AIR CONSTRUCTION PERMIT APPLICATION FOR PAYNE CREEK GENERATING STATION PEAKER PROJECT

Submitted by:

Seminole Electric
COOPERATIVE, INC.
IN PARTNERSHIP WITH THOSE WE SERVE
Tampa, Florida

Prepared by:

ECT
Environmental Consulting & Technology, Inc.
3701 Northwest 98th Street
Gainesville, Florida 32606

ECT No. 030790-0100

August 2004

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1.0 INTRODUCTION

1.1 INTRODUCTION

Seminole Electric Cooperative, Inc. (SECI), is planning to construct and operate 10 simple-cycle combustion turbines (SCCTs) at its existing Payne Creek Generating Station (PCGS). The PCGS is located approximately 9 miles northwest of the city of Wauchula at 6697 County Road (CR) 663, Bowling Green, Hardee County, Florida. The existing PCGS is currently comprised of two Siemens Westinghouse 501F(D) combined-cycle combustion turbine (CT) units, fuel oil storage, and ancillary support equipment. The existing combined-cycle units include one unfired heat recovery steam generator (HRSG) for each CT generator and one common steam turbine. The existing PCGS has a nominal electric generating capacity of 488 megawatts (MW).

The PCGS SCCT project consists of five Pratt & Whitney (P&W) FT8-3 Twin Pac aeroderivative CT units. Each P&W FT8-3 Twin Pac unit is comprised of two SCCTs coupled to one common generator having a nominal generation capacity of 62 MW. The P&W FT8-3 SCCTs will be fired primarily with pipeline-quality natural gas. Low-sulfur distillate fuel oil will serve as a backup fuel source. The new SCCTs will operate in peaking service for no more than 2,500 hours per year (hr/yr) per SCCT, including no more than 500 hr/yr per SCCT of oil firing. Accordingly, maximum natural gas firing annual hours at rated load will range from 2,500 hr/yr (with no oil firing) to 2,000 hr/yr (with 500 hr/yr of oil firing). The SCCTs will utilize water injection and oxidation catalyst technologies to control emissions of nitrogen oxides (NO_x) and carbon monoxide (CO), respectively. The SCCT project will also include one 611-horsepower emergency black-start diesel engine generator and one 1.35-million-gallon distillate fuel oil storage tank. The emergency generator is exempt from permitting pursuant to the Rule 62-210.300(3)(a)20, Florida Administrative Code (F.A.C.), exemption applicable to emergency generators. The distillate fuel oil storage tank is also exempt from permitting pursuant to Rule 62-210.300(3)(b)1., F.A.C., generic emissions unit exemption. The proposed SCCTs are being licensed under the Florida Electrical Power Plant Siting Act.

Operation of the proposed SCCTs will result in airborne emissions. Therefore, a permit is required prior to the beginning of facility construction, per Rule 62-212.300(1)(a), F.A.C. This report, including the required permit application forms and supporting documentation included in the attachments, constitutes SECI's application for authorization to commence construction in accordance with the Florida Department of Environmental Protection (FDEP) permitting rules contained in Chapter 62-212, et. seq., F.A.C.

The existing PCGS is located in an attainment area, is one of the 28 named prevention of significant deterioration (PSD) source categories (i.e., is a fossil fuel-fired steam electric plant of more than 250 million British thermal units per hour [MMBtu/hr] heat input), and has potential emissions of a regulated pollutant in excess of 100 tons per year (tpy). The proposed SCCT project will have potential emissions of one or more PSD pollutants above the PSD significant emissions rate thresholds. Consequently, the SCCT project qualifies as a major modification to an existing major source and is subject to the PSD new source review (NSR) requirements of Section 62-212.400, F.A.C. Therefore, this report and application are also submitted to satisfy the permitting requirements contained in FDEP PSD Section 62-212.400, F.A.C.

The SCCT project is potentially subject to the National Emissions Standards for Hazardous Air Pollutants (NESHAPs) for Stationary Combustion Turbines (40 CFR 63, Subpart YYYY. The SCCT project is not subject to 40 CFR 63, Subpart YYYY, since this regulation only applies to new CTs (i.e., those that commence construction after January 14, 2003) that are located at major sources of hazardous air pollutants (HAPs). The PCGS is a synthetic minor source of HAPs, and therefore 40 CFR 63, Subpart YYYY, is not applicable.

This report is organized as follows:

- Section 1.2 provides an overview and summary of the key regulatory determinations.
- Section 2.0 describes the proposed facility and associated air emissions.
- Section 3.0 describes national and state air quality standards and discusses applicability of NSR procedures to the proposed project.

- Section 4.0 describes the PSD NSR review procedures.
- Section 5.0 provides an analysis of best available control technology (BACT).
- Sections 6.0 (Dispersion Modeling Methodology) and 7.0 (Dispersion Modeling Results) address ambient air quality impacts.
- Section 8.0 discusses current ambient air quality in the vicinity of the project and preconstruction ambient air quality monitoring.
- Section 9.0 addresses other potential air quality impact analyses.
- Section 10.0 provides an assessment of impacts on the Chassahowitzka National Wildlife Refuge (NWR) Class I area.
- Section 11.0 lists the references used in preparing the report.

Attachments A through E provide the FDEP Application for Air Permit—Long Form, CT vendor emissions data, control system vendor quote, emissions rate calculations, and tables of prior national BACT determinations, respectively. All dispersion modeling input files for the ambient impact analyses are provided in CD-ROM format in Attachment F.

1.2 SUMMARY

The SCCT project will consist of five nominal 62-MW, simple-cycle P&W FT8-3 Twin Pac units. Each P&W FT8-3 Twin Pac unit consists of two SCCTs coupled to one common generator. Accordingly, there will be a total of 10 SCCTs and five generators. The SCCTs will be fired with pipeline-quality natural gas containing no more than 2.0 grains of total sulfur per one hundred standard cubic feet (gr S/100 scf). Low sulfur (containing no more than 0.05 weight percent sulfur [wt%S]) distillate fuel oil will serve as a backup fuel source.

The planned construction start date for the SCCT project is the third quarter of 2005. The projected date for the facility to begin commercial operation is December 2006, following initial equipment start-up and completion of required performance testing.

Based on an evaluation of anticipated worst-case annual operating scenarios, the SCCT project will have the potential to emit 448.0 tpy of NO_x, 87.8 tpy of CO, 47.5 tpy of particulate matter (PM)/particulate matter less than or equal to 10 micrometers aerodynamic diameter (PM_{10}), 54.7 tpy of sulfur dioxide (SO_2), and 33.8 tpy of volatile organic compounds (VOCs). Regarding noncriteria pollutants, the SCCT project will potentially emit 6.3 tpy of sulfuric acid (H_2SO_4) mist and trace amounts of heavy metals and organic compounds associated with distillate fuel oil combustion. Based on these annual emissions rate potentials, NO_x, PM/PM_{10}, and SO_2 emissions are subject to PSD review.

As presented in this report, the analyses required for this permit application resulted in the following conclusions:

- The use of good combustion practices and clean fuels is considered to be BACT for PM_{10}. The SCCTs will utilize the latest burner technologies to maximize combustion efficiency and minimize PM_{10} emissions rates and will be fired with pipeline-quality natural gas (primary fuel) and low-sulfur, low-ash distillate fuel oil (backup fuel).
- BACT for SO_2 will be achieved through the use of low-sulfur, pipeline-quality natural gas and distillate fuel oil containing no more than 0.05 wt%S. The cost effectiveness of combusting ultra-low sulfur distillate fuel oil (i.e., distillate fuel oil containing no more than 0.0015 wt%S) was determined to be $15,231 per ton of SO_2. Because this cost exceeds values previously determined by FDEP to be cost effective, use of ultra-low sulfur distillate fuel oil is considered economically unreasonable.
- Water injection technology is proposed as BACT for NO_x for the SCCTs during both natural gas and distillate fuel oil firing. For all normal operating loads, SCCT NO_x exhaust concentrations will not exceed 25 and 42 parts per million by dry volume (ppmvd), corrected to 15-percent oxygen for natural gas and oil firing, respectively. These concentrations are consistent with prior BACT determinations for simple-cycle aeroderivative CTs in peaking service. Cost effectiveness of a high temperature selective catalytic reduction (SCR) control system was determined to be $16,052 per ton of NO_x. Because this cost exceeds values previously determined by FDEP to be cost effective, installation of a high temperature SCR control system is considered economically unreasonable.

- The SCCT project is projected to emit NO_x, PM/PM_{10}, and SO_2 in greater than significant amounts. The ambient impact analysis demonstrates that project impacts will be below the PSD *de minimis* monitoring significance levels for these pollutants. Accordingly, the SCCT project qualifies for the Section 62-212.400, Table 212.400-3, F.A.C., exemption from PSD preconstruction ambient air quality monitoring requirements for all PSD pollutants.
- The ambient impact analysis demonstrates that project impacts for the pollutants emitted in significant amounts will be below the PSD significant impact levels defined in Rule 62-210.200(260), F.A.C. Accordingly, a multisource interactive assessment of national ambient air quality standards (NAAQS) attainment and PSD Class II increment consumption was not required.
- The ambient impact analysis demonstrates that project impacts for the pollutants emitted in significant amounts will be below the U.S. Environmental Protection Agency (EPA)-defined PSD Class I significant impact levels. Accordingly, a multisource interactive assessment of PSD Class I increment consumption was not required.
- Based on refined dispersion modeling, the SCCT project will not cause nor contribute to a violation of any NAAQS, Florida ambient air quality standards (AAQS), or PSD increment for Class I or Class II areas.
- The ambient impact analysis also demonstrates that SCCT project impacts will be well below levels detrimental to soils and vegetation and will not impair visibility.
- The nearest PSD Class I area (Chassahowitzka NWR) is located approximately 130 kilometers (km) northwest of the project site. The ambient impact analysis demonstrates that the SCCT project will have no adverse visibility and deposition impacts on this Class I area.

2.0 DESCRIPTION OF THE PROPOSED FACILITY

2.1 PROJECT DESCRIPTION, AREA MAP, AND PLOT PLAN

The proposed new, SCCT project will be located at the existing SECI PCGS. The PCGS is situated approximately 9 miles northwest of Wauchula in northwestern Hardee County, Florida. Figure 2-1 provides portions of a U.S. Geological Survey (USGS) topographical map showing the PCGS site location, property boundaries, and nearby prominent geographical features.

The proposed SCCT project consists of five P&W FT8-3 Twin Pac aeroderivative CT units. Each P&W FT8-3 Twin Pac unit consists of two SCCTs coupled to one common generator having a nominal generation capacity of 62 MW. Total SCCT project nominal generation capacity is 310 MW. The P&W FT8-3 SCCTs will be fired primarily with pipeline-quality natural gas. Low-sulfur distillate fuel oil will serve as a backup fuel source.

The new SCCTs will operate in peaking service for no more than 2,500 hr/yr per SCCT, including no more than 500 hr/yr per SCCT of oil firing. Accordingly, maximum natural gas-firing annual hours at rated load will range from 2,500 hr/yr (with no oil firing) to 2,000 hr/yr (with 500 hr/yr of oil firing). The SCCTs will normally operate between 50- and 100-percent load for both natural gas and oil firing.

Combustion of natural gas and distillate fuel oil in the SCCTs will result in emissions of PM/PM_{10}, SO_2, NO_x, CO, VOCs, H_2SO_4 mist, and minor amounts of HAPs. Emissions control systems proposed for the SCCTs include the use of water injection for control of NO_x; oxidation catalyst for abatement of CO and VOCs; and use of clean, low-sulfur, low-ash natural gas and distillate fuel oil to minimize PM/PM_{10}, SO_2, and H_2SO_4 mist emissions.

Figure 2-2 provides a site plan showing the existing combined-cycle units and major facility structures, and the new SCCT emissions points. Primary access to the PCGS is

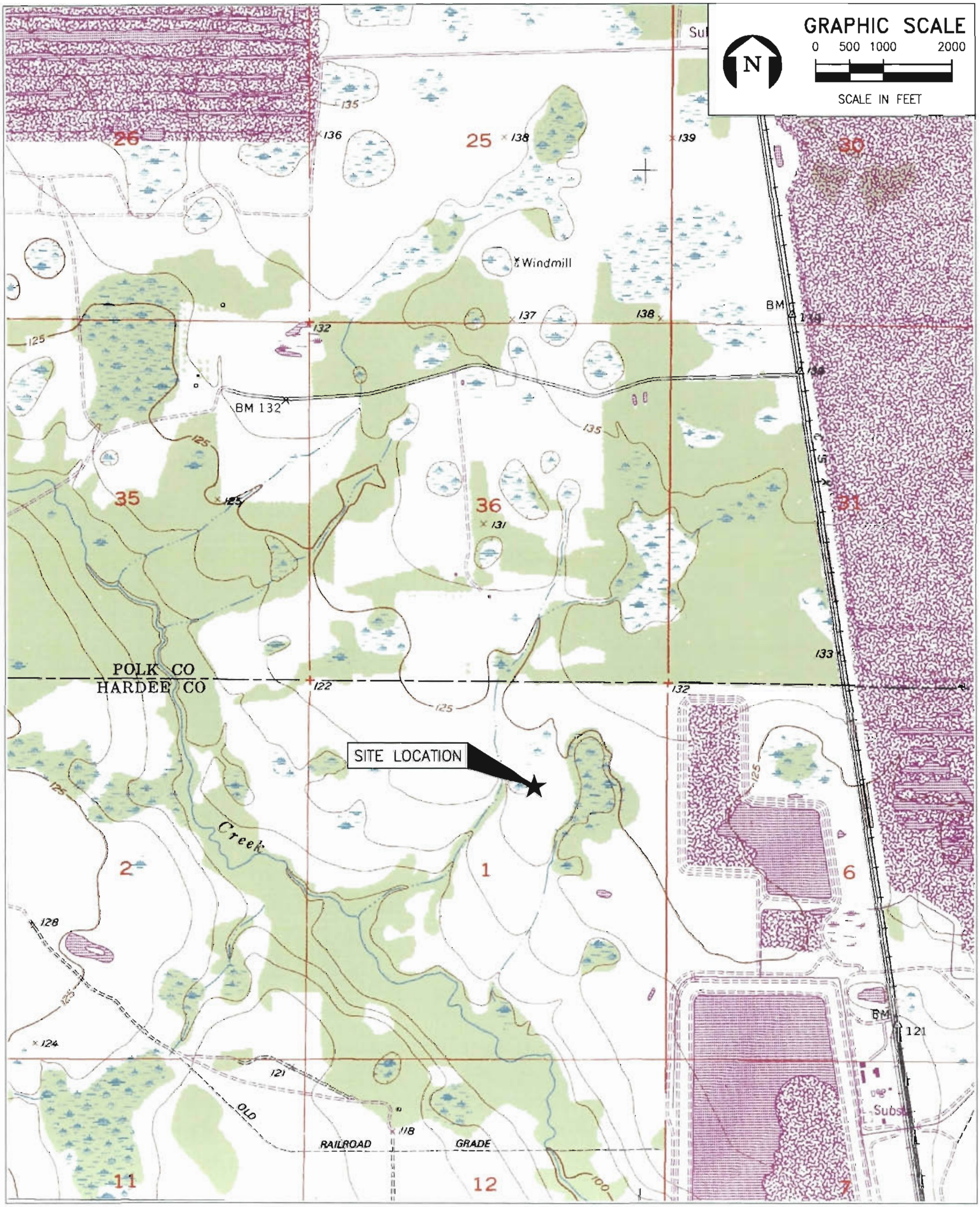

FIGURE 2-1.

SITE LOCATION MAP

Sources: USGS Quad: Baird, FL, 1987; ECT, 2004.

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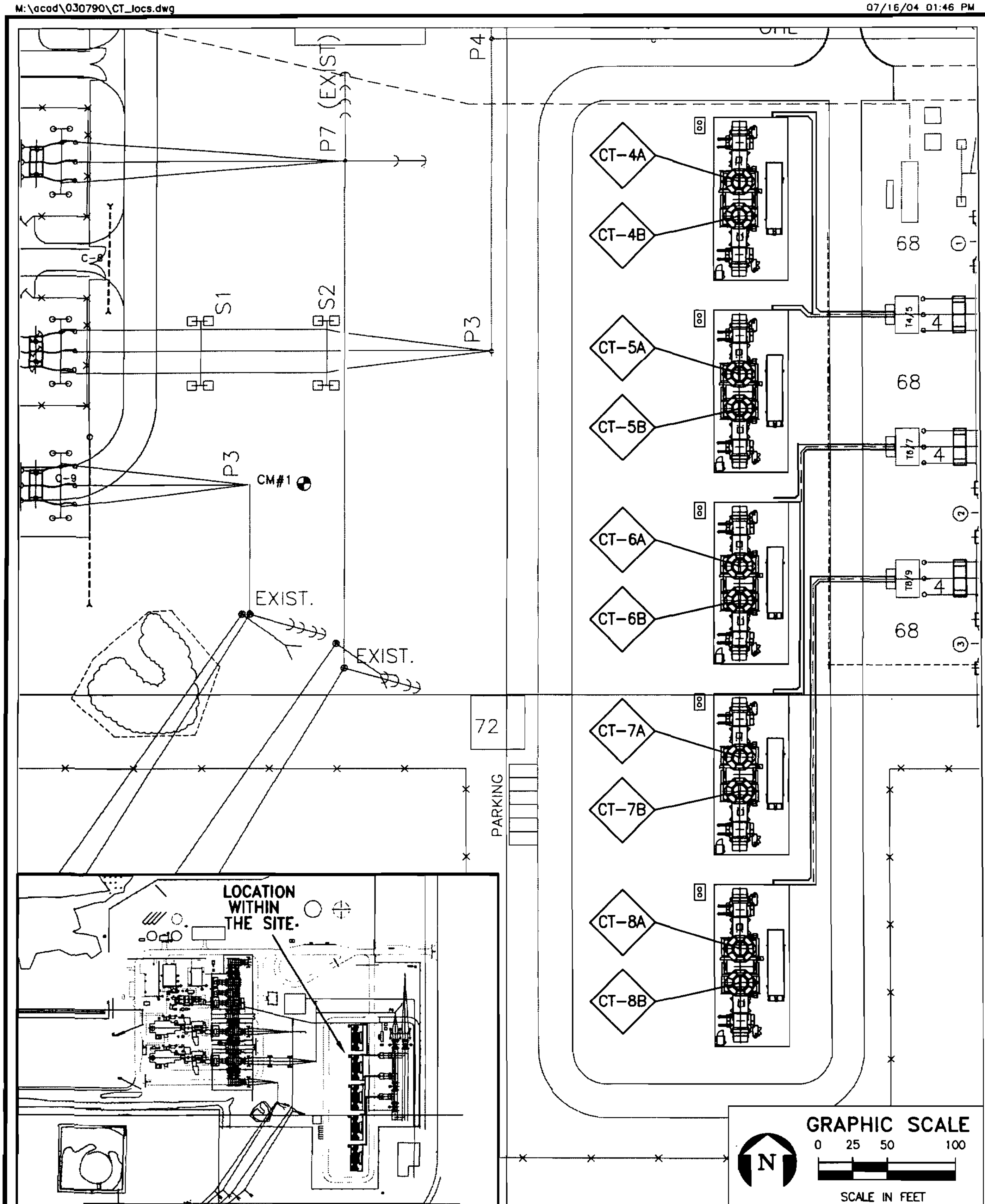

FIGURE 2-2.

PCGS SITE

Sources: Seminole Electric, 2004; ECT, 2004.

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from CR 663 on the east side of the site. The PCGS entrance has security to control site access.

2.2 PROCESS DESCRIPTION AND PROCESS FLOW DIAGRAM

The proposed SCCT project will include five nominal 62-MW P&W FT8-3 Twin-Pac units. Figure 2-3 presents a process flow diagram of the SCCT project.

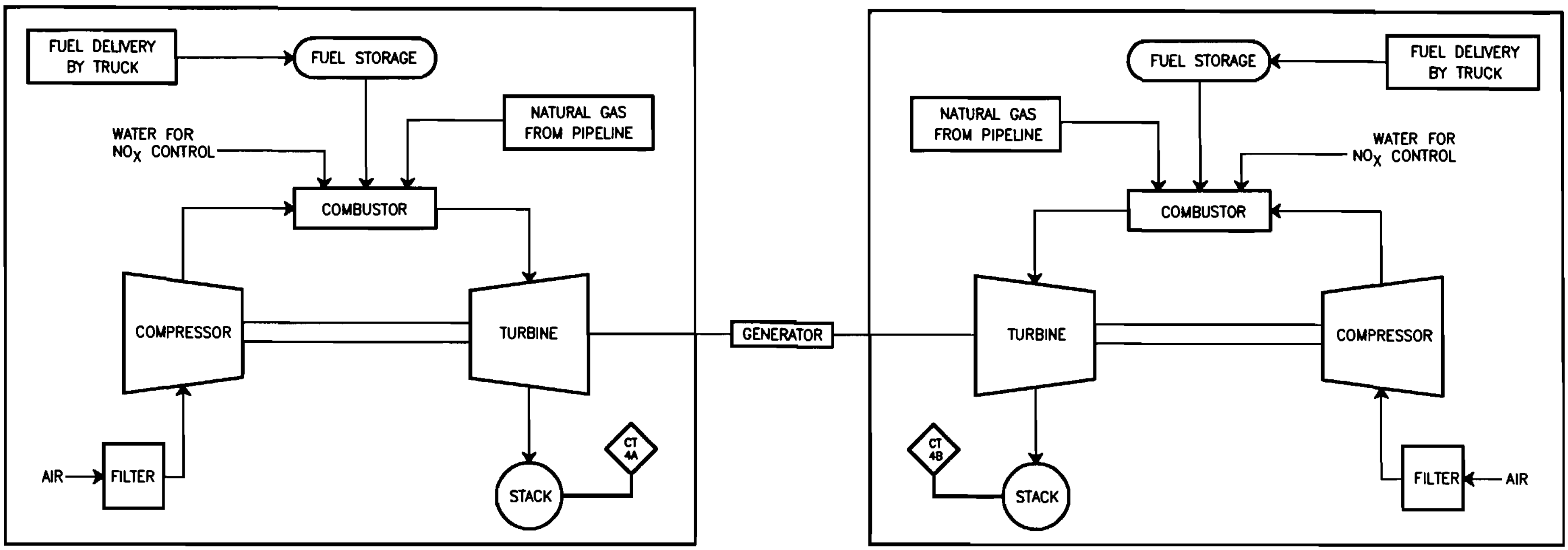
CTs are heat engines that convert latent fuel energy into work using compressed hot gas as the working medium. CTs deliver mechanical output by means of a rotating shaft used to drive an electrical generator, thereby converting a portion of the engine's mechanical output to electrical energy. Ambient air is first filtered and then compressed by the CT compressor. The CT compressor increases the pressure of the combustion air stream and also raises its temperature. The compressed combustion air is then combined with natural gas fuel or distillate fuel oil and burned in the CT's high-pressure combustors to produce hot exhaust gases. These high-pressure, hot gases expand and turn the CT's turbine to produce rotary shaft power, which is used to drive an electric generator as well as the CT combustion air compressor.

