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December 30, 1998

Mr. Cleve Holladay
Meteorologist - Bureau of Air Regulation
Florida Department of Environmental Protection
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Via FedEx
Airbill No.: 809689308374

Re: Tampa Electric Company - Big Bend Station
Revised Ambient Sulfur Dioxide (SO_2) Modeling
Draft Title V Air Operation Permit
FDEP File No. 0570039-002-AV

Dear Mr. Holladay:

As requested by the Department, please find enclosed TEC's revised detailed SO_2 modeling analysis and aerial photograph describing the nearby receptors for the Big Bend Station. The enclosed analysis reveals that no modeled exceedances of the Florida or National Ambient Air Quality Standards are recorded for any of the selected emission scenarios when using additional maximum SO_2 emissions of 16.5 tons per hour for Units 1 and 2, combined; and 8.5 tons per hour for Unit 3. As previously submitted, the current allowable SO_2 emission rates will still apply.

In order to represent how TEC will maintain compliance with the SO_2 Ambient Air Quality Standards at Big Bend Station, TEC's proposed SO_2 Compliance Plan is also enclosed for your review.

Please feel free to telephone me at (813) 641-5034, if you have any questions.

Sincerely,

Theresa J.L. Watley
Consulting Engineer
Environmental Planning

EP\gm\TJLW

Enclosures

c/enc: Mr. Clair Fancy, FDEP-Tallahassee
Mr. Scott Sheplak, FDEP-Tallahassee
Mr. Jerry Kissel, FDEP-SW District
Mr. Cindy Phillips, FDEP-Tallahassee
Mr. Richard Kirby, EPCHC

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PROPOSED

TAMPA ELECTRIC COMPANY

BIG BEND STATION

SULFUR DIOXIDE

REGULATORY COMPLIANCE PLAN

December 1998

PROPOSED

BIG BEND STATION

SULFUR DIOXIDE

REGULATORY COMPLIANCE PLAN

INTRODUCTION

This compliance plan has been developed to represent Tampa Electric Company's (TEC's) proposal of how compliance with the Sulfur Dioxide (SO_2) Ambient Air Quality Standards (AAQS) at Big Bend Station will be demonstrated through the sole use of CEMs. Previously the compliance methodology was fuel sampling and analysis.

COMPLIANCE WITH EMISSION LIMITS FOR PROTECTION OF FLORIDA AMBIENT AIR QUALITY STANDARDS

The current allowable SO_2 emission rate for individual coal burning Units 1-3 at Big Bend Station is 6.5 pounds per million British Thermal Units (lb/MMBtu) on a two-hour average. The current allowable SO_2 emission rate for the Units 1, 2, and 3 in total, is 31.5 tons per hour (tph) on a three-hour average, and 25 tph on a 24-hour average. Allowable SO_2 emission rates over a 24-hour averaging time are limited by the ambient air impacts predicted with dispersion modeling.

Based on dispersion modeling conducted during the Big Bend Station Title V permitting process, it was determined that the current SO_2 emission rates could contribute to modeled violations of the 24-hour AAQS, without additional individual unit limitations.

To rectify this, TEC conducted updated dispersion modeling for Big Bend Station to evaluate the potential worst case conditions that will become applicable per Big Bend Station's Phase II Acid Rain Compliance plan. TEC determined that by limiting Unit 3 to a SO_2 cap of 8.5 tph (on a 24-hour block average), and by limiting Units 1 and 2, combined stack in total, to a SO_2 cap of 16.5 tph (on a 24-hour block average), the Station can demonstrate compliance with the air dispersion modeling.

As such, Tampa Electric Company is proposing the incorporation of an additional allowable SO_2 emission limitation for the combined stack Units 1 and 2 of 16.5 tph and for Unit 3 of 8.5 tph, both on a 24-hour block average. TEC would still maintain compliance with the current allowable SO_2 emission rates of 6.5 lb/MMBtu on a two-hour average for individual coal burning units; and 31.5 tph on a three-hour average, and 25 tph on a 24-hour average for Units 1, 2, and 3 in total.

