PSD-FL-0005
OCCIDENTAL CHEM.
WHITE SPRINGS

Pre-Construction Review and Final Determination for Occidental Chemical Company's Phosphate Fertilizer Chemical Complex to be Constructed in Hamilton County, Florida

This review was performed by the U.S. Environmental Protection Agency in accordance with EPA regulations for Prevention of Significant Air Quality Deterioration

February 1978

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INTRODUCTION AND FINAL DETERMINATION

On December 5, 1974, the Environmental Protection Agency promulgated regulations for Prevention of Significant Air Quality Deterioration (PSD). These regulations were amended on June 12, 1975 and September 10, 1975. On August 7, 1977, the Clean Air Act Amendments of 1977 became law setting forth new PSD requirements. A November 3, 1977 final rulemaking further amended the PSD regulations to incorporate immediately effective changes required by the 1977 Amendments. Specifically, these changes are: 1) Mandatory Class I areas, 2) More restrictive ambient increments for sulfur dioxide and particulate matter, and 3) Restrictions on Class III reclassifications. Also, a new section of the Act on tall stacks limits the credit for stack height to good engineering practice. Under these regulations, a source that is included in one of 19 source categories must be reviewed with regard to significant deterioration prior to construction. Authority for implementing these regulations in the State of Florida presently rests with the EPA. Therefore, sources wishing to construct in Florida must obtain approval from both EPA and the State.

Under the PSD regulations a source must pass two criteria in order to be approved. The first criteria is that Best Available

Control Technology (BACT) must be applied to all emission points of sulfur oxides (SO_2) and particulate matter (TSP) within the facility. The second criteria is that increases in ambient concentrations of SO_2 and particulates resulting from emissions from this source must not exceed certain increments. All areas are presently classified as either Class I or Class II (see Attachment I).

Allowable increments in ambient concentrations are as follows:

Pollutant	Class I $\mu g/m^3$	Class II $\mu g/m^3$
Particulate Matter		
Annual Geometric Mean	5	19
24-hour Maximum	10	37
Sulfur Dioxide		
Annual Arithmetic Mean	2	20
24-hour Maximum	5	91
3-hour Maximum	25	512

The increments caused by the source are evaluated using air quality models developed by EPA.

Occidental Chemical Company (OXY) intends to construct a phosphate fertilizer chemical complex eight kilometers to the west of its existing phosphate chemical complex, the Suwannee River Chemical Complex, located in Hamilton County, north of White Springs, Florida (see Figure 1). The sources of air pollutant emissions associated with this expansion are: 1) Two sulfuric acid plants; 2) One auxiliary steam generator; 3) One phosphoric acid plant; and 4) Four superphosphoric acid plants. On November 25, 1977, EPA received OXY's application (see Attachment II) for review pursuant to federal PSD regulations. Additional information was submitted to EPA on January 23, 1978 to supplement the original application.

EPA has reviewed Occidental Chemical Company's applications including air quality modeling results submitted by engineering consultants for OXY and has made a final determination that in accordance with 40 CFR 52.21(d)(2)(ii), this construction can be approved with conditions. These conditions are necessary for the following reasons:

1. An emission limit for each source is required as a condition of approval under 40 CFR 52.21(d)(2)(ii) unless technological or economic limitations of measurement technology make it infeasible. Therefore a condition setting an emission limit for all emission points is required.

2. From the data submitted in the application, the company indicated that best available control technology (BACT) for control of particulate and sulfur dioxide emissions will be applied to the source. Sufficient operating parameters for the proposed control equipment at this time are not available. EPA could not adequately determine that the proposed control equipment would insure that the emission limits for each source (see 1 above) would be met. Therefore specific operating parameters for all control equipment must be submitted to EPA for approval prior to letting of contracts for the control equipment.

CONDITIONS TO APPROVAL

As required pursuant to 40 CFR 52.21(d)(2)(ii), a review was conducted to determine if the proposed: 1) sulfuric acid plants, 2) wet process phosphoric acid plant, 3) superphosphoric acid plants, and 4) auxiliary boiler, at Occidental Chemical Company, White Springs, Florida are applying best available control technology. Based on this review, it was determined that the applicant, Occidental Chemical Company, must meet emission limits and other requirements as specified by the U.S. Environmental Protection Agency's Standards of Performance for New Stationary Sources promulgated on December 23, 1971 and August 6, 1975 (40 CFR 60, Subparts H, T, and U). In addition, a requirement is given that the proposed auxiliary boiler shall utilize low sulfur fuel to help minimize SO_2 emissions.

1. Related to the sulfuric acid plant auxiliary boiler and the superphosphoric acid plant heaters:
   a. Gases discharged into the atmosphere shall not contain particulate matter:
      (i) in excess of 0.18 g per million cal (0.10 lb. per million BTU) heat input derived from fossil fuel,
      (ii) exhibiting greater than 20 percent opacity, except that 40 percent opacity shall be permissible for not more than two minutes in any hour.

b. Gases discharged into the atmosphere shall not contain sulfur dioxide in excess of 1.4 g per million cal (0.80 lb. per million BTU) heat input.

c. BACT for the fossil fuel fired facilities is considered to be low sulfur residual oil with a sulfur content not to exceed 0.77% by weight.

d. Analyses of representative samples of fuels to be burned in the furnace and boiler shall be submitted by the applicant to the U.S. Environmental Protection Agency (EPA) prior to initial start-up. The applicant should notify EPA in writing (and receive approval from EPA) for the procedures to be used in obtaining the representative fuel samples as well as the methods to be used in analyzing the samples.