Normal operation is expected to consist of the SCCTs operating at rated load firing natural gas. Alternate operating modes include reduced load (i.e., between 50 and 100 percent of rated load) operation depending on power demands and distillate fuel oil firing. As noted previously, the SCCTs will operate in peaking service for no more than 2,500 hr/yr per SCCT, including no more than 500 hr/yr per SCCT of oil firing.

The aeroderivative SCCTs will utilize water injection to control NO_x air emissions. The use of low-sulfur natural gas and distillate fuel oil in the SCCTs will minimize PM/PM_{10}, SO_2, and H_2SO_4 mist air emissions. Oxidation catalyst will be employed to control CO and VOC emissions.

2.3 EMISSION AND STACK PARAMETERS

Tables 2-1 and 2-2 provide maximum hourly criteria pollutant SCCT emissions rates for natural gas and distillate fuel oil firing, respectively. Table 2-3 summarizes maximum



SIMPLE CYCLE COMBUSTION TURBINE TWIN PAC

SIMPLE CYCLE COMBUSTION TURBINE TWIN PAC

FIGURE 2-3.

PCGS—SCCT PROCESS FLOW DIAGRAM

Source: ECT, 2004.

Seminole Electric Cooperative, Inc.

Table 2-1. Maximum Criteria Pollutant Emissions Rates for Three Unit Loads and Three Temperatures—Natural Gas (per SCCT)

Unit Load (%)	Ambient Temperature (°F)	PM/PM_{10}		SO_2		NO_x		CO		VOCs		Lead	
		lb/hr	g/s	lb/hr	g/s	lb/hr	ppmvd†	lb/hr	ppmvd†	lb/hr	ppmvd†	lb/hr	g/s
100	32	3.0	0.38	1.8	0.22	31.7	25	9.2	12	2.6	6	Neg.	Neg.
	50	3.0	0.38	1.8	0.23	32.0	25	7.0	9	2.7	6	Neg.	Neg.
	95	3.0	0.38	1.6	0.20	28.8	25	6.3	9	2.4	6	Neg.	Neg.
80	32	3.0	0.38	1.5	0.18	25.8	25	12.2	20	4.8	13	Neg.	Neg.
	50	3.0	0.38	1.5	0.18	26.1	25	9.8	16	3.2	9	Neg.	Neg.
	95	3.0	0.38	1.4	0.17	24.0	25	7.0	12	2.0	6	Neg.	Neg.
50	32	3.0	0.38	1.0	0.12	17.7	25	12.2	29	8.3	34	Neg.	Neg.
	50	3.0	0.38	1.0	0.12	18.1	25	9.8	22	4.4	17	Neg.	Neg.
	95	3.0	0.38	1.0	0.12	16.9	25	8.6	21	3.6	15	Neg.	Neg.

Note: Neg. = negligible.
g/s = gram per second.

*As measured by EPA References Methods 5 or 17.
†Corrected to 15-percent oxygen.

Sources: P&W, 2003.
ECT, 2004.

Table 2-2. Maximum Criteria Pollutant Emissions Rates for Three Unit Loads and Three Temperatures—Distillate Fuel Oil (per SCCT)

Unit Load (%)	Ambient Temperature (°F)	PM/PM_{10}		SO_2		NO_x		CO		VOCs		Lead	
		lb/hr	g/s	lb/hr	g/s	lb/hr	ppmvd†	lb/hr	ppmvd†	lb/hr	ppmvd†	lb/hr	g/s
100	32	7.0	0.88	14.3	1.80	49.7	42	2.0	3	2.1	5	Neg.	Neg.
	78	7.0	0.88	14.7	1.85	51.2	42	1.3	2	2.1	5	Neg.	Neg.
	95	7.0	0.88	14.0	1.76	48.7	42	1.3	2	2.0	5	Neg.	Neg.
80	32	7.0	0.88	11.8	1.49	41.2	42	2.3	4	1.9	6	Neg.	Neg.
	78	7.0	0.88	12.2	1.54	42.5	42	1.6	2	1.8	5	Neg.	Neg.
	95	7.0	0.88	11.6	1.47	40.6	42	1.4	2	1.7	5	Neg.	Neg.
50	32	7.0	0.88	8.4	1.06	29.2	42	2.9	7	4.6	19	Neg.	Neg.
	78	7.0	0.88	8.5	1.08	29.7	42	2.0	5	2.0	8	Neg.	Neg.
	95	7.0	0.88	8.2	1.03	28.6	42	1.8	4	1.6	7	Neg.	Neg.

Note: Neg. = negligible.
g/s = gram per second.

*As measured by EPA References Methods 5 or 17.
†Corrected to 15-percent oxygen.

Sources: P&W, 2003.
ECT, 2004.

Table 2-3. Maximum H_2SO_4 Mist Pollutant Emissions Rates for Three Loads and Three Ambient Temperatures (per SCCT)

Unit Load (%)	Ambient Temperature (°F)	Natural Gas H_2SO_4 Mist		Distillate Fuel Oil H_2SO_4 Mist	
		lb/hr	g/s	lb/hr	g/s
100	32	0.20	0.026	1.64	0.206
	50	0.21	0.026	—	—
	78	—	—	1.69	0.212
	95	0.19	0.023	1.60	0.670
80	32	0.17	0.021	1.36	0.171
	50	0.17	0.021	—	—
	78	—	—	1.40	0.176
	95	0.16	0.020	1.34	0.168
50	32	0.11	0.014	0.96	0.122
	50	0.12	0.015	—	—
	78	—	—	0.98	0.124
	95	0.11	0.014	0.94	0.119

Sources: P&W, 2003
ECT, 2004.

hourly H_2SO_4 mist emissions rates for natural gas and distillate fuel oil firing. Tables 2-4 and 2-5 provide maximum hourly noncriteria pollutant rates for natural gas and distillate fuel oil firing, respectively. The highest hourly emissions rates for each pollutant are prescribed, taking into account load and ambient temperature to develop maximum hourly emissions estimates for each CT. Noncriteria pollutants consist primarily of trace amounts of organic and inorganic compounds associated with the combustion of distillate fuel oil.

Maximum hourly emissions rates for all pollutants, in units of pounds per hour (lb/hr), are projected to occur for CT operations at low ambient temperature (i.e., 32 degrees Fahrenheit [°F]), rated load, and fuel oil firing. Attachment D provides the bases for these emissions rates.

Table 2-6 presents projected maximum annualized criteria and noncriteria emissions for the SCCT project. Two annual operating profiles were assessed. The first assumes rated load operation with natural gas firing for 2,500 hr/yr at an ambient temperature of 50°F. The second annual profile assumes rated load operation for 2,000 hr/yr (natural gas firing), rated load operation for 500 hr/yr (fuel oil firing), and ambient temperatures of 50°F (natural gas-firing) and 78°F (distillate fuel oil firing). Table 2-6 shows the highest annual emissions rates for either profile.

Tables 2-7 and 2-8 provide stack parameters for the SCCTs for natural gas and distillate fuel oil firing, respectively.

Table 2-4. Maximum Noncriteria Pollutant Emissions Rates for 100 Percent and 50°F Ambient Temperature—Natural Gas (per SCCT)

Unit Load (%)	Ambient Temperature (°F)	lb/hr	g/s	lb/hr	g/s	lb/hr	g/s	lb/hr	g/s	lb/hr	g/s	lb/hr	g/s
		1,3-Butadiene		Acetaldehyde		Acrolein		Arsenic		Benzene		Beryllium	
100	50	9.56E-05	1.21E-05	8.90E-03	1.12E-03	1.42E-03	1.79E-04	6.23E-05	7.85E-06	2.67E-03	3.36E-04	3.74E-06	4.71E-07
		Cadmium		Chromium		Ethylbenzene		Formaldehyde		Lead		Manganese	
100	50	3.43E-04	4.32E-05	4.36E-04	5.50E-05	7.12E-03	8.97E-04	1.58E-01	1.99E-02	1.56E-04	1.96E-05	1.18E-04	1.49E-05
		Mercury		Naphthalene		Nickel		PAH		Propylene Oxide		Selenium	
100	50	8.10E-05	1.02E-05	2.89E-04	3.64E-05	6.54E-04	8.24E-05	4.89E-04	6.17E-05	6.45E-03	8.13E-04	7.48E-06	9.42E-07
		Toluene		Xylene									
100	50	2.89E-02	3.64E-03	1.42E-02	1.79E-03								

Note: PAH = polycyclic aromatic hydrocarbon.
g/s = gram per second.

Source: ECT, 2004.

Table 2-5. Maximum Noncriteria Pollutant Emissions Rates for 100 Percent and 78°F Ambient Temperature—Distillate Fuel Oil (per SCCT)

Unit Load (%)	Ambient Temperature (°F)	lb/hr	g/s	lb/hr	g/s	lb/hr	g/s	lb/hr	g/s	lb/hr	g/s	lb/hr	g/s
		1,3-Butadiene		Acetaldehyde		Acrolein		Arsenic		Benzene		Beryllium	
100	78	9.56E-05	1.21E-05	—	—	—	—	3.17E-03	4.00E-04	1.11E-02	1.40E-03	8.94E-05	1.13E-05
		Cadmium		Chromium		Ethylbenzene		Formaldehyde		Lead		Manganese	
100	78	3.43E-04	4.32E-05	3.17E-03	4.00E-04	—	—	5.65E-02	7.12E-03	4.04E-03	5.09E-04	2.28E-01	2.87E-02
		Mercury		Naphthalene		Nickel		PAH		Propylene Oxide		Selenium	
100	78	3.46E-04	4.36E-05	7.07E-03	8.90E-04	1.33E-03	1.67E-04	8.08E-03	1.02E-03	—	—	7.21E-03	9.08E-04
		Toluene		Xylene									
100	78	—	—	—	—								

Note: PAH = polycyclic aromatic hydrocarbon.
g/s = gram per second.

Source: ECT, 2004.

Table 2-6. Maximum Annualized Emissions Rates (tpy)

Pollutant	SCCTs (10 CTs)
NO_x	448.0
CO	87.8
PM/PM_{10}*	47.5
SO_2	54.7
VOC	33.8
H_2SO_4 mist	6.3
1,3-Butadiene	0.0093
Acetaldehyde	0.1112
Acrolein	0.0178
Arsenic	0.0087
Benzene	0.0611
Beryllium	0.0003
Cadmium	0.0077
Chromium	0.0134
Ethylbenzene	0.0890
Formaldehyde	2.1154
Lead	0.0120
Manganese	0.5711
Mercury	0.0019
Naphthalene	0.0213
Nickel	0.0115
PAHs	0.0263
Propylene oxide	0.0806
Selenium	0.0181
Toluene	0.3615
Xylene	0.1779
Total HAPs	3.7162

*Filterable particulate.

Sources: P&W, 2003.
SECI, 2004.
ECT, 2004.

Table 2-7. Stack Parameters for Three Unit Loads and Three Ambient Temperatures—Natural Gas (per SCCT)

Unit Load (%)	Ambient Temperature (°F)	Stack Height		Stack Exit Temperature		Stack Exit Velocity		Stack Diameter	
		ft	meters	°F	K	ft/sec	m/sec	ft	meters
100	32	60	18.3	853	729	99.8	30.4	9.5	2.90
	50	60	18.3	891	750	100.9	30.7	9.5	2.90
	95	60	18.3	935	775	94.6	28.8	9.5	2.90
80	32	60	18.3	783	690	86.7	26.4	9.5	2.90
	50	60	18.3	823	713	87.6	26.7	9.5	2.90
	95	60	18.3	899	755	83.2	25.4	9.5	2.90
50	32	60	18.3	721	656	66.3	20.2	9.5	2.90
	50	60	18.3	763	679	68.3	20.8	9.5	2.90
	95	60	18.3	841	723	65.2	19.9	9.5	2.90

Note: K = Kelvin.
ft/sec = foot per second.
m/sec = meter per second.

Sources: P&W, 2003.
ECT, 2004.

Table 2-8. Stack Parameters for Three Unit Loads and Three Ambient Temperatures—Distillate Fuel Oil (Per Simple Cycle CT)

Unit Load (%)	Ambient Temperature (°F)	Stack Height		Stack Exit Temperature		Stack Exit Velocity		Stack Diameter	
		ft	meters	°F	K	ft/sec	m/sec	ft	meters
100	32	60	18.3	818	710	92.8	28.3	9.5	2.90
	78	60	18.3	918	765	95.4	29.1	9.5	2.90
	95	60	18.3	940	778	92.3	28.1	9.5	2.90
80	32	60	18.3	778	688	81.6	24.9	9.5	2.90
	78	60	18.3	878	743	83.7	25.5	9.5	2.90
	95	60	18.3	904	758	81.3	24.8	9.5	2.90
50	32	60	18.3	725	658	64.5	19.7	9.5	2.90
	78	60	18.3	820	711	65.6	20.0	9.5	2.90
	95	60	18.3	848	726	63.9	19.5	9.5	2.90

Sources: ECT, 2004.
P&W, 2003.

3.0 AIR QUALITY STANDARDS AND NEW SOURCE REVIEW APPLICABILITY

3.1 NATIONAL AND STATE AAQS

As a result of the 1977 Clean Air Act (CAA) Amendments, EPA has enacted primary and secondary NAAQS for six air pollutants (40 CFR 50). Primary NAAQS are intended to protect the public health, and secondary NAAQS are intended to protect the public welfare from any known or anticipated adverse effects associated with the presence of pollutants in the ambient air. Florida has also adopted AAQS (reference Section 62-204.240, F.A.C.). Table 3-1 presents the current national and Florida AAQS.

Areas of the country in violation of AAQS are designated as nonattainment areas, and new sources to be located in or near these areas may be subject to more stringent air permitting requirements. The PCGS is located in Hardee County approximately 14.5 km northwest of Wauchula. Hardee County is presently designated in 40 CFR 81.310 as better than national standards (for total suspended particulates [TSPs] and SO_2), unclassifiable/attainment (for CO and 1-hour ozone), unclassifiable or better than national standards (for nitrogen dioxide [NO_2]), and not designated (for lead). Hardee County is designated attainment (for 1-hour ozone, SO_2, CO, and NO_2) and unclassifiable (for PM_{10} and lead) by Section 62-204.340, F.A.C.

On April 30, 2004 EPA issued final designations for the new 8-hour ozone NAAQS. For Florida, 40 CFR 81.310 was revised to designate all areas of the state, including Hardee County, as unclassifiable/attainment for the 8-hour ozone NAAQS.

3.2 NONATTAINMENT NSR APPLICABILITY

The SCCT project will be located in Hardee County. As previously noted, Hardee County is presently designated as either better than national standards or unclassifiable/attainment for all criteria pollutants. Accordingly, the SCCT project is not subject to the nonattainment NSR requirements of Section 62-212.500, F.A.C.

Table 3-1. NAAQS and Florida AAQS (micrograms per cubic meter [$\mu g/m^3$] unless otherwise stated)

Pollutant	Averaging	National Standards		Florida
(units)	Periods	Primary	Secondary	Standards
SO_2	3-hour[1]		0.5	0.5
(ppmv)	24-hour[1]	0.14		0.1
	Annual[2]	0.03		0.02
SO_2	3-hour[1]			1,300
	24-hour[1]			260
	Annual[2]			60
PM_{10}	24-hour[3]	150	150	150
	Annual[4]	50	50	50
$PM_{2.5}$	24-hour[5]	65	65	
	Annual[6]	15	15	
CO	1-hour[1]	35		35
(ppmv)	8-hour[1]	9		9
CO	1-hour[1]			40,000
	8-hour[1]			10,000
Ozone	1-hour[7]			0.12
(ppmv)	8-hour[8]	0.08	0.08	
NO_2 (ppmv)	Annual[2]	0.053	0.053	0.05
NO_2	Annual[2]			100
Lead	Calendar quarter arithmetic mean	1.5	1.5	1.5

[1]Not to be exceeded more than once per calendar year.

[2]Arithmetic mean.

[3]The standards are attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$, as determined in accordance with 40 CFR 50 Appendix K, is equal to or less than one.

[4]The standards are attained when the expected annual arithmetic mean concentration, as determined in accordance with 40 CFR 50 Appendix K, is less than or equal to 50 $\mu g/m^3$.

[5]98th percentile concentration, as determined in accordance with 40 CFR 50 Appendix N.

[6]Arithmetic mean concentration, as determined in accordance with 40 CFR 50 Appendix N.

[7]Standard attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than 1, as determined by 40 CFR 50, Appendix H. The 1-hour ozone standard will be revoked on June 15, 2005, one year following the effective date of the 8-hour ozone standard designations.

[8]Standard attained when the average of the annual 4th highest daily maximum 8-hour average concentration is less than or equal to the standard, as determined by 40 CFR 50, Appendix I.

Sources: 40 CFR 50.
Section 62-204.240, F.A.C.

3.3 PSD NSR APPLICABILITY

The existing PCGS is classified as a *major facility*. A modification to a major facility that has potential net emissions equal to or exceeding the significant emissions rates indicated in Section 62-212.400, Table 212.400-2, F.A.C., is subject to PSD NSR.

The proposed new SCCTs will have potential emissions in excess of the significant emissions rate thresholds. Therefore, the SCCT project qualifies as a major modification to an existing major facility and is subject to the PSD NSR requirements of Section 62-212.400, F.A.C., for those pollutants that are emitted at or above the specified PSD significant emissions rate levels. Table 3-2 provides comparisons of estimated potential annual emissions rates for the SCCTs and the PSD significant emissions rate thresholds. As shown in this table, potential emissions of NO_x, PM, PM_{10}, and SO_2 are each projected to exceed the applicable PSD significant emissions rate level. These pollutants are, therefore, subject to the PSD NSR requirements of Section 62-212.400, F.A.C. Attachment D provides detailed emissions rate estimates for the SCCT project.

Table 3-2. Projected Emissions Compared to PSD Significant Emissions Rates

Pollutant	Projected Maximum Annual Emissions (tpy)	PSD Significant Emission Rate (tpy)	PSD Applicability
NO_x	448.0	40	Yes
CO	87.8	100	No
PM	47.5	25	Yes
PM_{10}	47.5	15	Yes
SO_2	54.7	40	Yes
Ozone/VOCs	33.8	40	No
Lead	0.01	0.6	No
Mercury	Negligible	0.1	No
Total fluorides	Not present	3	No
H_2SO_4 mist	6.3	7	No
Total reduced sulfur (including hydrogen sulfide)	Not present	10	No
Reduced sulfur compounds (including hydrogen sulfide)	Not present	10	No
Municipal waste combustor acid gases (measured as SO_2 and hydrogen chloride)	Not present	40	No
Municipal waste combustor metals (measured as PM)	Not present	15	No
Municipal waste combustor organics (measured as total tetra- through octa-chlorinated dibenzo-p-dioxins and dibenzofurans)	Not present	3.5 H 10^{-6}	No

Sources: Section 62-212.400, Table 212.400-2, F.A.C.
ECT, 2004.

4.0 PSD NSR REQUIREMENTS

4.1 CONTROL TECHNOLOGY REVIEW

Pursuant to Rule 62-212.400(5)(c), F.A.C., an analysis of BACT is required for each pollutant emitted by the proposed SCCT project in amounts equal to or greater than the PSD significant emissions rate levels. As defined by Rule 62-210.200(38), F.A.C., BACT is:

> "an emissions limitation, including a visible emissions standard, based on the maximum degree of reduction of each pollutant emitted which the Department, on a case by case basis, taking into account energy, environmental, and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems and techniques (including fuel cleaning or treatment or innovative fuel combustion techniques) for control of each such pollutant. If the Department determines that technological or economic limitations on the application of measurement methodology to a particular part of an emissions unit or facility would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard or combination thereof, may be prescribed instead to satisfy the requirement for the application of BACT. Such standard shall, to the degree possible, set forth the emissions reductions achievable by implementation of such design, equipment, work practice or operation. Each BACT determination shall include applicable test methods or shall provide for determining compliance with the standard(s) by means which achieve equivalent results."

BACT determinations are made on a case-by-case basis as part of the FDEP NSR process and apply to each pollutant that exceeds the PSD significant emissions rate thresholds shown in Table 3-2. All emissions units involved in a major modification or a new major source that emit or increase emissions of the applicable pollutants must undergo BACT analysis. Because each applicable pollutant must be analyzed, particular emissions units may undergo BACT analysis for more than one pollutant.

BACT is defined in terms of a numerical emissions limit unless determined to be infeasible. This numerical emissions limit can be based on the application of air pollution control equipment; specific production processes, methods, systems, or techniques; fuel cleaning; or combustion techniques. BACT limitations may not exceed any applicable federal new source performance standard (NSPS) or NESHAPs, or any other emissions limitation established by state regulations.