When burning fuels in Unit 3 that are 6.5 lb SO_2 per MMBtu or greater, TEC intends to divert and integrate the Unit 3 flue gas for purposes of treating that flue gas in the existing Unit 4 flue gas desulfurization (FGD) system. Unit 3 will be operated in this integrated mode except during unit or FGD startups, shutdowns, maintenance and/or malfunctions, during all of which best operational practices shall be employed to including the cessation of bunkering fuels higher than 6.5 lb SO_2 per MMBtu.

CONTINUOUS EMISSION MONITORING NETWORK AND ALARMS

To demonstrate TEC's compliance with emission limits that are protective of AAQS, data inputs will consist of hourly CEM data from the SO_2, Flow, and CO2 monitors for Units 1-3 at Big Bend Station. TEC will use CEM data from Common Stack #1 to represent individual unit compliance with the emission limitations for each Unit 1 and Unit 2. When Unit 3 is operated in the integrated mode, TEC will use apportioned CEM data from both Common Stack #2 and #3 to represent individual unit compliance with the emission limitations for Unit 3.

In the event any monitor fails for 4 hours or less, hourly data from the failed monitor(s) will be discarded and excluded from the Station's daily or hourly averages.

In the event any monitor fails for more than 4 hours up through 24 hours, TEC will incorporate Method of Determination Code (MODC) 6 pursuant to 40 CFR 75, Subpart D - The Missing Data Substitution Procedure. In general, this procedure allows for use of average hourly data from the hours before and after the outage.

In the event any monitor fails for more than 24 hours, TEC will incorporate MODC 11 pursuant to 40 CFR 75, Subpart D - The Missing Data Substitution Procedure. In general, this procedure allows for use of average hourly data from corresponding load ranges within the reporting quarter.

COMPLIANCE PLAN VERIFICATION

The CEMs at Big Bend Station are subject to the quality assurance requirements of 40 CFR 70. Therefore, an examination of weekly and/or daily CEMs data will allow a straightforward evaluation of compliance with allowable SO_2 emission rates.

COMPLIANCE REPORTING

1. **Frequency** - Reporting of compliance status shall be performed on a quarterly calendar basis. Reports will be due no later than 45 days following the last day of the reporting quarter.

2. **Content** - Quarterly reports will consist of:

   - two-hour average SO_2 emissions rate for each Units 1, 2, and 3 in lb/MMBtu;
   - three-hour average SO_2 emissions for Units 1-3 in tons per hour;
   - 24-hour average SO_2 emissions for Units 1-3 in tons per hour; and
   - 24-hour average SO_2 emissions for Units 1-2 and Unit 3 in tons per hour.

BIG BEND STATION

TITLE V SO_2
AIR DISPERSION MODELING

December 1998

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1.0 DISPERSION MODELING TECHNIQUES, INPUTS, AND RESULTS

1.1 MODEL SELECTION

The most recent regulatory version of the Industrial Source Complex Short-Term (ISCST3 Version 97363) dispersion model was used in the analyses of ambient SO_2 impacts caused by emissions from Big Bend Station. ISCST3 is a refined model appropriate for use under the following conditions:

- Industrial source complexes (i.e., multiple emission sources).
- Rural or urban areas.
- Flat or rolling terrain.
- Pollutant transport distances less than 50 kilometers (km).
- Multiple averaging periods (i.e., 3-hour, 24-hour, and annual).

ISCST3 was selected because:

- The Big Bend Station analysis falls within the ISCST3 applicability criteria.
- Per Chapter 40, Code of Federal Regulation (CFR), Part 51, Appendix W, the U.S. Environmental Protection Agency (EPA) has designated ISCST3 a preferred model. This designation means that EPA has determined that ISCST3 performs better under the criteria stated above than any other dispersion model.
- The Florida Department of Environmental Protection (FDEP) is also using ISCST3 to model ambient SO_2 levels from Big Bend Station.

Previous dispersion modeling of Big Bend Station has been conducted using other models. For example, SO_2 emissions from Big Bend Station were modeled in 1991 to demonstrate compliance for the flue gas desulfurization (FGD) integration using an earlier version of ISCST. Several versions of the SCREEN model have also been applied to Big Bend Station emissions. However, these older models were not used for this SO_2 ambient impact analysis because EPA and FDEP do not recognize superseded models as valid analytical tools.