2. Related to the sulfuric acid plants:

a. Gases discharged into the atmosphere shall not contain sulfur dioxide in excess of 2 kg per metric ton of acid produced (4 lb. per ton), the production being expressed as 100 percent H_2SO_4.

b. Gases discharged into the atmosphere shall not:

(i) Contain acid mist, expressed as H_2SO_4 in excess of 0.075 kg per metric ton of acid produced (0.15 lb. per ton), the production being expressed as 100 percent H_2SO_4.

(ii) Exhibit 10 percent opacity, or greater.

c. SO_2 emission will be controlled by double absorption.

d. SO_2 emissions from each plant shall be continuously monitored.

e. Acid mist emissions will be controlled by a mist eliminator. Design criteria of the mist eliminator must be submitted.

3. Related to the wet process phosphoric acid plant:

a. Gases discharged into the atmosphere shall not contain total fluorides in excess of 10.0 g/metric ton of equivalent P_2O_5 feed (0.020 lb/ton).

b. Particulate emissions from the phosphoric acid plant will be controlled by a baghouse or to an equivalent degree by process design. Design criteria for particulate control must be submitted to EPA within five working days after it becomes available.

c. Fluoride emissions from the phosphoric acid plant are to be controlled by a 3-stage scrubber or equivalent. Design criteria of the scrubber must be submitted.

4. Related to the superphosphoric acid plant:

a. Gases discharged into the atmosphere shall not contain total fluorides in excess of 5.0 g/metric ton of equivalent P_2O_5 feed (0.010 lb/ton of equivalent P_2O_5 feed).

b. Fluoride emissions from the superphosphoric acid plants are to be controlled by a venturi scrubber or equivalent. Design criteria of the scrubber must be submitted.

5. The applicant must submit to EPA within five (5) working days after it becomes available, copies of all technical data pertaining to selected control devices, including formal bid from the vendor, guaranteed efficiency or emission rate and and all design parameters.

Specifically, the design parameters pertaining to selected control devices are as follows:

Mist Eliminator

1. Flow rate, vapor velocity
2. Vapor density
3. Liquid density
4. Liquid viscosity
5. Surface tension
6. Liquid particle size and quantity (mist loading of gases)
7. Operating temperature and pressure
8. Material of construction
9. Area, thickness and Δp of mist eliminator
10. Collection efficiency

Venturi Scrubber and Packed Scrubber

1. Scaled drawings showing the design dimensions of the scrubbers
2. Gas velocity at throat for the venturi scrubber
3. Gas volumetric flow rates
4. Liquid flow rates and velocities
5. Δp across the scrubbers
6. Liquid supply pressures
7. Scrubbing liquids
8. Materials of construction
9. Type of venturi scrubber (water or gas actuated)
10. Particle loading, size distribution and collection efficiencies and fluoride loading

EPA may, upon review of these data, disapprove the application if EPA determines the selected control device(s) to be inadequate to meet the emission limits specified in this conditional approval.

6. Additional requirements for all processes:

   a. All sources must be tested within 60 days after reaching full production but in no case later than 180 days after initial start-up. Applicable EPA test procedures must be used.

   b. Continous monitors must be certified using applicable performance specifications.

   c. Thirty days notice must be given EPA before any tests are conducted so that they may have the opportunity to have an observer present.

AIR QUALITY ANALYSIS

The purpose of this section is to present the results of a diffusion analysis, using EPA's air quality models, to predict the maximum concentrations for suspended particulates (TSP) and sulfur dioxide (SO_2) for various averaging periods. The initial modeling analysis was conducted by an environmental consulting firm and submitted to EPA for review. The results of EPA's review are presented below. Based on these results the following conclusions may be drawn for the proposed construction of Occidental Chemical Company's phosphate fertilizer chemical complex:

1. The proposed facilities will be in compliance with EPA's regulations for the Prevention of Significant Deterioration as promulgated in the Federal Register on December 5, 1974, and as amended on June 12 and September 10, 1975, and November 3, 1977. Specifically, the impact of the proposed facilities will not cause a violation of the applicable PSD increments allowed for the Class I or Class II areas affected.
2. The ground level concentrations of TSP and SO_2 due solely to the operations of the proposed facilities will not contravene any applicable Federal ambient air quality standards.

Results

The impact of the proposed phosphate fertilizer facilities upon local ambient contaminant levels was evaluated by means of mathematical dispersion models which simulate the processes of transport and diffusion of stack effluents in the atmosphere. The models employed for this purpose are Gaussian plume models developed by the Meteorological Laboratory of the Environmental Protection Agency. Inputs include physical dimensions and emission characteristics of the source, as well as hourly values of those meteorological parameters affecting plume behavior.