BACT analyses are conducted using the *top-down* analysis approach, which was outlined in a December 1, 1987, memorandum from Craig Potter, EPA Assistant Administrator, to EPA Regional Administrators on the subject of "improving NSR implementation." Using the top-down methodology, available control technology alternatives are identified based on knowledge of the particular industry of the applicant and previous control technology permitting decisions for other identical or similar sources. These alternatives are rank ordered by stringency into a control technology hierarchy. The hierarchy is evaluated starting with the *top*, or most stringent alternative, to determine economic, environmental, and energy impacts and assess the feasibility or appropriateness of each alternative as BACT based on site-specific factors. If the top control alternative is not applicable or is technically or economically infeasible, it is rejected as BACT, and the next most stringent alternative is then considered. This evaluation process continues until an applicable control alternative is determined to be both technologically and economically feasible, thereby defining the emissions level corresponding to BACT for the pollutant in question emitted from the particular facility under consideration.

4.2 AMBIENT AIR QUALITY MONITORING

In accordance with the PSD requirements of Rule 62-212.400(5)(f), F.A.C., any application for a PSD permit must contain, for each pollutant subject to review, an analysis of ambient air quality data in the area affected by the proposed major stationary source or major modification. The affected pollutants are those that the source would potentially emit in significant amounts (i.e., those that exceed the PSD significant emissions rate thresholds shown in Table 3-2).

Preconstruction ambient air monitoring for a period of up to 1 year generally is appropriate to complete the PSD requirements. Existing data from the vicinity of the proposed source may be used if the data meet certain quality assurance (QA) requirements; otherwise, additional data may need to be gathered. Guidance in designing a PSD monitoring network is provided by EPA's Ambient Monitoring Guidelines for Prevention of Significant Deterioration (1987).

Rule 62-212.400(3)(e), F.A.C., provides an exemption that excludes or limits the pollutants for which an air quality monitoring analysis is conducted. This exemption states that a proposed facility shall be exempt from the monitoring requirements of Rule 62-212.400(5)(f) and (g), F.A.C., with respect to a particular pollutant if the emissions increase of the pollution from the source or modification would cause, in any area, air quality impacts less than the PSD *de minimis* ambient impact levels presented in Section 62-212.400, Table 212.400-3, F.A.C. (see Table 4-1). In addition, an exemption may be granted if the air quality impacts due to existing sources in the area of concern are less than the PSD *de minimis* ambient impact levels.

Applicability of the PSD preconstruction ambient monitoring requirements to the proposed SCCT project is discussed in Section 8.0.

4.3 AMBIENT IMPACT ANALYSIS

An air quality or source impact analysis must be performed for a proposed major source subject to PSD for each pollutant for which the increase in emissions exceeds the significant emissions rates (see Table 3-2). The FDEP rules specifically require the use of applicable EPA atmospheric dispersion models in determining estimates of ambient concentrations (refer to Rule 62-204.220[4], F.A.C.). Guidance for the use and application of dispersion models is presented in the EPA Guideline on Air Quality Models as published in Appendix W to 40 CFR 51. Criteria pollutants may be exempt from the full source impact analysis if the net increase in impacts due to the new source or modification is below the appropriate Rule 62-204.200(29), F.A.C., significant impact level, as presented in Table 4-2. Table 4-3 provides the EPA PSD Class I area significant impact levels.

Ozone is one pollutant for which a source impact analysis is not normally required. Ozone is formed in the atmosphere as a result of complex photochemical reactions. Models for ozone generally are applied to entire urban areas.

Various lengths of record for meteorological data can be used for impact analyses. A 5-year period can be used with corresponding evaluation of the highest of the second-highest short-term concentrations for comparison to AAQS or PSD increments. The term

Table 4-1. PSD *De Minimis* Ambient Impact Levels

Averaging Time	Pollutant	Significance Level ($\mu g/m^3$)
Annual	NO_2	14
Quarterly	Lead	0.1
24-Hour	PM_{10}	10
	SO_2	13
	Mercury	0.25
	Fluorides	0.25
8-Hour	CO	575
1-Hour	Hydrogen sulfide	0.2
N/A	Ozone	100 tpy of VOC emissions

Note: N/A = not applicable.

Source: Section 62-212.400, Table 212.400-3, F.A.C.

Table 4-2. PSD Class II Significant Impact Levels

Pollutant	Averaging Period	Concentration ($\mu g/m^3$)
SO_2	Annual	1
	24-Hour	5
	3-Hour	25
PM_{10}	Annual	1
	24-Hour	5
NO_2	Annual	1
CO	8-Hour	500
	1-Hour	2,000
Lead	Quarterly	0.03

Source: Rule 62-204.200(29), F.A.C.

Table 4-3. PSD Class I Significant Impact Levels

Pollutant	Averaging Period	Concentration ($\mu g/m^3$)
SO_2	Annual	0.1
	24-Hour	0.2
	3-Hour	1.0
PM_{10}	Annual	0.2
	24-Hour	0.3
NO_2	Annual	0.1
CO	8-Hour	N/A
	1-Hour	N/A
Lead	Quarterly	N/A

Note: N/A = not applicable.

Source: EPA, 1998.

highest, second-highest (HSH) refers to the highest of the second-highest concentrations at all receptors (i.e., the highest concentration at each receptor is discarded). The second-highest concentration is significant because short-term PSD increments specify that the standard should not be exceeded at any location more than once per year. If less than 5 years of meteorological data are used, the highest concentration at each receptor must be used.

In promulgating the 1977 CAA Amendments, Congress specified that certain increases above an air quality baseline concentration level for SO_2 and TSP would constitute significant deterioration. The magnitude of the increment that cannot be exceeded depends on the classification of the area in which a new source (or modification) will have an impact. Three classifications were designated based on criteria established in the CAA Amendments. Initially, Congress promulgated areas as Class I (international parks, national wilderness areas, and memorial parks larger than 2,024 hectares [ha] [5,000 acres], and national parks larger than 2,428 ha [6,000 acres]) or Class II (all other areas not designated as Class I). No Class III areas, which would be allowed greater deterioration than Class II areas, were designated. However, the states were given the authority to redesignate any Class II area to Class III status, provided certain requirements were met. EPA then promulgated, as regulations, the requirements for classifications and area designations.

On October 17, 1988, EPA promulgated PSD increments for NO_2; the effective date of the new regulation was October 17, 1989. However, the baseline date for NO_2 increment consumption was set at March 28, 1988, for Florida; new major sources or modifications constructed after this date will consume NO_2 increment.

On June 3, 1993, EPA promulgated PSD increments for PM_{10}; the effective date of the new regulation was June 3, 1994. The increments for PM_{10} replace the original PM increments, which were based on TSP. Baseline dates and areas that were previously established for the original TSP increments remain in effect for the new PM_{10} increments. Revised NAAQS for PM, which includes a revised NAAQS for PM_{10} and a new NAAQS for particulate matter less than or equal to 2.5 micrometers ($PM_{2.5}$), became effective on

September 16, 1997. In May 1999, the Supreme Court vacated EPA's 1997 PM_{10} NAAQS. EPA plans to propose a revised PM_{10} NAAQS in April 2005 with a final rule expected by December 2005. Accordingly, the pre-1997 PM_{10} NAAQS remain in effect.

In a March 26, 2002, decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld the $PM_{2.5}$ NAAQS. In addition, due to the significant technical difficulties that exist with respect to $PM_{2.5}$ monitoring, emissions estimation, and modeling, EPA has determined that implementation of PSD permitting for $PM_{2.5}$ is administratively impracticable at this time for State permitting authorities. Accordingly, EPA has advised that PM_{10} may be used as a surrogate for $PM_{2.5}$ in meeting NSR requirements until these difficulties are resolved.

Current Florida PSD allowable increments are specified in Section 62-204.260, F.A.C., and shown on Table 4-4.

The term baseline concentration evolved from federal and state PSD regulations and denotes a concentration level corresponding to a specified baseline date and certain additional baseline sources. By definition in the PSD regulations, as amended, baseline concentration means the ambient concentration level that exists in the baseline area at the time of the applicable minor source baseline date. A baseline concentration is determined for each pollutant for which a baseline date is established based on:

- The actual emissions representative of sources in existence on the applicable minor source baseline date.
- The allowable emissions of major stationary sources that commenced construction before the major source baseline date but were not in operation by the applicable minor source baseline date.

The following will not be included in the baseline concentration and will affect the applicable maximum allowable increase(s) (i.e., allowed increment consumption):

- Actual emissions from any major stationary source on which construction commenced after the major source baseline date.

Table 4-4. PSD Allowable Increments ($\mu g/m^3$)

Pollutant	Averaging Time	Class I	Class II	Class III
PM_{10}	Annual arithmetic mean	4	17	34
	24-Hour maximum*	8	30	60
SO_2	Annual arithmetic mean	2	20	40
	24-Hour maximum*	5	91	182
	3-Hour maximum*	25	512	700
NO_2	Annual arithmetic mean	2.5	25	50

*Maximum concentration not to be exceeded more than once per year at any one location.

Source: Section 62-204.260, F.A.C.

- Actual emissions increases and decreases at any stationary source occurring after the minor source baseline date.

It is not necessary to make a determination of the baseline concentration to determine the amount of PSD increment consumed. Instead, increment consumption calculations need only reflect the ambient pollutant concentration change attributable to emissions sources that affect increment. *Major* source baseline date means January 6, 1975, for PM (TSP/PM_{10}) and SO_2 and February 8, 1988, for NO_2. *Minor* source baseline date means the earliest date after the trigger date, on which the first complete application was submitted by a major stationary source or major modification subject to the requirements of 40 CFR 52.21 or Section 62-212.400, F.A.C. The trigger dates are August 7, 1977, for PM (TSP/PM_{10}) and SO_2 and February 8, 1988, for NO_2. Per Section 62-204.360, F.A.C., the minor source baseline dates for Florida are December 27, 1977 (for PM/PM_{10} and SO_2), and March 28, 1988 (for NO_2).

The ambient impact analysis for the project is provided in Sections 6.0 (methodology) and 7.0 (results).

4.4 ADDITIONAL IMPACT ANALYSES

Rule 62-212.400(5)(e), F.A.C., requires additional impact analyses for three areas: (1) associated growth, (2) soils and vegetation impact, and (3) visibility impairment. The level of analysis for each area should be commensurate with the scope of the project under review. A more extensive analysis would be conducted for projects having large emissions increases than those that will cause a small increase in emissions.

The growth analysis generally includes:

- A projection of the associated industrial, commercial, and residential growth that will occur in the area.
- An estimate of the air pollution emissions generated by the permanent associated growth.

- An air quality analysis based on the associated growth emissions estimates and the emissions expected to be generated directly by the new source or modification.

The soils and vegetation analysis is typically conducted by comparing projected ambient concentrations for the pollutants of concern with applicable susceptibility data from the air pollution literature. For most types of soils and vegetation, ambient air concentrations of criteria pollutants below the NAAQS will not result in harmful effects. Sensitive vegetation and emissions of toxic air pollutants could necessitate a more extensive assessment of potential adverse effects on soils and vegetation.

The visibility impairment analysis pertains particularly to Class I area impacts and other areas where good visibility is of special concern. A quantitative estimate of visibility impairment is conducted, if warranted by the scope of the project under review.

The additional impact analyses for the SCCT project are provided in Section 9.0.

5.0 BEST AVAILABLE CONTROL TECHNOLOGY ANALYSIS

5.1 METHODOLOGY

BACT analyses were performed in accordance with the EPA top-down method as previously described in Section 4.1. The first step in the top-down BACT procedure is the identification of all available control technologies. Alternatives considered included process designs and operating practices that reduce the formation of emissions, post-process stack controls that reduce emissions after they are formed, and combinations of these two control categories. Sources of information used to identify control alternatives included:

- EPA reasonably available control technology (**R**ACT)/**B**ACT/lowest achievable emissions rate (**L**AER) **C**learinghouse (RBLC) via the RBLC Information System database.
- EPA NSR Web site.
- EPA Control Technology Center (CTC) Web site.
- Recent FDEP BACT determinations for similar facilities.
- Vendor information.
- Environmental Consulting & Technology, Inc. (ECT), experience for similar projects.

Following the identification of available control technologies, the next step in the analysis is to determine which technologies may be technically infeasible. Technical feasibility was evaluated using the criteria contained in Chapter B of the EPA NSR Workshop Manual (EPA, 1990). The third step in the top-down BACT process is the ranking of the remaining technically feasible control technologies from high to low in order of control effectiveness.

An assessment of energy, environmental, and economic impacts is then performed. The economic analysis employed the procedures found in the Office of Air Quality Planning and Standards (OAQPS) Control Cost Manual (EPA, 2002). Tables 5-1 and 5-2 summarize the specific factors used in estimating capital and annual operating costs, respectively.

Table 5-1. Capital and Annual Operating Cost Factors

Cost Item	Factor
Direct Capital Costs (DCC)	
Instrumentation	0.10 × equipment cost
Sales tax	0.07 × equipment cost
Freight	0.05 × equipment cost
Purchased equipment cost (PEC)	Instrumentation + sales tax + freight
Foundations and supports	0.08 × PEC
Handling and erection	0.14 × PEC
Electrical	0.04 × PEC
Piping	0.02 × PEC
Insulation	0.01 × PEC
Painting	0.01 × PEC
Indirect Capital Costs (IIC)	
General facilities	0.05 × DCC
Engineering and home office fees	0.10 × DCC
Process contingency	0.05 × DCC
Project Contingency (PC)	0.15 × (DCC + IIC)
Total Plant Cost (TPC)	DCC + IIC + PC
Other Costs (OC)	
Preproduction cost	0.02 × TPC
Inventory capital	Initial reagent
Total Capital Investment (TCI)	TPC + OC

Sources: EPA, 2002.
ECT, 2004.

Table 5-2. Annual Operating Cost Factors

Cost Item	Factor
Total Direct Costs (TDC)	
Maintenance labor and materials	0.015 × TCI
Reagent (for SCR control system)	Aqueous ammonia (29.4 weight percent ammonia) \$444 ton delivered, dry ammonia basis
Electricity (for SCR control system)	0.105 × uncontrolled NO_x (lb/hr) × SCR control efficiency (%/100) × hr/yr × power cost (\$/kW-hr)
Catalyst replacement	Catalyst replacement cost × future worth factor
Energy penalty	0.2 percent of CT output per inch of pressure drop
Total Indirect Costs (TIC)	TCI × capital recovery factor
Total Annual Cost (TAC)	TDC + TIC

Sources: EPA, 2002.
ECT, 2004.

The fifth and final step is the selection of a BACT emissions limitation corresponding to the most stringent, technically feasible control technology that was not eliminated based on adverse energy, environmental, or economic grounds.

As indicated in Section 3.3, Table 3-2, projected annual emissions rates of NO_x, SO_2, PM, and PM_{10} for the SCCT project exceed the PSD significance rates and, therefore, are subject to BACT analysis. Control technology analyses using the five-step top-down BACT method are provided in Sections 5.3 and 5.4 for combustion products (PM/PM_{10}) and acid gases (NO_x and SO_2), respectively.

5.2 FEDERAL AND FLORIDA EMISSION STANDARDS

Pursuant to Rule 62-212.400(5)(b), F.A.C., BACT emissions limitations must be no less stringent than any applicable NSPS (40 CFR 60), NESHAPs (40 CFR Parts 61 and 63), and FDEP emissions standards (Chapter 62-296, F.A.C., Stationary Sources—Emissions Standards).

On the federal level, emissions from gas turbines are regulated by NSPS Subpart GG. Subpart GG is applicable to all stationary gas turbines with a heat input at peak load equal to or greater than 10.7 gigajoules per hour (10 MMBtu/hr), based on the lower heating value (LHV) of the fuel fired. Subpart GG establishes emissions limits for gas turbines that were constructed after October 3, 1977, and that meet any of the following criteria:

- Electric utility stationary gas turbines with a heat input at peak load of greater than 100 MMBtu/hr based on the LHV of the fuel.
- Stationary gas turbines with a heat input at peak load between 10 and 100 MMBtu/hr based on the fuel LHV.
- Stationary gas turbines with a manufacturer's rated load at International Standards Organization (ISO) standard day conditions of 30 MW or less.

The electric utility stationary gas turbine NSPS emissions criterion applies to stationary gas turbines that sell more than one-third of their potential electric output to any utility power distribution system. The SCCTs qualify as electric utility stationary gas turbines and, therefore, are subject to the NO_x and SO_2 emissions limitations of NSPS 40 CFR 60, Subpart GG, 60.332(a)(1) and 60.333, respectively.

As new units, the proposed SCCTs are potentially subject to the requirements of 40 CFR 63 NESHAPs/maximum achievable control technology (MACT) Subpart YYYY, NESHAPs for Stationary Combustion Turbines. However, the Part 63 NESHAPs are only applicable to emissions units that are located at major sources of HAPs. The existing PCGS is a synthetic minor source of HAPs due to operational constraints on distillate fuel oil combustion. The addition of the SCCTs will not change this classification (i.e., the PCGS will remain a synthetic minor source of HAPs). In addition, on April 2, 2004, EPA proposed to delist the diffusion flame gas-fired turbine subcategory from the source subcategories presently addressed by Part 63, Subpart YYYY, and has stayed the effectiveness of the Subpart YYYY standard for this turbine subcategory until a final decision is made on the delisting proposal. There are no other 40 CFR 61 or 63 NESHAPs that are potentially applicable to the SCCT project.

The SCCTs will be subject to the Acid Rain Program codified in 40 CFR 72. Under this federal regulatory program, the SCCTs will need to obtain SO_2 allowances equal to actual SO_2 emissions rates effective January of the year following commencement of commercial operation. Because the SCCTs will not use coal as a fuel, there are no Acid Rain Program NO_x emissions limits that are applicable. FDEP has adopted the federal Acid Rain Program requirements by reference in Chapter 62-214, Requirements for Sources Subject to the Federal Acid Rain Program.

FDEP emissions standards for stationary sources are contained in Chapter 62-296, F.A.C., Stationary Sources—Emissions Standards. Visible emissions are limited to a maximum of 20-percent opacity pursuant to Rule 62-296.320(4)(b), F.A.C. Sections 62-296.401 through 62-296.417, F.A.C., specify emissions standards for 17 categories of sources. None of these categories are applicable to CTs.

Finally, Section 62-204.800, F.A.C., adopts federal NSPS and NESHAPs, respectively, by reference. As noted previously, NSPS Subpart GG, Stationary Gas Turbines is applicable to the SCCTs. There are no applicable NESHAPs requirements. Tables 5-3 and 5-4 summarize applicable federal and state emissions standards, respectively.

Appendix D provides detailed calculations of NSPS Subpart GG NO_x limitations. BACT emissions limitations proposed for the simpler cycle CTs are all more stringent than the applicable federal and state standards cited in these tables.

5.3 BACT ANALYSIS FOR PM_{10}

PM_{10} emissions resulting from the combustion of natural gas and low-sulfur distillate fuel oil are due to oxidation of ash and sulfur contained in the fuel. Due to their low ash and sulfur contents, natural gas and distillate fuel oil combustion generate inherently low PM_{10} emissions.

5.3.1 POTENTIAL CONTROL TECHNOLOGIES

Available technologies used for controlling PM_{10} include the following:

- Centrifugal collectors.
- Electrostatic precipitators (ESPs).
- Fabric filters or baghouses.
- Wet scrubbers.

Centrifugal (cyclone) separators are primarily used to recover material from an exhaust stream before the stream is ducted to the principal control device since cyclones are effective in removing only large-sized (greater than 10 microns) particles. Particles generated from natural gas and distillate fuel oil combustion are typically less than 1.0 micron in size.

ESPs remove particles from a gas stream through the use of electrical forces. Discharge electrodes apply a negative charge to particles passing through a strong electrical field.

These charged particles then migrate to a collecting electrode having an opposite, or positive, charge. Collected particles are removed from the collecting electrodes by periodic

Table 5-3. Federal Emissions Limitations

NSPS Subpart GG, Stationary Gas Turbines

Pollutant	Emissions Limitation
NO_x	$STD = 0.0075 \times (14.4/Y) + F$

where: STD = allowable NO emissions (percent by volume at 15-percent oxygen and on a dry basis).

Y = manufacturer's rated heat rate in kilojoules per watt hour at manufacturer's rated load, or actual measured heat rate based on LHV of fuel as measured at actual peak load. Y cannot exceed 14.4 kilojoules per watt-hour.

F = NO_x emissions allowance for fuel-bound nitrogen (FNB) per:

FBN (weight percent)	F (NO_x - volume percent)
$N \leq 0.015$	0
$0.015 < N \leq 0.1$	$0.04 \times N$
$0.1 < N \leq 0.25$	$0.004 + 0.0067 \times (N-0.1)$
$N > 0.25$	0.005

where: N = nitrogen content of fuel; percent by weight.

SO2 = $\leq$0.015 percent by volume at 15-percent oxygen and on a dry basis; or fuel sulfur content $\leq$0.8 weight percent.

Source: 40 CFR 60, Subpart GG.

Table 5-4. Florida Emissions Limitations

Pollutant	Emissions Limitation
General Visible Emissions Standard Rule 62-296.320(4)(b)1., F.A.C.	
• Visible emissions	Less than 20-percent opacity (averaged over a 6-minute period)

Source: Chapter 62-296, F.A.C.

mechanical rapping of the electrodes. Collection efficiencies are typically 95 percent for particles smaller than 2.5 microns in size.

A fabric filter system consists of a number of filtering elements, bag cleaning system, main shell structure, dust removal system, and fan. PM is filtered from the gas stream by various mechanisms (inertial impaction, impingement, accumulated dust cake sieving, etc.) as the gas passes through the fabric filter. Accumulated dust on the bags is periodically removed using mechanical or pneumatic means. In pulse jet pneumatic cleaning, a sudden pulse of compressed air is injected into the top of the bag. This pulse creates a traveling wave in the fabric that separates the cake from the surface of the fabric. The cleaning normally proceeds by row, all bags in the row being cleaned simultaneously. Typical air-to-cloth ratios range from 2 to 8 cubic feet per minute-square foot (cfm-ft^2). Collection efficiencies are on the order of 99 percent for particles smaller than 2.5 microns in size.