1.2 SO_2 EMISSION RATES

The SO_2 emission rates used in the modeling analysis for Big Bend Station are presented in Table 1-1. Because the modeling analysis must evaluate the potential worst-case conditions, these emission rates are based on the maximum permitted rate for the appropriate time period, as noted in the table.

1.3 STACK PARAMETERS

The stack parameters used in the modeling analysis for Big Bend Station are presented in Table 1-2. The stack heights, diameters, and exit temperatures of the boilers were obtained from the appropriate Title V Air Operation Permit application. Stack exit velocities for the boilers were calculated from continuous emissions monitoring system (CEMS) volumetric flow measurements taken in 1995, as summarized in Table 1-3. CEMS volumetric flow data from 1995 was used because 1995 was the last full year of non-integrated operation for Units 3 and 4. The non-integrated operating mode represents the highest potential for ambient impact.

All of the combustion turbine stack parameters were obtained from Big Bend Station.

1.4 GOOD ENGINEERING PRACTICE/DOWNWASH CONSIDERATIONS

The 1977 Clean Air Act Amendments require that the degree of emission limitation required for control of any pollutant not be affected by a stack height that exceeds good engineering practice (GEP) or any other dispersion technique. On July 8, 1985, EPA promulgated final stack height regulations (40 CFR 51), in which GEP stack height is defined as the higher of 65 meters, or a height established by applying the formula:

$$Hg = H + 1.5\ L$$

where: Hg = GEP stack height.
H = height of the structure or nearby structure.
L = lesser dimension (height or projected width)of the nearby structure.

Table 1-1. Big Bend Station SO_2 Emission Rates for ISCST3 Dispersion Modeling

Emissions Unit	SO_2 Emission Rate					
	3-hr		24-hr		Annual	
	(lb/hr)	(g/sec)	(lb/hr)	(g/sec)	(lb/hr)	(g/sec)
Boiler 1*	21,000	2,646	16,468	2,075	16,468	2,075
Boiler 2*	21,000	2,646	16,468	2,075	16,468	2,075
Boiler 3*	21,000	2,646	17,064	2,150	17,064	2,150
Boiler 4	3,551	447.4	3,551	447.4	3,551	447.4
Combustion Turbine 1	87.3	11.0	87.3	11.0	87.3	11.0
Combustion Turbine 2	479.8	60.5	479.8	60.5	479.8	60.5
Combustion Turbine 3	479.8	60.5	479.8	60.5	479.8	60.5

*Three hour average emission based on cap of 31.5 tons per hour (tph) for Units 1, 2, and 3 combined, divided equally among the 3 units.

Twenty-four hour and annual average emission based on cap of 25 tph for Units 1, 2, and 3 combined.

Table 1-2. Big Bend Station Stack Parameters for ISCST3 Dispersion Modeling

Emissions Unit	Stack Height**		Stack Gas Temperature		Stack Gas Velocity		Stack Diameter	
	(ft)	(m)	(°F)	(K)	(ft/min)	(m/sec)	(ft)	(m)
Boiler 1*	490	149.4	294	419	6,955	35.34	24	7.3
Boiler 2*	490	149.4	294	419	6,955	35.34	24	7.3
Boiler 3	490	149.4	308	426	3,072	15.61	24	7.3
Boiler 4	490	149.4	127	326	4,698	23.87	24	7.3
Combustion Turbine 1	35	10.7	1011	817	5,510	28.00	11	3.4
Combustion Turbine 2	75	22.9	928	771	6,967	35.40	17	5.1
Combustion Turbine 3	75	22.9	928	771	6,967	35.40	17	5.1

*Units 1 and 2 share one stack. Stack data represents both units at maximum capacity.