The emission rates used for modeling the proposed facilities were emissions which represent best available control technology (see Table 1). Ground-level concentrations of TSP and SO_2 attributable to operation of the proposed facilities were computed for one hour, 24-hour, and annual averaging periods. The output obtained from application of the models consists of hourly, daily, and annual average concentrations at each designated "receptor" location.

The models used and brief summaries of each model are given below:

PTMAX - A single source model which calculates the maximum 10 minute concentration and downwind distance to point of maximum concentration as a function of stability class and a given set of wind speed categories.

CRSTER - A single source model which is designed to calculate maximum one-hour, 24-hour, and annual average concentrations at a specified set of receptors for a full year of actual hourly meteorological data.

PTMTPW - A multiple source model which calculates hourly concentrations and the average concentration for several hours as a function of specified meteorological conditions at specified receptors.

AQDM - A multiple source model which calculates the annual arithmetic average concentration from regional source emissions and meteorological data.

The Okefenokee National Wilderness Area (Class I) boundary is approximately 46 kilometers northeast of Occidental's proposed chemical complex site (see Figure 2). The maximum ground level concentrations of TSP and SO_2 for this Class I area occurred in this general direction at the nearest boundary to the Occidental Complex as modeled with CRSTER and PTMTPW, and these values are shown in Table 2A. The maximum impacts in the Class II area where the facility is located are presented in Table 2B. Figures 3-6 present in graphical form the isopleths of annual average particulate and sulfur dioxide concentrations for the 1974 and 1979 periods. Figures 7-9 present the short-term impact analysis for receptors showing the maximum concentrations predicted by the air quality modeling for both years 1974 and 1979. The air quality

modeling analysis predicted the impact of the proposed source to be in compliance with PSD regulations. As can be seen from Tables 2A and 2B, the annual and short-term PSD increments are not violated. Therefore, the construction is approved with conditions as outlined above to ensure compliance with BACT.

TABLE 1

OPERATING AND EMISSION PARAMETERS DURING NORMAL OPERATIONS

	2 H_2SO_4 Plants (2,000 TPD (each))	Auxiliary Steam Generator (125,000 lbs/hr)	2 SPA Plant Heaters (75,000 lb/hr each)
Sulfur (%)	N/A	<0.77	<0.77
SO_2 Emission Rate (g/sec)	42.0	12.9	15.5
TSP Emission Rate (g/sec)	1.58	0.53	0.06
Stack Height (meters)	61.0*	15.3	15.3/30.5
Stack Diameter (meters)	1.8	2.3	2.3
Exit Temperature (degress Kelvin)	356	468	468
Exit Velocity (m/sec)	30.6	9.5	11.8

* "Good Engineering Practice" stack height of 38.1 meters was used for air quality modeling

TABLE 2A

SUMMARY OF THE AIR QUALITY IMPACT ON THE CLASS I AREA IN THE VICINITY OF OCCIDENTAL CHEMICAL COMPANY'S PHOSPHATE FERTILIZER CHEMICAL COMPLEX

Pollutant/Averaging Time	Maximum 1974 Baseline Concentrations ($\mu g/m^3$)	Maximum 1979 Concentrations With the Proposed Facilities ($\mu g/m^3$)	Allowable PSD Increment ($\mu g/m^3$)	Maximum PSD Increment Consumed ($\mu g/m^3$)
Sulfur Dioxide				
Annual Arithmetic Mean	1	1	2	0
24-hour Maximum*	9	10	5	1
3-hour Maximum*	71	85	25	14
Particulate Matter**				
Annual Geometric Mean	30	30	5	0
24-hour Maximum*	61	61	10	0

* Not to be exceeded more than once per year

** Includes assumed background concentrations of: Annual Mean = 30 $\mu g/m^3$

24-hour = 60 $\mu g/m^3$

Note: Maximum PSD increments consumed occur at same receptor locations where maximum ground level concentrations occur. Therefore maximum PSD increments consumed are calculated by subtracting maximum 1974 baseline concentrations from maximum 1979 concentrations.

TABLE 2B

SUMMARY OF AIR QUALITY IMPACT ON THE CLASS II AREA IN THE VICINITY OF OCCIDENTAL CHEMICAL COMPANY'S PHOSPHATE FERTILIZER CHEMICAL COMPLEX

Pollutant/Averaging Time	Maximum 1974 Baseline ($\mu g/m^3$)	Maximum 1979 With Proposed Facilities ($\mu g/m^3$)	Allowable PSD Increment ($\mu g/m^3$)	Maximum PSD Increment Consumed ($\mu g/m^3$)
Sulfur Dioxide				
Annual Arithmetic Mean	29	22	20	4
24-hour Maximum*	395	345	91	70
3-Hour Maximum*	1177	931	512	192
Particulate Matter**				
Annual Geometric Mean	32	31	19	0
24-hour Maximum*	103	112	37	10

* Not to be exceeded more than once per year

** Includes measured background concentrations from 3 HiVol sampling stations

Annual Background = 27 $\mu g/m^3$

24-hour background = 60 $\mu g/m^3$

Note: Maximum PSD increments consumed do not occur at receptor locations where the maximum ground level concentraitons occur. Therefore maximum PSD increment consumed cannot be readily calculated from values of maximum baseline concentrations and maximum 1979 concentrations shown above.