Wet scrubbers remove PM from gas streams principally by inertial impaction of the particulate onto a water droplet. Particles can be wetted by impingement, diffusion, or condensation mechanisms. To be wetted, PM must either make contact with a spray droplet or impinge upon a wet surface. In a venturi scrubber, the gas stream is constricted in a throat section. The large volume of gas passing through a small constriction gives a high gas velocity and a high-pressure drop across the system. As water is introduced into the throat, the gas is forced to move at a higher velocity, causing the water to shear into droplets. Particles in the gas stream then impact onto the water droplets produced. The entrained water droplets are subsequently removed from the gas stream by a cyclone separator. Venturi scrubber collection efficiency increases with increasing pressure drop for a given particle size. Collection efficiency will also increase with increasing liquid-to-gas ratios up to the point where flooding of the system occurs. Packed-bed and venturi scrubber collection efficiencies are typically 90 percent for particles smaller than 2.5 microns in size.

While all of these post process technologies would be technically feasible for controlling PM_{10} emissions from SCCTs, none of the previously described control equipment has been applied to SCCTs because exhaust gas PM_{10} concentrations are inherently low. SCCTs operate with a significant amount of excess air resulting in high exhaust gas flow rates. The PCGS SCCTs will be fired with natural gas (primary fuel) and low-sulfur distillate fuel oil (backup fuel). Combustion of natural gas and distillate fuel oil will generate low PM_{10} emissions in comparison to other fuels due to their low ash and sulfur contents. The minor PM_{10} emissions coupled with a large volume of exhaust gas produces extremely low exhaust stream PM_{10} concentrations. Estimated PM_{10} exhaust concentrations for the SCCTs at rated load are approximately 0.002 and 0.006 grain per dry standard cubic foot (gr/dscf) during natural gas and distillate fuel oil firing, respectively. Exhaust stream PM_{10} concentrations of such low magnitude are not amenable to control using available technologies because removal efficiencies would be unreasonably low and costs excessive.

5.3.2 PROPOSED BACT EMISSION LIMITATIONS

Appendix E provides BACT PM/PM_{10} limits obtained from the RBLC and EPA Region 4 CT BACT databases for SCCTs. All determinations are based on the use of clean fuels and good combustion practice.

Because post process stack controls for PM/PM_{10} are not appropriate for SCCTs, the use of good combustion practices and clean fuels is considered to be BACT. The PCGS SCCTs will use the latest combustor technology to maximize combustion efficiency and minimize PM/PM_{10} emissions rates. Combustion efficiency, defined as the percentage of fuel completely oxidized in the combustion process, is projected to be greater than 99 percent. The SCCTs will be fired with pipeline-quality natural gas as a primary fuel. Due to the difficulties associated with stack testing exhaust streams containing low PM/PM_{10} concentrations, visible emissions limits are proposed as a surrogate BACT limits for PM/PM_{10}. Table 5-5 summarizes the PM/PM_{10} BACT emissions limits proposed for the SCCT project.

5.4 BACT ANALYSIS FOR NO_X

NO_x emissions from combustion sources consist of two components: oxidation of combustion air atmospheric nitrogen (thermal NO_x and prompt NO_x) and conversion of

Table 5-5. Proposed PM/PM_{10} BACT Emissions Limit

Emissions Source	Proposed PM/PM_{10} BACT Emissions Limit (% opacity)
P&W Twin Pac FT8-3 SCCTs (per CT) (natural gas or distillate fuel oil firing)	10

Sources: SECI, 2004.
ECT, 2004.

chemically fuel-bound nitrogen (FBN). Essentially all CT NO_x emissions originate as nitric oxide (NO). NO generated by the CT combustion process is subsequently further oxidized in the SCCT exhaust system or in the atmosphere to the more stable NO_2 molecule.

Thermal NO_x results from the oxidation of atmospheric nitrogen under high temperature combustion conditions. The amount of thermal NO_x formed is primarily a function of combustion temperature and residence time, air/fuel ratio, and, to a lesser extent, combustion pressure. Thermal NO_x increases exponentially with increases in temperature and linearly with increases in residence time as described by the Zeldovich mechanism. Prompt NO_x is formed near the combustion flame front from the oxidation of intermediate combustion products such as hydrogen cyanide, nitrogen, and ammonia. Prompt NO_x comprises a small portion of total NO_x in conventional near-stoichiometric CT combustors but increases under fuel-lean conditions. Prompt NO_x, therefore, is an important consideration with respect to dry low-NO_x combustors that use lean fuel mixtures. Fuel NO_x arises from the oxidation of nonelemental nitrogen contained in the fuel. The conversion of FBN to NO_x depends on the bound nitrogen content of the fuel. In contrast to thermal NO_x, fuel NO_x formation does not vary appreciably with combustion variables such as temperature or residence time. Presently, there are no combustion processes or fuel treatment technologies available to control fuel NO_x emissions. For this reason, the gas turbine NSPS (Subpart GG) contains an allowance for FBN (see Table 5-3). NO_x emissions from combustion sources fired with fuel oil are higher than those fired with natural gas due to higher combustion flame temperatures and FBN contents. Natural gas may contain molecular nitrogen; however, the nitrogen found in natural gas does not contribute significantly to fuel NO_x formation. Typically, natural gas contains a negligible amount of FBN.

5.4.1 POTENTIAL CONTROL TECHNOLOGIES

Available technologies for controlling NO_x emissions from SCCTs include combustion process modifications and postcombustion exhaust gas treatment systems. A listing of available technologies for each of these categories follows:

Combustion Process Modifications:

- Water or steam injection, with advanced combustors.
- Dry low-NO_x combustor design.
- Xonon™.

Postcombustion Exhaust Gas Treatment Systems:

- Selective non-catalytic reduction (SNCR).
- Non-selective catalytic reduction (NSCR).
- SCR.
- SCONOx™

A description of each of the listed control technologies is provided in the following sections.

Water or Steam Injection

Injection of water or steam into the primary combustion zone of advanced combustors of a CT reduces the formation of thermal NO_x by decreasing the peak combustion temperature. Water injection decreases the peak flame temperature by diluting the combustion gas stream and acting as a heat sink by absorbing heat necessary to vaporize the water (latent heat of vaporization) and raise the vaporized water temperature to the combustion temperature. High purity water must be employed to prevent turbine corrosion and deposition of solids on the turbine blades. Steam injection employs the same mechanisms to reduce the peak flame temperature with the exclusion of heat absorbed due to vaporization since the heat of vaporization has been added to the steam prior to injection. Accordingly, a greater amount of steam, on a mass basis, is required to achieve a specified level of NO_x reduction in comparison to water injection. Typical injection rates range from 0.3 to 1.0 and 0.5 to 2.0 pounds of water and steam, respectively, per pound of fuel. Water or steam injection will not reduce the formation of fuel NO_x.

The maximum amount of steam or water that can be injected depends on the SCCT combustor design. Excessive rates of injection will cause flame instability, combustor dynamic pressure oscillations, thermal stress (cold-spots), and increased emissions of CO and VOCs due to combustion inefficiency. Accordingly, the efficiency of steam or water injection to reduce NO_x emissions also depends on turbine combustor design. For a given turbine design, the maximum water-to-fuel ratio (and maximum NO_x reduction) will occur up to the point where cold-spots and flame instability adversely affect safe, efficient, and reliable operation of the turbine.

The use of water or steam injection in advanced combustors can typically achieve NO_x exhaust concentrations of 25 and 42 ppmvd for gas and oil firing, respectively.

Dry Low-NO_x Combustor Design

A number of turbine vendors have developed dry low-NO_x combustors that premix turbine fuel and air prior to combustion in the primary zone. Use of a premix burner results in a homogeneous air/fuel mixture without an identifiable flame front. For this reason, the peak and average flame temperatures are the same, causing a decrease in thermal NO_x emissions in comparison to a conventional diffusion burner. A typical dry low-NO_x combustor incorporates fuel staging using several operating modes as follows:

- Primary Mode—Fuel supplied to first stage only at turbine loads from 0 to 35 percent. Combustor burns with a diffusion flame with quiet, stable operation. This mode is used for ignition, warm-up, acceleration, and low-load operation.
- Lean-Lean Mode—Fuel supplied to both stages with flame in both stages at turbine loads from 35 to 50 percent. Most of the secondary fuel is premixed with air. Turbine loading continues with a flame present in both fuel stages. As load is increased, CO emissions will decrease, and NO_x levels will increase. Lean-lean operation will be maintained with increasing turbine load until a preset combustor fuel-to-air ratio is reached when transfer to premix operation occurs.
- Secondary Mode (Transfer to Premix)—At 70-percent load, all fuel is supplied to second stage.
- Premix Mode—Fuel is provided to both stages with approximately 80 percent furnished to the first stage at turbine loads from 70 to 100 percent. Flame is present in the second stage only.

Currently, premix burners are limited in application to natural gas and loads above approximately 35 to 50 percent of baseline due to flame stability considerations. For CTs capable of oil firing, wet injection is employed to control NO_x emissions.

In addition to lean premixed combustion, CT dry low-NO_x combustors typically incorporate lean combustion and reduced combustor residence time to reduce the rate of NO_x formation. All CTs cool the high-temperature exhaust gas stream with dilution air to lower the exhaust gas to an acceptable temperature prior to entering the CT. By adding additional dilution air, the hot CT exhaust gases are rapidly cooled to temperatures below those needed for NO_x formation. Reduced residence time combustors add the dilution air sooner than do standard combustors. The amount of thermal NO_x is reduced because the CT combustion gases are at a higher temperature for a shorter period of time.

Current dry low-NO_x combustor technology can typically achieve a NO_x exhaust concentration of 15 ppmvd or less using natural gas fuel.

The proposed PCGS SCCTs are P&W FT8-3 Twin Pac units. P&W does not presently offer a commercially available dry low-NO_x combustor for the FT8-3 CT. Accordingly, dry low-NO_x technology is not considered an available control technology for the SCCT project.

Xonon™

The Xonon™ Cool Combustion® technology, being developed for CTs by Catalytica Energy Systems, Inc. (CESI), employs a catalyst integral to the CT combustor to reduce the formation of NO_x. In a conventional CT combustor, fuel and air are oxidized in the presence of a flame to produce the hot exhaust gases required for power generation. The Xonon™ Cool Combustion® technology replaces this conventional combustion process with a two-step approach. First, a portion of the CT fuel is mixed with air and burned in a low-temperature precombustor. The main CT fuel is then added, and oxidation of the total fuel/air mixture stream is completed by means of flameless, catalytic combustion. The catalyst module is located within the CT combustor. NO_x formation is reduced due to the relatively low oxidation temperatures occurring within the precombustor and the flameless combustor catalyst module. Information provided by CESI indicates that the Xonon™ Cool Combustion® technology is capable of achieving CT NO_x exhaust concentrations of 2.5 ppmvd at 15-percent oxygen.

Commercial operation of the Xonon™ Cool Combustion® technology is limited to one small (1.5 MW) rated load, natural gas-fired Kawasaki CT operated by the Silicon Valley Power municipal utility. This CT is located in Santa Clara, California. Performance of the Xonon™ Cool Combustion® technology on larger CTs has not been demonstrated to date.

Availability of the Xonon™ Cool Combustion® technology is limited to specific gas turbine manufacturers that have agreements with CESI to adapt the proprietary Xonon™ combustion system to gas turbines in their product lines. CESI literature indicates that General Electric (GE) Power Systems is engaged in development work to adapt the Xonon™ Cool Combustion technology to their E- and F-Class CTs. Other CT vendors having agreements with CESI include P&W Canada (for their ST-18 and ST-30 CTs), Rolls Royce Allison, and Solar Turbines.

The proposed PCGS SCCTs are P&W FT8-3 Twin Pac units. The Xonon™ Cool Combustion® technology is not yet commercially available for this unit. Accordingly, the Xonon™ Cool Combustion® technology is not considered to be an available control technology for the SCCT project.

Selective Non-Catalytic Reduction

The SNCR process involves the gas phase reaction, in the absence of a catalyst, of NO_x in the exhaust gas stream with injected ammonia (NH_3) or urea to yield nitrogen and water vapor. The two commercial applications of SNCR include the Electric Power Research Institute's (EPRI's) NO_xOUT® and Exxon's Thermal DeNO_x™ processes. The two processes are similar in that either ammonia (Thermal DeNO_x™) or urea (NO_xOUT®) is injected into a hot exhaust gas stream at a location specifically chosen to achieve the optimum reaction temperature and residence time. Simplified chemical reactions for the Thermal DeNO_x™ process are as follows:

$$4NO + 4NH_3 + O_2 \rightarrow 4N_2 + 6\ H_2O \quad (1)$$

$$4\ NH_3 + 5\ O_2 \rightarrow 4NO + 6\ H_2O \quad (2)$$

The NO_xOUT® process is similar with the exception that urea is used in place of ammonia. The critical design parameter for both SNCR processes is the reaction temperature. At temperatures below 1,600°F, rates for both reactions decrease allowing unreacted ammonia to exit with the exhaust stream. Temperatures between 1,600 and 2,000°F will favor reaction (1) resulting in a reduction in NO_x emissions. Reaction (2) will dominate at temperatures above approximately 2,000°F, causing an increase in NO_x emissions. Due to reaction temperature considerations, the SNCR injection system must be located at a point in the exhaust duct where temperatures are consistently between 1,600 and 2,000°F.

Non-Selective Catalytic Reduction

The NSCR process uses a platinum/rhodium catalyst to reduce NO_x to nitrogen and water vapor under fuel-rich (less than 3-percent oxygen) conditions. NSCR technology has been applied to automobiles and stationary reciprocating engines.

Selective Catalytic Reduction

In contrast to SNCR, SCR reduces NO_x emissions by reacting ammonia with exhaust gas NO_x to yield nitrogen and water vapor in the presence of a catalyst. Ammonia is injected upstream of the catalyst bed where the following primary reactions take place:

$$4NH_3 + 4NO + O_2 \rightarrow 4N_2 + 6H_2O \quad (3)$$

$$4NH_3 + 2NO_2 + O_2 \rightarrow 3N_2 + 6H_2O \quad (4)$$

The catalyst serves to lower the activation energy of these reactions, which allows the NO_x conversions to take place at a lower temperature (i.e., in the range of 600 to 750°F). Typical SCR catalysts include metal oxides (titanium oxide and vanadium), noble metals (combinations of platinum and rhodium), zeolite (alumino-silicates), and ceramics.

Factors affecting SCR performance include space velocity (volume per hour of flue gas divided by the volume of the catalyst bed), ammonia/NO_x molar ratio, and catalyst bed temperature. Space velocity is a function of catalyst bed depth. Decreasing the space velocity (increasing catalyst bed depth) will improve NO_x removal efficiency by increasing residence time but will also cause an increase in catalyst bed pressure drop. The reaction of NO_x with ammonia theoretically requires a 1:1 molar ratio. Ammonia/NO_x molar ratios greater than 1:1 are necessary to achieve high-NO_x removal efficiencies due to imperfect mixing and other reaction limitations. However, ammonia/NO_x molar ratios are typically maintained at 1:1 or lower to prevent excessive unreacted ammonia (ammonia slip) emissions.

As was the case for SNCR, reaction temperature is critical for proper SCR operation. The optimum temperature range for conventional SCR operation is 600 to 750°F. Below this temperature range, reduction reactions (3) and (4) will not proceed. At temperatures exceeding the optimal range, oxidation of ammonia will take place resulting in an increase in NO_x emissions. Specially formulated, high-temperature zeolite catalysts have recently been developed that function at exhaust stream temperatures up to a maximum of approximately 1,050°F. NO_x removal efficiencies for SCR systems typically range from 60 to 90 percent.

SCR catalyst is subject to deactivation by a number of mechanisms. Loss of catalyst activity can occur from thermal degradation if the catalyst is exposed to excessive temperatures over a prolonged period of time. Catalyst deactivation can also occur due to chemical poisoning. Principal poisons include arsenic, sulfur, potassium, sodium, and calcium.

SCONO$_x$™

SCONO$_x$™ is a NO_x and CO control system offered by ABB Alstom Power Environment Segment (AAP) under an exclusive license agreement with Goal Line Environmental Technologies (GLET). GLET is a partnership formed by Sunlaw Energy Corporation and Advanced Catalyst Systems, Inc.

The SCONO$_x$™ system employs a single catalyst to simultaneously oxidize CO to carbon dioxide (CO_2) and NO to NO_2. NO_2 formed by the oxidation of NO is subsequently absorbed onto the catalyst surface through the use of a potassium carbonate absorber coating. The $SCONO_x$™ oxidation/absorption cycle reactions are:

$$CO + \frac{1}{2} O_2 \rightarrow CO_2 \quad (5)$$

$$NO + \frac{1}{2} O_2 \rightarrow NO_2 \quad (6)$$

$$2NO_2 + K_2CO_3 \rightarrow CO_2 + KNO_2 + KNO_3 \quad (7)$$

CO_2 produced by reactions (5) and (7) is released to the atmosphere as part of the CT/HRSG exhaust stream.

As shown in reaction (7), the potassium carbonate catalyst coating reacts with NO_2 to form potassium nitrites and nitrates. Prior to saturation of the potassium carbonate coating, the catalyst must be regenerated. This regeneration is accomplished by passing a dilute hydrogen-reducing gas across the surface of the catalyst in the absence of oxygen. Hydrogen in the reducing gas reacts with the nitrites and nitrates to form water and elemental nitrogen. CO_2 in the regeneration gas reacts with potassium nitrites and nitrates to form potassium carbonate; this compound is the catalyst absorber coating present on the surface of the catalyst at the start of the oxidation/absorption cycle. The $SCONO_x$™ regeneration cycle reaction is:

$$KNO_2 + KNO_3 + 4 H_2 + CO_2 \rightarrow K_2CO_3 + 4 H_2O_{(g)} + N_2 \quad (8)$$

Water vapor and elemental nitrogen are released to the atmosphere as part of the CT/HRSG exhaust stream. Following regeneration, the $SCONO_x$™ catalyst has a fresh coating of potassium carbonate, allowing the oxidation/absorption cycle to begin again. There is no net gain or loss of potassium carbonate after both the oxidation/absorption and regeneration cycles have been completed.

Since the regeneration cycle must take place in an oxygen-free environment, the section of catalyst undergoing regeneration is isolated from the exhaust gas stream using a set of louvers. Each catalyst section is equipped with a set of upstream and downstream louvers. During the regeneration cycle, these louvers close and valves open allowing fresh regeneration gas to enter and spent regeneration gas to exit the catalyst section being regenerated. At any given time, 80 percent of the catalyst sections will be in the oxidation/absorption cycle, while 20 percent will be in regeneration mode. A regeneration cycle is typically set to last for 3 to 8 minutes.

The $SCONO_x$™ operates at a temperature range of 300 to 700°F and, therefore, must be installed in the appropriate temperature section of a HRSG. For installations below 450°F, the $SCONO_x$™ system uses an inert gas generator for the production of hydrogen and CO_2. The regeneration gas is diluted to under 4-percent hydrogen using steam as a carrier gas; the typical system is designed for 2 percent hydrogen. The regeneration gas reaction is:

$$CH_4 + \frac{1}{2} O_2 + H_2O \rightarrow CO_2 + 3\,H_2 \quad (9)$$

For installations above 450°F, the $SCONO_x$™ catalyst is regenerated by introducing a small quantity of natural gas with a carrier gas, such as steam, over a steam reforming catalyst and then to the $SCONO_x$™ catalyst. The reforming catalyst initiates the conversion of methane to hydrogen, and the conversion is completed over the $SCONO_x$™ catalyst. The reformer catalyst works to partially reform the methane gas to hydrogen (2 percent by volume) to be used in the regeneration of the $SCONO_x$™ and $SCOSO_x$™ catalysts. The reformer converts methane to hydrogen by the steam reforming reaction as shown by the following equation:

$$CH_4 + 2\,H_2O \rightarrow CO_2 + 4\,H_2 \quad (10)$$

The reformer catalyst is placed upstream of the $SCONO_x$™ catalyst in a steam reformer reactor. The reformer catalyst is designed for a minimum 50-percent conversion of methane to hydrogen.

A gradual decrease in catalyst temperature is indicative of sulfur masking. AAP recommends the installation of a sulfur filter to reduce the rate of catalyst masking. The sulfur filter is placed in the inlet natural gas feed prior to the regeneration production skid. The sulfur filter consists of impregnated granular activated carbon that is housed in a stainless steel vessel. Spent media is discarded as a nonhazardous waste.

The SCONO$_x$™ system catalyst is subject to reduced performance and deactivation due to exposure to sulfur oxides. As necessary, an additional catalytic oxidation/absorption system (SCOSO$_x$™) to remove sulfur compounds is installed upstream of the SCONO$_x$™ catalyst. The SCOSO$_x$™ sulfur removal catalyst utilizes the same oxidation/absorption cycle and a regeneration cycle as the SCONO$_x$™ system. During regeneration of the SCOSO$_x$™ catalyst, either H_2SO_4 mist or SO_2 is released to the atmosphere as part of the CT/HRSG exhaust gas stream. The absorption portion of the SCOSO$_x$™ process is proprietary. SCOSO$_x$™ oxidation/absorption and regeneration reactions are:

$$CO + \tfrac{1}{2} O_2 \rightarrow CO_2 \quad (11)$$

$$SO_2 + \tfrac{1}{2} O_2 \rightarrow SO_3 \quad (12)$$

$$SO_3 + \text{sorber} \rightarrow [SO_3 + \text{sorber}] \quad (13)$$

$$[SO_3 + \text{sorber}] + 4\,H_2 \rightarrow H_2S + 3\,H_2O + [\text{sorber}] \text{ (below 500°F)} \quad (14)$$

$$[SO_3 + \text{sorber}] + H_2 \rightarrow SO_2 + H_2O + [\text{sorber}] \text{ (above 500°F)} \quad (15)$$

A programmable logic controller controls the SCONO$_x$™/ SCOSO$_x$™ system. The controller is programmed to control all essential SCONO$_x$™/ SCOSO$_x$™ functions, including the opening and closing of louver doors and regeneration gas inlet and outlet valves, and the maintaining of regeneration gas flow to achieve positive pressure in each section during the regeneration cycle.

