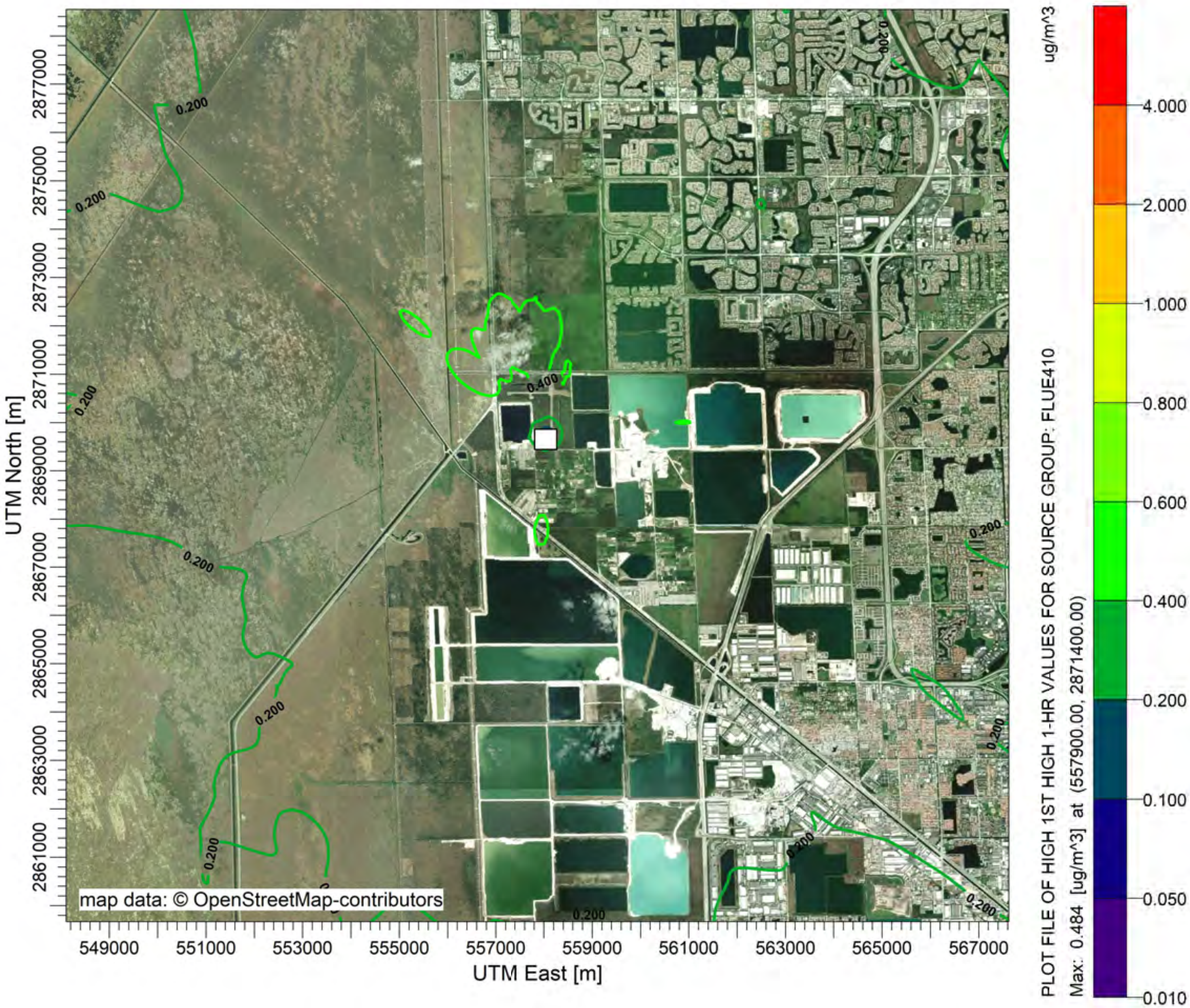
0 1 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

Conceptual Airport West WTE Facility
1-Hour H2SO4 Concentration (ug/m3 per 1 g/s)



COMMENTS:

410 ft Stack
Scenario 1A
Worst-case Conc

SOURCES:

3

RECEPTORS:

9041

OUTPUT TYPE:

Concentration

MAX:

0.484 ug/m^3

COMPANY NAME:

Arcadis, Inc

MODELER:

DATE:

12/11/2023

SCALE: 1:128,506

0 4 km

PROJECT NO.:

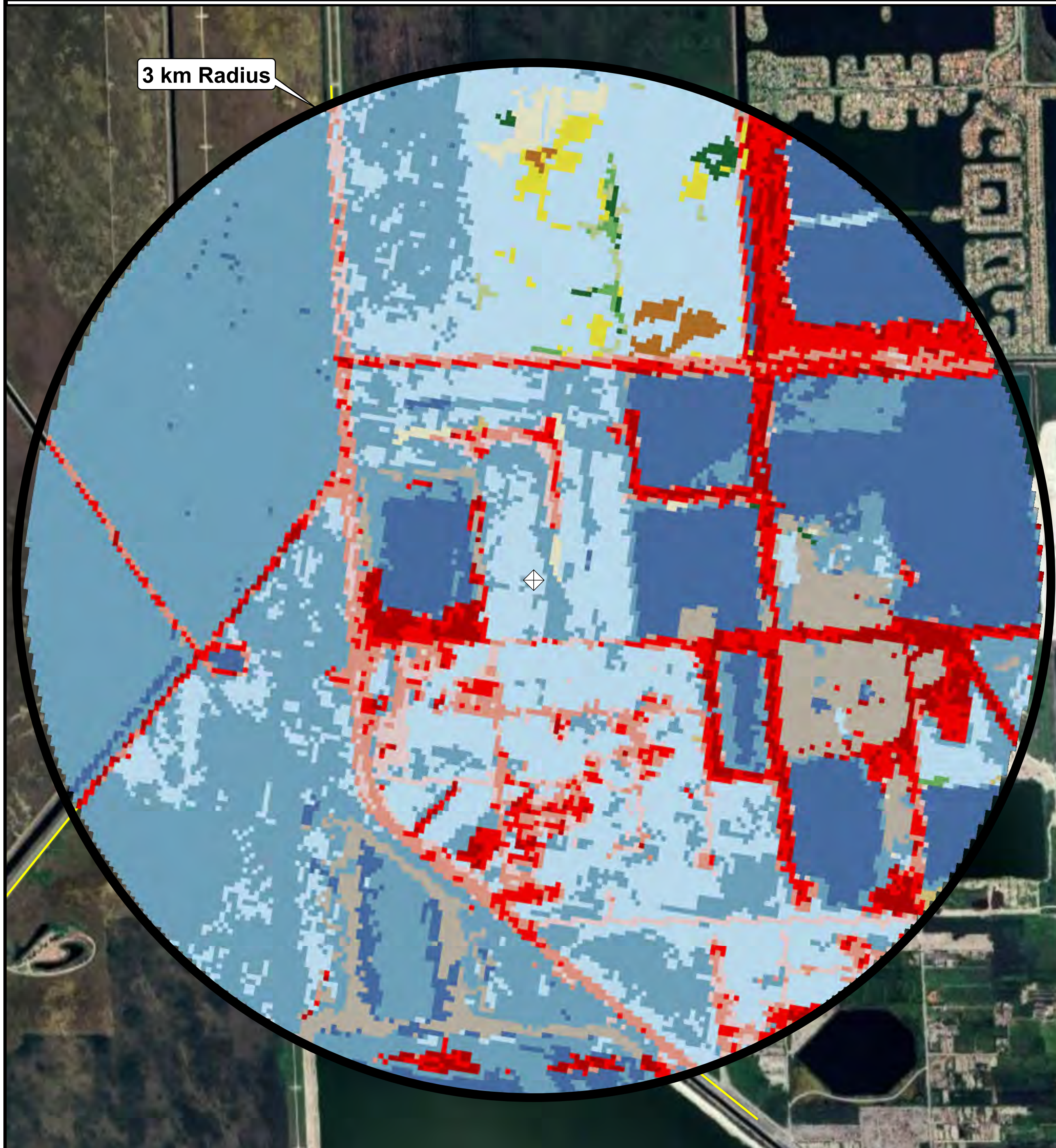
AERMOD View - Lakes Environmental Software

Arcadis U.S., Inc.
701 Waterford Way
Suite 420
Miami, FL 33126
Phone: 305.262.6250
www.arcadis.com

Appendix B

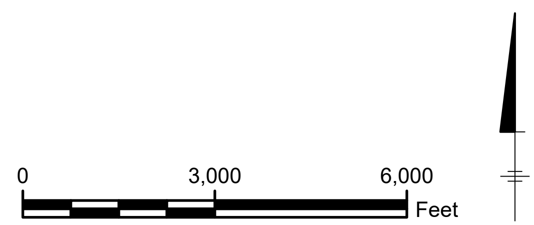
Land Use Analyses

City: Houston Div/Group: Remediation West -Air Group Created By: W Berry Last Saved By: wberry ; Client (Project #)
T:_EHSS\ArcGIS_Pro\Air\Miami_WTE\Miami_WTE_modeling.aprx 3/29/2024 4:33 PM



Value	Count	NLCD_Land
11	4959	Open Water
21	841	Developed, Open Space
22	1367	Developed, Low Intensity
31	1481	Barren Land
41	50	Deciduous Forest
42	70	Evergreen Forest
43	53	Mixed Forest
52	19	Shrub/Scrub
71	195	Herbaceous
81	192	Hay/Pasture
82	110	Cultivated Crops
90	7099	Woody Wetlands
95	11811	Emergent Herbaceous Wetlands
23	1836	Developed, Medium Intensity
24	1034	Developed, High Intensity

Total	31,117	
Rural	28,247	**91% Rural**
Urban	2,870	**9% Urban**



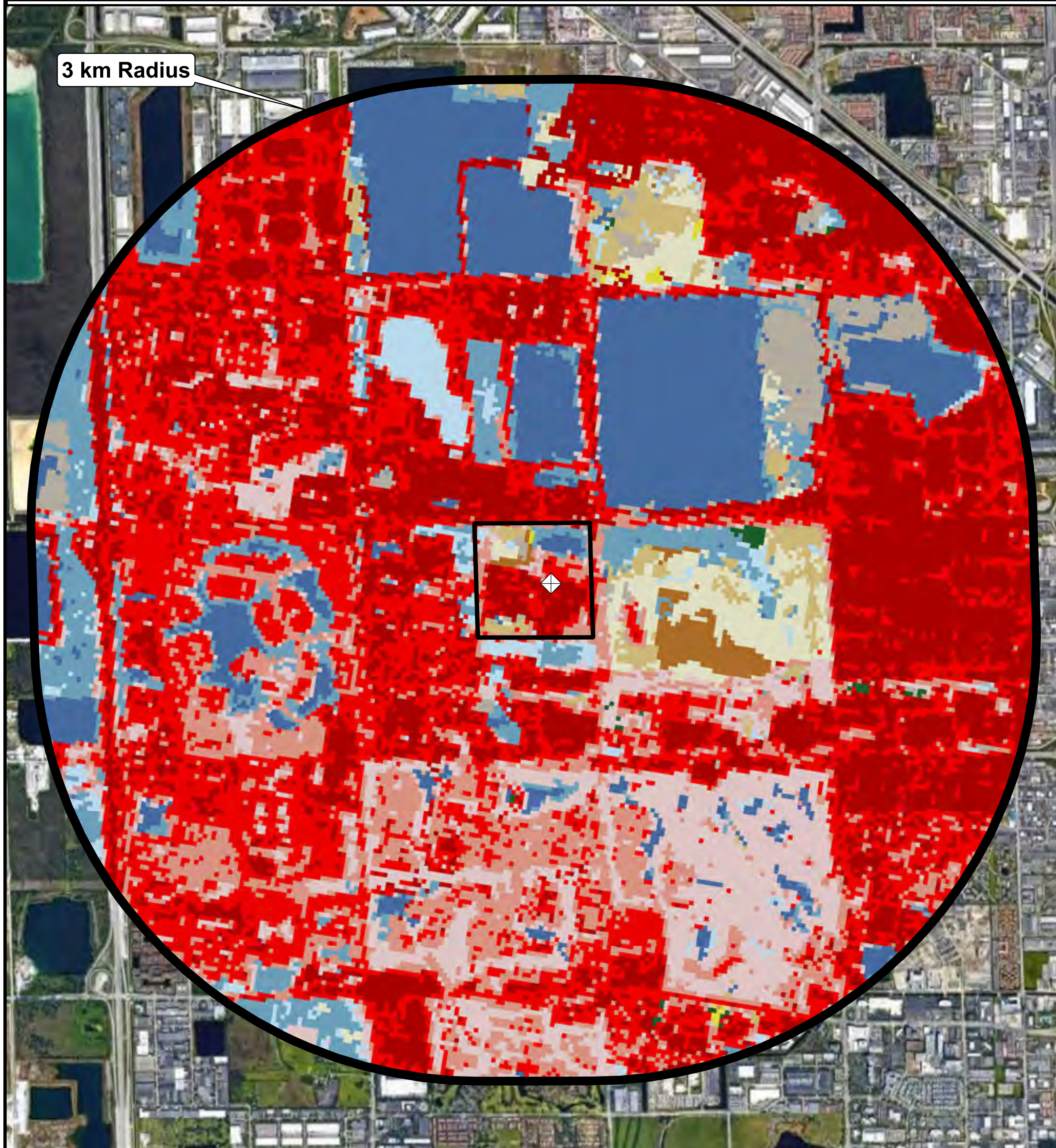
Miami Dade DSWM
Airport West

LANDUSE
April 2024

ARCADIS

FIGURE
1

City: Houston Div/Group: Remediation West -Air Group Created By: W Berry Last Saved By: wberry ; Client (Project #)
T:_EHSS\ArcGIS_Pro\Air\Miami_WTE\Miami_WTE_modeling.aprx 3/29/2024 4:37 PM



Value	Count	NLCD_Land
11	5160	Open Water
21	4113	Developed, Open Space
22	5151	Developed, Low Intensity
31	937	Barren Land
42	66	Evergreen Forest
43	2	Mixed Forest
52	686	Shrub/Scrub
71	1045	Herbaceous
81	38	Hay/Pasture
82	294	Cultivated Crops
90	866	Woody Wetlands
95	2690	Emergent Herbaceous Wetlands
23	11378	Developed, Medium Intensity
24	10194	Developed, High Intensity
Total	42,620	
Rural	21,048	**49% Rural**
Urban	21,572	**51% Urban**