**Height above grade.

Table 1-3. Stack Data: Big Bend Station Stack Velocity Determination

Stack	Exit Diameter		Exit Area		Standard (68 °F) Flow Rate		Stack Gas Temperature		Actual Flow Rate		Exit Velocity	
	(ft)	(m)	(ft^2)	(m^2)	(scf/hr)*	(scm/hr)	(°F)	(K)	(acf/min)	(acm/min)	(fps)	(m/s)
BB1/2	24.00	7.32	452.39	42.03	132,232,968	3,744,421	294.00	418.71	3,147,211	89,119	115.95	35.34
BB3	24.00	7.32	452.39	42.03	57,331,200	1,623,439	308.00	426.48	1,389,847	39,356	51.20	15.61
BB4	24.00	7.32	452.39	42.03	114,732,000	3,248,849	127.00	325.93	2,125,874	60,198	78.32	23.87

*Flow measurements obtained from maximum continuous monitoring system measurements, per FDEP suggestion.

Nearby is defined as a distance up to five times the lesser of the height or width dimension of a structure or terrain feature, but not greater than 800 meters. While GEP stack height regulations require that a stack height used in modeling for determining compliance with ambient air quality standards (AAQS) and prevention of significant deterioration (PSD) increments not exceed the GEP stack height, the actual stack height may be greater.

The EPA guidelines for application of the stack height regulations were followed in determining the GEP stack height for each stack.

The complex downwash analysis was performed using the Building Profile Input program (BPIP, version 95086) to determine the appropriate downwash parameters for ISCST3. The Big Bend Station structure locations and heights are provided in Table 1-4 and are presented in Figure 1-1. Stack locations and heights are also provided in the table and figure.

1.5 RECEPTOR LOCATIONS

Receptors were placed at locations considered to be ambient air, which is defined at 40 CFR 50.1(e) as that portion of the atmosphere, external to buildings, to which the general public has access. Those portions of Big Bend Station with restricted access were not considered ambient air.

Receptor locations were selected consistent with the definition of ambient air. Discrete receptors were placed on the restricted area boundaries at both stations. At Big Bend Station, additional discrete receptors were placed at 10 degree (°) increments, beginning at 10° on rings at 1,000, 1,250, 1,500, and 1,750 meters if the specific point was an ambient air location. Complete rings with receptors located at 10° increments, beginning at 10°, were located at 250 meter increments from 2,000 to 7,000 meters, and at 8,000, 9,000, 10,000, 12,000, 15,000, and 20,000 meters. This receptor grid was selected to be consistent with the grid used in the FDEP dispersion modeling.

Table 1-4. Big Bend Station - Stack and Structure Heights and Locations (Page 1 of 2)

Stack/Structure Name	Height (ft)	Stack /Structure Location* East/West (ft)	Stack /Structure Location* North/South (ft)	Stack/ Structure Name	Height (ft)	Stack /Structure Location* East/West (ft)	Stack /Structure Location* North/South (ft)
Unit 1/2 Stack	490	335	-4	Loft Structure	168	-15	298
Unit 3 Stack	490	0	0			-49	298
Unit 4 Stack	490	0	-83			-49	284
CT 1 Stack	35	-448	564			-88	284
CT 2 Stack	75	-695	1,814			-88	298
CT 3 Stack	75	-613	1,814			-197	298
Boiler 4 Structure	265	71	155			-197	284
		-38	155			-236	284
		-38	298			-236	298
		-15	298			-345	298
		-15	332			-345	284
		229	332			-384	284
		229	290			-384	298
		214	290			-444	298
		214	277			-444	292
		195	277			-473	292
		195	176			-473	338
		206	176			-444	338
		206	144			-444	332
		71	144			-384	332
Steam Turbine Structure	110	229	332			-384	349
		-49	332			-345	349
		-49	249			-345	332
		-88	349			-236	332
		-88	332			-236	349
		-197	332			-197	349
		-197	349			-197	332
		-236	349			-88	332
		-236	332			-88	349
		-345	332			-49	349
		-345	349			-49	332
		-384	349			-15	332
		-384	332				
		-444	332				
		-444	338				
		-473	338				
		-473	495				
		-434	495				
		-434	480				
		229	480				

*Locations are relative to the Unit 3 stack. Positive directions are east and north. Negative directions are west and south.