Utility materials needed for the operation of the SCONO$_x$™/ SCOSO$_x$™ control system include ambient air, natural gas, water, steam, and electricity. The primary utility material is natural gas used for regeneration gas production. Steam is used as the carrier/dilution gas for the regeneration gas. Electricity is required to operate the computer control system, control valves, and louver actuators.

Commercial experience to date with the SCONO$_x$™ control system is limited to several small CC power plants located in California. Representative of these small power plants is a GE LM2500 turbine, owned by GLET partner Sunlaw Energy Corporation, equipped with water injection to control NO$_x$ emissions to approximately 25 ppmvd. The low temperature SCONO$_x$™ control system (i.e., located downstream of the HRSG at a temperature between 300 and 400°F) was retrofitted to the Sunlaw Energy facility in December 1996 and has achieved a NO_x exhaust concentration of 3.5 parts per million by volume (ppmv) resulting in an approximate 85-percent NO_x removal efficiency. A high-temperature application of $SCONO_x$™ (i.e., control system located within the HRSG at a temperature between 600 and 700°F) has been in service since June 1999 on a small, 5-MW solar CT located at the Genetics Institute in Massachusetts. Following a 1-year scale-up developmental program, on December 1, 1999, AAP announced the commercial availability of the $SCONO_x$™ for large-scale natural gas-fired CTs, particularly F-Class units. Although considered commercially available for large natural gas-fired CTs, there are currently no CTs larger than 32 MW that have demonstrated successful application of the $SCONO_x$™ control technology.

Technical Feasibility

One of the combustion process modification technologies previously mentioned (i.e., water or steam injection with advanced combustor design) would be feasible for the SCCT project. As previously noted, the dry low-NO_x and Xonon™ control technologies are not currently commercially available for the aeroderivative P&W FT8-3 CTs. Of the post-combustion stack gas treatment technologies, SNCR is not feasible because the temperature required for this technology (between 1,600 and 2,000°F) exceeds that found in the SCCT exhaust gas stream (approximately 900°F). NSCR was also determined to be technically infeasible because the process must take place in a fuel-rich (less than 3-percent oxygen) environment. Due to high excess air rates, the oxygen content of the SCCT exhaust is approximately 13 percent. The $SCONO_x$™ control technology is not technically feasible because the temperature required for this technology (between 300 to 700°F) is below the 900°F SCCT exhaust gas stream. In addition, $SCONO_x$™ control technology has not been commercially demonstrated on aeroderivative SCCTs. Additional concerns with $SCONO_x$™ control technology include process complexity (multiple catalytic oxidation/absorption/regeneration systems), reliance on only one supplier, and the relatively brief operating history of the technology.

Accordingly, the BACT analysis for NO_x for the SCCT project was confined to high temperature ("hot") SCR control technology. The following sections provide information regarding energy, environmental, and economic impacts and proposed BACT limits for NO_x.

5.4.2 ENERGY AND ENVIRONMENTAL IMPACTS

The installation of hot SCR technology will cause an increase in back pressure on the SCCTs due to the pressure drop across the catalyst bed. Additional energy would be needed for the pumping of aqueous ammonia from storage to the injection nozzles and generation of steam for ammonia vaporization. A SCR control system for the SCCTs is projected to have a pressure drop across the catalyst bed of approximately 5.6 inches of water. This pressure drop will result in a 1.12-percent energy penalty due to reduced turbine output power. The reduction in turbine output power (lost power generation) will result in an energy penalty of 8,400,000 kilowatt-hours (kWh) (28,662 million British thermal units [MMBtu]) per year at rated load operation and 2,500 hr/yr per CT operation for the 10 SCCTs. This energy penalty is equivalent to the use of 28.0 million cubic feet (ft^3) of natural gas annually based on a natural gas heating value of 1,024 British thermal units per cubic foot (Btu/ft^3). The lost power generation energy penalty, based on a power cost of $0.035/kWh, is $294,000 per year.

Application of hot SCR technology would result in the following adverse environmental impacts:

- Ammonia emissions due to ammonia slip; ammonia emissions are estimated to total 27.0 tpy (at rated load operation for 2,500 hr/yr per CT) for a SCR design ammonia slip rate of 5 ppmvd for the 10 SCCTs. However, ammonia slip can increase significantly during start-ups, upsets, or failures of the ammonia injection system, or due to catalyst degradation. In instances where such events have occurred, ammonia exhaust concentrations of 50 ppmv or greater have been measured. Since the odor threshold of ammonia is 20 ppmv, releases of ammonia during upsets or malfunctions have the potential to cause ambient odor problems. Ammonia also acts as an irritant to human tissue. Depending on the concentration and duration of exposure, ammonia can cause eye, skin, and mucous membrane irritation. These effects can vary from minor irritation to severe damage. Contact of the skin or mucosa with liquid ammonia or a high vapor concentration can result in burns or obstructed breathing.

- Ammonium bisulfate and ammonium sulfate particulate emissions due to the reaction of ammonia with sulfur present in the exhaust gases.
- Disposal of spent catalyst that may be considered hazardous due to heavy metal contamination. As a potential hazardous waste, spent catalyst may have to be transported and disposed in a hazardous waste landfill. In addition, facility workers could be exposed to high levels of vanadium pentoxide particulates during catalyst handling.

5.4.3 ECONOMIC IMPACTS

An assessment of economic impacts was performed by comparing control costs between a baseline case of water injection technology and baseline technology with the addition of hot SCR controls. Baseline technology is expected to achieve NO_x exhaust concentrations of 25 and 42 ppmvd at 15-percent oxygen when firing natural gas and distillate fuel oil, respectively. SCR technology was premised to achieve NO_x concentrations of 5.0 and 8.4 ppmvd at 15-percent oxygen when firing natural gas and distillate fuel oil, respectively. The NO_x concentration of 5.0 ppmvd is representative of recent LAER determinations made in California for natural gas-fired aeroderivative SCCTs equipped with SCR controls.

The cost impact analysis was conducted using the OAQPS factors previously summarized in Tables 5-1 and 5-2 and project-specific economic factors provided in Table 5-7. Emissions reductions were calculated assuming rated load operation for 2,000 hr/yr at an annual average ambient temperature of 50°F for natural gas firing and 500 hr/yr at an annual average ambient temperature of 78°F for distillate fuel oil firing. Tables 5-8 and 5-9 summarize specific capital and annual operating costs for the SCR control system, respectively.

Cost effectiveness for the application of SCR technology to the SCCTs was determined to be $16,052 per ton of NO_x removed. This control cost is considered economically unreasonable. Table 5-10 summarizes results of the NO_x BACT analysis.

Table 5-7. Economic Cost Factors

Factor	Units	Value
Interest rate	%	7.0
Control system life	Years	15
SCR catalyst life	Years	3.5
Electricity cost	$/kWh	0.035
Aqueous ammonia cost (dry basis, delivered)	$/ton	444
Labor costs (base rates)	$/hour	
Operator		25.60
Maintenance		25.60

Sources: SECI, 2004.
ECT, 2004.

Table 5-8. Capital Costs for SCR System (10 SCCTs)

Item	Dollars	EPA Factor
Direct Capital Cost		
Equipment Cost*	11,277,500	EC
Sales tax	789,400	0.06 × EC
Instrumentation	1,127,800	0.10 × EC
Freight	563,900	0.05 × EC
Total Purchased Equipment Cost (PEC)	**$13,758,600**	
Installation Cost		
Foundations and supports	1,100,700	0.08 × PEC
Handling and erection	1,926,200	0.14 × PEC
Electrical	550,300	0.04 × PEC
Piping	275,200	0.02 × PEC
Insulation for ductwork	137,600	0.01 × PEC
Painting	137,600	0.01 × PEC
Total Installation Cost (TIC)	**$4,127,600**	
Total Direct Capital Costs (DCC)	**$17,886,200**	**PEC + TIC**
Indirect Installation Cost		
General facilities	894,300	0.05 × DCC
Engineering and home office fees	1,788,600	0.10 × DCC
Process contingency	894,300	0.05 × DCC
Total Indirect Installation Cost (IIC)	**$3,577,200**	
Project Contingency (PC)	3,219,500	0.15 x (DCC + IIC)
Total Plant Cost (TPC)	**$24,682,900**	DCC + IIC + PC
Preproduction cost (PPC)	493,700	0.02 × TPC
Initial ammonia inventory cost	1,425	14 day supply
Total Capital Investment (TCI)	**$25,178,025**	TPC + PPC

*Includes exhaust duct modifications

Sources: P&W, 2004.
ECT, 2004.

Table 5-9. Annual Operating Costs for SCR System (10 SCCTs)

Item	Dollars	EPA Factor
Direct Cost		
Maintenance labor and materials (ML&M)	377,670	0.015 × TCI
Catalyst replacement cost		
Replacement (materials and labor) (RC)	8,324,600	
Disposal	148,200	0.02 × RC
Total Catalyst Replacement Cost (CRC)	**$8,472,800**	
Future worth factor (FWF)	0.2620	7.0 percent, 3.5 years
Annualized Catalyst Cost (ACC)	**$2,219,700**	CRC × FWF
Energy cost	300	OAQPS algorithm
Aqueous ammonia (AA)	106,600	$444/ton (dry basis)
Energy penalty (EP) Turbine backpressure	294,000	0.20/inch delta P
Emissions fee credit (EFC)	(9,000)	$25 / ton NO_x
Total Direct Costs (TDC)	**$2,988,670**	ML&M + ACC + EP
Indirect Cost		
Capital recovery factor (CRF)	0.1098	7.0 percent, 15 years
Capital recovery	2,764,400	CRF × TCI
Total Indirect Cost (TIC)	**$2,764,400**	
Total Annual Cost (TAC)	**$5,753,070**	**TDC + TIC**

Sources: SECI, 2004.
ECT, 2004.

Table 5-10. Summary of NO_x BACT Analysis—10 SCCTs

Control Option	Emissions Impacts: Emissions Rates lb/hr	Emissions Rates tpy	Emissions Reduction (tpy)	Economic Impacts: Installed Capital Cost ($)	Total Annualized Cost ($/yr)	Cost Effectiveness Over Baseline ($/ton)	Energy Impacts: Increase Over Baseline (MMBtu/yr)	Environmental Impacts: Toxic Impact? (Yes/No)	Adverse Environmental Impact? (Yes/No)
SCR	71.7	89.6	358.4	25,178,025	5,753,070	16,052	28,662	Yes	Yes
Baseline	358.4	448.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: N/A = not applicable.

Basis: Ten P&W FT8-3 SCCTs, 100-percent load for 2,000 hr/yr per CT gas firing and 500 hr/yr per CT distillate oil firing.

Sources: P&W, 2003.
SECI, 2004.
ECT, 2004.

5.4.4 PROPOSED BACT EMISSIONS LIMITATIONS

Appendix E provides BACT NO_x limits obtained from the RBLC and EPA Region 4 CT databases for SCCTs. With the exception of SCCTs located in ozone nonattainment areas and subject to LAER technology, the NOx BACT emissions limits proposed for the SCCT project are consistent with prior determinations.

At rated load operation, maximum NO_x exhaust concentration and hourly mass emissions rate from each SCCT will be 25 ppmvd and 32.0 lb/hr during natural gas firing and 42 ppmvd and 51.2 lb/hr during distillate fuel oil firing based on the application of water injection. NO_x emissions rates proposed as BACT for the SCCTs are consistent with prior BACT determinations for aeroderivative SCCTs in peaking service.

Table 5-11 summarizes the NO_x BACT emissions limits proposed for the SCCT project.

5.5 BACT ANALYSIS FOR SO_2

5.5.1 POTENTIAL CONTROL TECHNOLOGIES

Technologies employed to control SO_2 emissions from combustion sources consist of fuel treatment and postcombustion add-on controls (i.e., flue gas desulfurization [FGD] systems).

Fuel Treatment

Fuel treatment technologies are applied to gaseous, liquid, and solid fuels to reduce their sulfur contents prior to delivery to end fuel users. For wellhead natural gas and fuel oils containing sulfur compounds, a variety of technologies are available to remove these sulfur compounds to acceptable levels. Desulfurization of natural gas and fuel oils are performed by the fuel supplier prior to distribution by pipeline.

Flue Gas Desulfurization

FGD systems remove SO_2 from exhaust streams by using an alkaline reagent to form sulfite and sulfate salts. The reaction of SO_2 with the alkaline chemical can be performed

Table 5-11. Proposed NO_x BACT Emissions Limits

Emissions Source	Proposed NO_x BACT Emissions Limits*	
	lb/hr	ppmvd†‡
P&W Twin Pac FT8-3 SCCTs (per CT); natural gas firing	32.0	25
P&W Twin Pac FT8-3 SCCTs (per CT); distillate fuel oil firing	51.2	42

*Maximum rates for all operating scenarios
†24-hour block average.
‡Corrected to 15-percent oxygen.

Sources: GE, 2003.
ECT, 2004.

using either a wet- or dry-contact system. FGD wet scrubbers typically employ sodium, calcium, or dual-alkali reagents using packed or spray towers. Wet FGD systems will generate wastewater and wet sludge streams requiring treatment and disposal. In a dry FGD system, an alkaline slurry is injected into the combustion process exhaust stream. The liquid sulfite/sulfate salts that form from the reaction of the alkaline slurry with SO_2 are dried by heat contained in the exhaust stream and subsequently removed by downstream PM control equipment.

Technical Feasibility

Treatment of natural gas and fuel oils to remove sulfur compounds is conducted by the fuel supplier, when necessary, prior to distribution. Accordingly, additional fuel treatment by end users is considered technically infeasible because the natural gas and distillate fuel oil sulfur contents have already been reduced to low levels.

There have been no applications of FGD technology to CTs because low sulfur fuels are typically used. The SCCTs will be fired with natural gas and distillate fuel oil. The sulfur content of natural gas, the primary fuel source, is more than 100 times lower than the fuels (e.g., coal) employed in boilers using FGD systems. In addition, SCCTs operate with a significant amount of excess air that generates high exhaust gas flow rates. Because FGD SO_2 removal efficiency decreases with decreasing inlet SO_2 concentration, application of an FGD system to a SCCT exhaust stream will result in unreasonably low SO_2 removal efficiencies. Due to low SO_2 exhaust stream concentrations, FGD technology is not considered technically feasible for SCCTs because removal efficiencies would be unreasonably low.

Pipeline-quality natural gas contains a negligible amount of sulfur; typically less than 0.50 gr/dscf (equivalent to 0.0016 wt%S and 16 parts per million [ppm] by weight). Ultra-low sulfur diesel (ULSD) fuel containing no more than 0.0015 wt%S (15 ppm by weight) will become available at distribution terminals by July 15, 2006, as required by the Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle standards and Highway Diesel Fuel Sulfur Control Requirements: Final Rule, promulgated by EPA on January 18, 2001. The PCGS SCCTs will commence commercial operation beginning in the second quarter of 2006; close to the timeframe when ULSD fuel will become widely available. Since there are no feasible SO_2 control technologies applicable to the SCCT project other than the use of commercially available low sulfur fuels and because there are no significant differences in the sulfur content of pipeline-quality natural gas, the BACT analysis for SO_2 for the SCCT project was confined to the evaluation of the baseline distillate fuel oil containing no more than 0.05 wt%S (500 ppm by weight) and ULSD fuel. There are no significant energy and non-air related environmental impacts associated with the use of ULSD fuel. The following sections provide information regarding economic impacts and proposed BACT limits for SO_2.

5.5.2 ECONOMIC IMPACTS

In May 2001, the Energy Information Agency (EIA) of the U.S. Department of Energy (DOE) assessed the additional costs associated with the use of ULSD fuel in a report entitled The Transition to Ultra-Low Sulfur Diesel Fuel: Effects on Prices and Supply. This EIA report estimated an average price increase between current diesel fuel oil containing 500 ppm sulfur and ULSD fuel of 6.8 cents per gallon for the 2007 to 2010 period and 5.4 cents per gallon for the 2011 to 2015 period. For the SCCT project economic analysis, an average price differential of 5.4 cents was used. Based on 500-hr/yr operation of distillate fuel oil firing per SCCT, annual distillate fuel oil consumption is 10,041,421 gallons per year for 10 SCCTs. The increase in distillate fuel oil costs in using ULSD fuel, based on the EIA data, is $542,237 per year for 10 SCCTs. The reduction in SO_2 emissions is 35.6 tpy for 10 SCCTs resulting in a cost effectiveness of $15,231 per ton of SO_2 reduced. Table 5-12 provides details of the SO_2 economic analysis.

5.5.3 PROPOSED BACT EMISSION LIMITATIONS

Because postcombustion SO_2 controls are not applicable, use of low-sulfur fuel is considered to represent BACT for the SCCT project. Natural gas used for the SCCT project will be pipeline-quality. Distillate fuel oil used for the new CT generator as a backup fuel source will contain no more than 0.05 wt%S. Table 5-13 summarizes the SO_2 BACT emissions limits proposed for the SCCT project.

Table 5-12. SO_2 Economic Analysis for ULSD Fuel

Data			
Number of SCCTs	10		
Hourly fuel oil usage	20,083	gal/hr for 10 CTs (Case 4, 100-percent load, 78°F)	
	146,810	lb/hr for 10 CTs (Case 4, 100-percent load, 78°F)	
Annual fuel oil hours	500	hr/yr per CT	
Fuel oil cost premium	0.054	$/gal (ULSD fuel versus 0.05 wt%S)	
Calculations			
Annual fuel oil usage	10,041,421	gal/yr for 10 CTs (Case 4, 100-percent load, 78°F)	
	73,405,000	lb/yr for 10 CTs (Case 4, 100-percent load, 78°F)	
Cost differential	542,237	$/yr for 10 CTs	
Fuel type	Sulfur (wt%S)	SO_2 (tpy)	SO_2 ($/ton)
Distillate fuel oil (base case)	0.05	36.7	-
Distillate fuel oil (ULSD fuel)	0.0015	1.1	15,231

Note: gal/hr = gallon per hour.
gal/yr = gallon per year.

Sources: EIA/DOE, 2001.
P&W, 2004.
SECI, 2004.
ECT, 2004.

Table 5-13. Proposed SO_2 BACT Emissions Limit

Emissions Source	Proposed SO_2 BACT Emissions Limits
P&W Twin Pac FT8-3 SCCTs	
Natural gas firing	Pipeline-quality
Distillate fuel oil firing	0.05 wt%S

Sources: SECI, 2004.
ECT, 2004.

Table 5-14 summarizes control technologies proposed as BACT for each pollutant subject to review. Table 5-15 summarizes specific proposed BACT emissions limits for each pollutant.

Table 5-14. Summary of BACT Control Technologies

Pollutant	Control Technology
P&W FT8-3 SCCTs	
All pollutants	• Limited annual hours of operation.
PM/PM_{10}	• Use of natural gas and low-sulfur distillate fuel oil. • Good combustion practice.
NO_x	• Water injection.
SO_2	• Use of natural gas and low-sulfur distillate fuel oil.

Sources: SECI, 2004.
ECT, 2004.

Table 5-15. Summary of Proposed BACT Emissions Limits

Emissions Source: P&W FT8-3 SCCTs	Pollutant	Proposed BACT Emissions Limits	
		ppmvd	lb/hr
Natural gas firing (per SCCT)	PM/PM_{10}	10-percent opacity	
	NO_x	25*†	32.0
	SO_2	Pipeline-quality	
Distillate fuel oil firing (per SCCT)	PM/PM_{10}	10-percent opacity	
	NO_x	42*†	51.2
	SO_2	0.05 wt%S	

*Corrected to 15-percent oxygen.
†24-hour block average.

Sources: SECI, 2004.
ECT, 2004.

6.0 AMBIENT IMPACT ANALYSIS METHODOLOGY

6.1 GENERAL APPROACH

The approach used to analyze the potential impacts of the proposed facility, as described in detail in the following sections, was developed in accordance with accepted practice. Guidance contained in EPA manuals and user's guides was sought and followed.

6.2 POLLUTANTS EVALUATED

Based on an evaluation of anticipated worst-case annual operating scenarios, the SCCT project will have the potential to emit 448.0 tpy of NO_x, 87.8 tpy of CO, 47.5 tpy of PM/PM_{10}, 54.7 tpy of SO_2, 33.8 tpy of VOCs, and 6.3 tpy of H_2SO_4 mist. Table 3-2 previously provided a comparison of estimated potential annual emissions rates for the SCCT project and the PSD significant emissions rate thresholds. As shown in that table, potential emissions of NO_x, PM, PM_{10}, and SO_2 are each projected to exceed the applicable PSD significant emissions rate level. These pollutants are, therefore, subject to the PSD NSR air quality impact analysis requirements of Rule 62-212.400(5)(d), F.A.C.

6.3 MODEL SELECTION AND USE

The latest version of EPA's Industrial Source Complex Short-Term (ISCST3) dispersion model (Julian date 02035 [February 4, 2002]), together with 5 years of hour-by-hour National Weather Service (NWS) meteorology, was used in the ambient impact analysis to obtain refined impact predictions for short-term (i.e., periods equal to or less than 24 hours) as well as long-term (i.e., annual averages) for each SCCT operating scenario. The ISCST3 model is a steady-state Gaussian plume model that can be used to assess air quality impacts over simple and complex terrain from a wide variety of sources. Also, ISCST3 is capable of calculating concentrations for averaging times ranging from 1 hour to annual.

The SCCTs will operate under a variety of operating scenarios. These scenarios include different loads, ambient air temperatures, and fuel type (i.e., natural gas and distillate fuel oil). Plume dispersion and, therefore, ground-level impacts will be affected by these different operating scenarios since emissions rates, exit temperatures, and exhaust gas velocities will change. For the pollutants of dispersion modeling concern (i.e., NO_x, PM, PM_{10}, and SO_2), maximum emissions rates will occur during distillate fuel oil firing. Accordingly, each of the oil firing SCCT operating scenarios were evaluated for each pollutant of concern to identify the highest air quality impact.