0 3,000 6,000 Feet

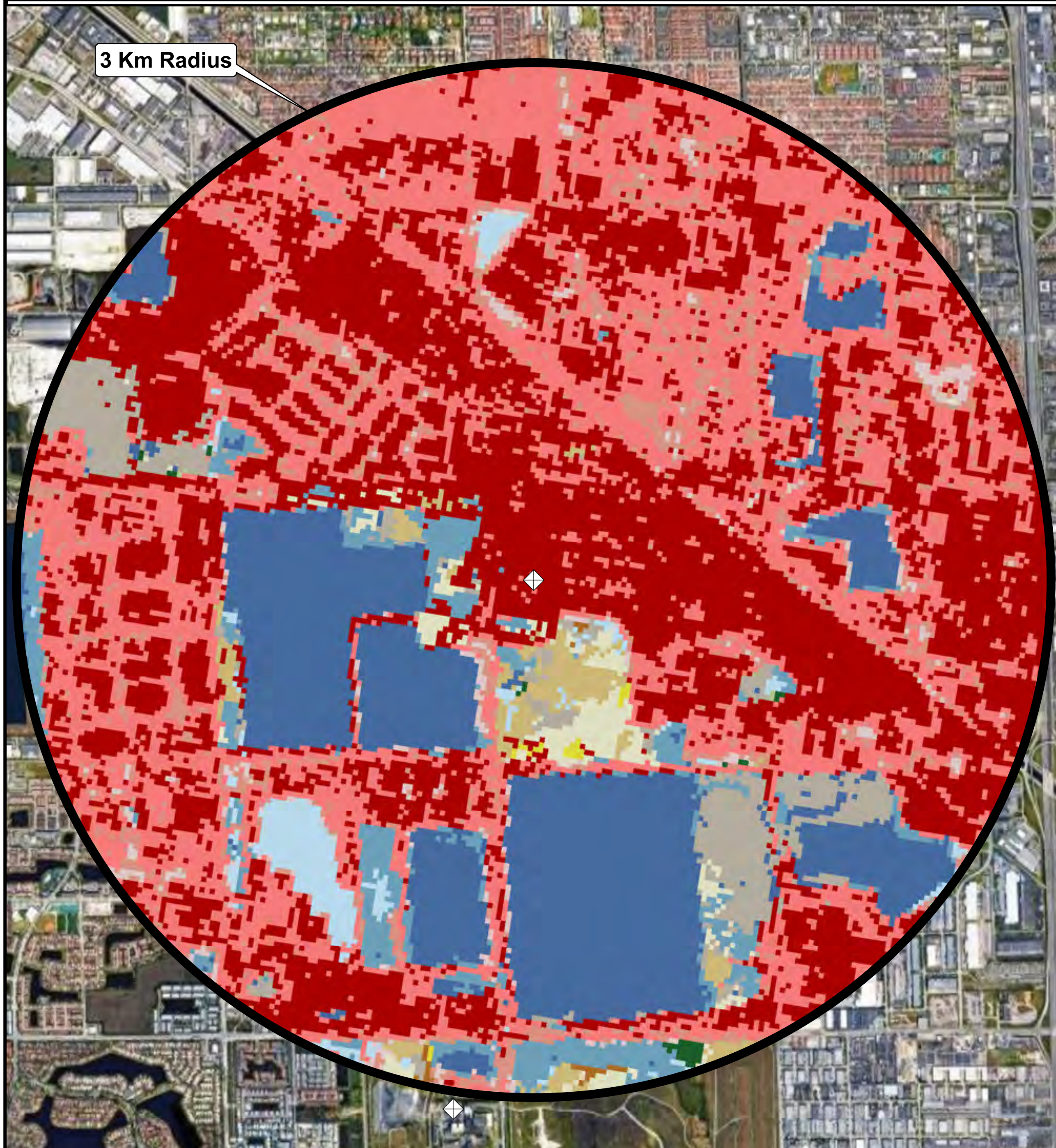
Miami Dade DSWM
Existing RRF

LANDUSE
April 2024

ARCADIS

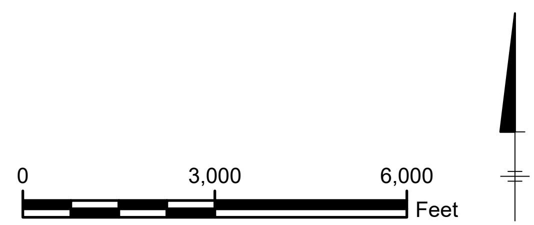
FIGURE
1

City: Houston Div/Group: Remediation West -Air Group Created By: W Berry Last Saved By: wberry ; Client (Project #)
T:_EHSS\ArcGIS_Pro\Air\Miami_WTE\Miami_WTE_modeling.aprx 3/29/2024 4:33 PM



Value	Count	NLCD_Land
11	4,849	Open Water
21	455	Developed, Open Space
22	1,556	Developed, Low Intensity
31	1,163	Barren Land
42	41	Evergreen Forest
43	4	Mixed Forest
52	445	Shrub/Scrub
71	434	Herbaceous
81	29	Hay/Pasture
82	35	Cultivated Crops
90	515	Woody Wetlands
95	1,278	Emergent Herbaceous Wetlands
23	9,527	Developed, Medium Intensity
24	11,241	Developed, High Intensity

Total	31,572	
Rural	10,804	**34% Rural**
Urban	20,768	**66% Urban**



Miami Dade DSWM
Medley

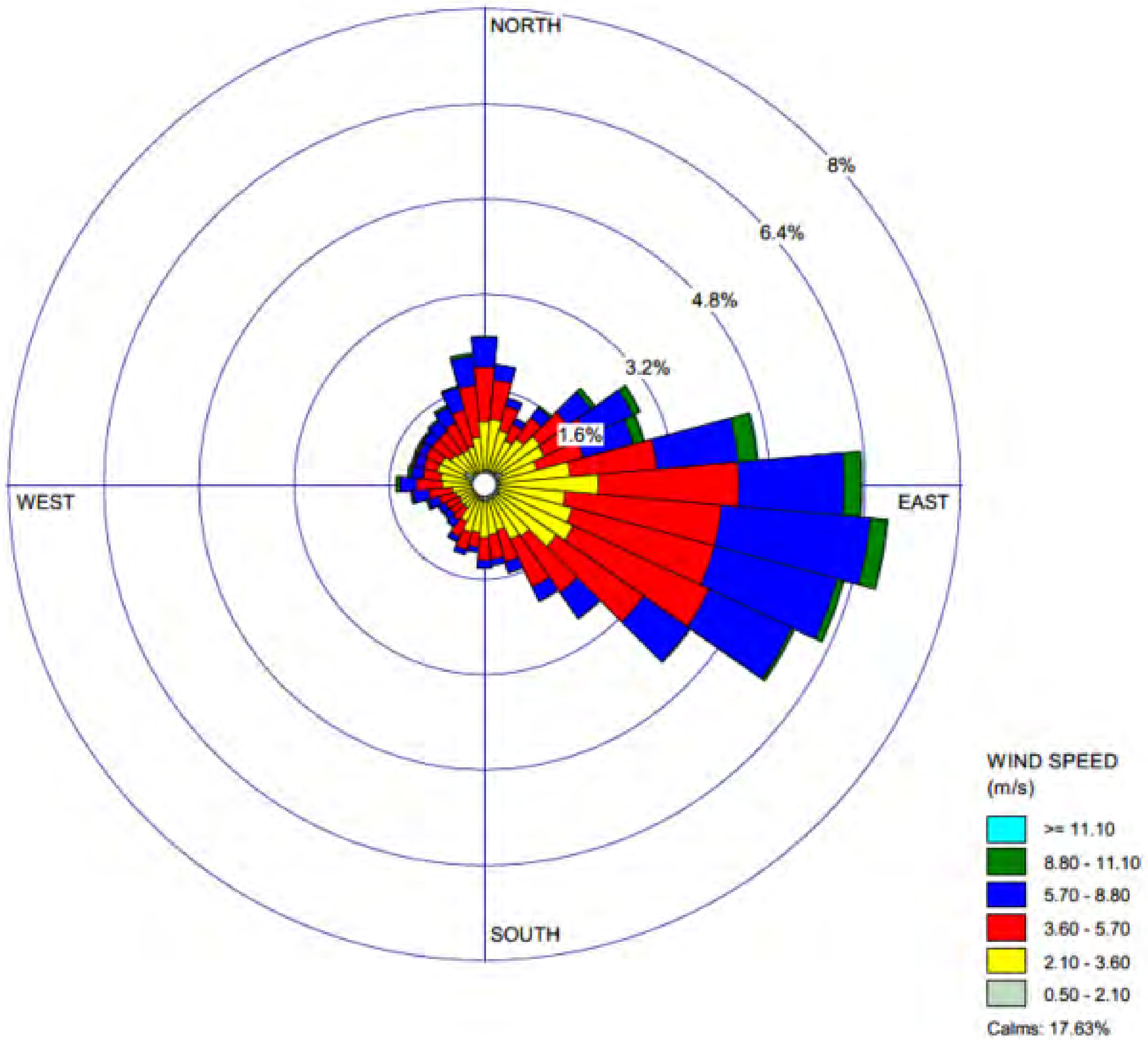
LANDUSE
April 2024

ARCADIS

FIGURE
1

Appendix C

Miami-Opa Locka Executive Airport Windrose



Appendix C 5-Year Wind Rose for Miami-Opa Locka Executive Airport (OPF, Station ID: 722029-12888) 2015-2019 (Blowing From)

Appendix D

Ozone and Secondary Formation of $PM_{2.5}$

MERPs Analysis for 24-Hour & Annual PM2.5 (NAAQS) & 8-Hr Ozone- Regional MERPs

Project Name: **Miami-Dade WTE Site Evaluation**

Project Location: **Three Proposed Sites**

Proposed Maximum Potential Emissions (same for each potential site)

Project Emissions	**Potential TPY[3]**
NOx	589.6
VOC	87.6
SO2	438.0
PM2.5[2]	205.8
Basis:	MWCs assumed at 8760 hrs/year operation

DRAFT INFO

Release Height:	76.2	meters	Range: 250-410 ft
Used for Analysis:	90	meters	

1. Secondary $PM_{2.5}$ Formation Evaluation using MERPs Values

MERPs Analysis for 24-Hour & Annual PM2.5 (SIL and NAAQS) - State/County MERPs

DRAFT INFO

MERPs Quick View
https://www.epa.gov/scram/merps-view-qlik#Modeled_Impacts

Applying State/County MERPs values

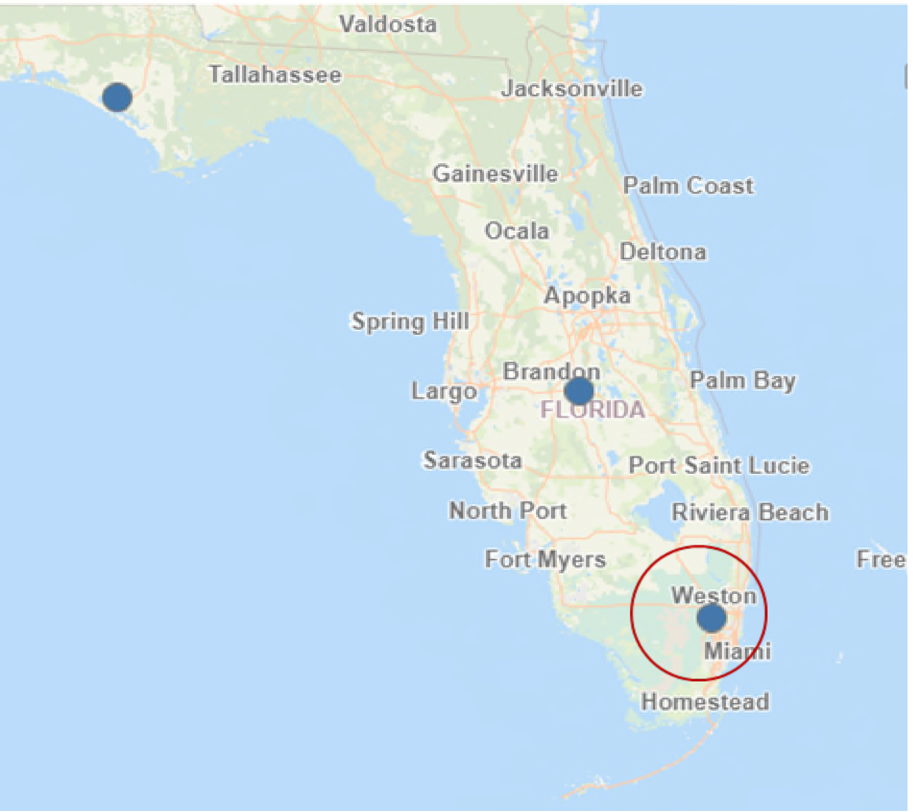
Project Name: Miami-Dade WTE Site Evaluation

Project Location: Three Proposed Sites

Project NOx	Regional MERPs NOx	Regional MERPs Hypo NOx Impact	Project SO2	Regional MERPs Hypo SO2	Regional MERPs Hypo SO2 Impact	
TPY	TPY	ug/m^3	TPY	TPY	ug/m^3	
589.6	6,172	0.1944	438.0	1,917	0.626	**24-hr MERP**
	18,404	0.0109		16,928	0.012	**Annual MERP**
	Broward Cty			Broward Cty		**Hypo Source Location**

	PM2.5 SILs	Cumulative MERP PM2.5	Direct PM2.5 (H1H)	Total PM2.5 (with MERPs)	Less than SIL	Background PM2.5	Cumulative PM2.5	PM2.5 NAAQS	Meets NAAQS
	ug/m^3	ug/m^3	ug/m^3	ug/m^3	(Y/N)	ug/m^3	ug/m^3	ug/m^3	(Y/N)
24-hr Average:	1.2	**0.162**	Site Specific					35	TBD
Annual Average	0.2	**0.0007**	Site Specific					12	TBD
Monitor Location:						Site Specific			

SILs - Proposed Miami-Dade WTE Facility Only



Criteria to choose appropriate MERP values:

1. Location of Project: Climatic zone, State, or Country.
2. Appropriate hypothetical source size based on project emissions (500, 1000, or 3000 tpy)
3. Representative release height based on proposed source (90 m - tall release or 10 m near ground release).
4. Choose the most conservative (lowest MERP tpy) for each each pollutant (NOx, VOC, SO2) and polutant/averaging period under review (8-hr O3, 24-hr PM2.5 or Annual PM2.5)

MERP = Critical Air Quality Threshold * (Modeled emission rate from hypothetical source / Modeled air quality impact from hypothethical source)

Critical Air Quality Threshold (ozone) = 1.2 ug/m^3 (24-hr) & 0.2 ug/m^3 (annual)

MERPs Analysis for 8-Hour Ozone (SIL and NAAQS) - State/County-specific MERPs DRAFT INFO

Applying State/County MERPs values

Project Name: Miami-Dade WTE Site Evaluation

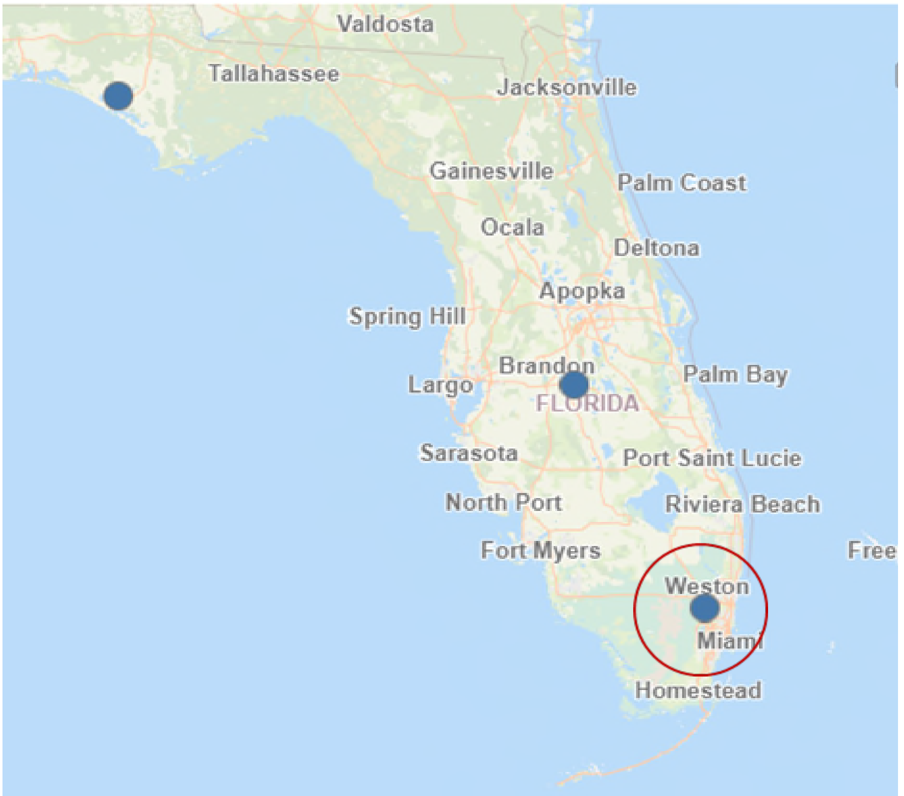
Project Location: Three Proposed Sites

	Project NOx	State/County MERPs NOx	Project VOC	State County MERPS VOC
	TPY	TPY	TPY	TPY
	589.6	259	87.6	1174
Hypo Src Location		FL		FL

	O_3 SILs	Cummulative MERP O_3	Less than SIL	Background O_3	Cummulative Ozone	Ozone NAAQS	Meets NAAQS
	ppb	ppb	(Y/N)	ppb	ppb	ppb	(Y/N)
	1	**2.35**	N	60	62.4	70	Y
Monitor Location:				Regional			

MERPs Quick View

https://www.epa.gov/scram/merps-view-qlik#Modeled_Impacts



Criteria to choose appropriate MERP values:

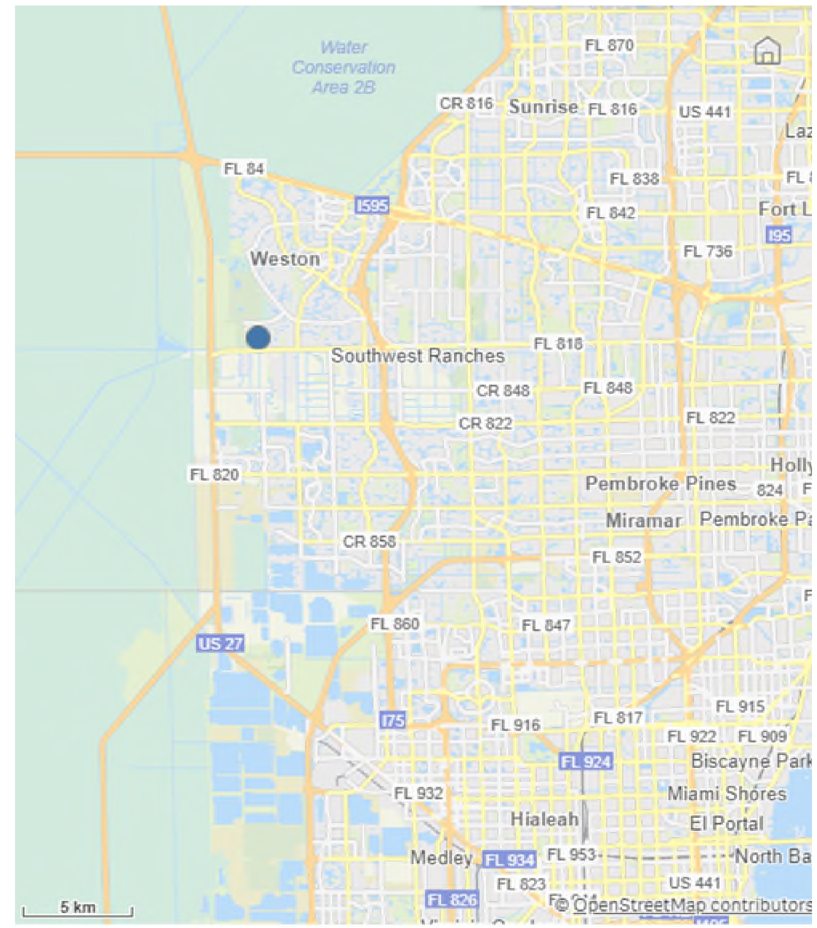
1. Location of Project: Climatic zone, State, or Country.
2. Appropriate hypothetical source size based on project emissions (500, 1000, or 3000 tpy)
3. Representative release height based on proposed source (90 m - tall release or 10 m near ground release).
4. Choose the most conservative (lowest MERP tpy) for each each pollutant (NOx, VOC, SO2) and polutant/averaging period under review (8-hr O3, 24-hr PM2.5 or Annual PM2.5)

MERP = Critical Air Quality Threshold * (Modeled emission rate from hypothetical source / Modeled air quality impact from hypothethical source)

Critical Air Quality Threshold (ozone) = 1 ppb

State	County	Metric	Precursor	Emissions	Stack	MERP	MaxConc
Florida	Broward Co	8-hr Ozone	NOx	1000	10	257	3.884258
Florida	Broward Co	8-hr Ozone	NOx	1000	90	259	3.856621
Florida	Broward Co	8-hr Ozone	VOC	500	10	1174	0.426048
Florida	Broward Co	Annual PM2.5	NOx	1000	10	9287	0.021536
Florida	Broward Co	Annual PM2.5	NOx	1000	90	18404	0.010867
Florida	Broward Co	Annual PM2.5	SO2	1000	10	10000	0.02
Florida	Broward Co	Annual PM2.5	SO2	1000	90	16928	0.011815
Florida	Broward Co	Daily PM2.5	NOx	1000	10	4481	0.267803
Florida	Broward Co	Daily PM2.5	NOx	1000	90	6172	0.194437
Florida	Broward Co	Daily PM2.5	SO2	1000	10	1065	1.126642
Florida	Broward Co	Daily PM2.5	SO2	1000	90	1917	0.625907

Notes:
All of the hypothetical sources in FL includes only a 10 m hypothetical source for VOCs
Broward Cty is more conservative VOC source in the Regional data
Broward Cty hypothetical is close to potential project sites.



