PRELIMINARY AIR QUALITY IMPACT EVALUATION OF FLORIDA POWER AND LIGHT GAS TURBINES IN PALATKA, FLORIDA

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1.0 - SUMMARY

The proposed new gas turbines for Florida Power and Light Company, to be located near Palatka, Florida, will produce electricity by burning low sulfur fuel oil and will meet the Federal and State emission standards. The preliminary impact evaluation indicates that the new gas turbines will not cause the Federal or State sulfur dioxide air quality standards to be exceeded.

CHAPTER 2.0 - INTRODUCTION

Florida Power and Light Company presently has two fossil fuel steam generating units approximately three miles southeast of Palatka in Putnam County (see Figure 1) and is planning to add new gas turbines near the existing plant.

Environmental Science and Engineering, Inc. (ESE) conducted a preliminary study to determine the probable impact that the new gas turbines may have on the sulfur dioxide levels in the Palatka area. Computerized atmospheric dispersion models were used to estimate the long-term and short-term ground-level sulfur dioxide concentrations for both the existing plant operation and the proposed turbines. Other significant sources were also considered.

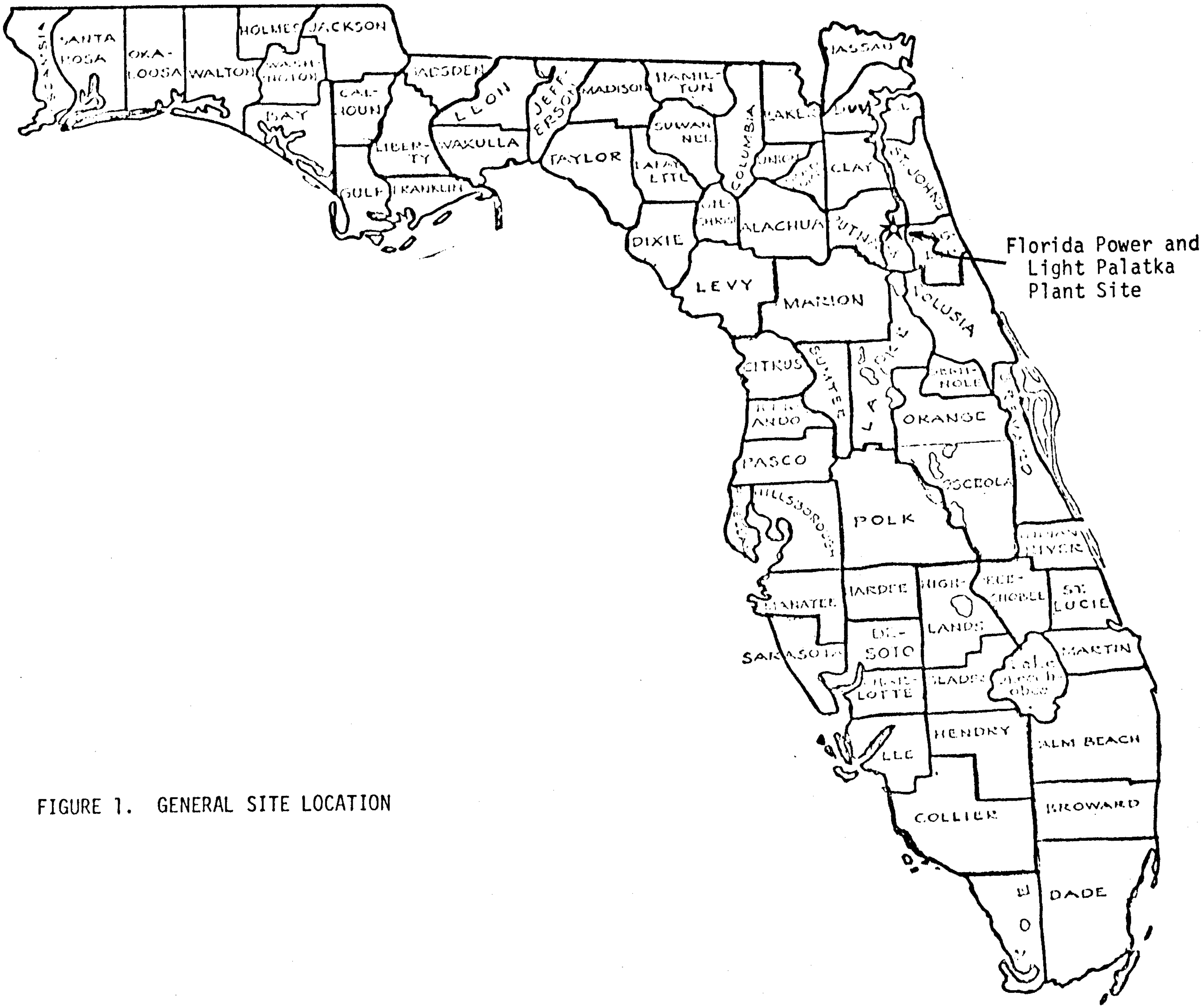

FIGURE 1. GENERAL SITE LOCATION

CHAPTER 3.0 - METHODOLOGY

The role of meteorology in air pollution has received much attention due to its influence on pollutant dispersion. With a constant rate of pollutant emission into the atmosphere from the proposed new gas turbines, together will all other air pollution sources, ground-level pollutant concentrations may be a thousand-fold greater under the most adverse meteorological conditions than under the most favorable ones. Mathematical modeling serves to provide insight into the relation between meteorological elements and air pollutant dispersion, thus enabling predictions concerning the impact on air quality, and the derivation of control strategies necessary to insure that the air quality standards are not exceeded.

The first to explore mathematical urban air pollution models was Dr. Francois N. Frenkiel when he developed a model for the city of Los Angeles. Others were soon to follow in his path. Turner developed the Nashville model, Clarke a Cincinnati model, and Miller and Holzworth a model for New York. Simultaneously, work on air pollution models progressed at a number of universities including Koogler's Jacksonville model at the University of Florida. The above models were designed to provide daily or hourly (short-term) values of concentrations at selected points over a city. Pooler and Meade and Pasquill led the way in developing models to provide monthly or seasonal (long-term) estimates of pollutant concentrations.

The Air Quality Display Model (AQDM) was developed within NAPCA for the computation of seasonal and annual pollutant concentration estimates. It is to be considered as a provisional dispersion model for estimating air quality until continuing research indicates an improved model is available. The AQDM is a computer program designed to estimate the ground-level spatial distribution of gaseous and particulate pollutant concentrations. Through a mathematical simulation of the atmospheric dispersion process, the program determines the arithmetic average pollutant concentrations at ground level over an annual period. A statistical model that transforms the predicted average annual concentration values from a limited number of receptor points into expected geometric mean and maximum concentrations for different averaging times is used to provide a direct comparison with air quality criteria and standards.

Short-term models presently available from the EPA's User's Network for Applied Modeling of Air Pollution (UNAMAP) were used to further investigate the maximum 3-hour and 24-hour concentrations. One such model, the PTMAX program, determines for each wind speed and stability the final plume rise using methods suggested by Briggs. This plume rise is added to the physical stack height to determine the effective height of emission. The effective height is used to determine both the maximum concentration and the distance to maximum concentration.

