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Pensacola, Florida 32520

Jeff
F91

GULF POWER
A SOUTHERN COMPANY

Certified Mail

January 23, 2007

Mr. Tom Rogers
Department of Environmental Protection
Division of Air Resource Management
2600 Blair Stone Road
Mail Station #5500
Tallahassee, Florida 32399-2400

Dear Mr. Rogers,

RE: Gulf Power BART Exemption Modeling Report
Lansing Smith Electric Generating Plant - 0050014

Pursuant to Rule 62-296.340 F.A.C, Gulf Power has completed the Best Available Retrofit Technology (BART) Exemption Modeling Report for the Lansing Smith Electric Generating Plant. The attached report utilized the revised BART modeling protocol previously submitted to the Department during December, 2006. The modeling results demonstrate that Plant Smith PM_{10} emissions do not cause or contribute to visibility impairment. Therefore, Plant Smith is not subject to BART for PM_{10} and no further BART analysis is required. A certification by the Responsible Official is enclosed.

If you have any questions or need further information regarding the Plant Smith BART Exemption Modeling Report, please call me at (850) 444.6527.

Sincerely,

Dwain Waters, Q.E.P.

G. Dwain Waters, Q.E.P.
Special Projects and Environmental Assets Coordinator

Cc/wo disks: James O. Vick, Gulf Power Company
Fred Ellis, Southern Company Services
John Jansen, Southern Company Services
Trina Vielhauer, FDEP – Tallahassee
Rick Bradburn, FDEP - Pensacola

LANSING SMITH BART EXEMPTION
MODELING REPORT
CERTIFICATION BY RESPONSIBLE OFFICIAL

"I, the undersigned, am the responsible official, as defined in Chapter 62-210.200, F.A.C., for the Title V source for which this report is being submitted. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made and data contained in this report are true, accurate and complete."

Responsible Official Signature:

Penny M. Manuel

Penny M. Manuel
Vice-President & Senior Production Officer

1-23-07

Date:

BART Exemption Modeling Report:

Gulf Power Company
Plant Smith

Prepared by:

Southern Company Services and ENSR Corporation
for Gulf Power Company

December 2006

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1.0 Introduction

1.1 Objectives

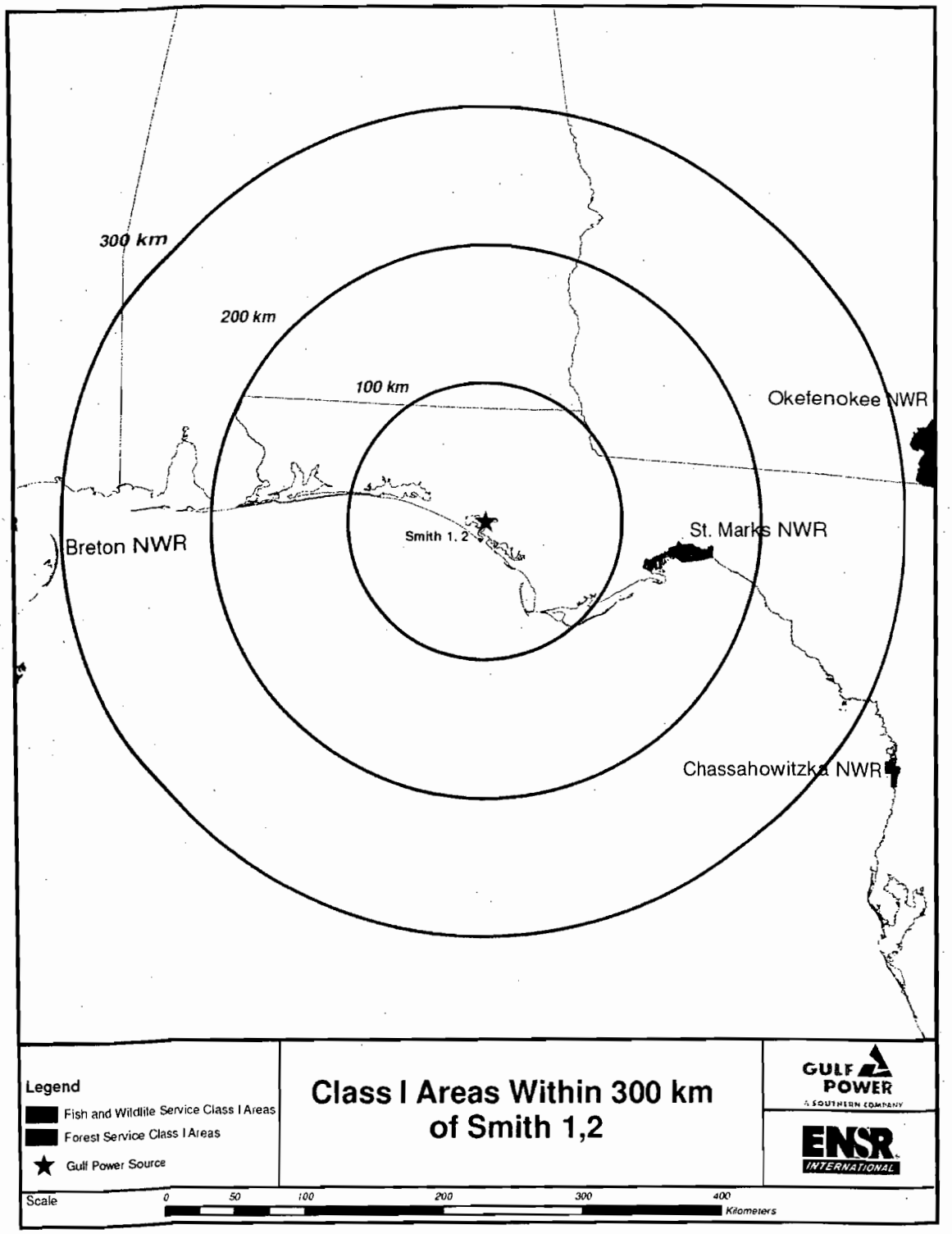
The Regional Haze Rule requires Best Available Retrofit Technology (BART) for any BART-eligible source that "emits any air pollutant which may reasonably be anticipated to cause or contribute to any impairment of visibility" in any mandatory Class I federal area. Pursuant to federal regulations, states have the option of exempting a BART-eligible source from the BART requirements based on dispersion modeling demonstrating that the source cannot reasonably be anticipated to cause or contribute to visibility impairment in a Class I area. In addition, the Environmental Protection Agency (EPA) has promulgated a rule allowing states subject to the Clean Air Interstate Rule (CAIR) to determine that CAIR satisfies the BART requirements for SO_2 and NO_x for electric generating units (EGUs). Feedback from the Florida Department of Environmental Protection indicates that CAIR satisfies BART for SO_2 and NO_x for EGUs. Therefore, this modeling report focuses on performing the BART modeling analysis for particulate matter (PM) only.