Procedures applicable to the ISCST3 dispersion model specified in EPA's Guideline on Air Quality Models (GAQM) were followed in conducting the refined dispersion modeling (EPA, 2003). The GAQM is codified in Appendix W of 40 CFR 51. In particular, the ISCST3 model control pathway MODELOPT keyword parameters DFAULT, CONC RURAL, and NOCMPL were selected. Selection of the parameter DFAULT, which specifies use of the regulatory default options, is recommended by the GAQM. The CONC, RURAL, and NOCMPL parameters specify calculation of concentrations, use of rural dispersion coefficients, and suppression of complex terrain calculations, respectively. As previously discussed, the ISCST3 model was also used to determine annual average impact predictions, in addition to short-term averages, by using the PERIOD parameter for the AVERTIME keyword. Conservatively, no consideration was given to pollutant exponential decay.

6.4 NO_2 AMBIENT IMPACT ANALYSIS

For annual NO_2 impacts, the tiered screening approach described in the GAQM, Section 6.2.3, was used. Tier 1 of this screening procedure assumes complete conversion of NO_x to NO_2. Tier 2 applies an empirically derived NO_2/NO_x ratio of 0.75 to the Tier 1 results.

6.5 DISPERSION OPTION SELECTION

Area characteristics in the vicinity of proposed emissions sources are important in determining model selection and use. One important consideration is whether the area is rural or urban since dispersion rates differ between these two classifications. In general, urban areas cause greater rates of dispersion because of increased turbulent mixing and buoyancy-induced mixing. This is due to the combination of greater surface roughness caused by more buildings and structures and greater amount of heat released from concrete and similar surfaces. EPA guidance provides two procedures to determine whether the character of an area is predominantly urban or rural. One procedure is based on land use typing, and the other is based on population density. The land use typing method uses the work of Auer (Auer, 1978) and is preferred by EPA and FDEP because it is meteorologically oriented. In other words, the land use factors employed in making a rural/urban designation are also factors that have a direct effect on atmospheric dispersion. These factors include building types, extent of vegetated surface area and water surface area, types of industry and commerce, etc. Auer recommends these land use factors be considered within 3 km of the source to be modeled to determine urban or rural classifications. The Auer land use typing method was used for the ambient impact analysis.

The Auer technique recognizes four primary land use types: industrial (I), commercial (C), residential (R), and agricultural (A). Practically all industrial and commercial areas come under the heading of urban, while the agricultural areas are considered rural. However, those portions of generally industrial and commercial areas that are heavily vegetated can be considered rural in character. In the case of residential areas, the delineation between urban and rural is not as clear. For residential areas, Auer subdivides this land use type into four groupings based on building structures and associated vegetation. Accurate classification of the residential areas into proper groupings is important to determine the most appropriate land use classification for the study area.

USGS 7.5-minute series topographic maps for the area were used to identify the land use types within a 3-km radius area of the proposed site. Based on this analysis, more than 50 percent of the land use surrounding the plant was determined to be rural under the Auer land use classification technique. Therefore, rural dispersion coefficients and mixing heights were used for the ambient impact analysis.

6.6 TERRAIN CONSIDERATION

The GAQM defines *flat* terrain as terrain equal to the elevation of the stack base, *simple* terrain as terrain lower than the height of the stack top, and *complex* terrain as terrain above the height of the plume center line (for screening modeling, complex terrain is terrain above the height of the stack top). Terrain above the height of the stack top but below the height of the plume center line is defined as *intermediate* terrain.

USGS 7.5-minute series topographic maps were examined for terrain features in the vicinity of the PCGS (i.e., within an approximate 10-km radius). Review of the USGS topographic maps indicates nearby terrain would be classified as simple terrain. Due to the minimal amount of terrain elevation differences in the vicinity, assignment of receptor terrain elevations was not conducted (i.e., all receptors were assumed to be at the same elevation as the SCCTs stack base for modeling purposes).

6.7 GOOD ENGINEERING PRACTICE STACK HEIGHT/BUILDING WAKE EFFECTS

The CAA Amendments of 1990 require the degree of emissions 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). GEP stack height is defined as the highest 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.

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 the GEP stack height regulations require that stack heights used in modeling for determining compliance with NAAQS and PSD increments not exceed GEP stack heights, the actual stack height may be greater. Guidelines for determining GEP stack height have been issued by EPA (1985).

The stack height proposed for the SCCTs (60 feet [ft]) is less than the *de minimis* GEP height of 65 meters (213 ft) and, therefore, complies with the EPA promulgated final stack height regulations (40 CFR 51).

While the GEP stack height rules address the maximum stack height that can be employed in a dispersion model analysis, stacks having heights lower than GEP stack height can potentially result in higher downwind concentrations due to building downwash effects. The Industrial Source Complex (ISC3) dispersion models contain two algorithms that assess the effect of building downwash; these algorithms are referred to as the Huber-Snyder and Schulman-Scire methods. The following steps are employed in determining the effects of building downwash:

- A determination is made as to whether a particular stack is located in the area of influence of a building (i.e., within five times the lesser of the building's height or projected width). If the stack is not within this area, it will not be subject to downwash from that building.
- If a stack is within a building's area of influence, a determination is made as to whether it will be subject to downwash based on the heights of the stack and building. If the stack height to building height ratio is equal to or greater than 2.5, the stack will not be subject to downwash from that building.
- If both conditions in the previous two items are satisfied (i.e., a stack is within the area of influence of a building and has a stack height to building height ratio of less than 2.5), the stack will be subject to building downwash. The determination is then made as to whether the Huber-Snyder or Schulman-Scire downwash method applies. If the stack height is less than or equal to the building height plus one-half the lesser of the building height or width, the Schulman-Scire method is used. Conversely, if the stack height is greater than this criterion, the Huber-Snyder method is employed.
- The ISCST3 downwash input data consists of an array of 36 wind direction-specific building heights and projected widths for each stack. LB is defined as the lesser of the height and projected width of the building. For directionally dependent building downwash, wake effects are assumed to occur if a stack is situated within a rectangle composed of two lines perpendicular to the wind direction, one line at 5 LB downwind of the building and the other at 2 LB upwind of the building, and by two lines parallel to the wind, each at 0.5 LB away from the side of the building.

For the ambient impact analysis, the complex downwash analysis described previously was performed using the current version of EPA's Building Profile Input Program (BPIP) (Julian date 04112 [April 22, 2004]). The EPA BPIP program was used to determine the area of influence for each building, whether a particular stack is subject to building downwash, the area of influence for directionally dependent building downwash, and finally to generate the specific building dimension data required by the model. Table 6-1 provides dimensions of the building/structures evaluated for wake effects; the locations of these buildings/structures were previously provided on Figure 2-2. BPIP output consists of an array of 36 direction-specific (10 to 360 degrees [°]) building heights and projected building widths for each stack suitable for use as input to the ISCST3 model.

6.8 RECEPTOR GRIDS

Receptors were placed at locations considered to be *ambient air*, which is defined as "that portion of the atmosphere, external to buildings, to which the general public has access." Figure 2-2 in Section 2.0 provided a plot plan showing the site fence lines. As shown in Figure 2-2, the entire perimeter of the plant site will be fenced. Therefore, the nearest locations of general public access are at the facility fence lines.

Consistent with GAQM recommendations, the ambient impact analysis used the following receptor grids:

- Fenceline Receptors—Discrete receptors placed on the site fence line at 100-meter intervals.
- Near-field Cartesian Receptors—Discrete receptors at 100-meter intervals from the fenceline to 3,000 meters
- Mid-field Cartesian Receptors—Discrete receptors at 250-meter intervals from 3,250 to 5,000 meters
- Far-field Cartesian Receptors—Discrete receptors at 500-meter intervals from 5,500 to 15,000 meters

Figure 6-1 illustrates a graphical representation of the receptor grids (out to a distance of 3 km). A depiction of the receptor grids (from 5 to 15 km) is shown in Figure 6-2.

Table 6-1. Building/Structure Dimensions

Building/Structure	Dimensions (ft)		
	Width	Length	Height*
Existing HRSG1 structure	28.3	87.5	82.5
Existing HRSG2 structure	28.3	87.5	82.5
Twin Pac CT			
Tier 1 (CT housing)	11.5	45.4	10.4
Tier 2 (secondary air exhaust silencer)	11.5	9.5	15.3
Tier 3 (air inlet)	11.5	9.55	17.3
Twin Pac air inlet filter †	20.5	14	11.7
Twin Pac air exhaust silencer †	16	11.2	16.5
Twin Pac electric generator			
Tier 1 (generator)	24.5	20.4	14.2
Tier 2 (generator exhaust)	24.5	10	19.9

*Height above ground.
†Elevated structure.

Sources: P&W, 2003.
ECT, 2004.

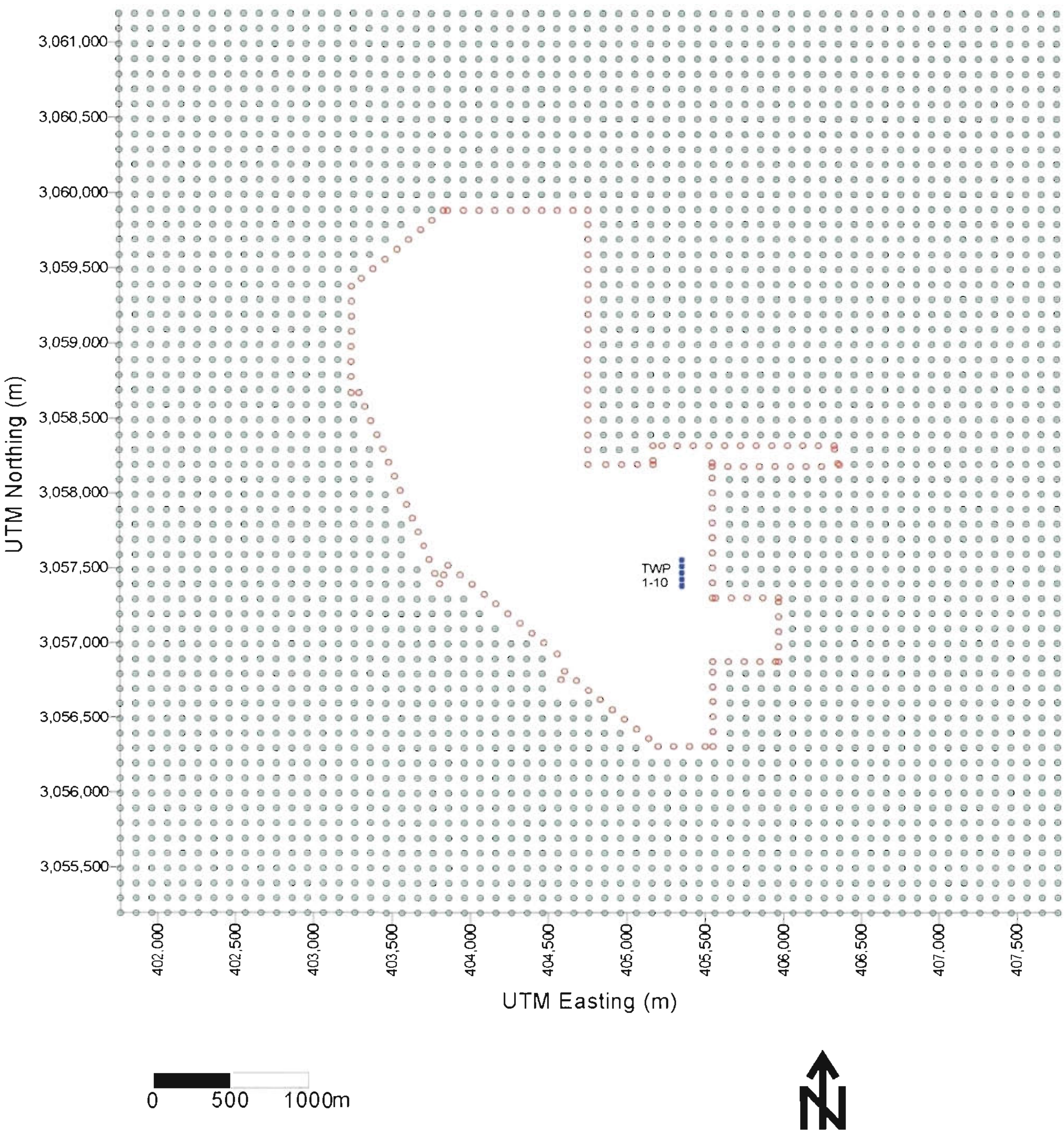


FIGURE 6-1.

RECEPTOR LOCATIONS WITHIN 3 km

Source: ECT, 2004.

ECT
Environmental Consulting & Technology, Inc.

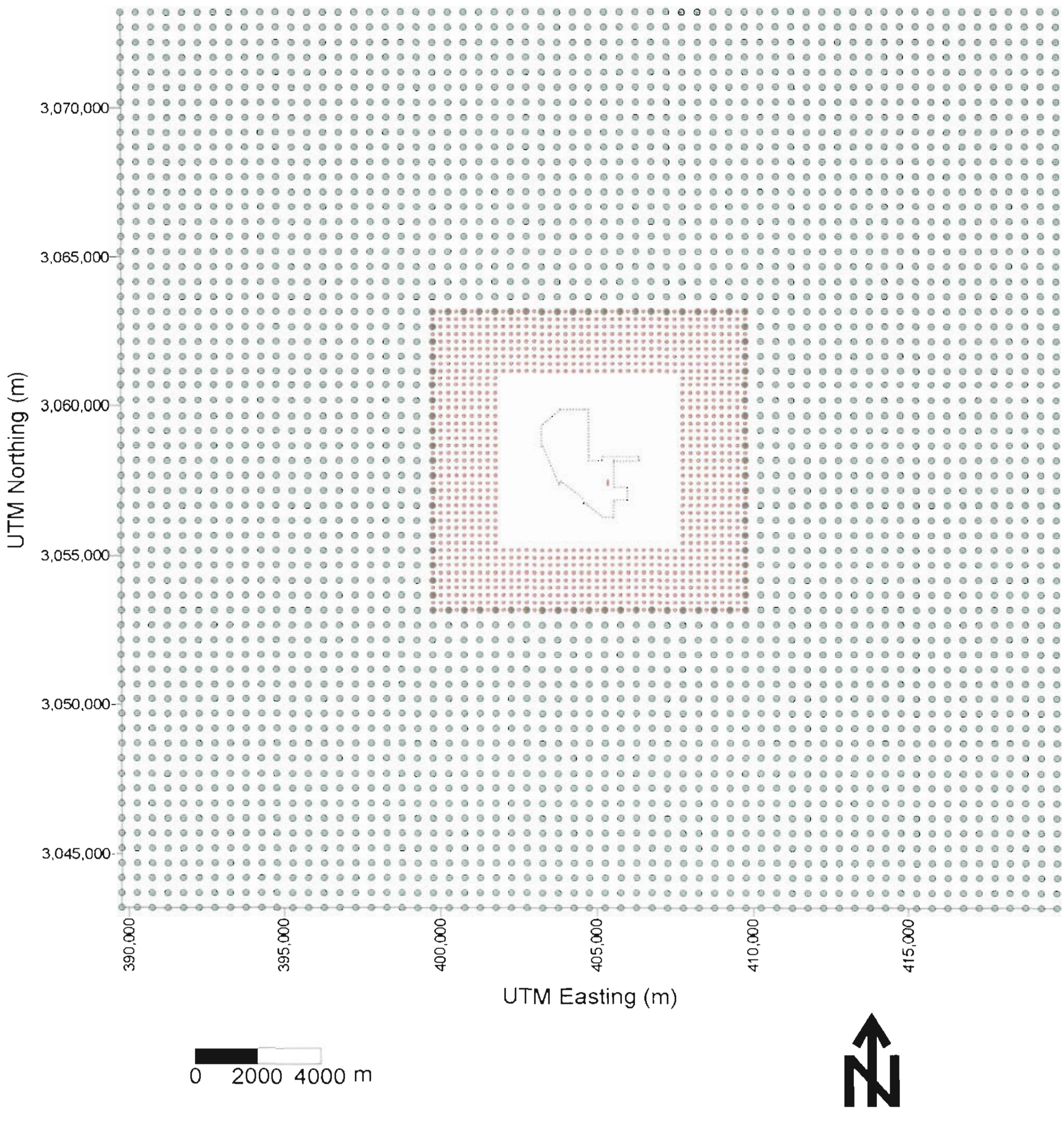


FIGURE 6-2.

RECEPTOR LOCATIONS FROM 3 TO 50 km

Source: ECT, 2004.

ECT
Environmental Consulting & Technology, Inc.

6.9 METEOROLOGICAL DATA

Detailed meteorological data are needed for modeling with the ISC3 dispersion models. The ISCST3 model requires a preprocessed data file compiled from hourly surface observations and concurrent twice-daily rawinsonde soundings (i.e., mixing height data).

Consistent with the GAQM and FDEP guidance, modeling should be conducted using the most recent, readily available, 5 years of meteorological data collected at a nearby observation station. In accordance with this guidance, the selected meteorological dataset consisted of St. Petersburg/Clearwater International Airport (SPG), Station ID 72211, surface data and Ruskin (RUS), Station ID 12842, upper air data. These data were obtained from the National Climatic Data Center (NCDC) for the 1992 through 1996 5-year period.

The surface and mixing height data for each of the 5 years of meteorological data were processed using the current version of EPA's PCRAMMET (Julian date 99169 [June 18, 1999]) preprocessing program to generate the meteorological data files in the format required by the ISCST3 dispersion model. PCRAMMET input files consisted of the quality assured NCDC surface and mixing height data.

In addition to the surface and mixing height meteorological data files, PCRAMMET requires input with respect to the following: (a) the use of dry or wet deposition calculations; (b) output filename; (c) output file type (UNFORM or ASCII); (d) surface data format (CD144, HUSWO, SAMSON, or SCRAM); and (e) latitude, longitude, and time zone of the surface meteorological station. In processing the meteorological data, the NONE deposition option was selected, ASCII output file chosen, and the SCRAM surface data format used. As obtained from NCDC records, St. Petersburg/Clearwater International Airport station latitude and longitude coordinates (in decimal degrees) are 27.92 North and 82.68 West, respectively. The St. Petersburg/Clearwater International Airport surface station is located in time zone 5.

Actual anemometer height for the St. Petersburg/Clearwater International Airport surface station, obtained from NCDC records, is 20 ft (6.1 meters) for the time period of interest (i.e., 1992 through 1996).

6.10 MODELED EMISSIONS INVENTORY

The modeled on-property emissions source consisted of the 10 proposed SCCTs. As will be discussed in Section 7.0, Ambient Impact Analysis Results, emissions from the new SCCTs resulted in air quality impacts below the significance impact levels (reference Table 4-2) for all pollutants and all averaging periods. Accordingly, additional, multisource interactive dispersion modeling was not required.

Emissions rates and stack parameters for the new SCCTs were previously presented in Tables 2-1 through 2-8.

7.0 AMBIENT IMPACT ANALYSIS RESULTS

7.1 MAXIMUM FACILITY IMPACTS AND SIGNIFICANT IMPACT AREAS

The ISCST3 model was used to model each of the nine SCCT oil firing operating cases. These operating scenarios included three SCCT loads (100, 80, and 50 percent) and three ambient temperatures (32, 78, and 95°F). Modeling was conducted for those project pollutants that exceed the PSD significant emissions rate thresholds (i.e., NO_x, SO_2, and PM/PM_{10}).

ISCST3 model results for each year of meteorology evaluated (1992 to 1996) are summarized on Table 7-1. This table shows the highest project impacts for each year and each operating scenario. For annual average impacts, the air quality analysis conservatively assumed continuous operation for each operating scenario. This approach will significantly overestimate annual impacts since the SCCTs will operate for no more than 2,500 hr/yr per SCCT.

The dispersion model results presented in Table 7-1 demonstrates that SCCT project impacts for all pollutants and averaging periods will be below the PSD significant impact levels previously shown in Table 3-3. Table 7-2 provides a summary of maximum SCCT project impacts and the PSD Class II area significant impact levels.

The PCGS is located in rural Hardee County. This area has not experienced significant general growth since August 7, 1977. The air quality impacts of any major industrial project in the area of the PCGS would have been subject to a detailed regulatory agency assessment under the PSD permitting program.

7.2 CONCLUSIONS

Comprehensive dispersion modeling using the ISCST3 model demonstrates that the SCCT project will result in ambient air quality impacts that are below the PSD Class II significant impact levels for all pollutants and all averaging periods. Accordingly, a multisource interactive assessment of air quality impacts with respect to the AAQS and PSD Class II increments is not required.