The following assumptions are made: a steady-state Gaussian plume model is applicable to determine ground level concentrations. Computations can be performed according to the "Workbook of Atmospheric Dispersion Estimates." The dispersion parameter values used for the horizontal dispersion coefficient, sigma y, and the vertical dispersion coefficient, sigma z, are those given in Figures 3-2 and 3-3 of the Workbook. The stated wind speed occurs at the stack top for dilution of the plume and through the layer that the plume rise occurs. That stated stability occurs from ground level to well above the top of the plume. If there is a limit to vertical mixing, it occurs far enogh above the top of the plume so that it has no influence upon the maximum concentration. There are no topographic obstructions in the vicinity of the source. The source exists in either flat or gently rolling terrain.

Use of the PTMAX program is applicable where single sources exist in relatively uniform terrain. It is not applicable if aerodynamic downwash around buildings in the vicinity of the source affects the plume emitted from the stack. The calculated concentrations are for a single source considered. Where multiple stacks exist for a given single plant, this program can be applied to each individual stack. This program is useful in determining what combinations of wind speed and stability produce maximum concentrations. For a given stability the critical wind velocity, that is, the wind speed that causes the maximum concentrations, can be determined.

The second EPA short-term model used was the PTMTP. The following major assumptions are made in this model: Meteorological conditions are steady-state for each hour and a Gaussian plume model is applicable to determine ground-level concentrations. Computations can be performed according to the "Workbook of Atmospheric Dispersion Estimates." The dispersion parameter values used for the horizontal dispersion coefficient, sigma y, and the vertical dispersion coefficient, sigma z, are those given in Figures 3-2 and 3-3 of the Workbook. The sources and receptors exist in either flat or gently rolling terrain, and the stacks are tall enough to be free from building turbulence so that no aerodynamic downwash occurs. The wind speed and wind direction apply from the shortest to the tallest plume height. No wind direction shear or wind speed shear occurs. The given stability exists from ground-level to well above the top of the plume.

Calculations for each hour are made in the PTMTP by considering each source-receptor pair. Plume rise is calculated according to Brigg's plume rise estimates. For each source-receptor pair, the downwind and cross-wind distances are determined. If the downwind distance is closer than the distance to final plume rise, the plume rise for this distance is calculated. The concentration from this source upon this receptor is determined using these distances by the Gaussian model.

CHAPTER 4.0 - EXISTING AIR QUALITY

The Air Quality Display Model (AQDM) and the short-term models should be calibrated with observed ambient sampling data and on-site meteorological data to determine the reliability of the calculated concentration. Sulfur dioxide sampling data were not available for this study, and the meteorological data taken in Palatka were not sufficient to use in the dispersion calculations. ESE experience using the AQDM indicates that the model over estimates the concentrations and, therefore, a calibration factor that was derived for Duval County in 1972 was assumed to be representative of the Palatka area. ESE's experience with the EPA short-term models tends to indicate that those models also over estimate the concentration; however, to be conservative, no calibration factor was assumed.

The existing sulfur dioxide levels near the study area are dominated by only two major sources -- Hudson Pulp and Paper Corporation and Florida Power and Light Company. The emission inventory used to estimate the existing air quality is summarized in Table 1.

Meteorological data for the Palatka area were not available; therefore, data gathered at the Jacksonville International Airport by the U.S. Weather Bureau were assumed to be representative of the Palatka area. A summary of the meteorological data is given in Figure 2 and Table 2. Concentrations calculated from this meteorological data will probably not exactly represent the spacial distribution but should indicate the maximum ground-level concentrations.

TABLE 1. 1972 EMISSION INVENTORY USED IN ESTIMATING EXISTING SULFUR DIOXIDE LEVELS.

Source	1972 Average Sulfur Dioxide Emissions (tons/day)
Hudson Pulp and Paper	
Bark Boiler	12.7
Power Boiler	5.1
Florida Power and Light	
Units 1 and 2 Combined	13.7

Stability Class	Relative Frequency of Occurrence
A	0.010959
B	0.064041
C	0.126027
D	0.404110
E	0.394863

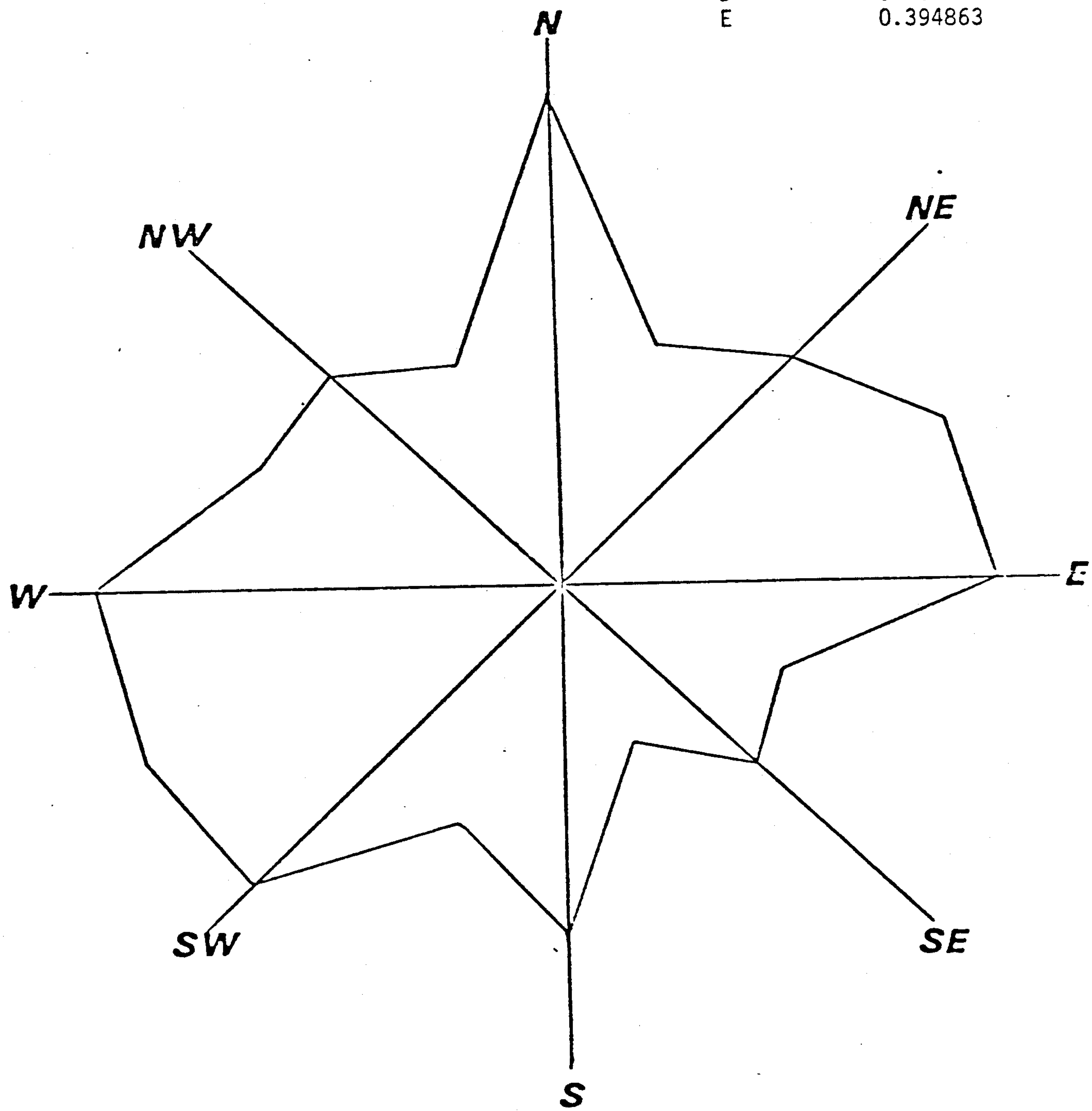

FIGURE 2. ANNUAL WIND ROSE, JACKSONVILLE, FLORIDA, 1972.