FIGURE 1

SITE LOCATION

OCCIDENTAL CHEMICAL COMPANY
WHITE SPRINGS, HAMILTON COUNTY, FLORIDA

FIGURE 2

AREA MAP

OCCIDENTAL CHEMICAL COMPANY
HAMILTON COUNTY, FLORIDA

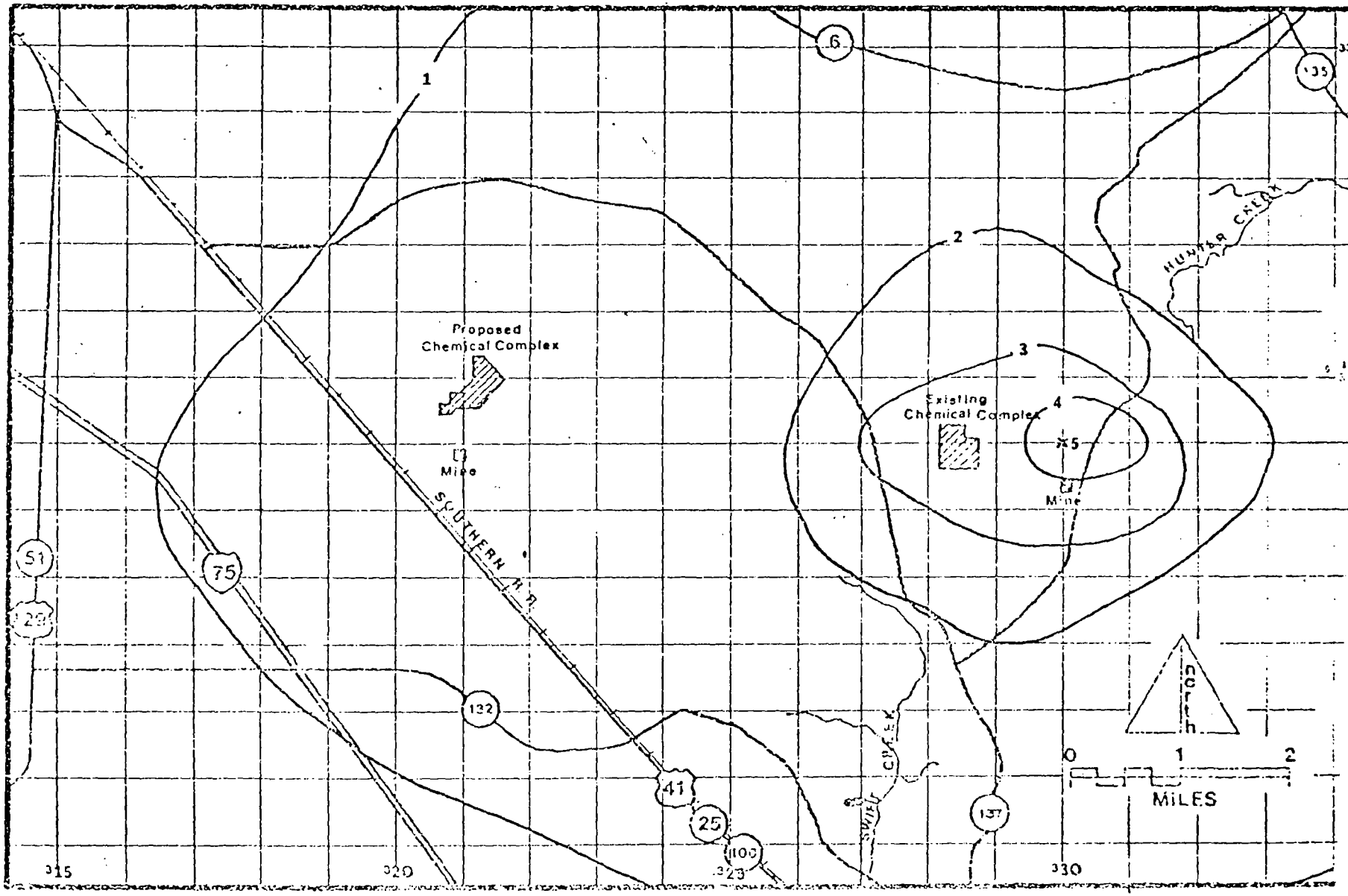


FIGURE 3

1974
TOTAL SUSPENDED PARTICULATE LEVELS
HAMILTON COUNTY, FLORIDA
($\mu g/m^3$)