Table 7-1. Air Quality Impact Analysis Summary—Distilate Fuel Oil Firing

	Case 1 (100% Load, 32°F Ambient)					Case 2 (80% Load, 32°F Ambient)					Case 3 (50% Load, 32°F Ambient)				
	1992	1993	1994	1995	1996	1992	1993	1994	1995	1996	1992	1993	1994	1995	1996
Nominal 10 g/s impacts (10 SCCTs):															
High, 3-hour (µg/m3)	51.1	51.7	49.7	52.2	50.2	57.5	58.2	55.9	59.1	56.2	75.5	72.1	68.9	72.7	68.7
High, 24-hour (µg/m3)	15.7	18.1	12.1	11.2	14.1	18.9	22.1	14.8	12.9	17.1	26.4	30.7	20.8	16.7	23.9
Annual (µg/m^3)	0.90	0.98	1.02	0.90	0.99	1.09	1.20	1.23	1.10	1.19	1.53	1.70	1.74	1.51	1.69
SO_2															
Emissions rate (g/s)	1.80	1.80	1.80	1.80	1.80	1.49	1.49	1.49	1.49	1.49	1.06	1.06	1.06	1.06	1.06
High, 3-hour (µg/m3)	9.2	9.3	9.0	9.4	9.0	8.6	8.7	8.3	8.8	8.4	8.0	7.6	7.3	7.7	7.3
High, 24-hour (µg/m3)	2.8	3.3	2.2	2.0	2.5	2.8	3.3	2.2	1.9	2.6	2.8	3.3	2.2	1.8	2.5
Annual (µg/m^3)	0.16	0.18	0.18	0.16	0.18	0.16	0.18	0.18	0.16	0.18	0.16	0.18	0.18	0.16	0.18
NO_2															
Emissions rate (g/s)	6.26	6.26	6.26	6.26	6.26	5.19	5.19	5.19	5.19	5.19	3.68	3.68	3.68	3.68	3.68
Tier 2 Annual (µg/m^3)	0.42	0.46	0.48	0.42	0.46	0.43	0.47	0.48	0.43	0.46	0.42	0.47	0.48	0.42	0.47
PM_{10}															
Emissions rate (g/s)	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
High, 24-hour (µg/m3)	1.4	1.6	1.1	1.0	1.2	1.7	1.9	1.3	1.1	1.5	2.3	2.7	1.8	1.5	2.1
Annual (µg/m^3)	0.08	0.09	0.09	0.08	0.09	0.10	0.11	0.11	0.10	0.10	0.13	0.15	0.15	0.13	0.15

	Case 4 (100% Load, 78°F Ambient)					Case 5 (80% Load, 78°F Ambient)					Case 6 (50% Load, 78°F Ambient)				
	1992	1993	1994	1995	1996	1992	1993	1994	1995	1996	1992	1993	1994	1995	1996
Nominal 10 g/s impacts (10 SCCTs):															
High, 3-hour (µg/m3)	47.9	48.6	46.7	48.8	47.2	54.1	54.6	52.6	55.5	53.0	68.8	68.0	64.7	68.8	64.6
High, 24-hour (µg/m3)	14.5	16.4	10.9	10.3	12.8	17.1	20.1	13.3	12.0	15.5	24.1	28.1	19.0	15.4	21.9
Annual (µg/m^3)	0.81	0.89	0.93	0.82	0.89	0.99	1.08	1.12	0.98	1.08	1.39	1.55	1.58	1.38	1.54
SO_2															
Emissions rate (g/s)	1.85	1.85	1.85	1.85	1.85	1.54	1.54	1.54	1.54	1.54	1.08	1.08	1.08	1.08	1.08
High, 3-hour (µg/m3)	8.9	9.0	8.6	9.0	8.7	8.3	8.4	8.1	8.5	8.2	7.4	7.3	7.0	7.4	7.0
High, 24-hour (µg/m3)	2.7	3.0	2.0	1.9	2.4	2.6	3.1	2.1	1.8	2.4	2.6	3.0	2.0	1.7	2.4
Annual (µg/m^3)	0.15	0.16	0.17	0.15	0.16	0.15	0.17	0.17	0.15	0.17	0.15	0.17	0.17	0.15	0.17
NO_2															
Emissions rate (g/s)	6.45	6.45	6.45	6.45	6.45	5.36	5.36	5.36	5.36	5.36	3.74	3.74	3.74	3.74	3.74
Tier 2 Annual (µg/m^3)	0.39	0.43	0.45	0.40	0.43	0.40	0.43	0.45	0.40	0.43	0.39	0.44	0.44	0.39	0.43
PM_{10}															
Emissions rate (g/s)	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
High, 24-hour (µg/m3)	1.3	1.4	1.0	0.9	1.1	1.5	1.8	1.2	1.1	1.4	2.1	2.5	1.7	1.4	1.9
Annual (µg/m^3)	0.07	0.08	0.08	0.07	0.08	0.09	0.10	0.10	0.09	0.10	0.12	0.14	0.14	0.12	0.14

Table 7-1. Air Quality Impact Analysis Summary—Distillate Fuel Oil Firing (Page 2 of 2)

	Case 7 (100% Load, 95°F Ambient)					Case 8 (80% Load, 95°F Ambient)					Case 9 (50% Load, 72°F Ambient)					Maximums
	1992	1993	1994	1995	1996	1992	1993	1994	1995	1996	1992	1993	1994	1995	1996	
Nominal 10 g/s impacts (10 SCCTs):																
High, 3-hour (µg/m3)	48.9	49.6	47.6	49.9	48.1	54.7	55.2	53.2	56.1	53.6	69.8	68.6	65.2	69.3	65.2	75.5
High, 24-hour (µg/m3)	14.9	16.9	11.2	10.6	13.2	17.4	20.5	13.6	12.1	15.8	24.4	28.5	19.2	15.6	22.2	30.7
Annual (µg/m^3)	0.84	0.92	0.96	0.84	0.92	1.01	1.10	1.14	1.00	1.10	1.41	1.57	1.60	1.40	1.56	1.74
SO_2																
Emissions rate (g/s)	1.76	1.76	1.76	1.76	1.76	1.47	1.47	1.47	1.47	1.47	1.03	1.03	1.03	1.03	1.03	1.8
High, 3-hour (µg/m3)	8.6	8.7	8.4	8.8	8.5	8.0	8.1	7.8	8.3	7.9	7.2	7.1	6.7	7.1	6.7	9.4
High, 24-hour (µg/m3)	2.6	3.0	2.0	1.9	2.3	2.6	3.0	2.0	1.8	2.3	2.5	2.9	2.0	1.6	2.3	3.3
Annual (µg/m^3)	0.15	0.16	0.17	0.15	0.16	0.15	0.16	0.17	0.15	0.16	0.15	0.16	0.16	0.14	0.16	0.18
NO_2																
Emissions rate (g/s)	6.14	6.14	6.14	6.14	6.14	5.12	5.12	5.12	5.12	5.12	3.60	3.60	3.60	3.60	3.60	6.3
Tier 2 Annual (µg/m^3)	0.39	0.42	0.44	0.39	0.42	0.39	0.42	0.44	0.38	0.42	0.38	0.42	0.43	0.38	0.42	0.48
PM_{10}																
Emissions rate (g/s)	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.9
High, 24-hour (µg/m3)	1.3	1.5	1.0	0.9	1.2	1.5	1.8	1.2	1.1	1.4	2.1	2.5	1.7	1.4	2.0	2.7
Annual (µg/m^3)	0.07	0.08	0.08	0.07	0.08	0.09	0.10	0.10	0.09	0.10	0.12	0.14	0.14	0.12	0.14	0.15

	Project Impact	Case Number	Year	Class II SIL	% of SIL (%)
SO_2					
High, 3-hour (µg/m3)	9.4	3	1995	25	38
High, 24-hour (µg/m3)	3.3	2	1993	5	66
Annual (µg/m^3)	0.18	1	1994	1	18
NO_2					
Annual (µg/m^3)	0.48	1	1994	1	48
PM_{10}					
High, 24-hour (µg/m3)	2.7	3	1993	5	54
Annual (µg/m^3)	0.15	3	1994	1	15

Source: ECT, 2004.

Table 7-2. ISCST3 Model Results—Maximum Criteria Pollutant Impacts

Pollutant	Averaging Time	Maximum Impact ($\mu g/m^3$)	Significant Impact ($\mu g/m^3$)
NO_x	Annual	0.48	1
PM_{10}	Annual	0.15	1
	24-hour	2.7	5
SO_2	Annual	0.18	1
	24-hour	3.3	5
	3-hour	9.4	25

Source: ECT, 2004.

8.0 AMBIENT AIR QUALITY MONITORING AND ANALYSIS

8.1 EXISTING AMBIENT AIR QUALITY MONITORING DATA

The nearest FDEP ambient air monitoring station is located in Mulberry, Polk County, approximately 25 km north of the PCGS. The FDEP monitoring station at Mulberry monitors PM_{10} and SO_2. The nearest FDEP station that monitors ozone is located in Lakeland, Polk County, approximately 34 km north of the project site. The nearest FDEP station that monitors NO_x is located in Tampa, Hillsborough County, approximately 51 km northwest of the project site. The nearest FDEP station that monitors CO is located in Tampa, Hillsborough County, approximately 42 km northwest of the project site. The nearest FDEP station monitoring for lead is situated in Tampa, Hillsborough County, approximately 55 km northwest of the project site. Tables 8-1 and 8-2 summarize 2002 and 2003 ambient air quality data for these FDEP stations.

8.2 PRECONSTRUCTION AMBIENT AIR QUALITY MONITORING EXEMPTION APPLICABILITY

As previously discussed in Section 4.2, PSD review may require continuous ambient air monitoring data to be collected in the area of the proposed source for pollutants emitted in significant amounts. Because several pollutants will be emitted from the SCCT project in excess of their respective significant emissions rates, preconstruction monitoring is required. However, Rule 62-212.400(2)(e), F.A.C., provides for an exemption from the preconstruction monitoring requirement for sources with *de minimis* air quality impacts. The *de minimis* ambient impact levels were previously presented in Table 4-1. To assess the appropriateness of monitoring exemptions, dispersion modeling analyses were performed to determine the maximum pollutant concentrations caused by emissions from the proposed facility. The results of these analyses were presented in detail in Section 7.2. The following paragraphs summarize the analyses results as applied to the preconstruction ambient air quality monitoring exemptions.

Table 8-1. Summary of FDEP 2002 Ambient Air Quality Data

Pollutant	Site Location		Site Name	Site Number	Site UTM Coordinates		Distance From Plant Origin (km)	Direction From Plant Origin (Vector °)	Averaging Period	Sampling Period	Number of Observations	Ambient Concentration (ug/m³)			
	County	City			Easting	Northing						1st High	2nd High	Arithmetic Mean	Standard
PM_{10}	Polk	Mulberry	SR640 & Anderson Road	1050010	399,800.0	3,081,600.0	25	347	24-Hour	Jan-Dec	357	43	38		150*
									Annual					18	50†
	Polk	Mulberry	Mulberry High School	1052006	405,500.0	3,086,000.0	29	0	24-Hour	Jan-Dec	361	78	64		150*
									Annual					21	50†
	Hillsborough	Tampa	Gardinier Park	0570083	363,890.0	3,082,701.0	49	301	24-Hour	Jan-Dec	112	50	38		150*
									Annual					22	50†
	Hillsborough	Tampa	Eisenhower Jr. High School	0570085	365,199.0	3,074,807.0	44	293	24-Hour	Jan-Dec	58	44	33		150*
									Annual					19	50†
SO_2	Polk	Nichols	SR640 & Anderson Road	1050010	399,800.0	3,081,600.0	25	347	1-Hour	Jan-Dec	8,612	135.8	130.6		
									3-Hour			122.8	96.7		1,300‡
									24-Hour			28.7	26.1		3653
									Annual					10.4	802
	Polk	Mulberry	Mulberry High School	1052006	405,500.0	3,086,000.0	29	0	1-Hour	Jan-Dec	8,729	211.6	203.8		
									3-Hour			180.2	107.1		1,300‡
									24-Hour			39.2	26.1		365‡
									Annual					10.4	80†
NO_2	Hillsborough	Tampa	Simmons Park	0570081	355,544.0	3,069,100.0	51	283	1-Hour	Jan-Dec	8,692	92.0	88.2		100†
									Annual					13.1	
	Hillsborough	Tampa	5121 Gandy Blvd	0571065	348,560.0	3,086,060.0	64	297	1-Hour	Jan-Dec	8,000	112.7	110.8		100†
									Annual					20.7	
CO	Hillsborough	Tampa	4702 Central Avenue	0571070	357,000.0	3,096,500.0	62	309	1-Hour	Jan-Dec	8,723	5,714.3	5,714.3		40,000‡
									8-Hour			5,714.3	4,571.4		10,000‡
	Hillsborough	Plant City	One Raider Place	0574004	389,300.0	3,096,710.0	42	338	1-Hour	Jan-Dec	8,273	3,428.6	2,285.7		40,000‡
									8-Hour			2,285.7	1,142.9		10,000‡
O_3	Polk	Lakeland	Sikes Elementary	1056005	401,588.0	3,090,755.0	34	354	1-Hour	Mar-Oct	244	174.4			235**
	Polk	Lakeland	Baptist Children's Home	1056006	404,435.0	3,100,652.0	43	359	1-Hour	Mar-Oct	244	180.2			235**
	Hillsborough	Tampa	Simmons park	0570081	355,544.0	3,069,100.0	51	283	1-Hour	Mar-Oct	240	186.1			235**
Lead	Hillsborough	Tampa	Gulf Coast Lead	0571066	364,000.0	3,093,400.0	55	311	24-Hour		54	5.3			
										Jan-Mar		1.00			1.5†
										Apr-Jun		0.33			1.5†
										Jul-Sep		0.39			1.5†
										Oct-Dec		1.27			1.5†

*9th percentile.
†Arithmetic mean.
‡2nd high.
**4th highest day with hourly value exceeding standard over a 3-year period.

Sources: FDEP, 2004.
ECT, 2004.

Table 8-2. Summary of FDEP 2003 Ambient Air Quality Data

Pollutant	Site Location: County	Site Location: City	Site Name	Site Number	Site UTM Coordinates: Easting	Site UTM Coordinates: Northing	Distance From Plant Origin (km)	Direction From Plant Origin (Vector °)	Averaging Period	Sampling Period	Number of Observations	Ambient Concentration (ug/m^3): 1st High	2nd High	Arithmetic Mean	Standard
PM_{10}	Polk	Mulberry	SR640 & Anderson Road	1050010	399,800.0	3,081,600.0	25	347	24-Hour	Jan-Dec	346	51	42		1501
									Annual					20	502
	Polk	Mulberry	Mulberry High School	1052006	405,500.0	3,086,000.0	29	0	24-Hour	Jan-Dec	355	59	49		1501
									Annual					20	502
	Hillsborough	Tampa	Gardinier Park	0570083	363,890.0	3,082,701.0	49	301	24-Hour	Jan-Dec	322	59	58		1501
									Annual					25	502
	Hillsborough	Tampa	Eisenhower Jr. High School	0570085	365,199.0	3,074,807.0	44	293	24-Hour	Jan-Dec	58	41	37		1501
									Annual					20	502
SO_2	Polk	Mulberry	SR640 & Anderson Road	1050010	399,800.0	3,081,600.0	25	347	1-Hour	Jan-Dec	8,282	431.0	193.3		
									3-Hour			117.6	88.8		1,3003
									24-Hour			44.4	39.2		3653
									Annual					13.1	802
	Polk	Mulberry	Mulberry High School	1052006	405,500.0	3,086,000.0	29	0	1-Hour	Jan-Dec	3,965	326.5	206.4		
									3-Hour			117.6	81.0		1,300‡
									24-Hour			26.1	23.5		365‡
									Annual					10.4	80†
NO_2	Hillsborough	Tampa	Simmons Park	0570081	355,544.0	3,069,100.0	51	283	1-Hour	Jan-Dec	8,444	90.1	90.1		100†
									Annual					13.1	
	Hillsborough	Tampa	5121 Gandy Blvd	0571065	348,560.0	3,086,060.0	64	297	1-Hour	Jan-Dec	8,636	108.9	107.0		100†
									Annual					18.8	
CO	Hillsborough	Tampa	4702 Central Avenue	0571070	357,000.0	3,096,500.0	62	309	1-Hour	Jan-Dec	8,459	8,342.9	6,514.3		40,000‡
									8-Hour			4,114.3	3,771.4		10,000‡
	Hillsborough	Plant City	One Raider Place	0574004	389,300.0	3,096,710.0	42	338	1-Hour	Jan-Dec	8,696	2,742.9	2,514.3		40,000‡
									8-Hour			1,257.1	1,257.1		10,000‡
O_3	Polk	Lakeland	Sikes Elementary	1056005	401,588.0	3,090,755.0	34	354	1-Hour	Mar-Oct	239	176.3			235**
	Polk	Lakeland	Baptist Children's Home	1056006	404,435.0	3,100,652.0	43	359	1-Hour	Mar-Oct	245	176.3			235**
	Hillsborough	Tampa	Simmons park	0570081	355,544.0	3,069,100.0	51	283	1-Hour	Mar-Oct	239	219.4			235**
Lead	Hillsborough	Tampa	Gulf Coast Lead	0571066	364,000.0	3,093,400.0	55	311	24-Hour		59	3.2			
										Jan-Mar		0.74			1.5†
										Apr-Jun		0.12			1.5†
										Jul-Sep		0.41			1.5†
										Oct-Dec		0.55			1.5†

*9th percentile.
†Arithmetic mean.
‡2nd high.
**4th highest day with hourly value exceeding standard over a 3-year period.

Sources: FDEP, 2004.
ECT, 2004.

8.2.1 PM_{10}

The maximum 24-hour PM_{10} impact was predicted to be 2.7 µg/m^3. This concentration is below the 10-µg/m^3 *de minimis* level ambient impact level. Therefore, a preconstruction monitoring exemption for PM_{10} is appropriate in accordance with the PSD regulations.

8.2.2 SO_2

The maximum 24-hour SO_2 impact was predicted to be 3.3 µg/m^3. This concentration is below the 13-µg/m^3 *de minimis* ambient impact level for the 24-hour averaging period. Therefore, a preconstruction monitoring exemption for SO_2 is appropriate in accordance with the PSD regulations.

8.2.3 NO_2

The maximum annual NO_2 impact was predicted to be 0.48 µg/m^3. This concentration is below the 14-µg/m^3 *de minimis* ambient impact level. Therefore, a preconstruction monitoring exemption is appropriate for NO_2 in accordance with the FDEP PSD regulations.

9.0 ADDITIONAL IMPACT ANALYSES

The additional impacts analysis required for projects subject to PSD review evaluates project impacts pertaining to associated growth; soils, vegetation, and wildlife; and visibility impairment. Each of these topics is discussed in the following sections.

9.1 GROWTH IMPACT ANALYSIS

The purpose of the growth impact analysis is to quantify growth resulting from the construction and operation of the proposed project and assess air quality impacts that would result from that growth.

Impacts associated with construction of the PCGS SCCTs will be minor. While not readily quantifiable, the temporary increase in vehicle miles traveled in the area would be insignificant, as would any temporary increase in vehicular emissions.

The new SCCTs are being constructed to meet general area electric power demands; therefore, no significant secondary growth effects due to operation of the project are anticipated. When operational, the SCCTs are projected to generate approximately one or two new jobs; this number of new personnel will not significantly affect growth in the area. The increase in natural gas and distillate fuel oil demand due to operation of the new SCCTs will have no major impact on local fuel markets. No significant air quality impacts due to associated industrial/commercial growth are expected.

9.2 IMPACTS ON SOILS, VEGETATION, AND WILDLIFE

Maximum air quality impacts in the vicinity of the PCGS due to operation of the proposed SCCTs will be well below applicable AAQS. Accordingly, no significant, adverse impacts on soils, vegetation, and wildlife in the vicinity of the PCGS are anticipated. The following sections discuss potential impacts on the nearest Class I area, the Chassahowitzka NWR.

9.2.1 IMPACTS ON SOILS

The U.S. Department of Agriculture (USDA) (1991a and 1991b) lists the primary soil type in Chassahowitzka NWR as Weekiwachee-Durbin muck. High levels of sulfur and organic content characterize this soil type. Sulfur levels may approach 4 percent in the upper soil layer. Daily flooding by high tides causes the pH to vary between 6.1 and 7.8.

Typically, SO_2 represents the greatest threat to soil since this pollutant causes increased sulfur content and decreased pH. However, for this project, given the extremely low levels of SO_2 emitted, the distance from the source, the naturally high sulfur content of the Class I area soils, and the pH variability caused by tidal influences, no impacts to soils are expected.

9.2.2 IMPACTS ON VEGETATION

The Chassahowitzka NWR is a complex ecosystem of vegetation assemblages that depend on the subtle interplay of slight changes in elevation, salinity, hydroperiod, and edaphic factors for distribution, extent, and species composition. The mosaic of plant communities at the Chassahowitzka NWR includes pine woods and hammock forests within areas of higher ground. Various fresh water forested and nonforested wetlands are situated within lowland depressions that are inundated/saturated with fresh water for at least part of the year (mixed swamp, marsh, etc.). Brackish to salt water wetlands such as salt marsh and mangrove swamp are distributed at lower elevations on land normally inundated by tidal action and freshwater pulses from upland surface water runoff. The predominant flora associated with these associations is typically common to the central Florida region and characterized by a high diversity of terrestrial, wetland, and aquatic species. Common vascular taxa within the Chassahowitzka NWR would include slash pine, laurel oak, live oak, cabbage palm, sweet gum, red maple, saw palmetto, and gallberry in the inland areas and needlerush, red mangrove, cordgrass, and saltgrass in the brackish to marine reaches.

The literature was reviewed as to potential effects of air pollutants on vegetation. It was concluded that even the maximum impacts projected to occur in the immediate vicinity of PCGS due to operation of the SCCTs would be below thresholds shown to cause damage to vegetation. Maximum air pollutant impacts at Chassahowitzka NWR due to emissions from the PCGS SCCTs will be far less, as presented previously. The potential for damage at the Chassahowitzka NWR could, therefore, be considered negligible given the much lower air pollution impacts predicted at Chassahowitzka NWR relative to the immediate PCGS plant vicinity. Impacts would also be minimized due to the absence of any plant species at Chassahowitzka NWR that would be especially sensitive to the low predicted pollutant concentrations.

9.2.3 IMPACTS ON WILDLIFE

Wildlife resources in the 30,500-acre Chassahowitzka NWR are fairly typical of central Florida's Gulf Coast. The eastern portions of the site are fringed by hardwood swamp habitats, but the primary habitats are the estuarine and brackish marshes along with the saltwater bays containing many mangrove-covered islands. These habitats support large numbers of resident and migratory waterfowl, water birds, and shorebirds. Wading birds are also quite common. Deer, raccoons, black bears, otters, and bobcats are the notable mammals. Alligators are numerous. Bald eagles and the West Indian manatee are the primary endangered/threatened species using the area.

Air pollution impacts to wildlife have been reported in the literature, although many of the incidents involved acute exposures to pollutants usually caused by unusual or highly concentrated releases or unique weather conditions. Generally, there are three ways pollutants may affect wildlife: through inhalation, exposure with skin, and ingestion (Newman, 1980). Ingestion is the most common means and can occur through eating or drinking of high concentrations of pollutants. Bioaccumulation is the process of animals collecting and accumulating pollutant levels in their bodies over time. Other animals that prey on these animals would then be ingesting concentrated pollutant levels.