TABLE 2. RELATIVE FREQUENCY OF OCCURRENCE OF WIND DIRECTION AND STABILITY CLASS, 1972 JACKSONVILLE INTERNATIONAL AIRPORT.

RELATIVE WIND FREQUENCY DISTRIBUTION

DIRECTION	STABILITY CLASS "A"	"B"	"C"	"D"	"E"	ALL CLASSES
N	0.000913	0.007401	0.006672	0.037323	0.037625	0.091084
NNE	0.000000	0.002520	0.006217	0.026539	0.012774	0.048523
NE	0.000000	0.002832	0.007132	0.038697	0.012431	0.061172
ENE	0.001370	0.002520	0.011354	0.037875	0.023223	0.076320
E	0.000913	0.002923	0.013582	0.037566	0.023672	0.078794
ESE	0.000457	0.003266	0.006390	0.016471	0.015749	0.042525
SE	0.000457	0.001774	0.005363	0.017807	0.024486	0.049319
SSE	0.000457	0.001835	0.003421	0.013183	0.012774	0.032085
S	0.000457	0.004789	0.005419	0.024175	0.030955	0.066059
SSW	0.000457	0.002550	0.004678	0.014142	0.026575	0.047906
SW	0.000000	0.006532	0.007986	0.027326	0.037389	0.078919
WSW	0.000913	0.005443	0.013924	0.029176	0.032774	0.081679
W	0.001826	0.005786	0.015234	0.027875	0.033481	0.083690
WNW	0.000913	0.004820	0.006503	0.020717	0.025064	0.058280
NW	0.000457	0.006128	0.006447	0.020753	0.023919	0.057384
NNW	0.001370	0.002923	0.005705	0.014485	0.021971	0.046260
TOTAL	0.010959	0.064041	0.126027	0.404110	0.394863	

Figure 3 shows the estimated annual sulfur dioxide concentrations near the existing power plant. As shown, the existing levels should be well below the annual standard of 60 $\mu g/m^3$. The levels near the Florida Power and Light plant are dominated by the power plants, but the levels in the Palatka area are dominated by the pulp mill.

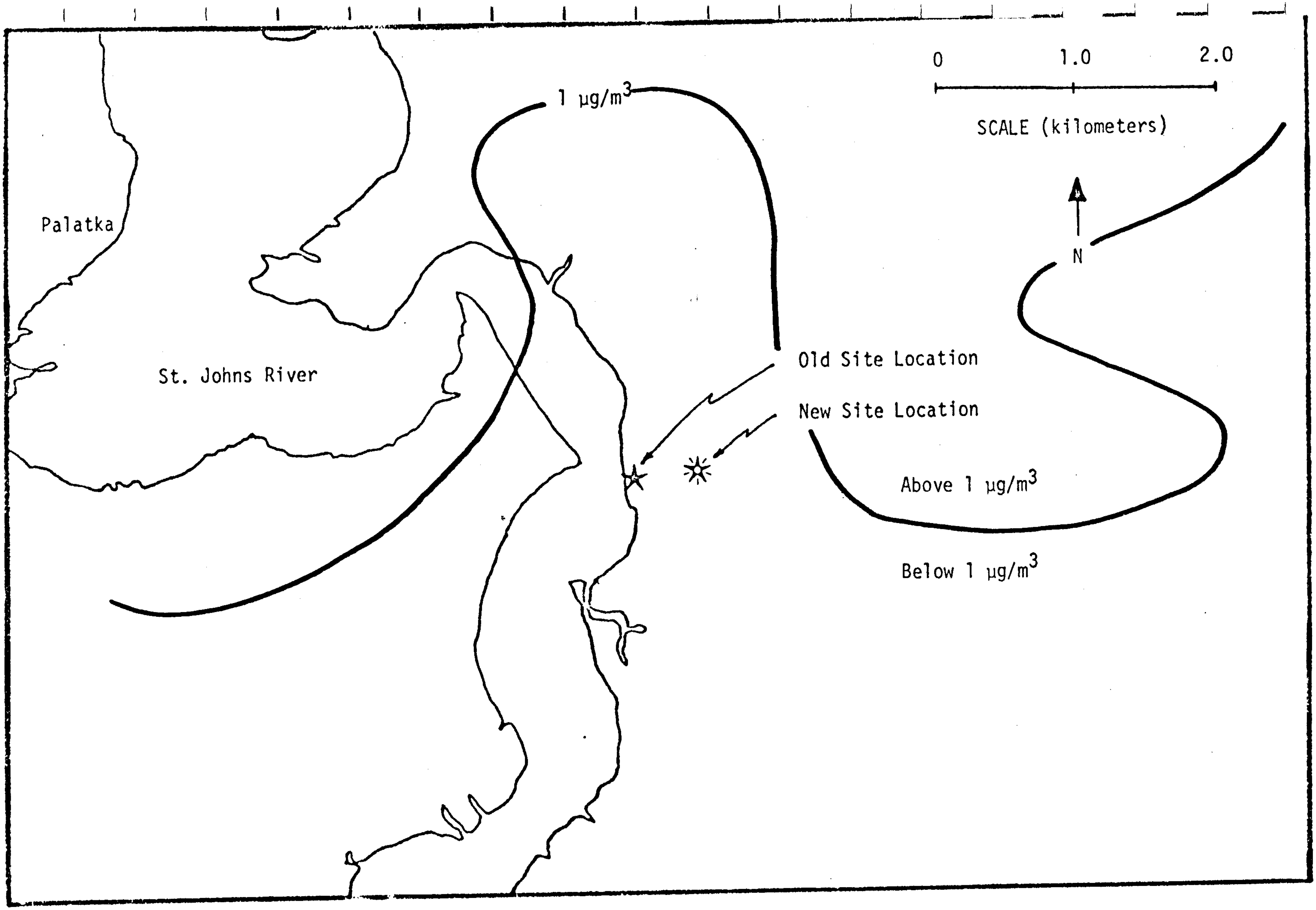

FIGURE 3. ESTIMATED EXISTING ANNUAL AVERAGE SULFUR DIOXIDE CONCENTRATIONS, ($\mu g/m^3$).

CHAPTER 5.0 - IMPACT EVALUATION

The impact to the sulfur dioxide levels was estimated by using the AQDM and the short-term models. It was assumed that all existing sources in the area would meet the Florida State emission standards (Chapter 17-2 allowable emissions) and that they would be operating approximately as they were in 1972.

Table 3 lists the emission inventory assumed in the impact evaluation. As shown, the new gas turbines are expected to exhaust the largest amount of sulfur dioxide. The emission inventory assumes that the new turbines will average a 60 percent load. The appendix lists the stack parameters and the AQDM output for all sources at allowable emissions.