Units 1 and 2 at Plant Smith, located near Lynn Haven, which is owned and operated by Gulf Power Company, have been identified as a BART-eligible source. The modeling procedures outlined in the source-specific BART modeling protocol for Plant Smith were used to determine whether the source is subject to BART requirements (exemption modeling). The modeling procedures are consistent with those outlined in the updated final VISTAS common BART modeling protocol (dated December 22, 2005, revision 3.2 – August 31, 2006), available at http://www.vistas-sesarm.org/documents/BARTModelingProtocol_rev3.2_31Aug06.pdf. The source-specific BART modeling protocol references relevant portions of the common VISTAS modeling protocol.

1.2 Location of source vs. relevant Class I Areas

The Florida Department of Environmental Protection, which is in charge of the state's BART program, has determined that Units 1 and 2 at Plant Smith are BART-eligible for PM. Figure 1-1 shows a plot of Plant Smith relative to nearby Class I Areas. There is one Class I area within 300 km of the plant: Saint Marks (118.6 km). The BART exemption modeling was conducted for this Class I area in accordance with the referenced VISTAS common BART modeling protocol and the procedures described in the source-specific BART modeling protocol.

Figure 1-1 Location of Class I Areas in Relation to Plant Smith



2.0 Source description and emissions data

2.1 Unit-specific source data

The emissions data used to assess the visibility impacts at the Class I areas within 300 km of Plant Smith are discussed in this section. The Florida Department of Environmental Protection has indicated that CAIR will satisfy BART for EGUs for SO_2 and NO_x. Therefore, this BART exemption modeling analysis focuses only on PM_{10}. Since various components of PM_{10} emissions have different visibility extinction efficiencies, the PM_{10} emissions are divided, or "speciated," into several components (VISTAS common protocol Sections 4.3.3 and 4.4.2). The VISTAS protocol (Section 5) allows for the use of source-specific emissions and speciation factors and/or default values from AP-42. The PM_{10} emissions and speciation approach used for the modeling described in this report is indicated below. Where default speciation values are used, the data represents a unit where current (baseline) emission controls include electrostatic precipitators (ESPs), but no post-combustion NO_x or SO_2 control equipment exists.

- Total PM_{10} is comprised of filterable and condensable emissions.
- Baseline filterable PM_{10} emissions are based on the highest stack test for the most recent 3-year period (2003-2005). This stack test is combined with the highest 24 hour heat input value for this period from CEMS data to calculate the "maximum 24-hour average emission rate" as required by the VISTAS protocol.
- Filterable PM_{10} has been subdivided by size category consistent with the default approach from AP-42 Table 1-1.6, and as noted on pages 43 and 44 of the VISTAS common BART modeling protocol. The AP-42 Table 1-1.6 specifies for the emission controls indicated above that 55.6% of filterable PM_{10} emission is coarse (greater than 2.5 microns in size) and 44.4% is fine. Of the fine portion, 3.7% is elemental carbon and the remainder is inorganic fine particulates (soil).
- Condensable PM_{10} consists of inorganic and organic compounds. The inorganic portion is by default assumed to be H_2SO_4, although other non-sulfate inorganic condensables could be present. The organic portion is modeled as organic aerosols.
- Baseline H_2SO_4 emissions are calculated consistent with the method used by Gulf Power to derive these emissions for TRI purposes. This approach assumes that the H_2SO_4 emissions released from the stack are proportional to SO_2 emissions from combustion and are dependent on the fuel type and the removal of H_2SO_4 by downstream equipment (i.e., ESP and air heater). For eastern bituminous coal the baseline H_2SO_4 release rate is in the range of 0.2 to 0.5% of the SO_2 emissions. Appendix A of the site-specific modeling protocol provides the basis for the site-specific values used.
- Baseline emissions of condensable organics (the remaining portion of condensable PM_{10}) are derived based on the supporting field observational information in Appendix B of the site-specific modeling protocol and is estimated as 0.32% of SO_2 emitted.
- Coarse filterable particles (between 2.5 and 10 microns in size) are modeled with a geometric mass mean diameter of 5 microns, while fine filterable and all condensable particles are modeled with a geometric mass mean diameter of 0.48 microns, consistent with the CALPUFF default value for fine particles. The geometric standard deviation for both fine and coarse particles are set to 2 microns, consistent with the CALPUFF default value. The 0.48 micron diameter value for fine particles comes from the default values in sample input files presented on the TRC web site. There is no default value presented for the coarse particles on the TRC web site. However, since 5 is the geometric mass mean diameter of 2.5 and 10 (the bounds of coarse particle sizes), it is a reasonable estimate for the geometric mass mean diameter for that class of particles.