Appendix E

Class II SIA Receptors

Airport West Site SIA Plots

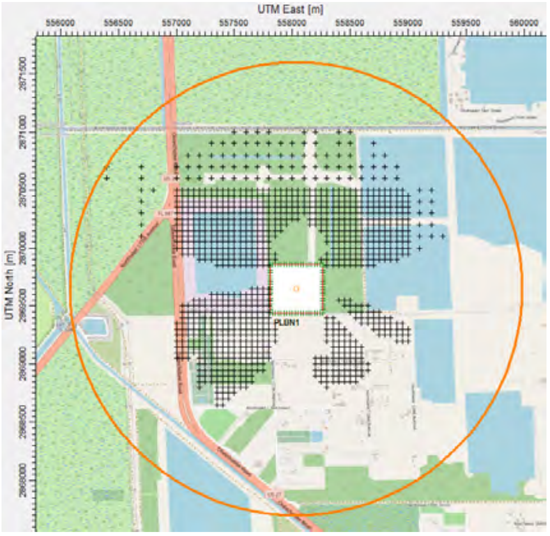


Figure 1 SO2 1HR 250 ft 2.1km SIA

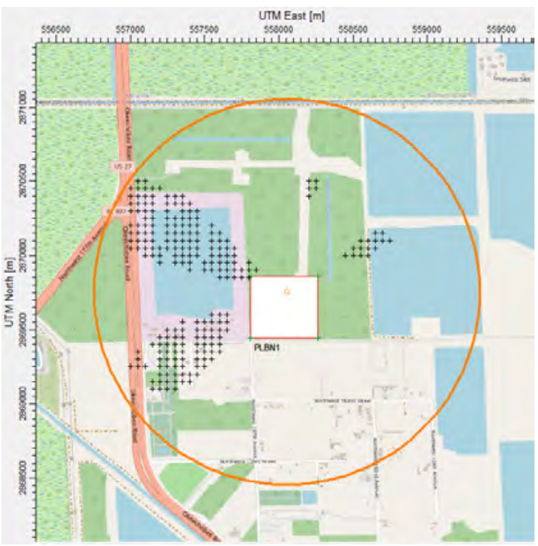


Figure 2 SO2 24HR 250 ft 1.6km SIA

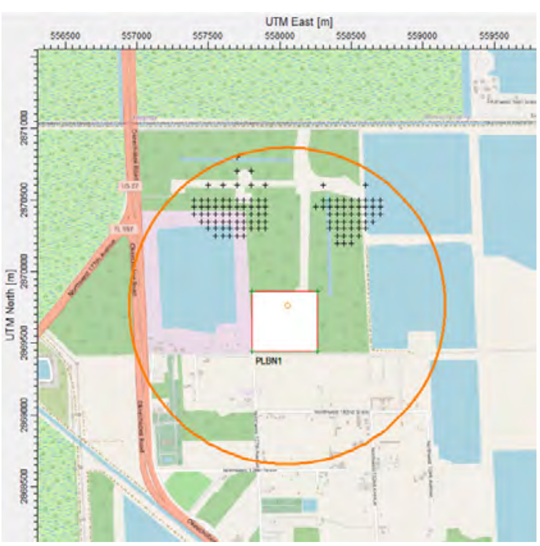


Figure 3 SO2 1HR 310 ft 1.1km SIA

Figure 4 PM10 24HR 250 ft 0.8km SIA

Airport West Site SIA Plots

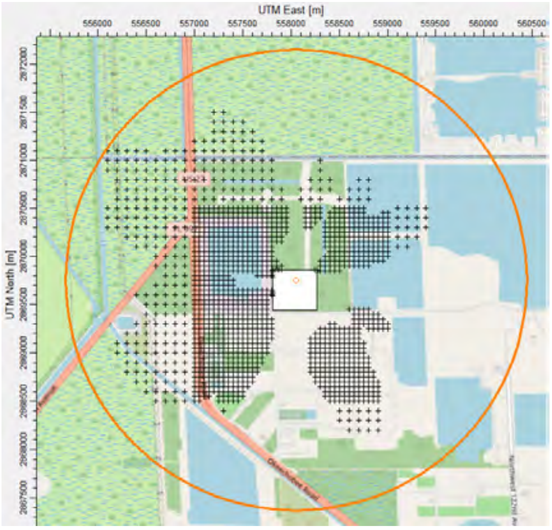


Figure 5 PM2.5 24HR 250 ft 2.37km SIA

Figure 6 PM2.5 24HR 310 ft 1.5km SIA

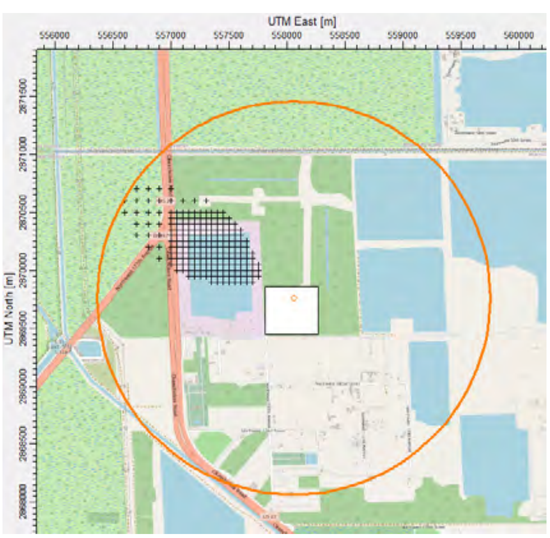


Figure 7 PM2.5 Annual 250 ft 1.7km SIA

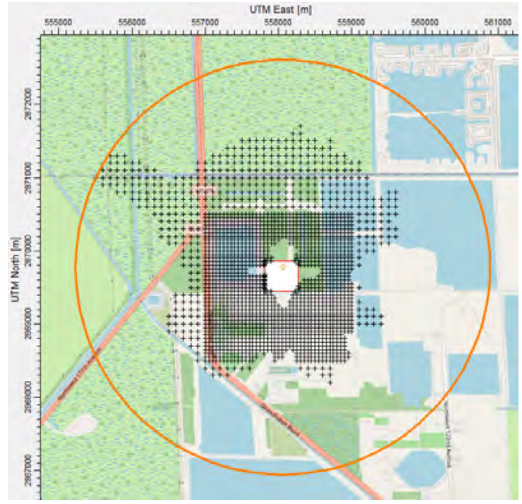


Figure 8 NO2 1HR 250 ft 2.8km SIA

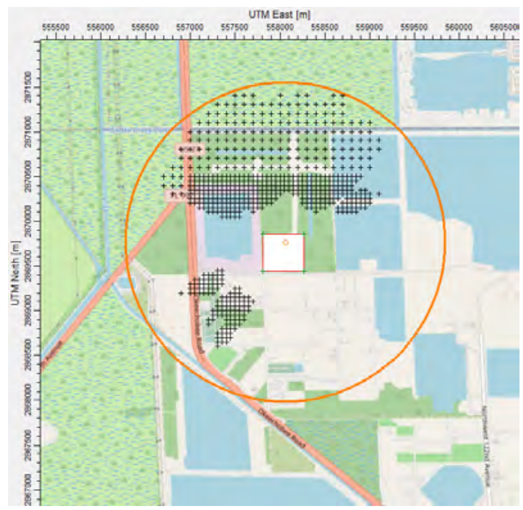


Figure 9 NO2 1 HR 310 ft 1.8km SIA

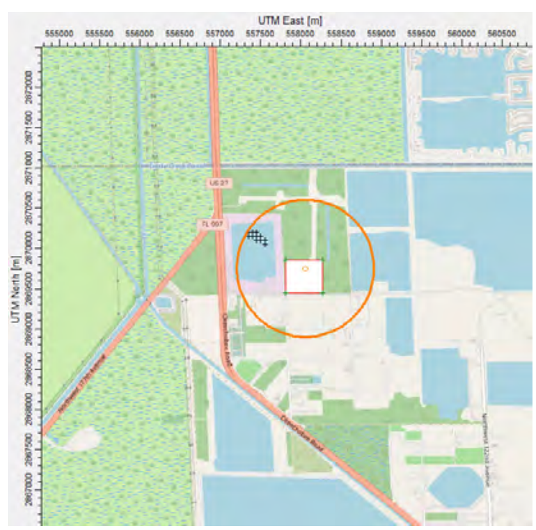


Figure 10 NO2 Annual 250 ft 0.8km SIA

Existing RRF Site – SIA Plots

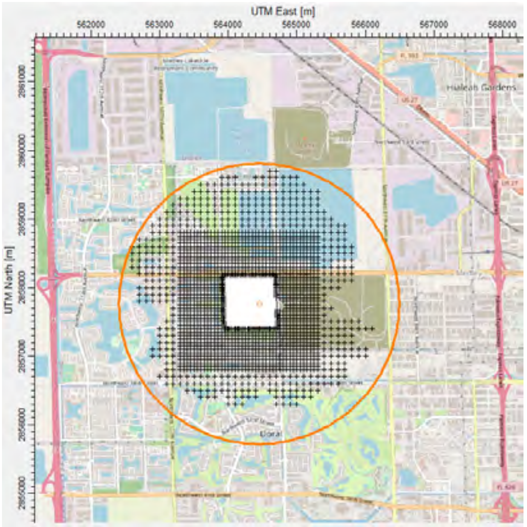


Figure 1 SO2 1HR 250 ft 2.01 km SIA

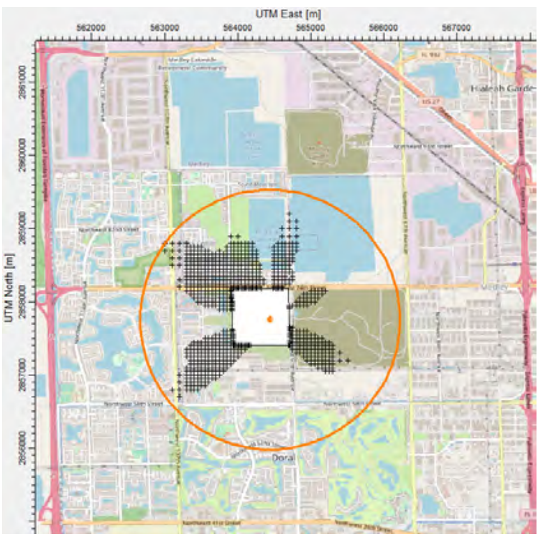


Figure 2 SO2 24HR 250 ft 1.77 km SIA

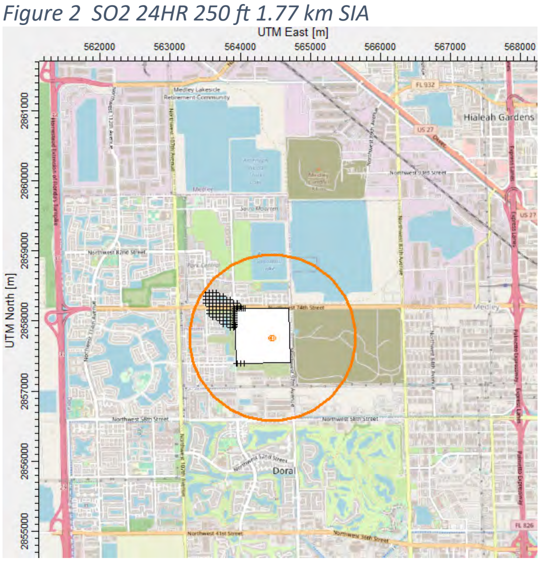


Figure 3 SO2 Annual 250 ft 1.1 km SIA

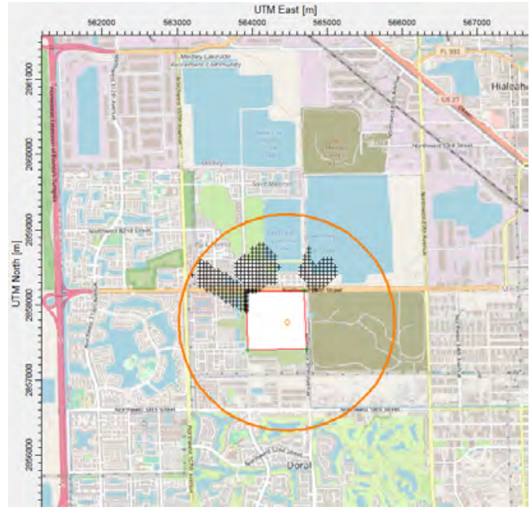


Figure 4SO2 1HR 310 ft1.4 km SIA

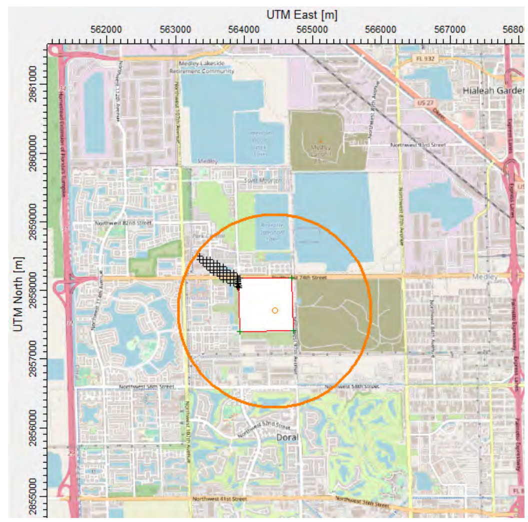


Figure 5 SO2 24HR 310 ft1.3 km SIA

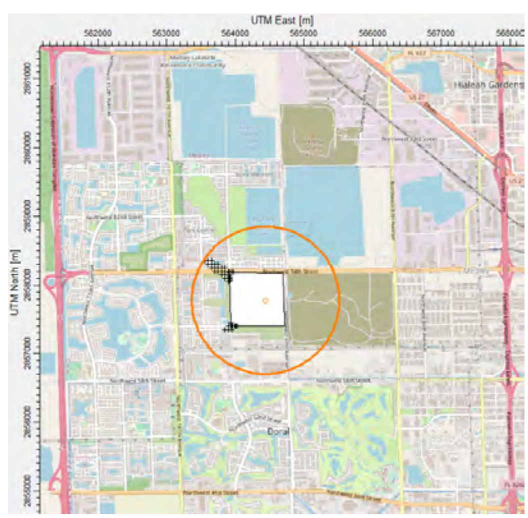


Figure 6 PM10 24HR 250ft 1.1 km SIA

Existing RRF Site – SIA Plots

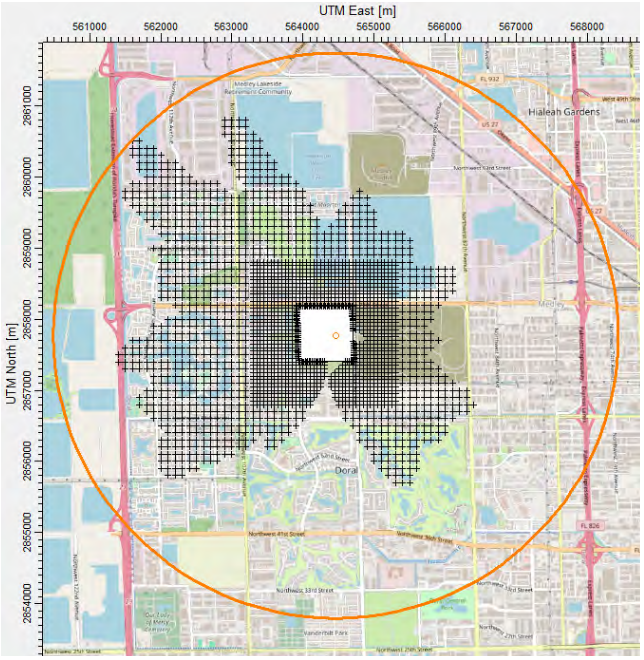


Figure 7 PM2.5 24HR 250 ft 3.9 km SIA

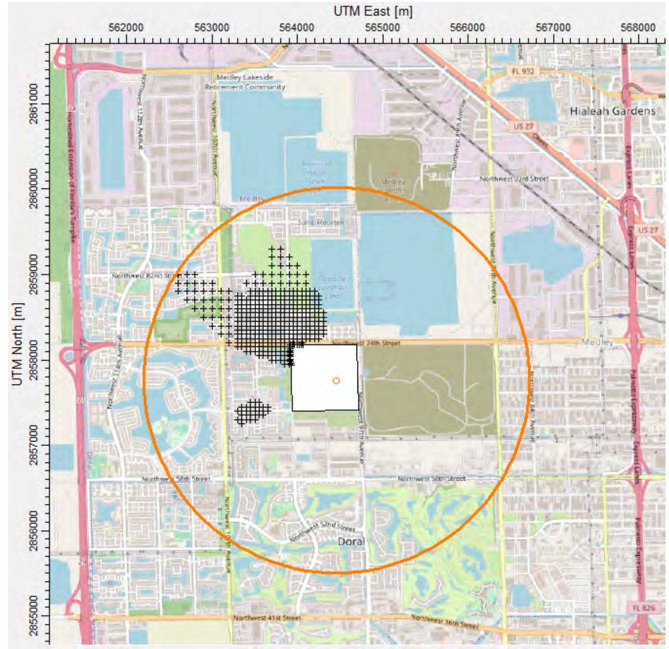


Figure 9 PM2.5 24HR 310 ft 2.2 km SIA

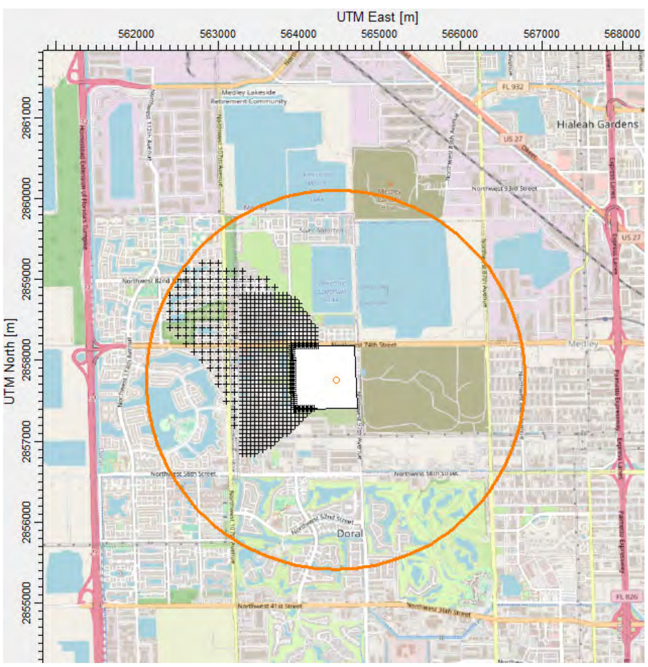


Figure 8 PM2.5 Annual 250 ft 2.3 km SIA

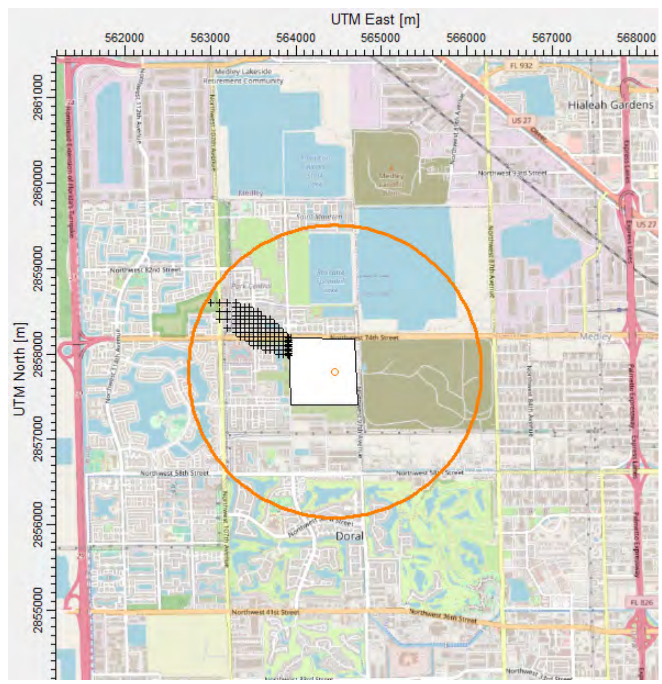


Figure 10 PM2.5 Annual 310 ft 1.7 km SIA

Existing RRF Site – SIA Plots

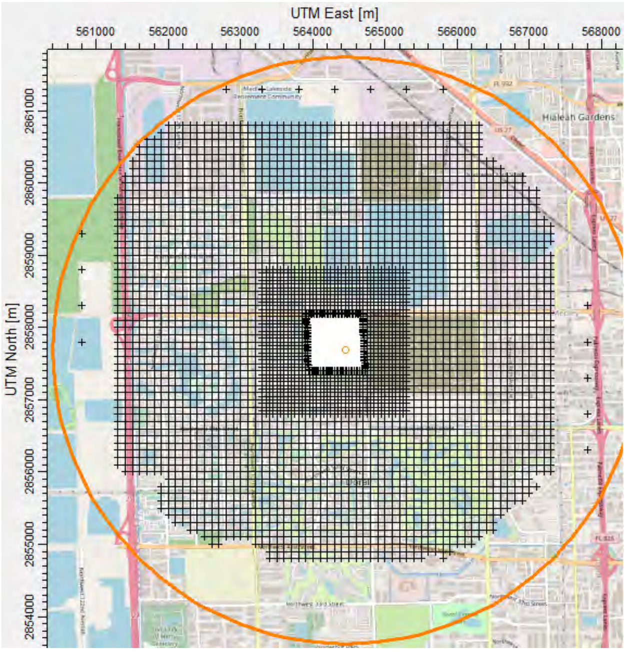


Figure 11 NO2 1H 250 ft 4.0 km SIA

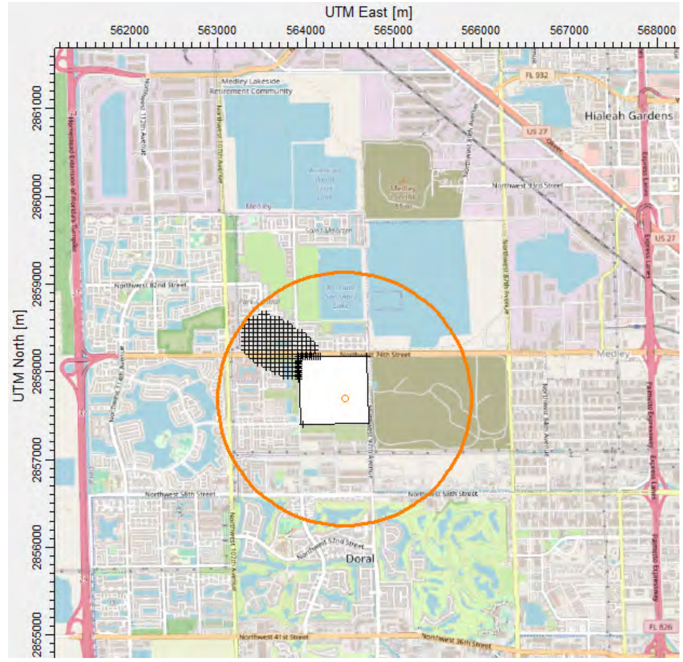


Figure 13 NO2 Annual 250 ft 1.4 km SIA

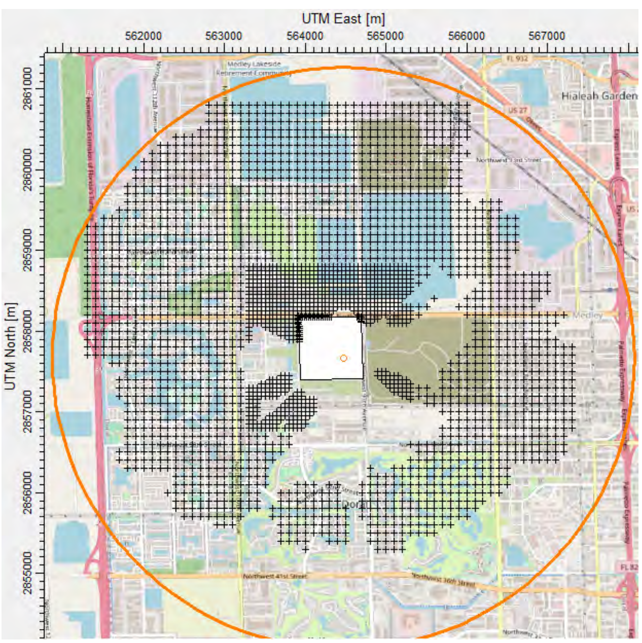


Figure 12 NO2 1 HR 310 ft 3.5 km SIA

Medley Site - SIA Plots

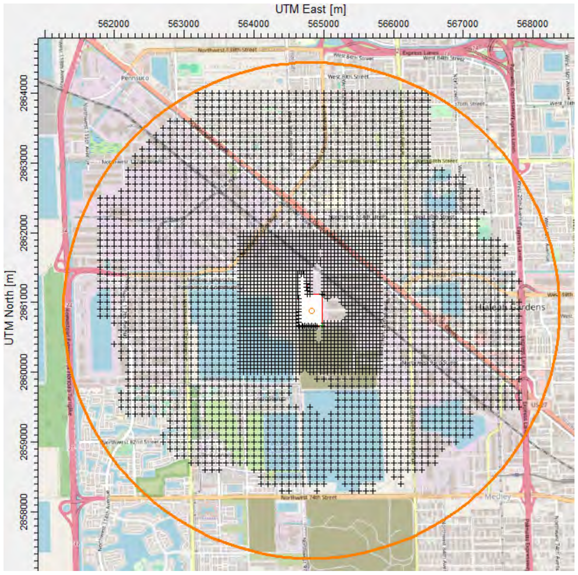


Figure 1 NO2 1HR 250ft 3.6 km SIA

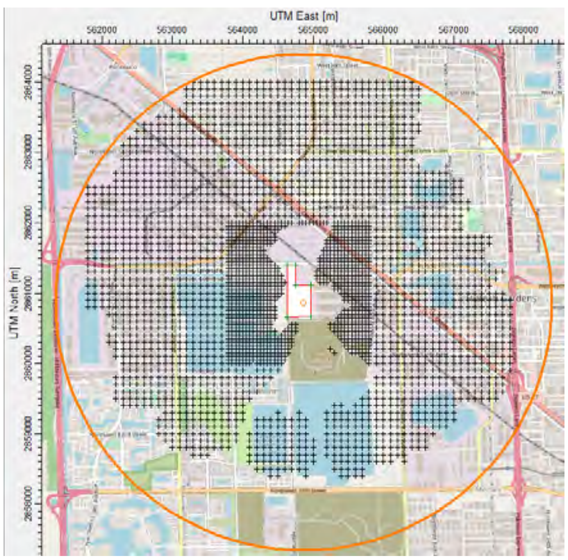


Figure 2 NO2 1HR 310ft 3.5 km SIA

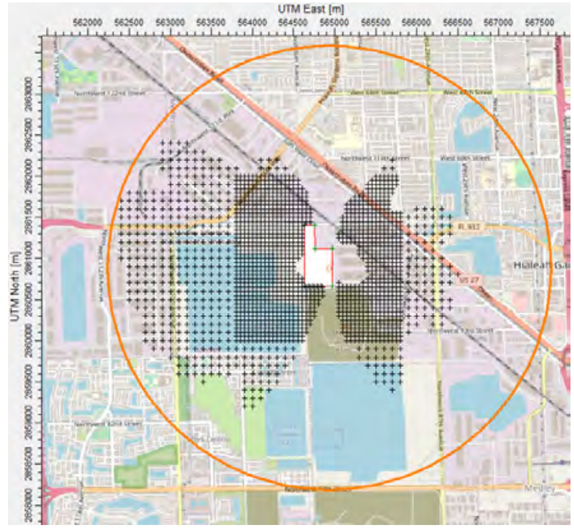


Figure 3 PM2.5 24HR 250ft 2.6 km SIA

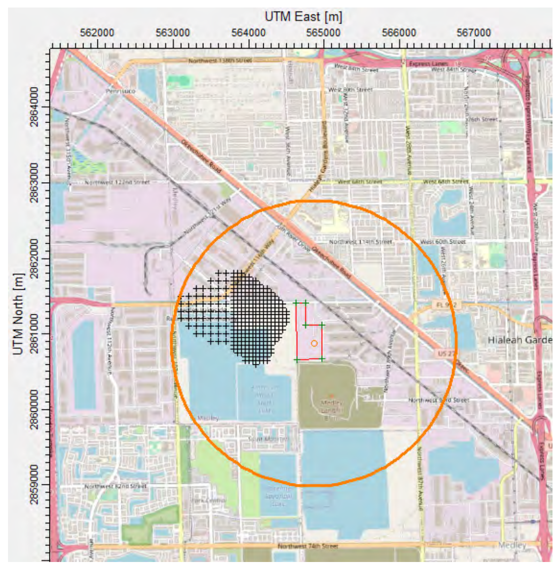


Figure 4 PM2.5 Annual 250ft 1.9 km SIA

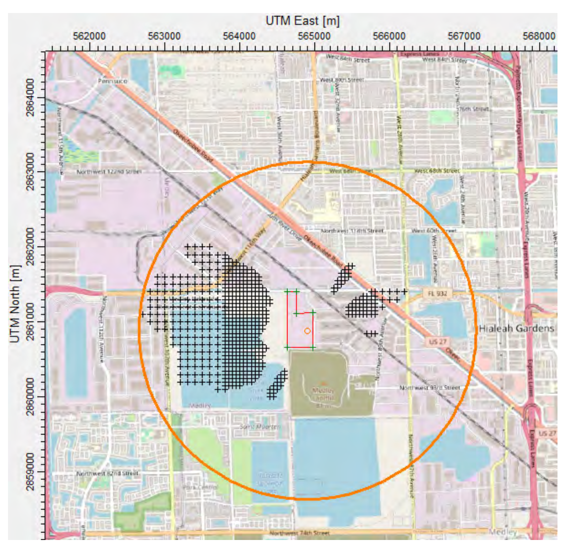


Figure 5 PM2.5 24HR 310ft 2.2 km SIA

Medley Site - SIA Plots

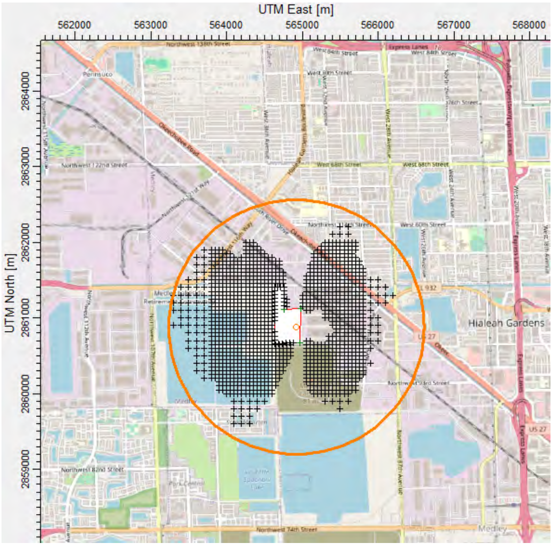


Figure 6 SO2 1HR 250ft 1.7 km SIA

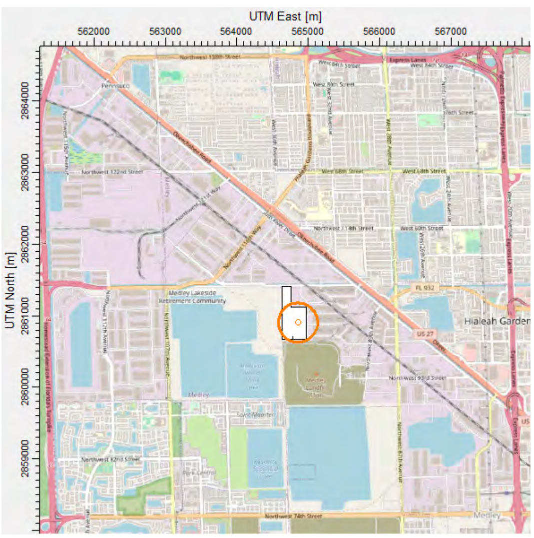


Figure 7 SO2 3HR 250ft 0.3 km SIA

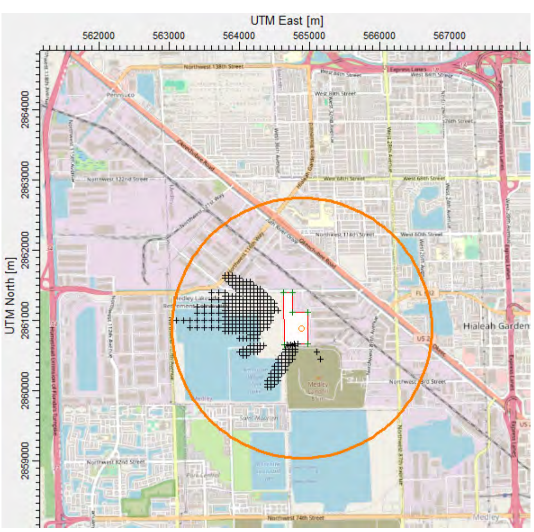


Figure 8 SO2 24HR 250ft 1.8 km SIA

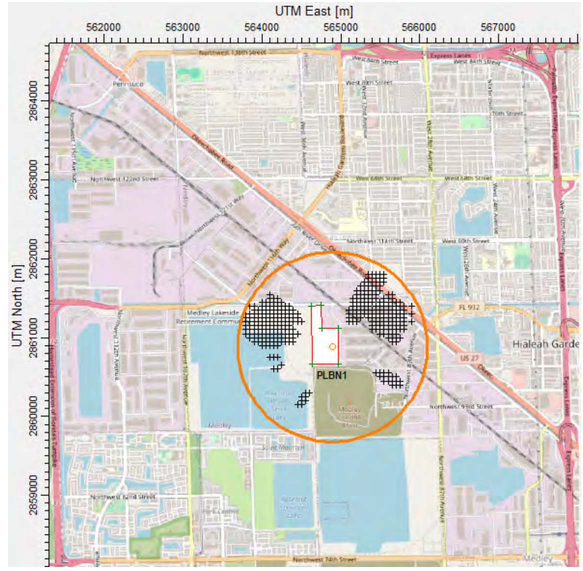


Figure 9 SO2 1HR 310ft 1.2 km SIA

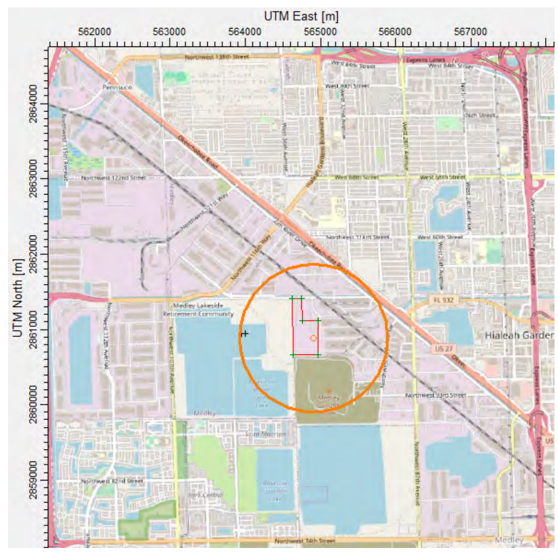


Figure 10 SO2 24HR 310ft 1.0 km SIA

Appendix F

Background Air Quality Monitors and Concentrations

Background Monitor Concentrations - Design Values 2020-2023

Pollutant	NAAQS	Units	Site Name	Site ID	Address	County	Sampling freq.	# of Samples 2020	# of Samples 2021	# of Samples 2022	# of Samples 2023	Value Used	2020	2021	2022	2023*	3-Year Average Design Value 2020-2022	3-Year Average Design Value 2021-2023
1-hour NO_2	188	$\mu g/m^3$	Near Road	12-011-0035	799 North I-95, Ft. Lauderdale, Fl 33311	Broward	Hourly	8035	7902	8401	8338	98th Percentile	74.0	81.0	81.0	85.0	**78.7**	**82.3**
			Eula Johnson State park	12-011-8002	7000 N. Ocean Drive, Dania, Fl 33004	Broward	Hourly	7568	7848	8199	7899	98th Percentile	76.0	85.0	74.0	83.0	**78.3**	**80.7**
			Perimeter Road	12-086-0035	5600 Perimeter Road	Miami-Dade	Hourly	7306	7941	8478	8059	98th Percentile	74.0	93.0	96.0	100.0	**87.7**	**96.3**
			Pennsuco	12-086-0019	14001-14027 N Okeechobee Rd, Hialeah, Fl 33018	Miami-Dade	Hourly	--	1953	8391	7114	99th Percentile	--	85.0	83.0	91.0	--	**86.3**
			3rd Street	12-086-4002	864 Nw 3rd Street, Miami, Fl 33127	Miami-Dade	Hourly	7789	5018	8164	--	98th Percentile	70.0	72.0	96.0	--	**79.3**	--
Annual NO_2	99.7	$\mu g/m^3$	Near Road	12-011-0035	799 North I-95, Ft. Lauderdale, Fl 33311	Broward	Hourly	8035	7902	8401	8338	Annual Mean	24.0	26.0	26.0	28.0	**25.3**	**26.7**