Figure 4 shows the estimated annual average sulfur dioxide levels considering only the existing sources and assumes that they meet the State emission standards. The highest annual average is estimated to be approximately 0.8 $\mu g/m^3$. Figure 5 shows the estimated incremental annual average sulfur dioxide levels of the new gas turbines and indicates that the new turbines will contribute a maximum of approximately 0.5 $\mu g/m^3$. Figure 6 shows the sulfur dioxide levels when considering all the sources and indicates that the maximum annual average will be approximately 1.3 $\mu g/m^3$. With or without the new turbines, the annual average concentrations will be well below the air quality standard of 60 $\mu g/m^3$.

Table 4 summarizes the results of the Air Quality Display Model and lists the expected short-term concentrations as estimated using the Larsen statistical model. As shown, the maximum sulfur dioxide levels are expected to be well below any Florida standard.

The EPA short-term models were used to estimate the maximum 24-hour and 3-hour concentrations resulting from the new gas turbines. The meteorological conditions assumed are expected to yield a "worst day" situation and were based upon ESE's experience with the short-term model in Jacksonville, Florida. Table 5 summarizes the results of the short-term model and compares it to the long-term model. The new gas turbines are not expected to cause the State standards to be exceeded.

The short-duration downwash situation causing fumigation may occur but was not considered in this study.

TABLE 3. EMISSION INVENTORY USED IN ESTIMATING SULFUR DIOXIDE LEVELS (TONS/DAY).

Control Strategy	Hudson Pulp & Paper		FP&L Palatka Units 1 + 2	FP&L Total Gas Turbines
	Bark Boiler	Power Boiler		
1972 Operation	12.7	5.1	13.7	----
17-2 Allowable Emissions. FP&L and Hudson using same amount of fuel as in 1972.	4.3	1.7	9.0	17.4

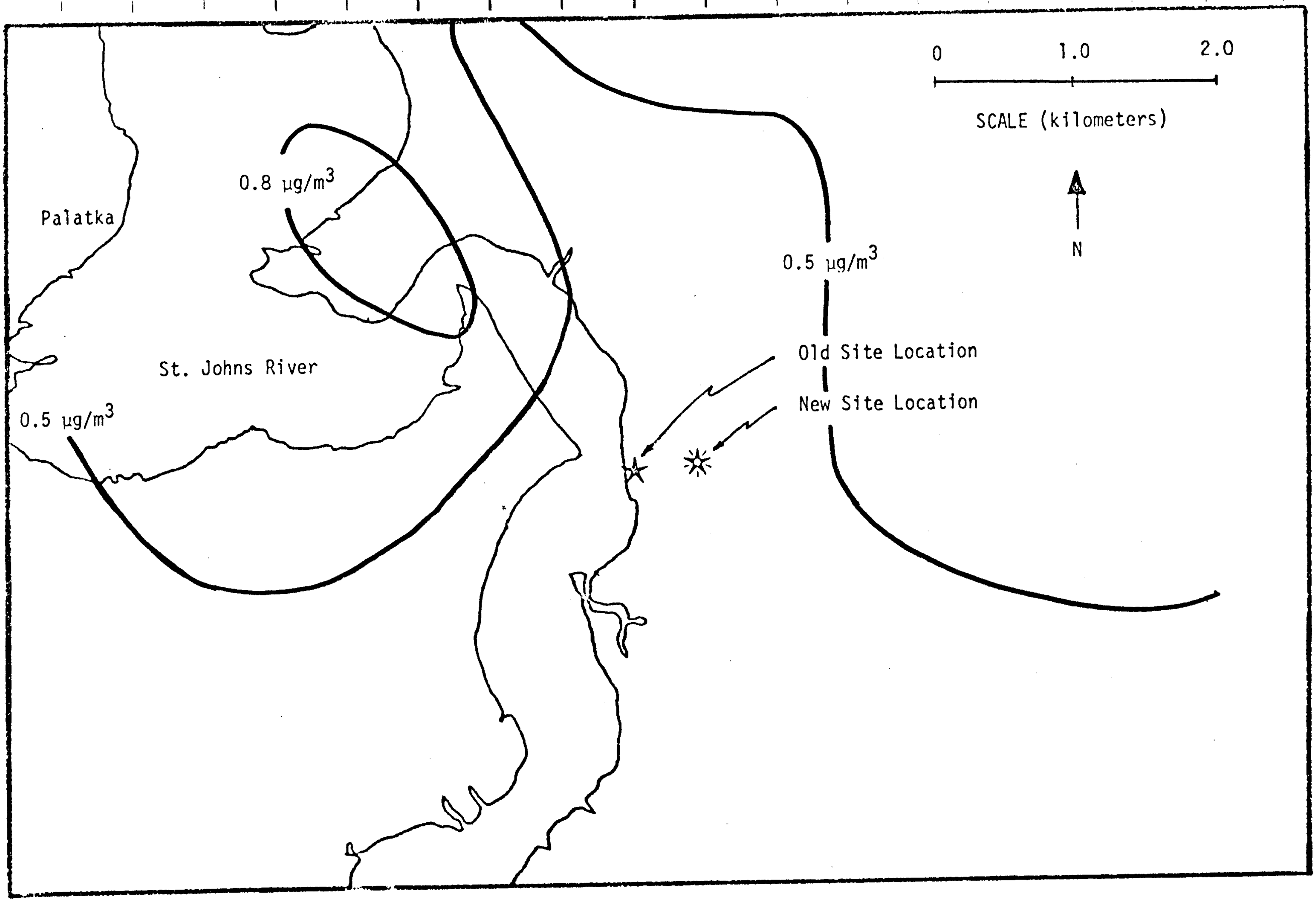

FIGURE 4. ANNUAL AVERAGE SO_2 CONCENTRATIONS ($\mu g/m^3$). EXISTING PLANTS AT 17-2 ALLOWABLE EMISSIONS.