Table 1-4. Big Bend Station - Stack and Structure Heights and Locations (Page 2 of 2)

Stack or Structure Name	Height (ft)	Stack /Structure Location* East/West (ft)	Stack /Structure Location* North/South (ft)	Stack or Structure Name	Height (ft)	Stack /Structure Location* East/West (ft)	Stack /Structure Location* North/South (ft)
Boilers 1, 2, and 3 Structure	192	-38	105				
		-61	105				
		-61	96				
		-76	96				
		-76	105				
		-91	105				
		-91	113				
		-153	113				
		-153	122				
		-179	122				
		-179	167				
		-217	167				
		-217	122				
		-285	122				
		-285	184				
		-317	184				
		-317	143				
		-343	143				
		-343	139				
		-418	139				
		-418	214				
		-473	214				
		-473	292				
		-444	292				
		-444	298				
		-384	298				
		-384	284				
		-345	284				
		-345	298				
		-236	298				
		-236	284				
		-197	284				
		-197	298				
		-88	298				
		-88	284				
		-49	284				
		-49	298				
		-38	298				

*Locations are relative to the Unit 3 stack. Positive directions are east and north. Negative directions are west and south.

98010/gt

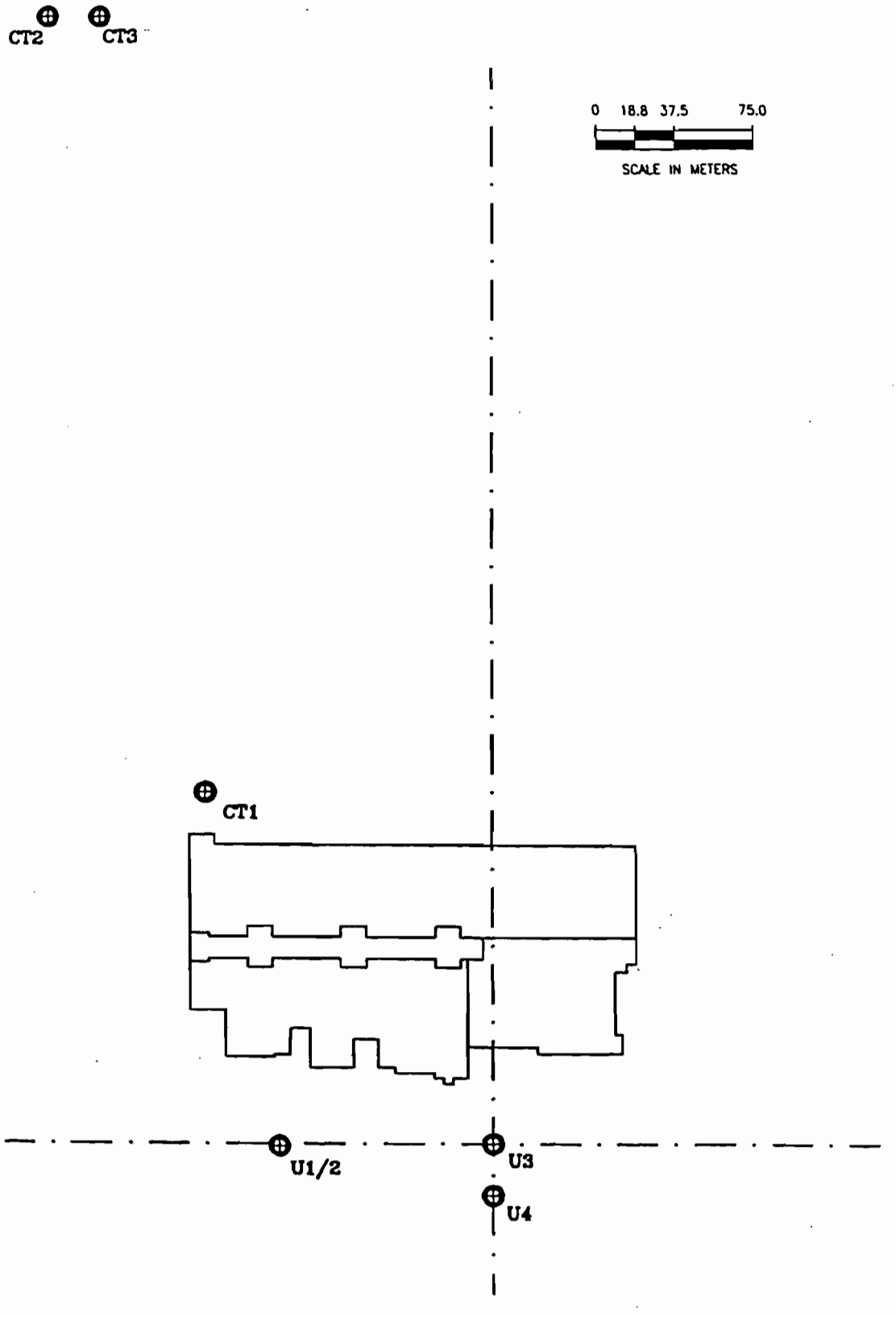

FIGURE 1-1.