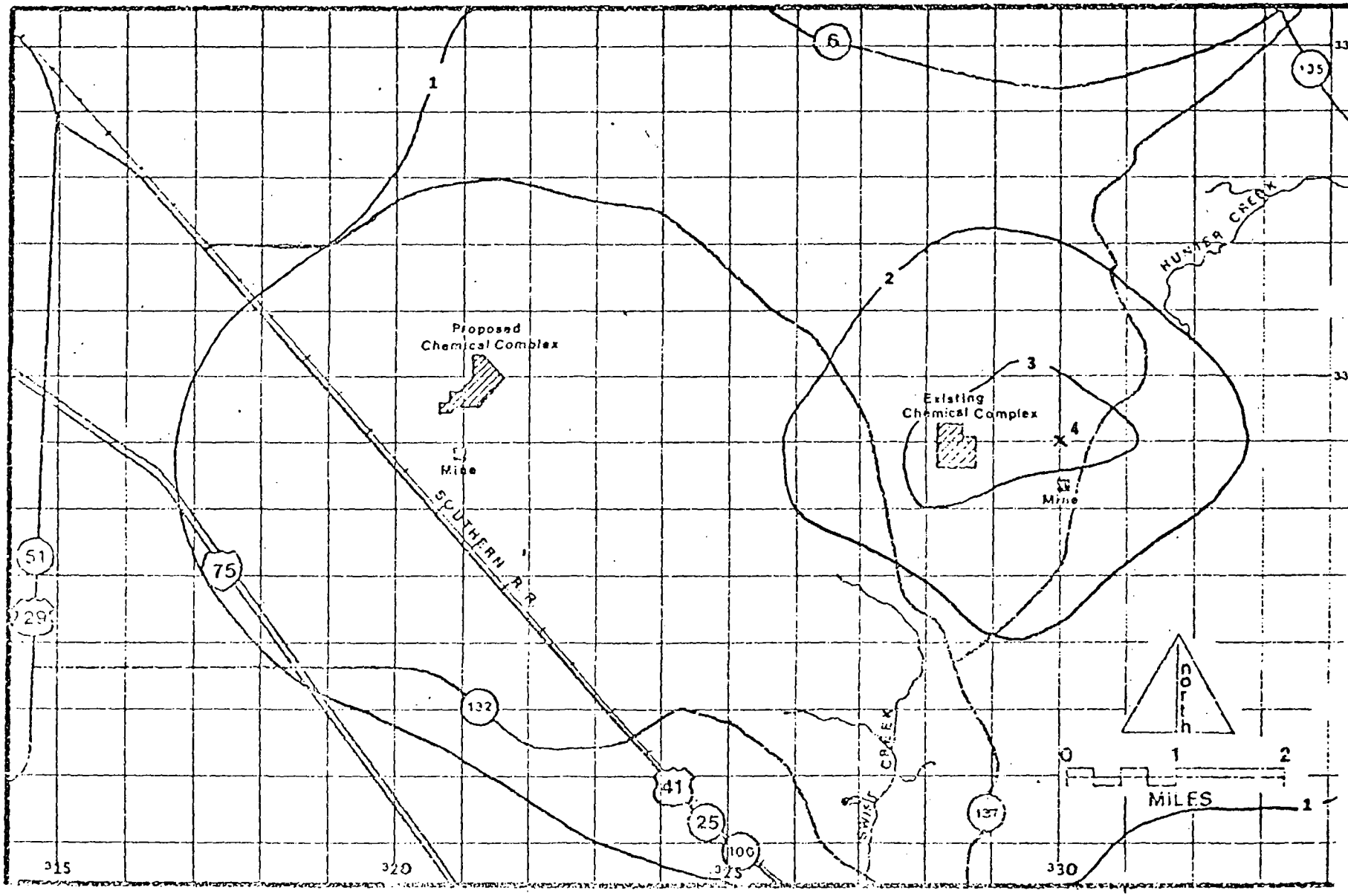


FIGURE 4

1979
TOTAL SUSPENDED PARTICULATE LEVELS
HAMILTON COUNTY, FLORIDA
($\mu g/m3$)

3	45	52	
4	19	22	168
5	30	32	168
6	24	27	196

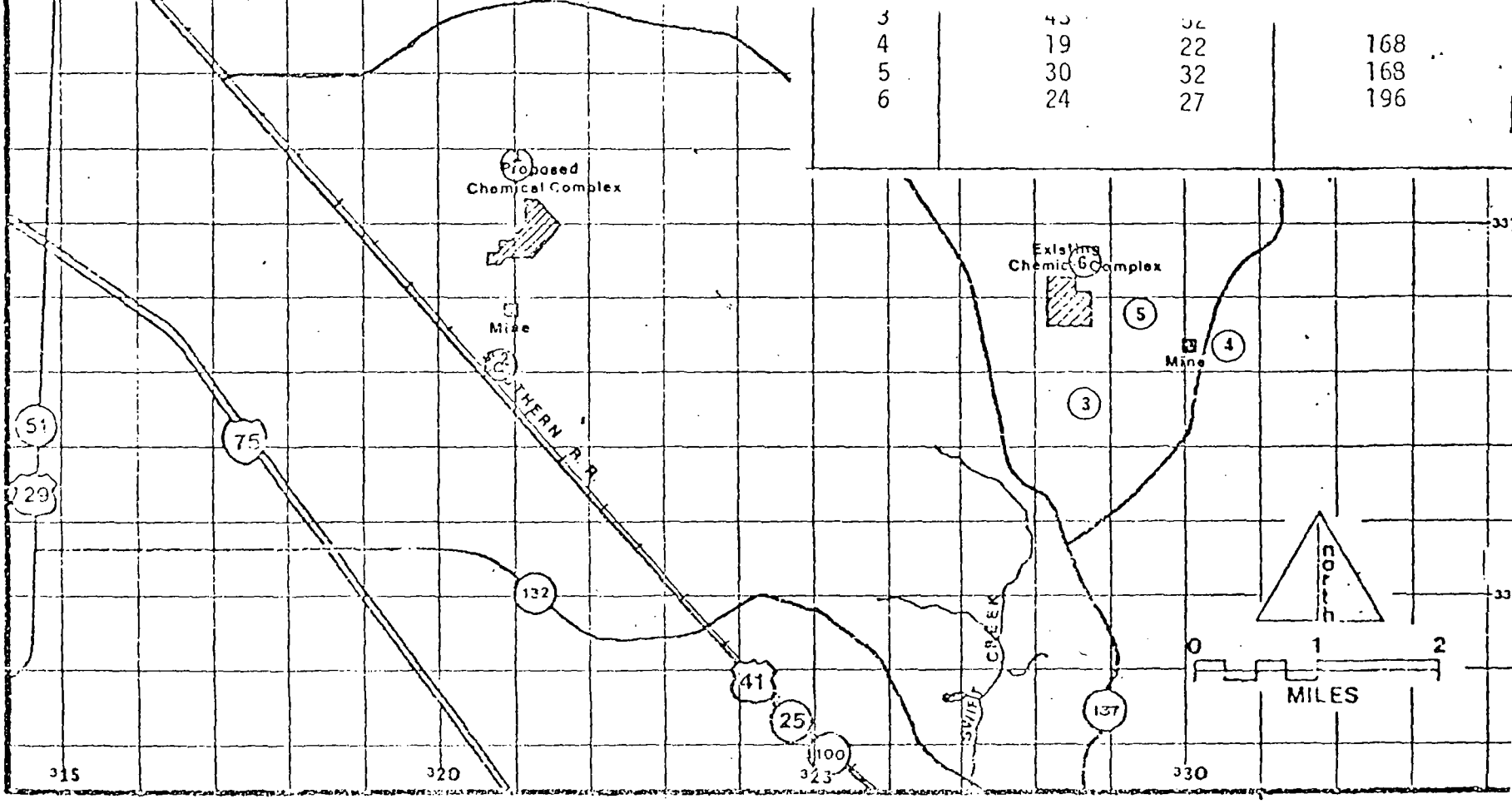


FIGURE 7
24-HOUR PARTICULATE MATTER
IMPACT ANALYSIS
HAMILTON COUNTY, FLORIDA

HAMILTON COUNTY, FLORIDA