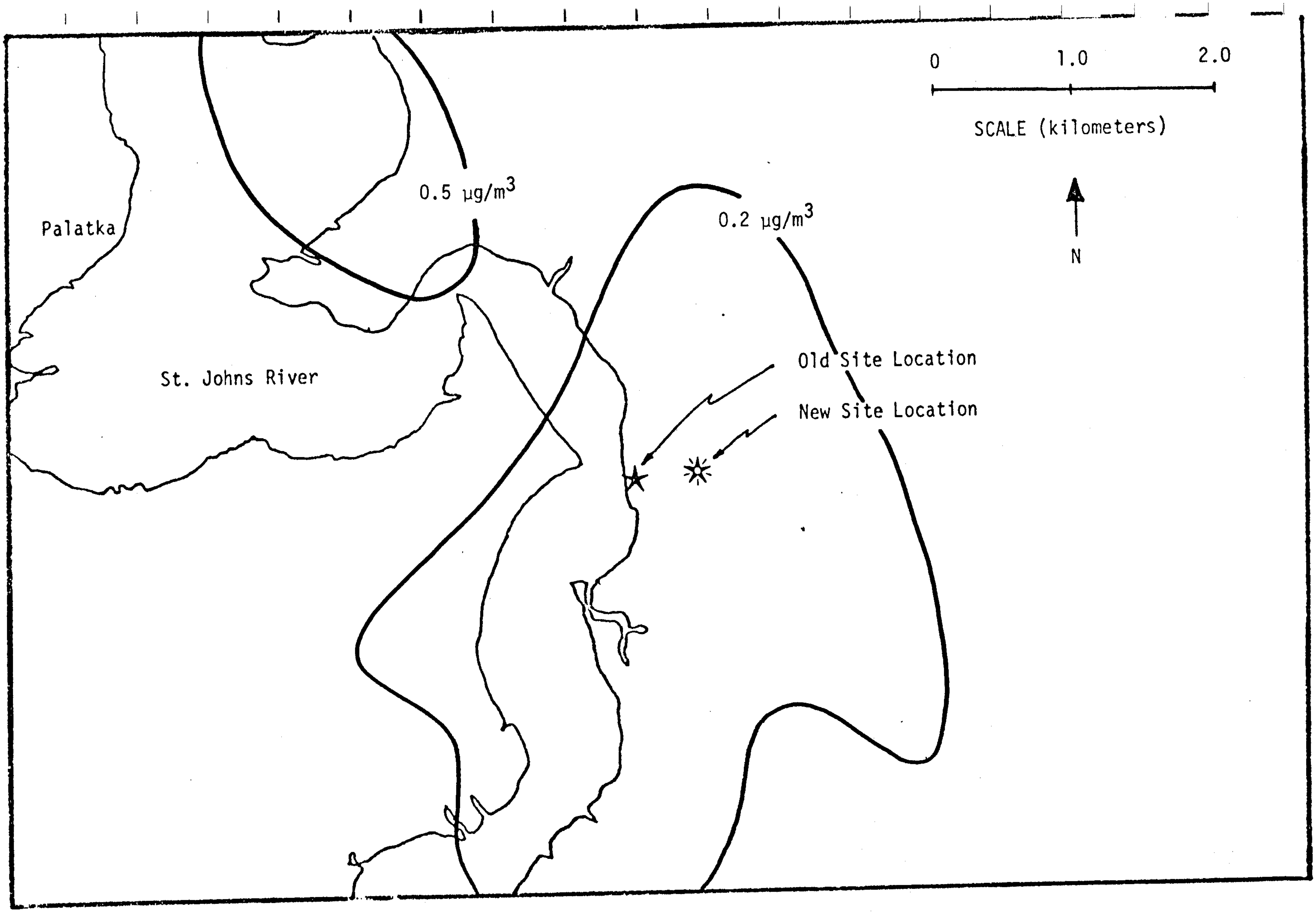

FIGURE 5. ANNUAL AVERAGE INCREMENTAL SO_2 CONCENTRATIONS ($\mu g/m^3$) OF NEW TURBINES (60% LOAD).

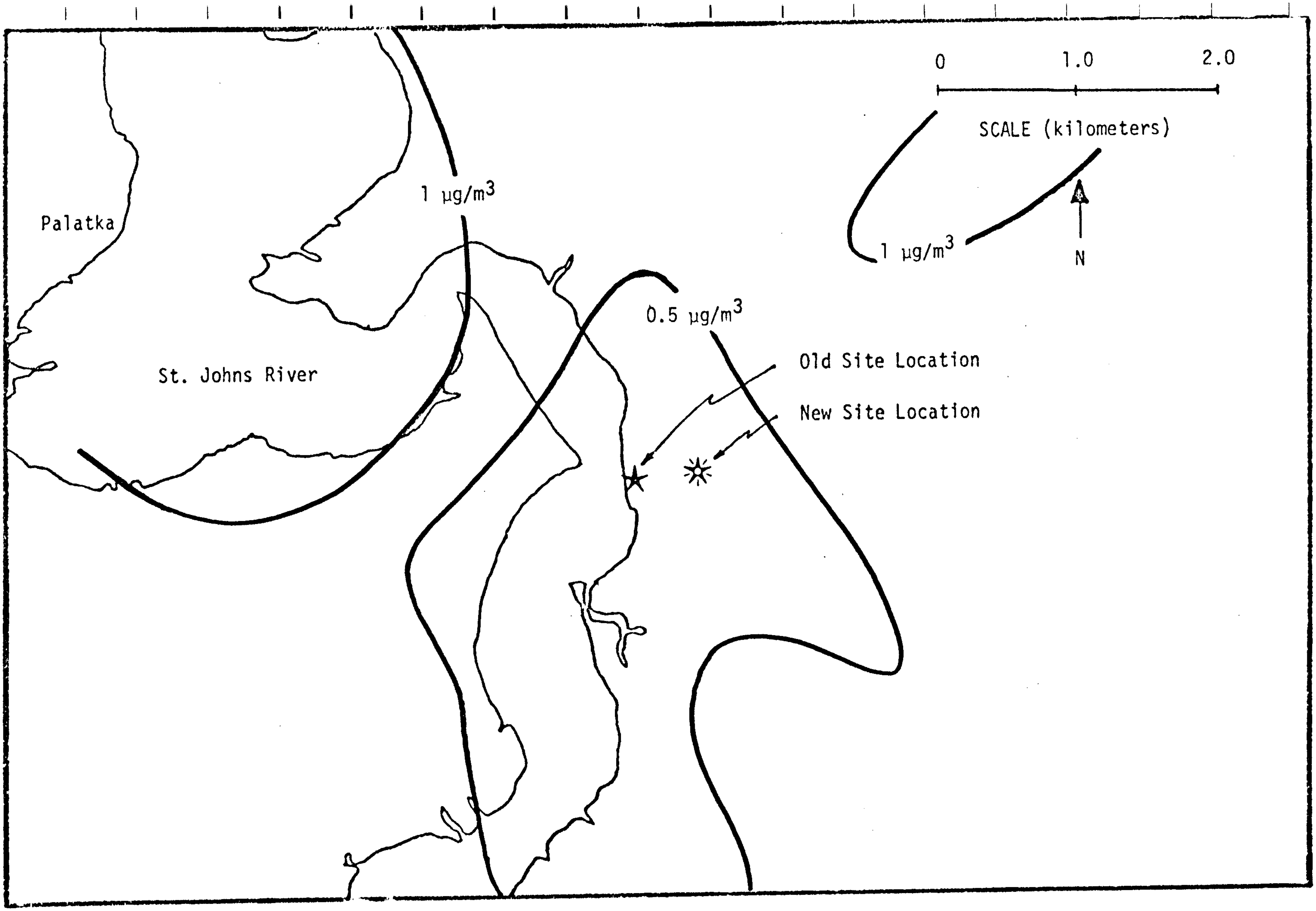

FIGURE 6. ANNUAL AVERAGE SO_2 CONCENTRATIONS ($\mu g/m^3$). ALL SOURCES (INCLUDING NEW TURBINES) AT 17-2 ALLOWABLE EMISSIONS.

TABLE 4. MAXIMUM SULFUR DIOXIDE LEVELS WITHIN THREE MILES OF FLORIDA POWER AND LIGHT IN PALATKA. LONG-TERM MODEL CALCULATIONS, ($\mu g/m^3$).

Control Strategy	Maximum Annual Average	Maximum 24-Hour	Maximum 3-Hour
All Significant Sources, 1972	1	15	40
All Existing Sources at 17-2 Allowable Emissions and same Operating Rate as 1972	<1	10	30
All Existing Sources and New Gas Turbines at 17-2 Allowable Emissions	1.3	17	50
Florida Standards	60	260	1300

TABLE 5. INCREMENTAL IMPACT OF GAS TURBINES ($\mu g/m^3$).