In practice, CALPUFF allows for the user to input certain components of PM_{10} as separate species and separate sizes, which will result in more accurate wet and dry deposition velocity results and also more

accurate effects on light scattering. As noted above, the particle size distribution information is provided in AP-42 Table 1-1.6, and was used for the BART exemption modeling.

Table 2-1 provides a summary of the modeling emission parameters used in the BART CALPUFF modeling, consistent with the source emissions data presented in Appendices A and B of the site-specific modeling protocol for the baseline. All of the emissions in Table 2-1 were derived from CEMS data for the 2003 to 2005 period and represent the maximum 24-hour average lb/hr rates (excluding days where startup, shutdown, or malfunctions occurred). For NO_x and SO_2 the values are directly from CEMS. Filterable PM_{10} emissions were calculated using the highest stack test over the 2003 to 2005 period and multiplying these values times the maximum 24-hour average heat input derived from CEMS. These values were then adjusted using AP-42 factors from Table 1.1-6 that indicate that PM_{10} is 67% of total PM for a pulverized coal unit with an ESP. PM_{10} speciation was then performed as indicated above such that total Filterable PM_{10} is made up of Coarse Soil plus total Fine PM and total Fine PM is made up of Fine Soil plus Elemental Carbon (EC).

Table 2-1 Plant Smith modeling emission parameters

Case	Source / Unit	Location UTM (Zone 16 NAD-83)		Actual Stack Ht	Base Elev.	Flue Dia-meter	Gas Exit Vel.	Stack Gas Exit Temp.	Emissions[1]			Particle Speciation[2]							
		UTM East	UTM North						SO_2	NO_X	PM_{10}	Filt. PM_{10}	Coarse Soil	Fine PM	Fine Soil	EC	Cond. PM_{10}	H_2SO_4	Organic
		m	m	m	m	m	m/s	deg K	lbs/hr	lbs/hr	lbs/hr	lbs/hr	lbs/hr	lbs/hr	lbs/hr	lbs/hr	lbs/hr	lbs/hr	lbs/hr
Baseline Data - Current Configuration (Unit Basis)																			
Baseline	Unit 1	625,053	3,349,243	60.7	1.5	5.5	19.7	440.8	4194.00	1350.00	48.56	27.37	15.22	12.15	11.70	0.45	21.19	7.77	13.42
Baseline	Unit 2	625,053	3,349,243	60.7	1.5	5.5	19.7	440.8	3922.00	889.00	47.98	28.15	15.65	12.50	12.04	0.46	19.82	7.27	12.55
Baseline Data - Current Configuration (Stack Basis)																			
				Modeled Stk Ht[3]															
		m	m	m	m	m	m/s	deg K	lbs/hr	lbs/hr	lbs/hr	lbs/hr	lbs/hr	lbs/hr	lbs/hr	lbs/hr	lbs/hr	lbs/hr	lbs/hr
Stack 1	1&2	625,053	3,349,243	60.7	1.5	5.5	19.7	440.8	8116.00	2239.00	96.53	55.52	30.87	24.65	23.74	0.91	41.01	15.04	25.97
Stack Basis Emissions Converted to g/sec									g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec
Stack 1	1&2	625,053	3,349,243	60.7	1.5	5.5	19.7	440.8	1022.62	282.11	12.16	7.00	3.89	3.11	2.99	0.11	5.17	1.90	3.27

[1] SO_2 and NO_x emissions are not BART-applicable for EGU sources in CAIR states, if the state agency agrees with EPA's interpretation of the BART final rule. The emissions for SO_2 and NO_x are provided for information purposes, and for reference in the computation of certain particle species such as H_2SO_4.

[2] Elemental carbon (EC) and Fine PM are a part of Filterable PM_{10} and H_2SO_4 and Organics are a part of Condensable PM_{10}. Note that H_2SO_4 is input to CALPUFF as SO_4. The molecular weights of H_2SO_4 and SO_4 are 98 and 96, respectively, therefore the conversion factor from H_2SO_4 to SO_4 is 96/98.

[3] Stack credit is equal to actual stack height since this stack is grandfathered under stack height regulations.