BIG BEND STATION STRUCTURE LOCATIONS FOR DOWNWASH ANALYSIS

Source: ECT, 1998.

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1.6 METEOROLOGICAL DATA

EPA dispersion modeling guidance recommends that modeling be conducted using one year of onsite meteorological, if available. Otherwise, the guidance recommends that modeling be conducted using the most recently available five years of meteorological data collected at a nearby observation station. Following this guidance, the selected meteorological data set included St. Petersburg/Clearwater International Airport (SPG) surface observations and mixing heights derived from SPG surface data and Ruskin (RUS) upper air observations. These data were obtained from the National Climatic Data Center (NCDC) for January 1, 1992, through December 31, 1996. Completeness information for the data as received from NCDC is presented in Table 1-5. Missing data were replaced following EPA guidance. The data were then prepared for use in ISCST3 using the RAMMET preprocessor.

Two other surface weather observation stations were evaluated for possible use in ISCST but were subsequently rejected. Surface data from Tampa International Airport (TPA) are available through 1994. In 1995, the TPA observation station was automated and sky cover observations were terminated. Because sky cover is a required element for ISCST3, the post-1994 TPA data unsuitable for use. Surface data from McDill Air Force Base is available through 1992. After 1992, surface observations become more sporadic and no longer meet EPA criteria for data recovery. Because SPG appropriate data are available through 1996, SPG surface data were selected for use over TPA and MAC surface data, consistent with EPA guidance.

1.7 DISPERSION MODELING RESULTS

The Big Bend Station dispersion modeling results are presented in Table 1-6. During the period January 1, 1992 through December 31, 1996, no modeled exceedances of the national or Florida AAQS were recorded. The dispersion model input and output files are provided in electronic format on the enclosed floppy disk. The St. Petersburg/Ruskin

Table 1-5. St. Petersburg/Ruskin, Florida (Station Nos. 72211/12842)—Data Recovery, January 1, 1992, through December 31, 1996

Year	Data Element									
	Dry-Bulb Temperature		Wind Direction		Wind Speed		Ceiling Height/Sky Cover		Mixing Height	
	Number of Observations	Recovery (pct)	Number of Observations	Recovery (pct)	Number of Observations	Recovery (pct)	Number of Observations	Recovery (pct)	Number of Observations	Recovery (pct)
1992	8,489	96.6	8,522	97.0	8,522	97.0	8,543	97.3	728	99.5
1993	8,407	96.0	8,430	96.2	8,430	96.2	8,433	96.3	721	98.8
1994	8,304	94.8	8,356	95.4	8,356	95.4	8,359	95.4	714	97.8
1995	8,103	92.5	8,161	93.2	8,161	93.2	8,174	93.3	712	97.5
1996	8,365	95.2	8,375	95.3	8,412	95.8	8,385	95.5	714	97.5

Table 1-6. Big Bend Station SO_2 Dispersion Modeling Results

Averaging Period	Modeled Ambient Impact ($\mu g/m^3$)					Ambient Air Quality Standard ($\mu g/m^3$)	
	1992	1993	1994	1995	1996	National	Florida
Annual	13.2	15.3	13.7	11.3	13.2	80	60
Highest 24-Hr	274.0	258.0	298.3	205.0	382.6	None	None
Highest 2nd-Highest 24-Hr	223.8	194.7	224.9	204.7	245.6	365	260
Highest 3-Hr	914.7	772.6	807.4	805.1	1,007.8	None	None
Highest 2nd-Highest 3-Hr	662.8	715.8	654.0	740.4	807.6	1,300	1,300

post-RAMMET meteorological data files are provided in electronic format on a second floppy disk.