Model	SO_2 Levels		
	Maximum Annual Average	Maximum 24-Hour	Maximum 3-Hour
Long-Term	<1	13	20
Short-Term	NA	25	60
Florida Standards	60	260	1300

APPENDIX

AQDM OUTPUT

PALATKA ALL SOURCES AT ALLOWABLE EM.S

SOURCE DATA

SOURCE NUMBER	SOURCE LOCATION (KILOMETERS) HORIZONTAL	SOURCE LOCATION (KILOMETERS) VERTICAL	SOURCE AREA SQUARE KILOMETERS	ANNUAL SOURCE EMISSION RATE (TONS/DAY) SO2	ANNUAL SOURCE EMISSION RATE (TONS/DAY) PART	STACK DATA HT (M)	STACK DATA DIAM (M)	STACK DATA VEL (M/SEC)	STACK DATA TEMP (DEG K)
1	434.0	283.4	0.0	4.300	0.0	48.2	3.0	12.1	491.
2	434.0	283.4	0.0	1.700	0.0	48.2	2.7	15.1	505.
3	442.9	277.8	0.0	9.000	0.0	45.7	4.0	27.0	408.
4	443.3	277.7	0.0	17.400	0.0	15.2	3.0	50.0	755.

Source No. 1 - Hudson Bark Boiler
Source No. 2 - Hudson Power Boiler
Source No. 3 - FP&L Units 1 and 2
Source No. 4 - New Gas Turbines

PALATKA ALL SOURCES AT ALLOWABLE EM.S

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

MIXING DEPTH = 1450. METERS
AMBIENT TEMPERATURE = 298. DEGREES,KELVIN
AMBIENT PRESSURE = 1000. MILLIBARS

STABILITY CLASS 1

WIND DIRECTION	WINDSPEED CLASS 1	2	3	4	5	6
N	0.0	0.0	0.0	0.0	0.0	0.0
NNE	0.0	0.0	0.0	0.0	0.0	0.0
NE	0.0000	0.0007	0.0	0.0	0.0	0.0
ENE	0.0	0.0	0.0	0.0	0.0	0.0
E	0.0000	0.0007	0.0	0.0	0.0	0.0
ESE	0.0000	0.0007	0.0	0.0	0.0	0.0
SE	0.0000	0.0003	0.0	0.0	0.0	0.0
SSE	0.0	0.0	0.0	0.0	0.0	0.0
S	0.0004	0.0	0.0	0.0	0.0	0.0
SSW	0.0000	0.0003	0.0	0.0	0.0	0.0
SW	0.0000	0.0003	0.0	0.0	0.0	0.0
WSW	0.0	0.0	0.0	0.0	0.0	0.0
W	0.0004	0.0007	0.0	0.0	0.0	0.0
WNW	0.0	0.0	0.0	0.0	0.0	0.0
NW	0.0	0.0	0.0	0.0	0.0	0.0
NNW	0.0	0.0	0.0	0.0	0.0	0.0

PALATKA ALL SOURCES AT ALLOWABLE EM.S

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

STABILITY CLASS 2

WIND DIRECTION	WINDSPEED CLASS 1	2	3	4	5	6
N	0.0007	0.0014	0.0010	0.0	0.0	0.0
NNE	0.0004	0.0007	0.0010	0.0	0.0	0.0
NE	0.0000	0.0007	0.0003	0.0	0.0	0.0
ENE	0.0007	0.0007	0.0007	0.0	0.0	0.0
E	0.0004	0.0017	0.0020	0.0	0.0	0.0
ESE	0.0000	0.0010	0.0020	0.0	0.0	0.0
SE	0.0004	0.0027	0.0024	0.0	0.0	0.0
SSE	0.0000	0.0017	0.0014	0.0	0.0	0.0
S	0.0000	0.0014	0.0017	0.0	0.0	0.0
SSW	0.0007	0.0010	0.0014	0.0	0.0	0.0
SW	0.0008	0.0027	0.0048	0.0	0.0	0.0
WSW	0.0004	0.0020	0.0020	0.0	0.0	0.0
W	0.0011	0.0020	0.0024	0.0	0.0	0.0
WNW	0.0011	0.0007	0.0010	0.0	0.0	0.0
NW	0.0004	0.0017	0.0003	0.0	0.0	0.0
NNW	0.0004	0.0020	0.0058	0.0	0.0	0.0

PALATKA ALL SOURCES AT ALLOWABLE EM.S

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

STABILITY CLASS 3

WIND DIRECTION	WINDSPEED CLASS 1	2	3	4	5	6
N	0.0004	0.0007	0.0	0.0	0.0	0.0
NNE	0.0007	0.0010	0.0017	0.0003	0.0	0.0
NE	0.0000	0.0007	0.0027	0.0003	0.0	0.0
ENE	0.0000	0.0010	0.0027	0.0	0.0	0.0
E	0.0000	0.0007	0.0089	0.0027	0.0003	0.0
ESE	0.0000	0.0003	0.0092	0.0041	0.0	0.0
SE	0.0004	0.0014	0.0103	0.0041	0.0	0.0
SSE	0.0007	0.0003	0.0041	0.0010	0.0	0.0
S	0.0004	0.0014	0.0041	0.0003	0.0	0.0
SSW	0.0004	0.0010	0.0051	0.0010	0.0	0.0
SW	0.0008	0.0017	0.0075	0.0020	0.0003	0.0
WSW	0.0008	0.0024	0.0079	0.0010	0.0	0.0
W	0.0002	0.0044	0.0082	0.0027	0.0	0.0
WNW	0.0001	0.0017	0.0038	0.0003	0.0	0.0
NW	0.0004	0.0024	0.0024	0.0003	0.0	0.0
NNW	0.0008	0.0014	0.0014	0.0	0.0	0.0

PALATKA ALL SOURCES AT ALLOWABLE EM.S

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

STABILITY CLASS 4

WIND DIRECTION	WINDSPEED CLASS 1	2	3	4	5	6
N	0.0004	0.0024	0.0089	0.0048	0.0	0.0003
NNE	0.0004	0.0007	0.0041	0.0058	0.0	0.0
NE	0.0000	0.0010	0.0051	0.0147	0.0010	0.0
ENE	0.0000	0.0003	0.0082	0.0103	0.0007	0.0
E	0.0005	0.0044	0.0140	0.0192	0.0010	0.0
ESE	0.0000	0.0017	0.0096	0.0151	0.0010	0.0
SE	0.0001	0.0027	0.0144	0.0226	0.0003	0.0003
SSE	0.0004	0.0024	0.0103	0.0062	0.0003	0.0
S	0.0001	0.0024	0.0154	0.0079	0.0007	0.0
SSW	0.0000	0.0014	0.0130	0.0072	0.0010	0.0
SW	0.0001	0.0038	0.0250	0.0168	0.0020	0.0
WSW	0.0004	0.0027	0.0130	0.0103	0.0007	0.0
W	0.0005	0.0048	0.0147	0.0157	0.0038	0.0
WNW	0.0001	0.0024	0.0079	0.0086	0.0024	0.0
NW	0.0001	0.0034	0.0072	0.0051	0.0020	0.0
NNW	0.0000	0.0014	0.0041	0.0041	0.0003	0.0