			Eula Johnson State park	12-011-8002	7000 N. Ocean Drive, Dania, Fl 33004	Broward	Hourly	7568	7848	8199	7899	Annual Mean	8.0	10.0	10.0	12.0	**9.3**	**10.7**
			Perimeter Road	12-086-0035	5600 Perimeter Road	Miami-Dade	Hourly	7306	7941	8478	8059	Annual Mean	17.0	22.0	24.0	27.0	**21.0**	**24.3**
			Pennsuco	12-086-0019	14001-14027 N Okeechobee Rd, Hialeah, Fl 33018	Miami-Dade	Hourly	--	1953	8391	7114	Annual Mean	--	--	24.0	26.0	--	--
			3rd Street	12-086-4002	864 Nw 3rd Street, Miami, Fl 33127	Miami-Dade	Hourly	7789	5018	8164	--	Annual Mean	11.0	--	24.0	--	--	--
1-hour SO_2	196.4	$\mu g/m^3$	Daniela - Davie	12-011-0034	5300 South Pine Island Road, Davie, Fl 33328	Broward	Hourly	8483	8598	8582	8504	99th %tile	3.0	6.0	6.0	2.0	**5.0**	**4.7**
			Pennsuco	12-086-0019	14001-14027 N Okeechobee Rd, Hialeah, Fl 33018	Miami-Dade	Hourly	8292	7923	8612	8132	99th %tile	3.0	6.0	4.0	1.0	**4.3**	**3.7**
24-hour $PM_{2.5}$	35	$\mu g/m^3$	Daniela - Davie	12-011-0034	5300 South Pine Island Road, Davie, Fl 33328	Broward	every 3rd day	115	115	111	110	98th Percentile	16.0	22.0	13.0	16.0	**17.0**	**17.0**
			Daniela - Davie	12-011-0034	5300 South Pine Island Road, Davie, Fl 33328	Broward	Daily	357	362	358	364	98th Percentile	16.0	18.0	14.0	18.0	**16.0**	**16.7**
			Near Road	12-011-0035	799 North I-95, Ft Lauderdale, FL 33311	Broward	Daily	364	363	359	365	99th Percentile	18.3	20.0	17.0	25.0	**18.4**	**20.7**
			Vista View	12-011-0033	3211 College Ave, Davie, Fl 33314 4001 SW 142 Ave., Davie, Fl	Broward	Daily	--	142	336	352	98th Percentile	--	18.0	13.0	16.0	--	**15.7**
			Miami FS	12-086-1016	1200 NW 20th St, Miami, FL	Miami-Dade	Periodic	31	30	29	28	99th Percentile	12.0	20.0	25.0	18.0	**19.0**	**21.0**
			Miami FS	12-086-1016	1200 NW 20th St, Miami, FL	Miami-Dade	Daily	326	365	357	357	100th Percentile	16.0	15.0	16.0	17.0	**15.7**	**16.0**
			Palm Springs	12-086-0033	7700 Nw 186 Street	Miami-Dade	every 3rd day	122	114	117	108	98th Percentile	14.0	22.0	13.0	16.0	**16.3**	**17.0**
Annual $PM_{2.5}$	9	$\mu g/m^3$	Daniela - Davie	12-011-0034	5300 South Pine Island Road, Davie, Fl 33328	Broward	every 3rd day	115	115	111	110	Annual Avg.	6.6	6.7	5.8	6.4	**6.4**	**6.3**
			Daniela - Davie	12-011-0034	5300 South Pine Island Road, Davie, Fl 33328	Broward	Daily	357	362	358	364	Annual Avg.	7.4	7.4	6.8	7.3	**7.2**	**7.2**
			Near Road	12-011-0035	799 North I-95, Ft Lauderdale, FL 33311	Broward	Daily	364	363	359	365	Annual Avg.	9.3	9.5	9.4	10.1	**9.4**	**9.7**
			Vista View	12-011-0033	4001 SW 142 Ave., Davie, FL	Broward	Daily	--	142	336	352	Annual Avg.	--	6.4*	6.4	7.1	--	--
			Miami FS	12-086-1016	1200 NW 20th St, Miami, FL	Miami-Dade	Periodic	31	30	39	28	Annual Avg.	6.5	7.9	7.8	7.3	**7.4**	**7.7**
			Miami FS	12-086-1016	1200 NW 20th St, Miami, FL	Miami-Dade	Daily	326	365	357	357	Annual Avg.	7.7*	5.7	7.9	8.3	**6.8**	**7.3**
			Palm Springs	12-086-0033	7700 Nw 186 Street	Miami-Dade	every 3 days	122	114	117	108	Annual Avg.	6.4	7.1	6.1	6.5*	**6.5**	--
24-hour PM_{10}	150	$\mu g/m^3$	Daniela - Davie	12-011-0034	5300 South Pine Island Road, Davie, Fl 33328	Broward	Daily	357	362	358	364	High 2nd-High	79	73	80	62	**77.3**	**71.7**
			Winston Park	12-011-5005	4010 Winston Park Blvd	Broward	Daily	314	356	360	341	High 2nd-High	70	66	97	64	**77.7**	**75.7**
			Miami FS	12-086-1016	1200 NW 20th St, Miami, FL	Miami-Dade	Daily	326	365	357	357	High 2nd-High	87	46	96	65	**76.3**	**69.0**
			South Congress Ave	12-099-2005	225 South Congress Ave Delray Beach, Fl	Miami-Dade	Daily	341	338	360	365	High 2nd-High	87	49	104	62	**80.0**	**71.7**
8-hour Ozone	70	ppb	Daniela - Davie	12-011-0034	5300 South Pine Island Road, Davie, Fl 33328	Broward	Hourly	355	352	358	347	4th Highest	60	55	60	60	**58.8**	**58.3**
			Vista View	12-011-0033	4001 SW 142 Ave., Davie, FL	Broward	Hourly	356	361	350	350	4th Highest	67	55	57	59	**59.5**	**57.0**
			Eula Johnson State park	12-011-8002	7000 N. Ocean Drive, Dania, Fl 33004	Broward	Hourly	359	361	357	356	4th Highest	59	57	59	59	**58.5**	**58.3**
			Rosenstiel	12-086-0027	U of Miami, Miami, FL 33149	Miami-Dade	Hourly	339	346	358	353	4th Highest	55	58	68	66	**61.8**	**64.0**
			Perdue	12-086-0029	19590 Old Cutler Rd, Cutler Ridge, FL 33157	Miami-Dade	Hourly	354	349	345	350	4th Highest	60	56	65	64	**61.3**	**61.7**