3.0 Modeling results

The exemption modeling results are provided in Table 3-1, and Appendix A lists delta-deciview results for the top 20 days for each year modeled and the top 25 days for the overall three years at each Class I area. The table indicates that both the 8th highest day's impacts for each year and the 22nd highest day's impacts over all three years are below 0.5 delta-dv. These results demonstrate that Plant Smith's PM_{10} emissions do not cause or contribute to visibility impairment. Therefore, the source is not subject to BART for PM_{10}, and no further BART analysis is required.

Electronic data related to this application are provided on the attached disk. They include all input (INP) and list (LST) files.

Table 3-1 Summary of Results – Plant Smith Refined BART Exemption Modeling

Class I area	Distance from source to Class I area boundary	2001			2002			2003			Highest of 8th Highest delta-dv for the 3-years	22nd Highest delta-dv over 3-year period
		# of days and receptors beyond 98th percentile with impact > 0.5 delta-dv		8th Highest delta-dv	# of days and receptors beyond 98th percentile with impact > 0.5 delta-dv		8th Highest delta-dv	# of days and receptors beyond 98th percentile with impact > 0.5 delta-dv		8th Highest delta-dv		
	km	Days	Rec	delta-dv	Days	Rec	delta-dv	Days	Rec	delta-dv	delta-dv	delta-dv
Saint Marks												
New Improve	118.6	0	0	0.05	0	0	0.05	0	0	0.05	0.05	0.05
Old Improve	118.6	0	0	0.06	0	0	0.06	0	0	0.06	0.06	0.06

Appendix A

Delta-Deciview Values for the Top 20 Days – for Each Year/Each Class I Area and for the Top 25 Days – Over Three Years

New IMPROVE Equation - Ranked Daily Visibility Change for Saint Marks (Top 20 Days for Each Year)