PALATKA ALL SOURCES AT ALLOWABLE EM.S

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

STABILITY CLASS 5

WIND DIRECTION	WINDSPEED CLASS 1	2	3	4	5	6
N	0.0074	0.0127	0.0096	0.0	0.0	0.0
NNE	0.0023	0.0058	0.0007	0.0	0.0	0.0
NE	0.0041	0.0048	0.0020	0.0	0.0	0.0
ENE	0.0030	0.0086	0.0017	0.0	0.0	0.0
E	0.0079	0.0137	0.0048	0.0	0.0	0.0
ESE	0.0055	0.0082	0.0072	0.0	0.0	0.0
SE	0.0036	0.0113	0.0106	0.0	0.0	0.0
SSE	0.0036	0.0116	0.0051	0.0	0.0	0.0
S	0.0074	0.0219	0.0089	0.0	0.0	0.0
SSW	0.0031	0.0140	0.0041	0.0	0.0	0.0
SW	0.0061	0.0147	0.0092	0.0	0.0	0.0
WSW	0.0044	0.0130	0.0103	0.0	0.0	0.0
W	0.0100	0.0212	0.0134	0.0	0.0	0.0
WNW	0.0085	0.0130	0.0055	0.0	0.0	0.0
NW	0.0050	0.0151	0.0079	0.0	0.0	0.0
NNW	0.0081	0.0079	0.0055	0.0	0.0	0.0

PALATKA ALL SOURCES AT ALLOWABLE EM.S

INPUT REGRESSION PARAMETERS ARE:

POLLUTANT	Y-INTERCEPT	SLOPE
SO2	0.0	1.0000

PALATKA ALL SOURCES AT ALLOWABLE EM.S

RECEPTOR CONCENTRATION DATA

RECEPTOR NUMBER	RECEPTOR LOCATION (KILOMETERS) HORIZ	VERT	EXPECTED ARITHMETIC MEAN (MICROGRAMS/CU. METER) SO2	PARTICULATES
1	440.0	275.0	2.	0.
2	440.0	275.5	2.	0.
3	440.0	276.0	2.	0.
4	440.0	276.5	2.	0.
5	440.0	277.0	3.	0.
6	440.0	277.5	4.	0.
7	440.0	278.0	4.	0.
8	440.0	278.5	4.	0.
9	440.0	279.0	4.	0.
10	440.0	279.5	4.	0.
11	440.0	280.0	4.	0.
12	440.0	280.5	4.	0.
13	440.0	281.0	4.	0.
14	440.0	281.5	4.	0.
15	440.0	282.0	4.	0.
16	440.5	275.0	2.	0.
17	440.5	275.5	2.	0.
18	440.5	276.0	2.	0.
19	440.5	276.5	2.	0.
20	440.5	277.0	3.	0.
21	440.5	277.5	4.	0.
22	440.5	278.0	4.	0.
23	440.5	278.5	4.	0.
24	440.5	279.0	4.	0.
25	440.5	279.5	4.	0.
26	440.5	280.0	4.	0.
27	440.5	280.5	4.	0.
28	440.5	281.0	4.	0.
29	440.5	281.5	4.	0.
30	440.5	282.0	3.	0.
31	441.0	275.0	2.	0.
32	441.0	275.5	2.	0.
33	441.0	276.0	2.	0.
34	441.0	276.5	2.	0.
35	441.0	277.0	2.	0.
36	441.0	277.5	3.	0.
37	441.0	278.0	4.	0.
38	441.0	278.5	4.	0.
39	441.0	279.0	4.	0.
40	441.0	279.5	5.	0.

NOTE: ALL CONCENTRATIONS MUST BE MULTIPLIED BY 0.23

PALATKA ALL SOURCES AT ALLOWABLE EM.S

RECEPTOR CONCENTRATION DATA

RECEPTOR NUMBER	RECEPTOR LOCATION (KILOMETERS) HORIZ	VERT	EXPECTED ARITHMETIC MEAN (MICROGRAMS/CU. METER) SO2	PARTICULATES
41	441.0	280.0	4.	0.
42	441.0	280.5	4.	0.
43	441.0	281.0	3.	0.
44	441.0	281.5	3.	0.
45	441.0	282.0	3.	0.
46	441.5	275.0	2.	0.
47	441.5	275.5	2.	0.
48	441.5	276.0	2.	0.
49	441.5	276.5	2.	0.
50	441.5	277.0	1.	0.
51	441.5	277.5	2.	0.
52	441.5	278.0	3.	0.
53	441.5	278.5	4.	0.
54	441.5	279.0	4.	0.
55	441.5	279.5	4.	0.
56	441.5	280.0	4.	0.
57	441.5	280.5	3.	0.
58	441.5	281.0	3.	0.
59	441.5	281.5	3.	0.
60	441.5	282.0	3.	0.
61	442.0	275.0	1.	0.
62	442.0	275.5	1.	0.
63	442.0	276.0	1.	0.
64	442.0	276.5	1.	0.
65	442.0	277.0	1.	0.
66	442.0	277.5	1.	0.
67	442.0	278.0	2.	0.
68	442.0	278.5	3.	0.
69	442.0	279.0	3.	0.
70	442.0	279.5	3.	0.
71	442.0	280.0	3.	0.
72	442.0	280.5	2.	0.
73	442.0	281.0	2.	0.
74	442.0	281.5	3.	0.
75	442.0	282.0	3.	0.
76	442.5	275.0	1.	0.
77	442.5	275.5	1.	0.
78	442.5	276.0	1.	0.
79	442.5	276.5	1.	0.
80	442.5	277.0	1.	0.

NOTE: ALL CONCENTRATIONS MUST BE MULTIPLIED BY 0.23

PALATKA ALL SOURCES AT ALLOWABLE EM.S

RECEPTOR CONCENTRATION DATA				
RECEPTOR NUMBER	RECEPTOR LOCATION		EXPECTED ARITHMETIC MEAN	
	(KILOMETERS) HORIZ	VERT	(MICROGRAMS/CU. METER) SO2	PARTICULATES
81	442.5	277.5	1.	0.
82	442.5	278.0	1.	0.
83	442.5	278.5	1.	0.
84	442.5	279.0	2.	0.
85	442.5	279.5	2.	0.
86	442.5	280.0	2.	0.
87	442.5	280.5	2.	0.
88	442.5	281.0	3.	0.
89	442.5	281.5	3.	0.
90	442.5	282.0	3.	0.
91	443.0	275.0	1.	0.
92	443.0	275.5	1.	0.
93	443.0	276.0	1.	0.
94	443.0	276.5	1.	0.
95	443.0	277.0	1.	0.
96	443.0	277.5	1.	0.
97	443.0	278.0	1.	0.
98	443.0	278.5	1.	0.
99	443.0	279.0	1.	0.
100	443.0	279.5	2.	0.
101	443.0	280.0	2.	0.
102	443.0	280.5	2.	0.
103	443.0	281.0	3.	0.
104	443.0	281.5	3.	0.
105	443.0	282.0	3.	0.
106	443.5	275.0	1.	0.
107	443.5	275.5	2.	0.
108	443.5	276.0	2.	0.
109	443.5	276.5	1.	0.
110	443.5	277.0	1.	0.
111	443.5	277.5	1.	0.
112	443.5	278.0	1.	0.
113	443.5	278.5	1.	0.
114	443.5	279.0	2.	0.
115	443.5	279.5	2.	0.
116	443.5	280.0	2.	0.
117	443.5	280.5	2.	0.
118	443.5	281.0	3.	0.
119	443.5	281.5	3.	0.
120	443.5	282.0	3.	0.