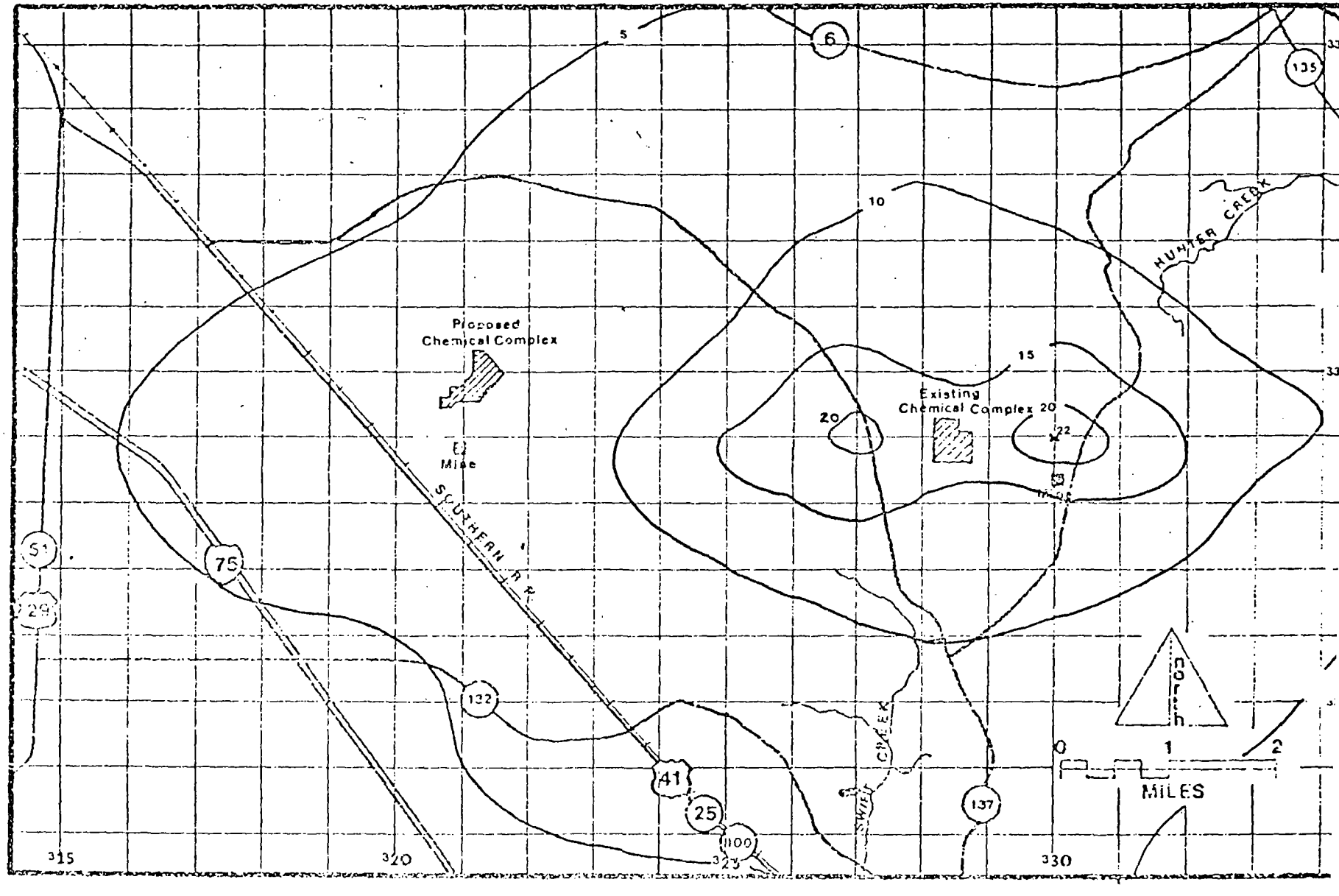
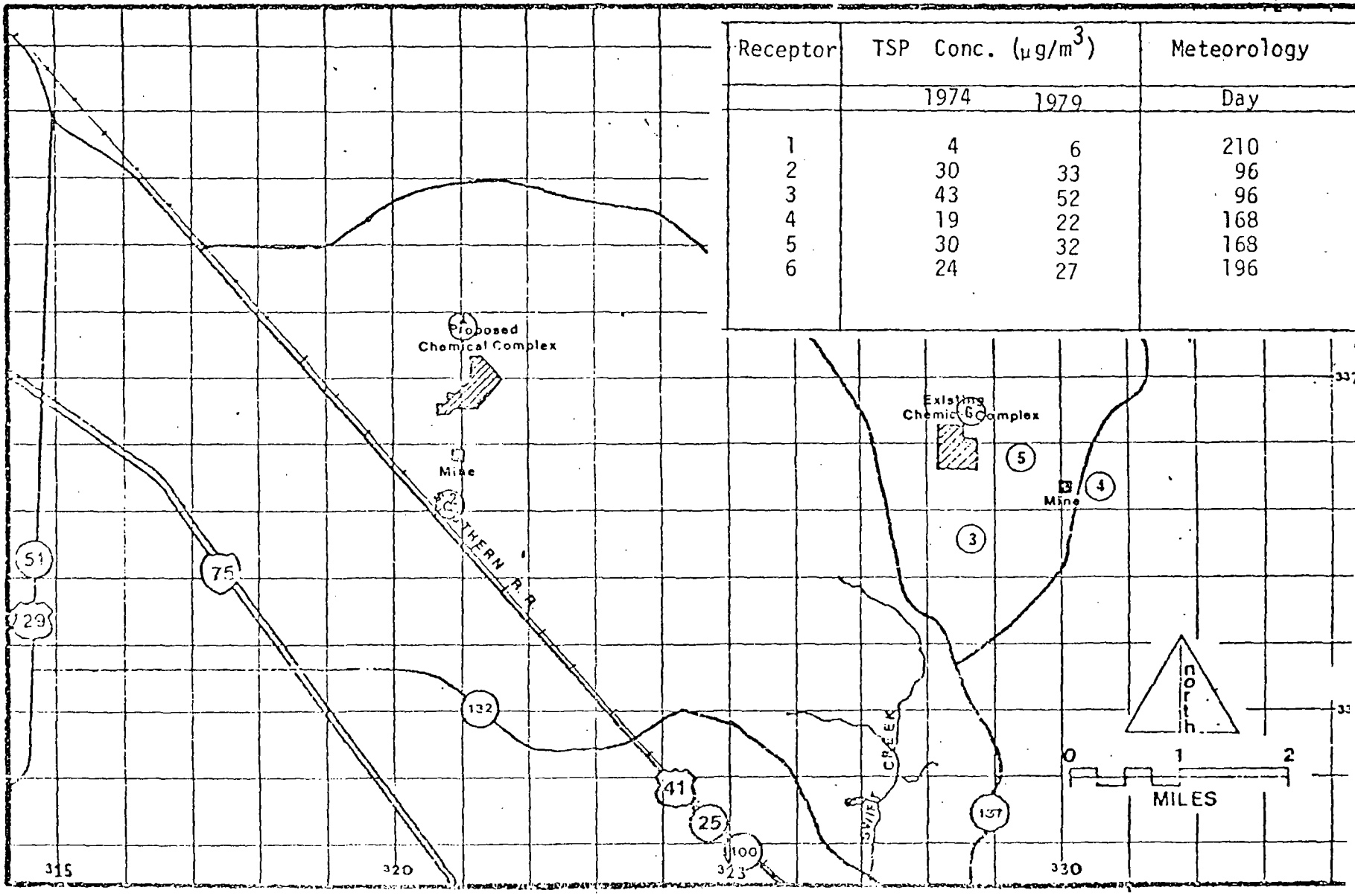
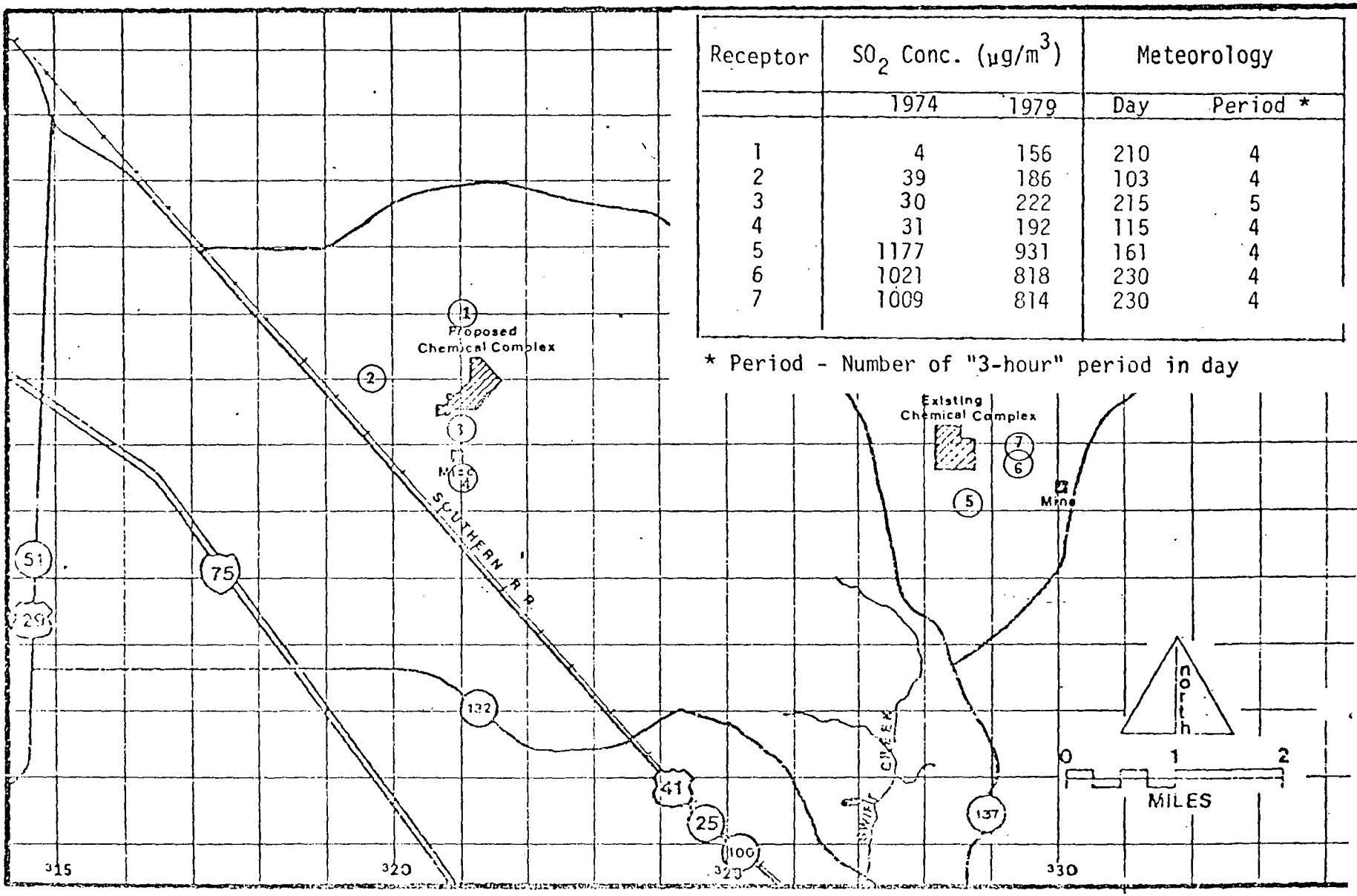


FIGURE 6
1979
SULFUR DIOXIDE LEVELS
HAMILTON COUNTY, FLORIDA
($\mu g/m^3$)



Receptor	TSP Conc. ($\mu g/m^3$)		Meteorology
	1974	1979	Day
1	4	6	210
2	30	33	96
3	43	52	96
4	19	22	168
5	30	32	168
6	24	27	196

FIGURE 7
24-HOUR PARTICULATE MATTER
IMPACT ANALYSIS
HAMILTON COUNTY, FLORIDA



Receptor	SO_2 Conc. ($\mu g/m^3$)		Meteorology	
	1974	1979	Day	Period *
1	4	156	210	4
2	39	186	103	4
3	30	222	215	5
4	31	192	115	4
5	1177	931	161	4
6	1021	818	230	4
7	1009	814	230	4

* Period - Number of "3-hour" period in day

FIGURE 9
3-HOUR SULFUR DIOXIDE
IMPACT ANALYSIS
HAMILTON COUNTY, FLORIDA

ATTACHMENTS

I. Prevention of Significant Deterioration of Air Quality Regulations

II. Application for Review for the Proposed Phosphate Fertilizer Chemical Complex Expansion

III. 1974 and 1979 Emissions Inventory and Air Quality Modeling Printouts