Monitor Values Report | US EPA

Cells in beige represent year did not satisfy minimum data completeness criteria.

Cells in grey represent no monitor data for a given year.

2023 Monitoring data is expected to be finalized by EPA in May 2024, but included for worst-case analysis.

Appendix G

VISCREEN Analysis

VISCREEN Analysis

Level-1 VISCREEN Results

Worst-case (Nearest Class I Receptor)

Visual Effects Screening Analysis for
Source: Conceptual WTE Facility
Class I Area: Everglades NP

*** Level-1 Screening ***

Input Emissions for

Particulates	46.98	LB /HR
NOx (as NO2)	149.52	LB /HR
Primary NO2	0.00	LB /HR
Soot	0.00	LB /HR
Primary SO4	31.25	LB /HR

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	0.04 ppm
Background Visual Range:	172.00 km
Source-Observer Distance:	23.50 km
Min. Source-Class I Distance:	23.50 km
Max. Source-Class I Distance:	128.20 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	155.	41.8	14.	2.00	13.875*	0.05	0.287*
SKY	140.	155.	41.8	14.	2.00	6.760*	0.05	-0.225*
TERRAIN	10.	84.	23.5	84.	2.00	25.934*	0.05	0.206*
TERRAIN	140.	84.	23.5	84.	2.00	3.068*	0.05	0.040

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	30.363*	0.05	0.692*
SKY	140.	0.	1.0	168.	2.00	15.144*	0.05	-0.445*
TERRAIN	10.	0.	1.0	168.	2.00	49.864*	0.05	0.581*
TERRAIN	140.	0.	1.0	168.	2.00	22.028*	0.05	0.558*

Visual Effects Screening Analysis for
Source: Doral Conceptual WTE Fac
Class I Area: Everglades

*** Level-1 Screening ***

Input Emissions for

Particulates	46.98	LB /HR
NOx (as NO2)	149.52	LB /HR
Primary NO2	0.00	LB /HR
Soot	0.00	LB /HR
Primary SO4	31.25	LB /HR

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	0.04 ppm
Background Visual Range:	172.00 km
Source-Observer Distance:	18.80 km
Min. Source-Class I Distance:	18.80 km
Max. Source-Class I Distance:	119.40 km
Plume-Source-Observer Angle:	11.25 degrees

Stability: 6
Wind Speed: 1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	155.	33.4	14.	2.00	15.721*	0.05	0.327*
SKY	140.	155.	33.4	14.	2.00	8.112*	0.05	-0.257*
TERRAIN	10.	84.	18.8	84.	2.00	30.718*	0.05	0.230*
TERRAIN	140.	84.	18.8	84.	2.00	3.692*	0.05	0.043

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	1.	1.0	168.	2.00	33.483*	0.05	0.769*
SKY	140.	1.	1.0	168.	2.00	16.796*	0.05	-0.494*
TERRAIN	10.	1.	1.0	168.	2.00	56.145*	0.05	0.647*
TERRAIN	140.	1.	1.0	168.	2.00	24.771*	0.05	0.616*

Visual Effects Screening Analysis for
Source: Medley Conceptual WTE Si
Class I Area: Everglades

*** Level-1 Screening ***

Input Emissions for

Particulates	46.98	LB /HR
NOx (as NO2)	149.52	LB /HR
Primary NO2	0.00	LB /HR
Soot	0.00	LB /HR
Primary SO4	31.25	LB /HR

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	0.04 ppm
Background Visual Range:	172.00 km
Source-Observer Distance:	20.90 km
Min. Source-Class I Distance:	20.90 km
Max. Source-Class I Distance:	122.60 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	155.	37.2	14.	2.00	14.835*	0.05	0.308*
SKY	140.	155.	37.2	14.	2.00	7.450*	0.05	-0.242*
TERRAIN	10.	84.	20.9	84.	2.00	28.393*	0.05	0.219*
TERRAIN	140.	84.	20.9	84.	2.00	3.381*	0.05	0.042

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	1.	1.0	168.	2.00	32.009*	0.05	0.733*
SKY	140.	1.	1.0	168.	2.00	16.019*	0.05	-0.471*
TERRAIN	10.	1.	1.0	168.	2.00	53.182*	0.05	0.617*
TERRAIN	140.	1.	1.0	168.	2.00	23.473*	0.05	0.590*

VISCREEN Analysis

Level-1 Refined Particulates Speciation (Nearest Class I Receptor)

Visual Effects Screening Analysis for
Source: Conceptual WTE Facility
Class I Area: Everglades NP

*** Level-1 Screening ***

Input Emissions for

Particulates	15.73	LB /HR
NOx (as NO2)	149.52	LB /HR
Primary NO2	0.00	LB /HR
Soot	0.00	LB /HR
Primary SO4	31.25	LB /HR

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	0.04 ppm
Background Visual Range:	172.00 km
Source-Observer Distance:	23.50 km
Min. Source-Class I Distance:	23.50 km
Max. Source-Class I Distance:	128.20 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	155.	41.8	14.	2.00	10.205*	0.05	0.205*
SKY	140.	155.	41.8	14.	2.00	6.120*	0.05	-0.199*
TERRAIN	10.	84.	23.5	84.	2.00	21.528*	0.05	0.167*
TERRAIN	140.	84.	23.5	84.	2.00	2.608*	0.05	0.034