						F(RH)			% of Modeled Extinction by Species						
YEAR	DAY	REC	DV(Total)	DV(BKG)	DELTA DV	S	L	SS	% SO4	% NO3	% OC	% EC	% PMC	% PMF	Rank
2001	139	32	8.02	7.94	0.08	3.8	2.9	4.3	57.73%	0.00%	27.52%	2.73%	3.82%	8.20%	1
2001	187	2	8.27	8.21	0.06	4.5	3.3	4.9	61.63%	0.00%	24.38%	2.80%	4.20%	6.99%	2
2001	313	7	8.08	8.02	0.06	4.0	3.0	4.5	58.78%	0.00%	26.14%	2.87%	4.31%	7.90%	3
2001	221	56	8.39	8.33	0.06	4.9	3.5	5.1	64.12%	0.00%	23.37%	2.21%	3.68%	6.62%	4
2001	223	16	8.39	8.33	0.06	4.9	3.5	5.1	63.67%	0.00%	23.03%	2.35%	3.91%	7.04%	5
2001	189	2	8.26	8.21	0.05	4.5	3.3	4.9	61.53%	0.00%	24.39%	2.49%	4.14%	7.46%	6
2001	222	16	8.39	8.33	0.05	4.9	3.5	5.1	63.82%	0.00%	23.53%	2.53%	3.37%	6.75%	7
2001	336	1	8.15	8.10	0.05	4.2	3.2	4.6	60.11%	0.00%	25.08%	2.78%	4.63%	7.40%	8
2001	194	101	8.25	8.21	0.05	4.5	3.3	4.9	61.67%	0.00%	24.77%	2.91%	3.88%	6.78%	9
2001	151	1	7.98	7.94	0.05	3.8	2.9	4.3	57.70%	0.00%	26.95%	3.07%	4.09%	8.19%	10
2001	186	11	8.25	8.21	0.04	4.5	3.3	4.9	61.53%	0.00%	24.00%	3.10%	4.13%	7.23%	11
2001	202	99	8.25	8.21	0.04	4.5	3.3	4.9	61.04%	0.00%	24.00%	2.14%	5.34%	7.48%	12
2001	60	1	7.91	7.87	0.04	3.6	2.8	4.1	55.84%	0.00%	28.22%	3.42%	4.55%	7.97%	13
2001	6	101	8.06	8.02	0.04	4.0	3.0	4.5	58.12%	0.00%	26.14%	3.37%	4.50%	7.87%	14
2001	191	1	8.25	8.21	0.04	4.5	3.3	4.9	61.87%	0.00%	24.54%	2.26%	4.53%	6.79%	15
2001	193	85	8.25	8.21	0.04	4.5	3.3	4.9	62.58%	0.00%	24.83%	2.29%	3.43%	6.87%	16
2001	8	1	8.06	8.02	0.04	4.0	3.0	4.5	58.54%	0.00%	26.26%	2.34%	4.68%	8.18%	17
2001	354	1	8.14	8.10	0.04	4.2	3.2	4.6	60.73%	0.00%	25.74%	2.46%	3.69%	7.38%	18
2001	91	7	7.91	7.87	0.03	3.6	2.8	4.1	58.07%	0.00%	28.36%	2.71%	2.71%	8.14%	19
2001	314	7	8.05	8.02	0.03	4.0	3.0	4.5	59.82%	0.00%	26.49%	2.74%	2.74%	8.21%	20
2002	121	11	7.95	7.87	0.08	3.6	2.8	4.1	55.72%	0.00%	27.94%	2.82%	5.07%	8.45%	1
2002	185	1	8.27	8.21	0.06	4.5	3.3	4.9	61.30%	0.00%	24.39%	2.86%	4.29%	7.15%	2
2002	364	1	8.16	8.10	0.06	4.2	3.2	4.6	60.00%	0.00%	25.25%	3.10%	3.88%	7.76%	3
2002	260	11	8.39	8.33	0.06	4.9	3.5	5.1	63.17%	0.00%	23.08%	2.29%	4.58%	6.88%	4
2002	280	78	8.16	8.10	0.06	4.2	3.2	4.6	60.33%	0.00%	25.32%	2.39%	4.78%	7.18%	5
2002	155	13	8.26	8.21	0.05	4.5	3.3	4.9	62.10%	0.00%	24.55%	2.50%	3.34%	7.51%	6
2002	168	1	8.26	8.21	0.05	4.5	3.3	4.9	61.09%	0.00%	23.93%	2.81%	4.68%	7.49%	7
2002	165	2	8.25	8.21	0.05	4.5	3.3	4.9	61.66%	0.00%	24.16%	2.84%	3.78%	7.56%	8
2002	220	2	8.38	8.33	0.04	4.9	3.5	5.1	63.60%	0.00%	23.34%	3.01%	3.01%	7.03%	9
2002	219	7	8.37	8.33	0.04	4.9	3.5	5.1	64.74%	0.00%	23.39%	2.16%	3.24%	6.47%	10
2002	255	101	8.37	8.33	0.04	4.9	3.5	5.1	64.39%	0.00%	23.33%	2.23%	3.35%	6.69%	11
2002	273	7	8.37	8.33	0.04	4.9	3.5	5.1	64.29%	0.00%	23.86%	2.37%	2.37%	7.11%	12
2002	213	101	8.24	8.21	0.03	4.5	3.3	4.9	61.93%	0.00%	24.75%	2.66%	3.99%	6.66%	13
2002	197	11	8.24	8.21	0.03	4.5	3.3	4.9	62.77%	0.00%	25.09%	2.70%	2.70%	6.75%	14
2002	154	1	8.24	8.21	0.03	4.5	3.3	4.9	61.89%	0.00%	24.41%	2.74%	4.11%	6.85%	15
2002	202	6	8.24	8.21	0.03	4.5	3.3	4.9	61.74%	0.00%	24.51%	2.75%	4.13%	6.88%	16
2002	113	11	7.90	7.87	0.03	3.6	2.8	4.1	57.92%	0.00%	29.42%	3.17%	1.58%	7.91%	17
2002	335	101	8.05	8.02	0.03	4.0	3.0	4.5	60.87%	0.00%	26.63%	3.13%	1.56%	7.81%	18
2002	111	1	7.90	7.87	0.03	3.6	2.8	4.1	55.60%	0.00%	26.98%	3.48%	5.23%	8.71%	19
2002	112	1	7.90	7.87	0.03	3.6	2.8	4.1	54.99%	0.00%	27.35%	3.53%	5.30%	8.83%	20
2003	295	1	8.19	8.10	0.09	4.2	3.2	4.6	60.52%	0.00%	25.62%	2.67%	3.73%	7.46%	1
2003	199	11	8.27	8.21	0.07	4.5	3.3	4.9	61.84%	0.00%	24.20%	2.66%	3.99%	7.31%	2
2003	82	7	7.93	7.87	0.06	3.6	2.8	4.1	57.00%	0.00%	28.36%	3.25%	3.25%	8.13%	3
2003	44	1	7.93	7.87	0.06	3.6	2.8	4.1	56.81%	0.00%	28.26%	3.32%	3.32%	8.29%	4
2003	148	2	7.99	7.94	0.06	3.8	2.9	4.3	57.00%	0.00%	27.15%	3.34%	4.17%	8.34%	5
2003	151	1	7.99	7.94	0.05	3.8	2.9	4.3	58.38%	0.00%	27.44%	2.66%	3.54%	7.97%	6
2003	154	7	8.26	8.21	0.05	4.5	3.3	4.9	62.23%	0.00%	24.79%	2.60%	3.46%	6.92%	7
2003	221	7	8.38	8.33	0.05	4.9	3.5	5.1	64.03%	0.00%	23.72%	2.62%	2.62%	7.00%	8
2003	298	101	8.15	8.10	0.05	4.2	3.2	4.6	60.06%	0.00%	25.71%	2.85%	3.79%	7.59%	9
2003	19	7	8.06	8.02	0.05	4.0	3.0	4.5	60.25%	0.00%	26.61%	3.03%	2.02%	8.08%	10
2003	20	1	8.06	8.02	0.04	4.0	3.0	4.5	59.13%	0.00%	26.41%	3.10%	3.10%	8.26%	11
2003	210	1	8.25	8.21	0.04	4.5	3.3	4.9	61.37%	0.00%	24.40%	3.05%	4.07%	7.11%	12
2003	222	1	8.38	8.33	0.04	4.9	3.5	5.1	63.79%	0.00%	22.93%	2.04%	4.08%	7.15%	13
2003	272	12	8.37	8.33	0.04	4.9	3.5	5.1	64.39%	0.00%	23.33%	2.23%	3.35%	6.69%	14
2003	105	1	7.91	7.87	0.04	3.6	2.8	4.1	55.64%	0.00%	27.68%	3.57%	4.76%	8.34%	15
2003	78	101	7.91	7.87	0.04	3.6	2.8	4.1	56.31%	0.00%	28.01%	3.62%	3.62%	8.44%	16
2003	10	101	8.05	8.02	0.04	4.0	3.0	4.5	59.73%	0.00%	26.72%	2.46%	3.70%	7.39%	17
2003	123	1	7.97	7.94	0.04	3.8	2.9	4.3	57.47%	0.00%	27.02%	2.58%	5.17%	7.75%	18
2003	162	101	8.24	8.21	0.03	4.5	3.3	4.9	62.10%	0.00%	24.64%	2.65%	3.98%	6.63%	19
2003	104	10	7.90	7.87	0.03	3.6	2.8	4.1	56.51%	0.00%	28.68%	2.96%	2.96%	8.89%	20