NOTE: ALL CONCENTRATIONS MUST BE MULTIPLIED BY 0.23

PALATKA ALL SOURCES AT ALLOWABLE EM.S

RECEPTOR CONCENTRATION DATA

RECEPTOR NUMBER	RECEPTOR LOCATION (KILOMETERS)		EXPECTED ARITHMETIC MEAN (MICROGRAMS/CU. METER)	
	HORIZ	VERT	SO2	PARTICULATES
121	444.0	275.0	2.	0.
122	444.0	275.5	2.	0.
123	444.0	276.0	2.	0.
124	444.0	276.5	2.	0.
125	444.0	277.0	1.	0.
126	444.0	277.5	1.	0.
127	444.0	278.0	2.	0.
128	444.0	278.5	2.	0.
129	444.0	279.0	3.	0.
130	444.0	279.5	3.	0.
131	444.0	280.0	2.	0.
132	444.0	280.5	2.	0.
133	444.0	281.0	3.	0.
134	444.0	281.5	3.	0.
135	444.0	282.0	3.	0.
136	444.5	275.0	2.	0.
137	444.5	275.5	2.	0.
138	444.5	276.0	2.	0.
139	444.5	276.5	1.	0.
140	444.5	277.0	1.	0.
141	444.5	277.5	2.	0.
142	444.5	278.0	2.	0.
143	444.5	278.5	2.	0.
144	444.5	279.0	3.	0.
145	444.5	279.5	4.	0.
146	444.5	280.0	3.	0.
147	444.5	280.5	3.	0.
148	444.5	281.0	3.	0.
149	444.5	281.5	3.	0.
150	444.5	282.0	3.	0.
151	445.0	275.0	2.	0.
152	445.0	275.5	2.	0.
153	445.0	276.0	2.	0.
154	445.0	276.5	2.	0.
155	445.0	277.0	2.	0.
156	445.0	277.5	3.	0.
157	445.0	278.0	3.	0.
158	445.0	278.5	3.	0.
159	445.0	279.0	3.	0.
160	445.0	279.5	4.	0.

NOTE: ALL CONCENTRATIONS MUST BE MULTIPLIED BY 0.23

PALATKA ALL SOURCES AT ALLOWABLE EM.S

RECEPTOR CONCENTRATION DATA

RECEPTOR NUMBER	RECEPTOR LOCATION (KILOMETERS) HORIZ	VERT	EXPECTED ARITHMETIC MEAN (MICROGRAMS/CU. METER) SO2	PARTICULATES
161	445.0	280.0	4.	0.
162	445.0	280.5	3.	0.
163	445.0	281.0	3.	0.
164	445.0	281.5	3.	0.
165	445.0	282.0	3.	0.
166	445.5	275.0	2.	0.
167	445.5	275.5	2.	0.
168	445.5	276.0	2.	0.
169	445.5	276.5	2.	0.
170	445.5	277.0	2.	0.
171	445.5	277.5	3.	0.
172	445.5	278.0	4.	0.
173	445.5	278.5	3.	0.
174	445.5	279.0	3.	0.
175	445.5	279.5	4.	0.
176	445.5	280.0	4.	0.
177	445.5	280.5	4.	0.
178	445.5	281.0	3.	0.
179	445.5	281.5	3.	0.
180	445.5	282.0	3.	0.
181	446.0	275.0	2.	0.
182	446.0	275.5	2.	0.
183	446.0	276.0	2.	0.
184	446.0	276.5	2.	0.
185	446.0	277.0	3.	0.
186	446.0	277.5	3.	0.
187	446.0	278.0	4.	0.
188	446.0	278.5	3.	0.
189	446.0	279.0	3.	0.
190	446.0	279.5	3.	0.
191	446.0	280.0	4.	0.
192	446.0	280.5	4.	0.
193	446.0	281.0	4.	0.
194	446.0	281.5	3.	0.
195	446.0	282.0	3.	0.
196	446.5	275.0	2.	0.
197	446.5	275.5	2.	0.
198	446.5	276.0	2.	0.
199	446.5	276.5	2.	0.
200	446.5	277.0	3.	0.

NOTE: ALL CONCENTRATIONS MUST BE MULTIPLIED BY 0.23

PALATKA ALL SOURCES AT ALLOWABLE EM.S

RECEPTOR CONCENTRATION DATA

RECEPTOR NUMBER	RECEPTOR LOCATION (KILOMETERS)		EXPECTED ARITHMETIC MEAN (MICROGRAMS/CU. METER)	
	HORIZ	VERT	SO2	PARTICULATES
201	446.5	277.5	3.	0.
202	446.5	278.0	4.	0.
203	446.5	278.5	3.	0.
204	446.5	279.0	3.	0.
205	446.5	279.5	3.	0.
206	446.5	280.0	3.	0.
207	446.5	280.5	4.	0.
208	446.5	281.0	4.	0.
209	446.5	281.5	4.	0.
210	446.5	282.0	3.	0.
211	447.0	275.0	2.	0.
212	447.0	275.5	2.	0.
213	447.0	276.0	2.	0.
214	447.0	276.5	2.	0.
215	447.0	277.0	3.	0.
216	447.0	277.5	3.	0.
217	447.0	278.0	3.	0.
218	447.0	278.5	3.	0.
219	447.0	279.0	3.	0.
220	447.0	279.5	3.	0.
221	447.0	280.0	3.	0.
222	447.0	280.5	3.	0.
223	447.0	281.0	3.	0.
224	447.0	281.5	4.	0.
225	447.0	282.0	3.	0.

NOTE: ALL CONCENTRATIONS MUST BE MULTIPLIED BY 0.23

PALATKA ALL SOURCES AT ALLOWABLE EM.S

SOURCE CONTRIBUTIONS TO FIVE MAXIMUM RECEPTORS

ANNUAL SO2

MICROGRAMS PER CUBIC METER

SOURCE	RECEPTOR 40	RECEPTOR 26	RECEPTOR 41	RECEPTOR 25	RECEPTOR 12
1	12.29 % 0.5588	13.74 % 0.6132	12.86 % 0.5584	13.99 % 0.6071	15.79 % 0.6742
2	4.80 % 0.2185	5.36 % 0.2395	5.03 % 0.2183	5.47 % 0.2372	6.16 % 0.2630
3	46.95 % 2.1355	43.80 % 1.9554	42.14 % 1.8302	44.52 % 1.9319	40.82 % 1.7433
4	35.96 % 1.6356	37.10 % 1.6563	39.98 % 1.7365	36.02 % 1.5629	37.23 % 1.5899
BACK-GROUND	0.0 % 0.	0.0 % 0.	0.0 % 0.	0.0 % 0.	0.0 % 0.
TOTAL	100.0 % 4.5484	100.0 % 4.4644	100.0 % 4.3434	100.0 % 4.3390	100.0 % 4.2705

NOTE: ALL CONCENTRATIONS MUST BE MULTIPLIED BY 0.23

PALATKA ALL SOURCES AT ALLOWABLE EM.S

TRANSFER COEFFICIENTS TO FIVE MAXIMUM RECEPTORS

ANNUAL SO2

MICROGRAMS PER CUBIC METER PER TON OF POLLUTANT PER DAY

SOURCE	EFFECTIVE STACK HEIGHT	RECEPTOR 40	RECEPTOR 26	RECEPTOR 41	RECEPTOR 25	RECEPTOR 12
1	65.8010	0.1300	0.1426	0.1299	0.1412	0.1568
2	67.1443	0.1285	0.1409	0.1284	0.1395	0.1547
3	95.0313	0.2373	0.2173	0.2034	0.2147	0.1937
4	114.5604	0.0940	0.0952	0.0998	0.0898	0.0914

NOTE: ALL CONCENTRATIONS ARE MULTIPLIED BY 0.23