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	26.248*	0.05	0.577*
SKY	140.	0.	1.0	168.	2.00	14.529*	0.05	-0.432*
TERRAIN	10.	0.	1.0	168.	2.00	48.945*	0.05	0.571*
TERRAIN	140.	0.	1.0	168.	2.00	21.023*	0.05	0.532*

Visual Effects Screening Analysis for
Source: Existing Site Conceptual
Class I Area: Everglades NP

*** Level-1 Screening ***

Input Emissions for

Particulates	15.73	LB /HR
NOx (as NO2)	149.52	LB /HR
Primary NO2	0.00	LB /HR
Soot	0.00	LB /HR
Primary SO4	31.25	LB /HR

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	0.04 ppm
Background Visual Range:	172.00 km
Source-Observer Distance:	18.80 km
Min. Source-Class I Distance:	18.80 km
Max. Source-Class I Distance:	119.40 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	155.	33.4	14.	2.00	11.749*	0.05	0.235*
SKY	140.	155.	33.4	14.	2.00	7.446*	0.05	-0.228*
TERRAIN	10.	84.	18.8	84.	2.00	25.834*	0.05	0.187*
TERRAIN	140.	84.	18.8	84.	2.00	3.135*	0.05	0.036

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	1.	1.0	168.	2.00	29.432*	0.05	0.640*
SKY	140.	1.	1.0	168.	2.00	16.101*	0.05	-0.480*
TERRAIN	10.	1.	1.0	168.	2.00	55.161*	0.05	0.635*
TERRAIN	140.	1.	1.0	168.	2.00	23.586*	0.05	0.584*

Visual Effects Screening Analysis for
Source: Medley Conceptual WTE
Class I Area: Everglades NP

*** Level-1 Screening ***

Input Emissions for

Particulates	15.73	LB /HR
NOx (as NO2)	149.52	LB /HR
Primary NO2	0.00	LB /HR
Soot	0.00	LB /HR
Primary SO4	31.25	LB /HR

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	0.04 ppm
Background Visual Range:	172.00 km
Source-Observer Distance:	20.90 km
Min. Source-Class I Distance:	20.90 km
Max. Source-Class I Distance:	122.60 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	155.	37.2	14.	2.00	11.006*	0.05	0.220*
SKY	140.	155.	37.2	14.	2.00	6.796*	0.05	-0.214*
TERRAIN	10.	84.	20.9	84.	2.00	23.732*	0.05	0.177*
TERRAIN	140.	84.	20.9	84.	2.00	2.872*	0.05	0.035

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	1.	1.0	168.	2.00	27.926*	0.05	0.611*
SKY	140.	1.	1.0	168.	2.00	15.361*	0.05	-0.458*
TERRAIN	10.	1.	1.0	168.	2.00	52.228*	0.05	0.606*
TERRAIN	140.	1.	1.0	168.	2.00	22.375*	0.05	0.561*

VISCREEN Analysis

Meteorological Data Cumulative Frequency for Level-2 Analysis

VISCREEN (Level 2) Airport West/Medley Sites 2017-2021 Miami International Airport

Stability, wind speed	(SIGMA Y)* (SIGMA Z)* U (M3/S)	Wind Speed Category (m/s)	Midpoint Value of Windspeed (m/s)[1]	Downwind Distance (X) (m/s)	Transport Time (hours)	Frequency (f) and Cumulative Frequency (cf) for Given Time of Day (percent) for Worst-case Wind Direction							
						0-6		6-12		12-18		18-24	
						f	cf	f	cf	f	cf	f	cf
F,1	3.67E+04	0-1	0.5	23500	**13**	1.10	0.00	0.17	0.00	0.00	0.00	0.18	0.00
F,2	7.34E+04	1-2	1.5	23500	4	1.70	**1.70**	0.18	0.18	0.00	0.00	0.79	0.79
E,1	1.01E+05	0-1	0.5	23500	**13**	0.00	**1.70**	0.03	0.18	0.00	0.00	0.00	0.79
F,3	1.10E+05	2-3	2.5	23500	3	0.00	**1.70**	0.00	0.18	0.00	0.00	0.00	0.79
E,2	2.01E+05	1-2	1.5	23500	4	1.33	**3.03**	0.16	0.35	0.02	0.02	0.91	**1.71**
D,1	2.57E+05	0-1	0.5	23500	**13**	0.00	**3.03**	0.03	0.35	0.00	0.02	0.00	**1.71**
E,3	3.02E+05	2-3	2.5	23500	3	2.67	**5.70**	0.34	0.68	0.11	0.13	3.69	**5.39**
E,4	4.03E+05	3-4	3.5	23500	2	1.65	**7.36**	0.16	0.85	0.47	0.60	3.61	**9.01**
E,5	5.04E+05	4-5	4.5	23500	1	0.89	**8.25**	0.19	**1.04**	0.35	0.95	2.95	**11.96**
D,2	5.13E+05	1-2	1.5	23500	4	0.00	**8.25**	0.33	**1.37**	0.06	**1.01**	0.07	**12.03**
D,3	7.70E+05	2-3	2.5	23500	3	0.00	**8.25**	1.24	**2.61**	0.39	**1.41**	0.07	**12.10**
D,4	1.03E+06	3-4	3.5	23500	2	0.00	**8.25**	1.30	**3.91**	1.35	**2.76**	0.05	**12.16**
D,5	1.28E+06	4-5	4.5	23500	1	0.00	**8.25**	1.36	**5.27**	1.94	**4.70**	0.04	**12.19**
D,6	1.54E+06	5-6	5.5	23500	1	0.00	**8.25**	1.05	**6.32**	2.45	**7.15**	0.05	**12.25**
D,7	1.80E+06	6-7	6.5	23500	1	0.00	**8.25**	0.79	**7.11**	2.07	**9.22**	0.00	**12.25**
D,8	2.05E+06	7-8	7.5	23500	1	0.00	**8.25**	0.48	**7.59**	1.13	**10.35**	0.00	**12.25**

1. Midpoint value for the wind speed was chosen to determine transport time. Referenced in "Workbook for Plume Visual Impact Screening and Analysis (Revised)", p 45-48
2. Transport time needs to be less than 12 hours to be included in cumulative frequency (cf).
3. Transport path from all three proposed sites to the Everglades NP - Wind direction from 25 to 65 degrees.

VISCREEN (Level 2) Existing RRF Site 2017-2021 Miami International Airport

Stability, wind speed	(SIGMA Y)* (SIGMA Z)* U (M3/S)	Wind Speed Category (m/s)	Midpoint Value of Windspeed (m/s)[1]	Downwind Distance (X) (m/s)	Transport Time (hours)	Frequency (f) and Cumulative Frequency (cf) for Given Time of Day (percent) for Worst-case Wind Direction							
						0-6		6-12		12-18		18-24	
						f	cf	f	cf	f	cf	f	cf
F,1	2.80E+04	0-1	0.5	23500	**13**	1.10	0.00	0.17	0.00	0.00	0.00	0.18	0.00
F,2	5.61E+04	1-2	1.5	23500	4	1.70	**1.70**	0.18	0.18	0.00	0.00	0.79	0.79
E,1	7.61E+04	0-1	0.5	23500	**13**	0.00	**1.70**	0.03	0.18	0.00	0.00	0.00	0.79
F,3	8.41E+04	2-3	2.5	23500	3	0.00	**1.70**	0.00	0.18	0.00	0.00	0.00	0.79
E,2	1.52E+05	1-2	1.5	23500	4	1.33	**3.03**	0.16	0.35	0.02	0.02	0.91	**1.71**
D,1	1.88E+05	0-1	0.5	23500	**13**	0.00	**3.03**	0.03	0.35	0.00	0.02	0.00	**1.71**
E,3	2.28E+05	2-3	2.5	23500	3	2.67	**5.70**	0.34	0.68	0.11	0.13	3.69	**5.39**
E,4	3.04E+05	3-4	3.5	23500	2	1.65	**7.36**	0.16	0.85	0.47	0.60	3.61	**9.01**
D,2	3.76E+05	1-2	1.5	23500	4	0.00	**7.36**	0.33	**1.18**	0.06	0.67	0.07	**9.08**
E,5	3.80E+05	4-5	4.5	23500	1	0.89	**8.25**	0.19	**1.37**	0.35	**1.01**	2.95	**12.03**
D,3	5.64E+05	2-3	2.5	23500	3	0.00	**8.25**	1.24	**2.61**	0.39	**1.41**	0.07	**12.10**
D,4	7.52E+05	3-4	3.5	23500	2	0.00	**8.25**	1.30	**3.91**	1.35	**2.76**	0.05	**12.16**
D,5	9.41E+05	4-5	4.5	23500	1	0.00	**8.25**	1.36	**5.27**	1.94	**4.70**	0.04	**12.19**
D,6	1.13E+06	5-6	5.5	23500	1	0.00	**8.25**	1.05	**6.32**	2.45	**7.15**	0.05	**12.25**
D,7	1.32E+06	6-7	6.5	23500	1	0.00	**8.25**	0.79	**7.11**	2.07	**9.22**	0.00	**12.25**
D,8	1.50E+06	7-8	7.5	23500	1	0.00	**8.25**	0.48	**7.59**	1.13	**10.35**	0.00	**12.25**

1. Midpoint value for the wind speed was chosen to determine transport time. Referenced in "Workbook for Plume Visual Impact Screening and Analysis (Revised)", p 45-48
2. Transport time needs to be less than 12 hours to be included in cumulative frequency (cf).

VISCREEN Analysis

Level-2 Analysis - Worst-case (Nearest Class I Receptor)

Visual Effects Screening Analysis for
Source: Conceptual WTE (Airport
Class I Area: Everglades NP

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	46.98	LB /HR
NOx (as NO2)	149.52	LB /HR
Primary NO2	0.00	LB /HR
Soot	0.00	LB /HR
Primary SO4	31.25	LB /HR

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.5	6
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone:	0.04 ppm
Background Visual Range:	172.00 km
Source-Observer Distance:	23.50 km
Min. Source-Class I Distance:	23.50 km
Max. Source-Class I Distance:	128.20 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	5
Wind Speed:	5.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	155.	41.8	14.	2.00	2.060*	0.05	0.039
SKY	140.	155.	41.8	14.	2.00	0.915	0.05	-0.030
TERRAIN	10.	84.	23.5	84.	2.00	4.232*	0.05	0.027
TERRAIN	140.	84.	23.5	84.	2.00	0.347	0.05	0.004

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	12.106*	0.05	0.245*
SKY	140.	0.	1.0	168.	2.00	4.914*	0.05	-0.172*
TERRAIN	10.	0.	1.0	168.	2.00	27.316*	0.05	0.293*
TERRAIN	140.	0.	1.0	168.	2.00	6.305*	0.05	0.142*

```
              Visual Effects Screening Analysis for
                Source: Concept WTE Doral Site
                Class I Area: Everglades NP


              *** User-selected Screening Scenario Results ***
Input Emissions for

   Particulates    46.98  LB /HR
   NOx (as NO2)   149.52  LB /HR
   Primary NO2      0.00  LB /HR
   Soot             0.00  LB /HR
   Primary SO4     31.25  LB /HR


              PARTICLE CHARACTERISTICS
              Density       Diameter
              =======       ========
Primary Part.     2.5           6
Soot              2.0           1
Sulfate           1.5           4

              Transport Scenario Specifications:

    Background Ozone:                 0.04 ppm
    Background Visual Range:        172.00 km
    Source-Observer Distance:        18.80 km
    Min. Source-Class I Distance:    18.80 km
    Max. Source-Class I Distance:   119.40 km
    Plume-Source-Observer Angle:     11.25 degrees
    Stability:   4
    Wind Speed:   2.00 m/s

                           R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

         Maximum Visual Impacts INSIDE  Class I Area
            Screening Criteria ARE Exceeded
                                   Delta E       Contrast
                                 ===========   ============
Backgrnd Theta Azi Distance Alpha Crit  Plume   Crit  Plume
======== ===== === ======== ===== ====  =====   ====  =====
 SKY      10. 155.   33.4    14.  2.00  3.095*  0.05  0.057*
 SKY     140. 155.   33.4    14.  2.00  1.434   0.05 -0.045
 TERRAIN  10.  84.   18.8    84.  2.18  7.248*  0.08  0.043
 TERRAIN 140.  84.   18.8    84.  2.00  0.588   0.08  0.006


         Maximum Visual Impacts OUTSIDE Class I Area
            Screening Criteria ARE Exceeded
                                   Delta E       Contrast
                                 ===========   ============
Backgrnd Theta Azi Distance Alpha Crit  Plume   Crit  Plume
======== ===== === ======== ===== ====  =====   ====  =====
 SKY      10.   1.    1.0   168.  2.00 19.863*  0.05  0.412*
 SKY     140.   1.    1.0   168.  2.00  8.247*  0.05 -0.277*
 TERRAIN  10.   1.    1.0   168.  2.00 40.838*  0.05  0.444*
 TERRAIN 140.   1.    1.0   168.  2.00 10.984*  0.05  0.239*
```

Visual Effects Screening Analysis for
Source: Concept WTE Medley Site
Class I Area: Everglades NP

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	46.98	LB /HR
NOx (as NO2)	149.52	LB /HR
Primary NO2	0.00	LB /HR
Soot	0.00	LB /HR
Primary SO4	31.25	LB /HR

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.5	6
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone: 0.04 ppm
Background Visual Range: 172.00 km
Source-Observer Distance: 20.90 km
Min. Source-Class I Distance: 20.90 km
Max. Source-Class I Distance: 122.60 km
Plume-Source-Observer Angle: 11.25 degrees
Stability: 5
Wind Speed: 5.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	155.	37.2	14.	2.00	2.276*	0.05	0.042
SKY	140.	155.	37.2	14.	2.00	1.031	0.05	-0.033
TERRAIN	10.	84.	20.9	84.	2.00	4.835*	0.05	0.029
TERRAIN	140.	84.	20.9	84.	2.00	0.388	0.05	0.005

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	1.	1.0	168.	2.00	12.876*	0.05	0.259*
SKY	140.	1.	1.0	168.	2.00	5.241*	0.05	-0.182*
TERRAIN	10.	1.	1.0	168.	2.00	29.678*	0.05	0.314*
TERRAIN	140.	1.	1.0	168.	2.00	6.687*	0.05	0.144*

VISCREEN Analysis

Level-2 Analysis – Shark Valley Observation Tower Distance

Visual Effects Screening Analysis for
Source: Concept WTE Airport West
Class I Area: Everglades NP (Shark Val