New IMPROVE Equation - Ranked Daily Visibility Change for Saint Marks (Top 25 Days Over 3 Years)

						F(RH)			% of Modeled Extinction by Species						
YEAR	DAY	REC	DV(Total)	DV(BKG)	DELTA DV	S	L	SS	% SO4	% NO3	% OC	% EC	% PMC	% PMF	Rank
2003	295	1	8.19	8.10	0.09	4.2	3.2	4.6	60.52%	0.00%	25.62%	2.67%	3.73%	7.46%	1
2001	139	32	8.02	7.94	0.08	3.8	2.9	4.3	57.73%	0.00%	27.52%	2.73%	3.82%	8.20%	2
2002	121	11	7.95	7.87	0.08	3.6	2.8	4.1	55.72%	0.00%	27.94%	2.82%	5.07%	8.45%	3
2003	199	11	8.27	8.21	0.07	4.5	3.3	4.9	61.84%	0.00%	24.20%	2.66%	3.99%	7.31%	4
2001	187	2	8.27	8.21	0.06	4.5	3.3	4.9	61.63%	0.00%	24.38%	2.80%	4.20%	6.99%	5
2001	313	7	8.08	8.02	0.06	4.0	3.0	4.5	58.78%	0.00%	26.14%	2.87%	4.31%	7.90%	6
2002	185	1	8.27	8.21	0.06	4.5	3.3	4.9	61.30%	0.00%	24.39%	2.86%	4.29%	7.15%	7
2001	221	56	8.39	8.33	0.06	4.9	3.5	5.1	64.12%	0.00%	23.37%	2.21%	3.68%	6.62%	8
2002	364	1	8.16	8.10	0.06	4.2	3.2	4.6	60.00%	0.00%	25.25%	3.10%	3.88%	7.76%	9
2002	260	11	8.39	8.33	0.06	4.9	3.5	5.1	63.17%	0.00%	23.08%	2.29%	4.58%	6.88%	10
2003	82	7	7.93	7.87	0.06	3.6	2.8	4.1	57.00%	0.00%	28.36%	3.25%	3.25%	8.13%	11
2002	280	78	8.16	8.10	0.06	4.2	3.2	4.6	60.33%	0.00%	25.32%	2.39%	4.78%	7.18%	12
2001	223	16	8.39	8.33	0.06	4.9	3.5	5.1	63.67%	0.00%	23.03%	2.35%	3.91%	7.04%	13
2003	44	1	7.93	7.87	0.06	3.6	2.8	4.1	56.81%	0.00%	28.26%	3.32%	3.32%	8.29%	14
2003	148	2	7.99	7.94	0.06	3.8	2.9	4.3	57.00%	0.00%	27.15%	3.34%	4.17%	8.34%	15
2001	189	2	8.26	8.21	0.05	4.5	3.3	4.9	61.53%	0.00%	24.39%	2.49%	4.14%	7.46%	16
2002	155	13	8.26	8.21	0.05	4.5	3.3	4.9	62.10%	0.00%	24.55%	2.50%	3.34%	7.51%	17
2001	222	16	8.39	8.33	0.05	4.9	3.5	5.1	63.82%	0.00%	23.53%	2.53%	3.37%	6.75%	18
2003	151	1	7.99	7.94	0.05	3.8	2.9	4.3	58.38%	0.00%	27.44%	2.66%	3.54%	7.97%	19
2003	154	7	8.26	8.21	0.05	4.5	3.3	4.9	62.23%	0.00%	24.79%	2.60%	3.46%	6.92%	20
2003	221	7	8.38	8.33	0.05	4.9	3.5	5.1	64.03%	0.00%	23.72%	2.62%	2.62%	7.00%	21
2001	336	1	8.15	8.10	0.05	4.2	3.2	4.6	60.11%	0.00%	25.08%	2.78%	4.63%	7.40%	22
2002	168	1	8.26	8.21	0.05	4.5	3.3	4.9	61.09%	0.00%	23.93%	2.81%	4.68%	7.49%	23
2003	298	101	8.15	8.10	0.05	4.2	3.2	4.6	60.06%	0.00%	25.71%	2.85%	3.79%	7.59%	24
2002	165	2	8.25	8.21	0.05	4.5	3.3	4.9	61.66%	0.00%	24.16%	2.84%	3.78%	7.56%	25

Old IMROVE Equation - Ranked Daily Visibility Change for Saint Marks (Top 20 Days for Each Year)

							% of Modeled Extinction by Species					
YEAR	DAY	REC	DV(Total)	DV(BKG)	DELTA DV	F(RH)	% SO4	% NO3	% OC	% EC	% PMC	% PMF	Ranking
2001	139	32	7.772	7.669	0.104	3.5	59.11	0	28.79	2.42	3.1	6.58	1
2001	187	2	7.748	7.669	0.08	4.1	62.39	0	25.94	2.18	3.56	5.93	2
2001	313	7	7.748	7.669	0.079	3.7	60.29	0	27.78	2.34	3.25	6.35	3
2001	221	56	7.745	7.669	0.076	4.4	64.13	0	24.85	2.09	3.25	5.68	4
2001	223	16	7.74	7.669	0.072	4.4	64.22	0	24.88	2.09	3.12	5.69	5
2001	189	2	7.736	7.669	0.068	4.1	62.44	0	25.96	2.18	3.47	5.94	6
2001	222	16	7.735	7.669	0.066	4.4	64.6	0	25.03	2.1	2.55	5.72	7
2001	336	1	7.729	7.669	0.061	3.8	60.31	0	27.06	2.28	4.18	6.18	8
2001	194	101	7.726	7.669	0.058	4.1	62.78	0	26.11	2.2	2.95	5.97	9
2001	151	1	7.724	7.669	0.055	3.5	59.06	0	28.77	2.42	3.18	6.58	10
2001	186	11	7.722	7.669	0.054	4.1	62.59	0	26.03	2.19	3.24	5.95	11
2001	202	99	7.721	7.669	0.052	4.1	62.06	0	25.81	2.17	4.06	5.9	12
2001	191	1	7.718	7.669	0.05	4.1	62.38	0	25.94	2.18	3.57	5.93	13
2001	60	1	7.719	7.669	0.05	3.4	58.1	0	29.13	2.45	3.66	6.66	14
2001	6	101	7.719	7.669	0.05	3.7	60	0	27.65	2.33	3.71	6.32	15
2001	193	85	7.718	7.669	0.049	4.1	62.94	0	26.17	2.2	2.71	5.98	16
2001	8	1	7.717	7.669	0.049	3.7	60.08	0	27.68	2.33	3.58	6.33	17
2001	354	1	7.714	7.669	0.045	3.8	60.9	0	27.32	2.3	3.24	6.25	18
2001	91	7	7.712	7.669	0.043	3.4	58.71	0	29.44	2.48	2.65	6.73	19
2001	314	7	7.71	7.669	0.042	3.7	60.92	0	28.07	2.36	2.23	6.42	20
2002	121	11	7.77	7.669	0.101	3.4	57.78	0	28.97	2.44	4.19	6.62	1
2002	185	1	7.747	7.669	0.078	4.1	62.5	0	25.99	2.19	3.39	5.94	2
2002	364	1	7.74	7.669	0.071	3.8	60.98	0	27.36	2.3	3.1	6.25	3
2002	260	11	7.74	7.669	0.071	4.2	62.84	0	25.5	2.14	3.68	5.83	4
2002	280	78	7.739	7.669	0.07	3.8	60.66	0	27.21	2.29	3.62	6.22	5
2002	155	13	7.735	7.669	0.066	4	62.13	0	26.48	2.23	3.1	6.05	6
2002	168	1	7.727	7.669	0.059	4	61.66	0	26.28	2.21	3.85	6.01	7
2002	165	2	7.727	7.669	0.058	4	61.9	0	26.38	2.22	3.48	6.03	8
2002	220	2	7.724	7.669	0.055	4.4	64.67	0	25.06	2.11	2.44	5.73	9
2002	219	7	7.721	7.669	0.052	4.4	64.48	0	24.98	2.1	2.74	5.71	10
2002	255	101	7.717	7.669	0.049	4.2	63.43	0	25.75	2.17	2.77	5.89	11
2002	273	7	7.714	7.669	0.046	4.2	63.89	0	25.93	2.18	2.06	5.93	12
2002	213	101	7.711	7.669	0.042	4.1	62.58	0	26.02	2.19	3.26	5.95	13
2002	202	6	7.71	7.669	0.041	4.1	62.43	0	25.96	2.18	3.49	5.93	14
2002	197	11	7.71	7.669	0.041	4.1	63.53	0	26.41	2.22	1.8	6.04	15
2002	154	1	7.709	7.669	0.041	4	62.11	0	26.47	2.23	3.14	6.05	16
2002	335	101	7.705	7.669	0.037	3.7	61.14	0	28.17	2.37	1.89	6.44	17
2002	113	11	7.706	7.669	0.037	3.4	59.22	0	29.69	2.5	1.8	6.79	18
2002	111	1	7.701	7.669	0.033	3.4	57.91	0	29.04	2.44	3.97	6.64	19
2002	19	56	7.701	7.669	0.033	3.7	59.96	0	27.63	2.32	3.77	6.32	20
2003	295	1	7.773	7.669	0.105	3.8	60.86	0	27.3	2.3	3.3	6.24	1
2003	199	11	7.753	7.669	0.084	4.1	62.49	0	25.98	2.19	3.4	5.94	2
2003	82	7	7.74	7.669	0.071	3.4	58.57	0	29.37	2.47	2.87	6.71	3
2003	44	1	7.738	7.669	0.069	3.4	58.82	0	29.49	2.48	2.47	6.74	4
2003	148	2	7.736	7.669	0.068	3.5	58.86	0	28.67	2.41	3.51	6.55	5
2003	221	7	7.732	7.669	0.064	4.4	64.8	0	25.11	2.11	2.24	5.74	6
2003	154	7	7.733	7.669	0.064	4	62.26	0	26.54	2.23	2.9	6.07	7
2003	151	1	7.733	7.669	0.064	3.5	59.45	0	28.96	2.44	2.55	6.62	8
2003	298	101	7.727	7.669	0.059	3.8	61.05	0	27.39	2.3	3	6.26	9
2003	19	7	7.725	7.669	0.057	3.7	61.35	0	28.27	2.38	1.55	6.46	10
2003	222	1	7.723	7.669	0.055	4.4	64.26	0	24.9	2.09	3.05	5.69	11
2003	210	1	7.724	7.669	0.055	4.1	62.5	0	25.99	2.19	3.38	5.94	12
2003	20	1	7.723	7.669	0.055	3.7	60.79	0	28.01	2.36	2.44	6.4	13
2003	272	12	7.718	7.669	0.049	4.2	63.27	0	25.68	2.16	3.01	5.87	14
2003	105	1	7.717	7.669	0.048	3.4	58.07	0	29.12	2.45	3.71	6.66	15
2003	78	101	7.716	7.669	0.048	3.4	58.36	0	29.26	2.46	3.22	6.69	16
2003	10	101	7.715	7.669	0.047	3.7	60.48	0	27.87	2.34	2.94	6.37	17
2003	123	1	7.713	7.669	0.044	3.5	58.66	0	28.57	2.4	3.84	6.53	18
2003	162	101	7.71	7.669	0.042	4	61.89	0	26.38	2.22	3.49	6.03	19
2003	104	10	7.707	7.669	0.039	3.4	59.11	0	29.64	2.49	1.98	6.78	20