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	46.98	LB /HR
NOx (as NO2)	149.52	LB /HR
Primary NO2	0.00	LB /HR
Soot	0.00	LB /HR
Primary SO4	31.25	LB /HR

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.5	6
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone:	0.04 ppm
Background Visual Range:	172.00 km
Source-Observer Distance:	46.00 km
Min. Source-Class I Distance:	23.50 km
Max. Source-Class I Distance:	128.20 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	5
Wind Speed:	5.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	11.	23.5	157.	2.00	1.431	0.05	0.027
SKY	140.	11.	23.5	157.	2.00	0.611	0.05	-0.021
TERRAIN	10.	11.	23.5	157.	2.00	3.358*	0.05	0.035
TERRAIN	140.	11.	23.5	157.	2.00	0.517	0.05	0.012

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	169.	2.00	8.125*	0.05	0.150*
SKY	140.	0.	1.0	169.	2.00	3.236*	0.05	-0.105*
TERRAIN	10.	0.	1.0	169.	2.00	14.665*	0.05	0.163*
TERRAIN	140.	0.	1.0	169.	2.00	4.215*	0.05	0.108*

Visual Effects Screening Analysis for
Source: Concept WTE Doral
Class I Area: Everglades NP (Shark Val

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	46.98	LB /HR
NOx (as NO2)	149.52	LB /HR
Primary NO2	0.00	LB /HR
Soot	0.00	LB /HR
Primary SO4	31.25	LB /HR

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.5	6
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone: 0.04 ppm
Background Visual Range: 172.00 km
Source-Observer Distance: 45.00 km
Min. Source-Class I Distance: 18.80 km
Max. Source-Class I Distance: 119.40 km
Plume-Source-Observer Angle: 11.25 degrees
Stability: 4
Wind Speed: 2.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	8.	18.8	161.	2.00	2.268*	0.05	0.044
SKY	140.	8.	18.8	161.	2.00	0.950	0.05	-0.034
TERRAIN	10.	8.	18.8	161.	2.00	5.142*	0.05	0.055*
TERRAIN	140.	8.	18.8	161.	2.00	0.881	0.05	0.022

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	12.170*	0.05	0.232*
SKY	140.	0.	1.0	168.	2.00	5.044*	0.05	-0.156*
TERRAIN	10.	0.	1.0	168.	2.00	20.526*	0.05	0.231*
TERRAIN	140.	0.	1.0	168.	2.00	6.694*	0.05	0.170*

Visual Effects Screening Analysis for
Source: Concept WTE Medley Site
Class I Area: Everglades NP (Shark Val

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	46.98	LB /HR
NOx (as NO2)	149.52	LB /HR
Primary NO2	0.00	LB /HR
Soot	0.00	LB /HR
Primary SO4	31.25	LB /HR

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.5	6
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone: 0.04 ppm
Background Visual Range: 172.00 km
Source-Observer Distance: 46.00 km
Min. Source-Class I Distance: 20.90 km
Max. Source-Class I Distance: 122.60 km
Plume-Source-Observer Angle: 11.25 degrees
Stability: 5
Wind Speed: 5.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	9.	20.9	160.	2.00	1.554	0.05	0.030
SKY	140.	9.	20.9	160.	2.00	0.652	0.05	-0.023
TERRAIN	10.	9.	20.9	160.	2.00	3.575*	0.05	0.038
TERRAIN	140.	9.	20.9	160.	2.00	0.582	0.05	0.014

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	169.	2.00	8.125*	0.05	0.150*
SKY	140.	0.	1.0	169.	2.00	3.236*	0.05	-0.105*
TERRAIN	10.	0.	1.0	169.	2.00	14.665*	0.05	0.163*
TERRAIN	140.	0.	1.0	169.	2.00	4.215*	0.05	0.108*

Appendix H

CALPUFF Model Options

CALPUFF Model Options

Variable	Description	USEPA 2006	Miami WTE Siting Analysis
METDAT	CALMET input data filename(s) (12 files)	CALMET. DAT	CMETjan1.dat
PUFLST	Filename for general output from CALPUFF	CALPUFF.LST	***EV01*.lst
CONDAT	Filename for output concentration data	CONC.DAT	***EV01*.con
DFDAT	Filename for output dry deposition fluxes	DFLX.DAT	***EV01*.dfx
WFDAT	Filename for output wet deposition fluxes	WFLX.DAT	***EV01*.wfx
VISDAT	Filename for output relative humidity (for visibility)	VISB.DAT	**EV*01*RH.dat
METRUN	Do we run all periods (1) or a subset (0)?	0	0
IBYR	Beginning year	User Defined	2001,2002, 2003
IBMO	Beginning month	User Defined	1
IBDY	Beginning day	User Defined	1
IBHR	Beginning hour	User Defined	1
IRLG	Length of run (hours)	User Defined	8760
NSPEC	Number of species modeled (for MESOPUFF II chemistry)	5	7
NSE	Number of species emitted	3	7
MRESTART	Restart options (0 = no restart), allows splitting runs into smaller segments	0	0
METFM	Format of input meteorology (1 = CALMET)	1	1
AVET	Averaging time lateral dispersion parameters (minutes)	60	60
MGAUSS	Near-field vertical distribution (1 = Gaussian)	1	1
MCTADJ	Terrain adjustments to plume path (3 = Plume path)	3	3
MCTSG	Do we have subgrid hills? (0 = No), allows CTDM-like treatment for subgrid scale hills	0	0
MSLUG	Near-field puff treatment (0 = No slugs)	0	0
MTRANS	Model transitional plume rise? (1 = Yes)	1	1
MTIP	Treat stack tip downwash? (1 = Yes)	1	1
MSHEAR	Treat vertical wind shear? (0 = No)	0	0
MSPLIT	Allow puffs to split? (0 = No)	0	0
MCHEM	MESOPUFF-II Chemistry? (1 = Yes)	1	1
MWET	Model wet deposition? (1 = Yes)	1	1
MDRY	Model dry deposition? (1 = Yes)	1	1
MDISP	Method for dispersion coefficients (3 = PG & MP)	3	3
MTURBVW	Turbulence characterization? (Only if MDISP 1 or 5)	3	3
MDISP2	Backup coefficients (Only if MDISP = 1 or 5)	3	3
MROUGH	Adjust PG for surface roughness? (0 = No)	0	0
MPARTL	Model partial plume penetration? (0 = No)	1	1
MTINV	Elevated inversion strength (0=compute from data)	0	0
MPDF	Use PDF for convective dispersion? (0 = No)	0	0
MSGTIBL	Use TIBL module? (0 = No) allows treatment of subgrid scale coastal areas	0	0
MREG	Regulatory default checks? (1 = Yes)	1	1

CALPUFF Model Options

Variable	Description	USEPA 2006	Miami WTE Siting Analysis
CSPECn	Names of species modeled (for MESOPUFF II, must be S02, S04, NOX, HNO3, N03)	User Defined	$S0_2$, $S0_4$, NO_X, HNO_3, $N0_3$,
Species Names	Manner species will be modeled	User Defined	$S0_2$, $S0_4$, NO_X, HNO_3, $N0_3$, PM10,PM2.5
Specie Groups	Grouping of species, if any.	User Defined	PMC = PM10, PMF = PM2.5
NX	Number of east-west grids of input meteorology	User Defined	263
NY	Number of north-south grids of input meteor.	User Defined	206
NZ	Number of vertical layers of input meteorology	User Defined	10
DGRIDKM	Meteorology grid spacing (km)	User Defined	4
ZFACE	Vertical cell face heights of input meteorology	User Defined	0,20,40,80, 160,320,640, 1200,2000, 3000, 4000
XORIGKM	Southwest corner (east-west) of input meteorology	User Defined	721.995
YORIGIM	Southwest corner (north-south) of input meteorology	User Defined	-1598.0
IUTMZN	UTM zone	User Defined	NA
XLAT	Latitude of center of meteorology domain	User Defined	NA
XLONG	Longitude of center of meteorology domain	User Defined	NA
XTBZ	Base time zone of input meteorology	User Defined	5
IBCOMP	Southwest X-index of computational domain	User Defined	1
JBCOMP	Southwest Y-index of computational domain	User Defined	1
IECOMP	Northeast X-index of computational domain	User Defined	263
JECOMP	Northeast Y-index of computational domain	User Defined	206
LSAMP	Use gridded receptors? (T = Yes)	F	F
IBSAMP	Southwest X-index of receptor grid	User Defined	NA
JBSAMP	Southwest Y-index of receptor grid	User Defined	NA
IESAMP	Northeast X-index of receptor grid	User Defined	NA
JESAMP	Northeast Y-index of receptor grid	User Defined	NA
MESHDN	Gridded receptor spacing = DGRIDKM / MESHDN	1	NA
ICON	Output concentrations? (1 = Yes)	1	1
IDRY	Output dry deposition flux? (1 = Yes)	1	1
IWET	Output west deposition flux? (1 = Yes)	1	1
IVIS	Output RH for visibility calculations (1 = Yes)	1	1
LCOMPRS	Use compression option in output? (T = Yes)	T	T
ICPRT	Print concentrations? (0 = No)	0	0
IDPRT	Print dry deposition fluxes (0 = No)	0	0
IWPRT	Print wet deposition fluxes (0 = No)	0	0
ICFRQ	Concentration print interval (1 = hourly)	1	1
IDFRQ	Dry deposition flux print interval (1 = hourly)	1	1
IWFRQ	West deposition flux print interval (1 = hourly)	1	1
IPRTU	Print output units (1 = g/m**3; g/m**2/s)	1	3

CALPUFF Model Options

Variable	Description	USEPA 2006	Miami WTE Siting Analysis
IMESG	Status messages to screen? (1 = Yes)	1	1
Output Species	Where to output various species	User Defined	Default
LDEBUG	Turn on debug tracking? (F = No)	F	F
Dry Gas Dep	Chemical parameters of gaseous deposition species	User Defined	Default
Dry Part. Dep	Chemical parameters of particulate deposition species	User Defined	Default
RCUTR	Reference cuticle resistance (s/cm)	30.	30
RGR	Reference ground resistance (s/cm)	10.	10
REACTR	Reference reactivity	8	8
NINT	Number of particle-size intervals	9	9
IVEG	Vegetative state (1 = active and unstressed)	1	1
Wet Dep	Wet deposition parameters	User Defined	Default
MOZ	Ozone background? (1 = read from ozone.dat)	1	1
BCKO3	Ozone default (ppb) (Use only for missing data)	80	12 * 80
BCKNH3	Ammonia background (ppb)	10	12 * 0.5
RNITE1	Nighttime S02 loss rate (%/hr)	0.2	.2
RNITE2	Nighttime NOx loss rate (%/hr)	2	2
RNITE3	Nighttime HNO3 loss rate (%/hr)	2	2
SYTDEP	Horizontal size (m) to switch to time dependence	550.	550
MHFTSZ	Use Heifter for vertical dispersion? (0 = No)	0	0
JSUP	PG Stability class above mixed layer	5	5
CONK1	Stable dispersion constant (Eq 2.7-3)	0.01	0.01
CONK2	Neutral dispersion constant (Eq 2.7-4)	0.1	0.1
TBD	Transition for downwash algorithms (0.5 = ISC)	0.5	0.5
IURB1	Beginning urban land use type	10	10
IURB2	Ending urban land use type	19	19
XMXLEN	Maximum slug length in units of DGRIDKM	1	1
XSAMLEN	Maximum puff travel distance per sampling step (units of DGRIDKM)	1	1
MXNEW	Maximum number of puffs per hour	99	99
MXSAM	Maximum sampling steps per hour	99	99
SL2PF	Maximum Sy/puff length	10	10
PLXO	Wind speed power-law exponents	0.07, 0.07, 0.10, .015, 0.35, 0.55	0.07, 0.07, 0.10, .015, 0.35, 0.55
WSCAT	Upper bounds 1st 5 wind speed classes (m/s)	1.54,3.09,5.14, 8.23.10.8	1.54,3.09,5.14, 8.23.10.8
PGGO	Potential temp. gradients PG E and F (deg/km)	0.020, 0.035	0.020, 0.035
SYMIN	Minimum lateral dispersion of new puff (m)	1.0	1.0
SZMIN	Minimum vertical dispersion of new puff (m)	1.0	1.0
SVMIN	Array of minimum lateral turbulence (m/s)	6 * 0.50	6 * 0.50
SWMIN	Array of minimum vertical turbulence (m/s)	0.20, 0.12, 0.08, 0.06, 0.03, 0.016	0.20, 0.12, 0.08, 0.06, 0.03, 0.016

CALPUFF Model Options

Variable	Description	USEPA 2006	Miami WTE Siting Analysis
CDIV	Divergence criterion for dw/dz (1/s)	0.0	0.0
WSCALM	Minimum non-calm wind speed (m/s)	0.5	0.5
XMAXZI	Maximum mixing height (m)	3000	3000
XMINZI	Minimum mixing height (m)	50	50
PPC	Plume path coefficients (only if MCTADJ = 3)	0.5,0.5,0.5,0.5, 0.35,0.35	0.5,0.5,0.5,0.5, 0.35,0.35
NSPLIT	Number of puffs when puffs split	3	3
IRESPLIT	Hours when puff are eligible to split	**User Defined**	NA
ZISPLIT	Previous hour's mixing height (minimum), (m)	100	100
ROLDMAX	Previous Max mixing height/current mixing height ratio, must be less then this value to allow puff split	0.25	0.25
EPSSLUG	Convergence criterion for slug sampling integration	1.0E-04	1.0E-04
EPSAREA	Convergence criterion for area source integration	1.0E-06	1.0E-06
NPT1	Number of point sources	User Defined	1
IPTU	Units of emission rates (1 = g/s)	1	3
NSPT1	Number of point source - species combinations	0	0
NPT2	Number of point sources with fully variable emission rates	0	0
Point Sources	Point sources characteristics	User Defined	MWC Flues
Area Sources	Area sources characteristics	User Defined	NA
Line Sources	Buoyant lines source characteristics	User Defined	NA
Volume Sources	Volume sources characteristics	User Defined	NA
NREC	Number of user defined receptors	User Defined	901 (Everglades NP)
Receptor Data	Location and elevation (MSL) of receptors	User Defined	NPS Provided (0 – 1 m)

Notes:

1 Bolded text indicates variables that will need to be tailored for a given application (IWAQM, 1998).

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