Old IMPROVE Equation - Ranked Daily Visibility Change for Saint Marks (Top 25 Days Over 3 Years)

							% of Modeled Extinction by Species						
YEAR	DAY	REC	DV(Total)	DV(BKG)	DELTA DV	F(RH)	% SO4	% NO3	% OC	% EC	% PMC	% PMF	Ranking
2003	295	1	7.773	7.669	0.105	3.8	60.86	0	27.3	2.3	3.3	6.24	1
2001	139	32	7.772	7.669	0.104	3.5	59.11	0	28.79	2.42	3.1	6.58	2
2002	121	11	7.77	7.669	0.101	3.4	57.78	0	28.97	2.44	4.19	6.62	3
2003	199	11	7.753	7.669	0.084	4.1	62.49	0	25.98	2.19	3.4	5.94	4
2001	187	2	7.748	7.669	0.08	4.1	62.39	0	25.94	2.18	3.56	5.93	5
2001	313	7	7.748	7.669	0.079	3.7	60.29	0	27.78	2.34	3.25	6.35	6
2002	185	1	7.747	7.669	0.078	4.1	62.5	0	25.99	2.19	3.39	5.94	7
2001	221	56	7.745	7.669	0.076	4.4	64.13	0	24.85	2.09	3.25	5.68	8
2001	223	16	7.74	7.669	0.072	4.4	64.22	0	24.88	2.09	3.12	5.69	9
2002	364	1	7.74	7.669	0.071	3.8	60.98	0	27.36	2.3	3.1	6.25	10
2002	260	11	7.74	7.669	0.071	4.2	62.84	0	25.5	2.14	3.68	5.83	11
2003	82	7	7.74	7.669	0.071	3.4	58.57	0	29.37	2.47	2.87	6.71	12
2002	280	78	7.739	7.669	0.07	3.8	60.66	0	27.21	2.29	3.62	6.22	13
2003	44	1	7.738	7.669	0.069	3.4	58.82	0	29.49	2.48	2.47	6.74	14
2001	189	2	7.736	7.669	0.068	4.1	62.44	0	25.96	2.18	3.47	5.94	15
2003	148	2	7.736	7.669	0.068	3.5	58.86	0	28.67	2.41	3.51	6.55	16
2001	222	16	7.735	7.669	0.066	4.4	64.6	0	25.03	2.1	2.55	5.72	17
2002	155	13	7.735	7.669	0.066	4	62.13	0	26.48	2.23	3.1	6.05	18
2003	221	7	7.732	7.669	0.064	4.4	64.8	0	25.11	2.11	2.24	5.74	19
2003	154	7	7.733	7.669	0.064	4	62.26	0	26.54	2.23	2.9	6.07	20
2003	151	1	7.733	7.669	0.064	3.5	59.45	0	28.96	2.44	2.55	6.62	21
2001	336	1	7.729	7.669	0.061	3.8	60.31	0	27.06	2.28	4.18	6.18	22
2002	168	1	7.727	7.669	0.059	4	61.66	0	26.28	2.21	3.85	6.01	23
2003	298	101	7.727	7.669	0.059	3.8	61.05	0	27.39	2.3	3	6.26	24
2001	194	101	7.726	7.669	0.058	4.1	62.78	0	26.11	2.2	2.95	5.97	25