Based on a review of the limited literature on air pollutant effects on wildlife, it is unlikely that the levels of pollutants produced by this project will cause injury or death to wildlife. Concentrations of pollutants will be low, emissions will be dispersed over a large area, and mobility of wildlife will minimize their exposure to any unusual concentrations caused by equipment malfunction or unique weather patterns.

Bioaccumulation, particularly of mercury, has been a concern in Florida. There is increasing evidence that mercury may be naturally evolved in Florida and that, combined with manmade sources, is becoming bioaccumulated in certain fish and wildlife. It is unknown what naturally occurring levels may be present in onsite fish and wildlife. However, the likelihood that the small amount attributable to this project would all be methylated, end up in the food chain, and then consumed by predators is considered negligible.

The acid rain effects on wildlife in Florida are primarily those related to aquatic animals. Acidified water may prevent fish egg hatching, damage larvae, and lower immunity factors in adult fish (Barker, 1983). Acid rain can also result in release of metals (especially aluminum) from lake sediments; this can cause a biochemical deterioration of fish gills leading to death by suffocation. However, the sensitivity of Florida lakes to acid rain is in question. Florida lakes have a wide natural range of pH (from 4 to 8.8 pH units). Most well-buffered lakes are in central and south Florida, and rainfall is in the pH range of 4.8 to 5.1. According to Barker (1983) and Charles (1991), no evidence is currently available to clearly show that degradation of aquatic systems has occurred as a direct result of acid precipitation in Florida. The air emissions from the PCGS SCCTs that could contribute to the formation of atmospheric acids are not predicted to significantly increase acid precipitation and are predicted to have no impact on wildlife at Chassahowitzka NWR.

In conclusion, it is unlikely the projected air emissions levels from the PCGS SCCTs will have any measurable direct or indirect effects on wildlife using Chassahowitzka NWR.

9.3 VISIBILITY IMPAIRMENT POTENTIAL

No visibility impairment at the local level is expected due to the types and quantities of emissions projected for the SCCTs. Opacity of the SCCTs exhausts will be 10 percent or less, excluding water. Emissions of primary particulates and sulfur oxides from the SCCTs will be low due to the primary use of pipeline-quality natural gas and low sulfur, low ash distillate fuel oil as the backup fuel source. The SCCTs will comply with all applicable FDEP requirements pertaining to visible emissions.

10.0 CLASS I IMPACTS

10.1 INTRODUCTION

The required Class I area impact assessments were conducted using the CALPUFF dispersion model in accordance with the recommendations contained in the Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long-Range Transport Impacts, the Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I Report, and EPA's GAQM. The CALPUFF model was employed in a refined mode using three years (1990, 1992, and 1996) of meteorology developed using the CALMET pre-processor program and specific receptors recommended by the National Park Service (NPS) for the Chassahowitzka NWR. The CALPUFF suite of programs, including the POSTUTIL and CALPOST post-processing programs, was employed to develop estimates of SCCT project impacts on the Chassahowitzka NWR for PSD increments, regional haze, and deposition.

10.2 SUMMARY

The CALMET/CALPUFF/CALPOST modeling assessment resulted in the following conclusions:

- Maximum SO_2, NO_2, and PM_{10} impacts at the Chassahowitzka NWR are projected to be well below the EPA Class I area significant levels for all pollutants and averaging periods. The critical averaging time and pollutant was determined to be the 3-hour average SO_2 impact. The maximum 3-hour average SO_2 impact on the Chassahowitzka NWR is projected to be 0.52 $\mu g/m^3$, or only 52 percent of the EPA PSD Class I significant impact level. The EPA PSD Class I significant impact levels were previously provided in Section 4.0, Table 4-3.
- Maximum change in light extinction coefficient (β_{ext}) at the Chassahowitzka NWR is projected to be 5.15 percent or a 0.502 change in deciview (dv). These visibility impacts are slightly above the FLM significance levels of a 5-percent change in β_{ext} and 0.5-change in dv.
- Maximum total (wet and dry) sulfur deposition rate is projected to be 0.0019 kilograms per hectare per year (kg/ha/yr). This same deposition rate,

0.0019 kg/ha/yr, was also projected for total nitrogen deposition. These deposition impacts are only 0.2 percent of the FLM significance level of 0.01 kg/ha/yr for sulfur and nitrogen deposition, respectively.

10.3 MODEL SELECTION AND USE

The nearest Class I area to the PCGS is the Chassahowitzka NWR, located approximately 130 km north of the project site. Steady-state dispersion models do not consider temporal or spatial variations in plume transport direction nor do they limit the downwind transport of a pollutant as a function of windspeed and travel time. Due to these limitations, conventional steady-state dispersion models, such as the ISC models, are not considered suitable for predicting air quality impacts at receptors located more than 50 km from an emissions source.

Because of the need to assess air quality impacts at PSD Class I areas, which are typically located at distances greater than 50 km from emissions sources of interest, EPA and FLM have initiated efforts to develop dispersion models appropriate for the assessment of long-range transport of air pollutants. IWAQM was formed to coordinate the model development efforts of EPA and the FLMs.

The IWAQM work plan indicates that a phased approach would be taken with respect to the implementation of recommendations for long-range transport modeling. In Phase 1, the IWAQM would review current EPA modeling guidance and issue an interim modeling approach applicable to projects undergoing permit review. For Phase 2, a review would be made of other available long-range transport models and recommendations developed for the most appropriate modeling techniques.

The Phase 1 recommendation, issued in April 1993, is to use the Lagrangian puff model, MESOPUFF II, for long-range transport air quality assessments.

The Phase 2 recommendations, issued in December 1998, are contained in the IWAQM Phase 2 Summary Report and Recommendations for Modeling Long-Range Transport Impacts. Additional FLM guidance with respect to the assessment of visibility and deposition impacts is provided in the FLAG Phase I Report dated December 2000. The Phase 2 IWAQM recommendation is to apply the CALPUFF modeling system to assess air quality impacts at distances greater than 50 km from an emissions source. In April 2003, EPA designated the CALPUFF model as a preferred model (i.e., a model listed in Appendix A to Appendix W of 40 CFR 51, Summaries of Preferred Air Quality Models) for use in assessing the long-range transport of air pollutants. The CALPUFF modeling system consists of three main components: CALMET, CALPUFF, and CALPOST. Each of these components is described in the following sections.

CALMET

CALMET is a meteorological model that develops hourly wind and temperature fields on a three-dimensional gridded modeling domain. The meteorological file produced by CALMET for use by CALPUFF also includes two-dimensional parameters such as mixing height, surface characteristics, and dispersion properties.

CALMET requires a number of input data files to develop the gridded three- and two-dimensional meteorological file used by CALPUFF. The specific meteorological data used by the CALMET program include:

- Penn State/NCAR Mesoscale Model gridded, prognostic wind field data (terrain elevation, land use code, sea level pressure, rainfall amount, snow cover indicator, pressure, temperature/dew point, wind direction, and windspeed).
- Surface station weather data (windspeed, wind direction, ceiling height, opaque sky cover, air temperature, relative humidity, station pressure, and precipitation type code).
- Upper air sounding (mixing height) data (pressure, height above sea level, temperature, wind direction, and windspeed at each sounding).
- Surface station precipitation data (precipitation rates).
- Overwater data (air-sea surface temperature difference, air temperature, relative humidity, overwater mixing height, windspeed, and wind direction).

- Geophysical data (land use type; terrain elevation; surface parameters including surface roughness, length, albedo, Bowen ratio, soil heat flux, and vegetation leaf area index; and anthropogenic heat flux).

CALMET output files for calendar years 1990, 1992, and 1996 were obtained from FDEP in July 2004 for use in assessing air quality impacts at the Chassahowitzka NWR. Further details regarding the meteorological data used in the CALMET program are provided in Section 10.5, Meteorological Data. Appendix F contains an example CALMET output list file. This output file shows all of the CALMET options employed by FDEP in developing their CALMET files for the Chassahowitzka NWR.

CALPUFF

CALPUFF is a transport and puff model that advects *puffs* of material from an emissions source. These puffs undergo various dispersion and transformation simulation processes as they are advected from an emissions source to a receptor of interest. The simulation processes include wet and dry deposition and chemical transformation. CALPUFF typically uses the gridded meteorological data created by the CALMET program. CALPUFF, when used in a screening mode, can also use non-gridded meteorological data similar to that used by a steady-state Gaussian model such as the ISC3 dispersion model. The distribution of puffs by CALPUFF explicitly incorporates the temporal and spatial variations in the meteorological fields thereby overcoming one of the main shortcomings of steady-state dispersion models.

There are a number of optional CALPUFF input files that were not used for the Chassahowitzka NWR impact assessments. These include time-varying emissions rates, user-specified deposition velocities and chemical transformation conversion rates, complex terrain receptor and hill geometry data, and coastal boundary data.

CALPUFF generates output files consisting of hourly concentrations, deposition fluxes, and data required for visibility assessments for each receptor. These CALPUFF output files are subsequently processed by the POSTUTIL and CALPOST programs to provide impact summaries for the pollutants and averaging periods of interest.

The various CALPUFF program options are implemented by means of a control file. CALPUFF options selected for the Chassahowitzka NWR impact assessments conform to the recommendations contained in the IWQAM Phase 2 report and EPA's GAQM. Options selected include modeling of six species (SO_2, sulphion [SO_4] NO_x, nitric acid [HNO_3], nitrate [NO_3], and PM_{10}), chemical transformation using the MESOPUFF II scheme, wet removal, and a 72 by 88 meteorological and computational grid with a 5-km grid spacing. The meteorological and computational grids include the Payne Creek Generating SCCT emissions sources and the Chassahowitzka NWR receptors. The current version of CALPUFF (Version 5.7, Level 030402) was used in the Chassahowitzka NWR air quality impact assessments. Appendix F includes an example CALPUFF output list file. This output file shows all of the CALPUFF options employed for the SCCT project Class I area impact analysis.

POSTUTIL

POSTUTIL is a post-processing program used to process the concentration generated by CALPUFF. POSTUTIL was used to recompute the HNO_3/NO_3 concentration partition, consolidate the wet and dry nitrogen and sulfur fluxes, and convert sulfate and nitrate fluxes to total sulfur and total nitrogen fluxes. The current version of POSTUTIL (Version 1.3, Level 030402) was used in the Chassahowitzka NWR air quality impact assessments. Appendix F includes an example POSTUTIL output list file. This output file shows all of the POSTUTIL options employed for the SCCT project Class I area impact analysis.

CALPOST

CALPOST is a post-processing program used to process the concentration, deposition, and visibility files generated by CALPUFF. The CALPOST program was formulated to average and report pollutant concentrations or wet/dry deposition fluxes using the hourly data contained in the CALPUFF output files. CALPOST can produce summary tables of pollutant concentrations and depositions for each receptor for various averaging times and can develop ranked lists of these impacts. For visibility-related modeling (e.g., regional haze), CALPOST uses the CALPUFF generated pollutant concentrations to calculate extinction coefficients and other related indicators of visibility.

For visibility assessments, background conditions were estimated using *natural* background data (i.e., absent anthropogenic influences) and hourly relative humidity data. The CALPOST program was then used to compute background extinction coefficients using the natural background data and the IWQAM recommended extinction efficiency for each species.

Similar to the CALPUFF program, the various CALPOST program options are implemented by means of a control file. CALPOST options selected for the Chassahowitzka NWR impact assessments conform to the recommendations contained in the FLAG Phase I Report. Background light extinction Method 2 was selected to develop visibility impacts; this method uses speciated particulate concentration data and hourly relative humidity data. The current version of CALPOST (Version 5.4, Level 030402) was used in the Chassahowitzka NWR air quality impact assessments. Appendix F includea an example CALPOST output list file. This output file shows all of the CALPOST options employed for the SCCT project Class I area impact analysis.

10.4 RECEPTOR GRID

Consistent with FLM modeling guidance, the CALPUFF receptor grid consisted of 113 discrete receptors, obtained from the National Park Service (NPS) Web site, located throughout the Chassahowitzka NWR.

10.5 METEOROLOGICAL DATA

Processed CALMET meteorological data for calendar years 1990, 1992, and 1996 were obtained from FDEP in July 2004. Meteorological data used by FDEP to develop the CALMET files consisted of mesoscale data (MM4 data for 1990 and 1992, and MM5 data for 1996) together with four upper air, five overwater, nine surface, and 32 precipitation stations located throughout the modeling domain.

10.6 MODELED EMISSION SOURCES

Modeled emissions sources consisted of the 10 SCCTs assuming oil firing at Case 4 conditions (i.e., rated load and 78°F ambient temperature). These operating conditions were selected because they result in the highest emissions rates. Specific SCCT emissions source characteristics used in the CALPUFF modeling assessments are summarized in Table 10-1.

10.7 MODEL RESULTS

Refined CALPUFF/CALPOST modeling results for Class I PSD increments, visibility, and deposition impacts at the Chassahowitzka NWR are discussed in the following sections.

10.7.1 PSD CLASS I INCREMENTS

Tables 10-2, 10-3, and 10-4 summarize maximum annual NO_2, SO_2, and PM_{10} impacts, respectively. Tables 10-5 and 10-6 summarize maximum 3- and 24-hour SO_2 impacts, respectively. Table 10-7 summarize maximum 24-hour PM_{10} impacts. These tables provide the highest impact for each pollutant and averaging period, the location of the highest impact, the time of occurrence for short-term (3- and 24-hour average) impacts, and the PSD Class I significant impact levels.

The critical pollutant and averaging period was determined to be the 3-hour average SO_2 impact. The maximum project 3-hour average SO_2 impact at the Chassahowitzka NWR is projected to be 0.52 $\mu g/m^3$, or only 52 percent of the EPA PSD Class I significant impact level.

The CALPUFF/CALPOST results demonstrate that maximum SCCT project impacts at the Chassahowitzka NWR will be less than the EPA Class I PSD significant impact levels for all pollutants and averaging periods.

10.7.2 REGIONAL HAZE

Table 10-8 summarizes maximum 24-hour regional haze impacts. This table provides the emissions source beta extinction coefficient ($ß_{ext}$), for each species (SO_4, NO_3, and PMC)

Table 10-1. SCCT CALPUFF Emissions Source Data

Parameter	Units	Value
Stack height	ft	60
Stack diameter	ft	9.5
Stack velocity	ft/sec	95.4
Stack temperature	°F	918
SO_2 emissions	lb/hr	13.6
H_2SO_4 mist emissions	lb/hr	1.7
NO_x emissions	lb/hr	51.2
PM_{10} emissions	lb/hr	7.0

Source: ECT, 2004.

Table 10-2. CALPUFF Model Results: Maximum Annual NO_2 Impacts—Chassahowitzka NWR

Maximum Annual Impacts	1900	1992	1996
Modeled impact ($\mu g/m^3$)	0.0059	0.0077	0.0031
PSD Class I significant impact ($\mu g/m^3$)	0.1	0.1	0.1
Exceed PSD Class I significant impact (Yes/No)	No	No	No
Percent of PSD significant impact (%)	5.9	7.7	3.1
Receptor UTM Easting (km)	336.7	339.9	335.9
Receptor UTM Northing (km)	3,166.9	3,166.0	3,167.9
Distance from PCGS (km)	128.9	126.3	130.1
Direction from PCGS (Vector ^{o})	328	329	328

Source: ECT, 2004.

Table 10-3. CALPUFF Model Results: Maximum Annual SO_2 Impacts—
Chassahowitzka NWR

Maximum Annual Impacts	1900	1992	1996
Modeled impact (µg/m^3)	0.0034	0.0040	0.0020
PSD Class I significant impact (µg/m^3)	0.1	0.1	0.1
Exceed PSD Class I significant impact (Yes/No)	No	No	No
Percent of PSD significant impact (%)	3.4	4.0	2.0
Receptor UTM Easting (km)	337.5	339.9	337.5
Receptor UTM Northing (km)	3,166.0	3,166.0	3,166.0
Distance from PCGS (km)	127.6	126.3	127.6
Direction from PCGS (Vector °)	328	329	328

Source: ECT, 2004.

Table 10-4. CALPUFF Model Results: Maximum Annual PM_{10} Impacts—Chassahowitzka NWR

Maximum Annual Impacts	1900	1992	1996
Modeled impact ($\mu g/m^3$)	0.0023	0.0025	0.0015
PSD Class I significant impact ($\mu g/m^3$)	0.2	0.2	0.2
Exceed PSD Class I significant impact (Yes/No)	No	No	No
Percent of PSD significant impact (%)	1.1	1.2	0.7
Receptor UTM Easting (km)	337.5	339.9	337.5
Receptor UTM Northing (km)	3,166.0	3,166.0	3,166.0
Distance from PCGS (km)	127.6	126.3	127.6
Direction from PCGS (Vector °)	328	329	328

Source: ECT, 2004.

Table 10-5. CALPUFF Model Results: Maximum 3-Hour SO_2 Impacts—
Chassahowitzka NWR

Maximum Annual Impacts	1900	1992	1996
Modeled impact ($\mu g/m^3$)	0.3075	0.5211	0.2125
PSD Class I significant impact ($\mu g/m^3$)	1.0	1.0	1.0
Exceed PSD Class I significant impact (Yes/No)	No	No	No
Percent of PSD significant impact (%)	30.8	52.1	21.3
Receptor UTM Easting (km)	335.9	331.9	337.5
Receptor UTM Northing (km)	3,167.9	3,178.1	3,166.0
Distance from PCGS (km)	130.1	140.8	127.6
Direction from PCGS (Vector °)	328	329	328
Date of maximum impact	03/15/90	11/04/92	05/04/96
Julian date of maximum impact	74	309	125
Ending hour of maximum impact	0800	0800	0800

Source: ECT, 2004.

Table 10-6. CALPUFF Model Results: Maximum 24-Hour SO_2 Impacts—
Chassahowitzka NWR

Maximum Annual Impacts	1900	1992	1996
Modeled impact (μg/m^3)	0.1022	0.0916	0.0478
PSD Class I significant impact (μg/m^3)	0.2	0.2	0.2
Exceed PSD Class I significant impact (Yes/No)	No	No	No
Percent of PSD significant impact (%)	51.1	45.8	23.9
Receptor UTM Easting (km)	335.9	331.9	337.5
Receptor UTM Northing (km)	3,167.9	3,178.1	3,166.0
Distance from PCGS (km)	130.1	140.8	127.6
Direction from PCGS (Vector °)	328	329	328
Date of maximum impact	03/15/90	11/04/92	05/04/96
Julian date of maximum impact	74	309	125

Source: ECT, 2004.

Table 10-7. CALPUFF Model Results: Maximum 24-Hour PM_{10} Impacts—Chassahowitzka NWR

Maximum Annual Impacts	1900	1992	1996
Modeled impact (μg/m^3)	0.0548	0.0503	0.0281
PSD Class I significant impact (μg/m^3)	0.3	0.3	0.3
Exceed PSD Class I significant impact (Yes/No)	No	No	No
Percent of PSD significant impact (%)	18.3	16.8	9.4
Receptor UTM Easting (km)	335.9	339.2	338.3
Receptor UTM Northing (km)	3,167.9	3,171.5	3,166.9
Distance from PCGS (km)	130.1	131.5	128.0
Direction from PCGS (Vector °)	328	330	328
Date of maximum impact	03/15/90	07/13/92	04/20/96
Julian date of maximum impact	74	195	111

Source: ECT, 2004.

Table 10-8. CALPUFF Model Results: Regional Haze—Chassahowitzka NWR

Maximum 24-Hour Average Impacts	Units	1990	1992	1996
$ß_{ext-s}$—SO_4	MM^{-1}	0.346	0.448	0.216
$ß_{ext-s}$—NO_3	MM^{-1}	0.105	0.517	0.518
$ß_{ext-s}$—PMF	MM^{-1}	0.247	0.225	0.100
$ß_{ext-s}$—Total	MM^{-1}	0.698	1.190	0.834
$ß_{ext-b}$—Background	MM^{-1}	22.2	23.1	23.1
Visual range, background	km	176.1	169.2	169.5
Visual range, background	mile	109.4	105.1	105.3
Visual range, background	dv	8.0	8.4	8.4
Relative humidity factor (FRH)	—	4.13	5.13	5.08
Number of days with $ß_{ext}$ >5.0%	days	0	1	0
Largest $ß_{ext}$ change	%	3.14	5.15	3.61
Date of largest $ß_{ext}$ change	date	08/15/90	11/04/92	03/31/96
NPS significant impact, $ß_{ext}$ change	%	5.00	5.00	5.00
Exceed NPS significant impact	Yes/No	No	Yes	No
Percent of NPS significant impact	%	62.8	103.0	72.2
Number of days with Delta deciview >0.5%	days	0	1	0
Largest Delta deciview change	—	0.310	0.502	0.355

Source: ECT, 2004.

as well as the total emissions source β_{ext}, background β_{ext} based on natural conditions as defined by the FLM, background visual range in units of km and dv, and the highest changes in β_{ext} and dv as calculated by the CALPOST program. The maximum change in β_{ext} is projected to be 5.14 percent, or slightly above the 5.0-percent FLM significant impact level. The project regional haze impacts are considered acceptable for the following reasons:

- Only one 24-hour period out of 1,097 modeled events (1990, 1992, and 1996) exceeded the FLM 5.0-percent guideline (i.e., the guideline was exceeded for only 0.091 percent of the modeled period).
- The regional haze impacts assumed continuous oil firing. For the SCCT project, oil-firing hours will be limited to no more than 500 hr/yr.
- The 5.0-percent FLM guideline is half of the level that is perceptible (i.e. increases in β_{ext} above 10 percent [equivalent to a dv change of 1.0] are considered to be perceptible at the furthest extent of the visual range). Accordingly, the predicted SCCT maximum regional haze impact of 5.14 percent will not be perceptible.
- The regional haze analysis compares project impacts with *natural* background (i.e., a theoretical background that would occur in the absence of all anthropogenic activities). This results in a natural background visual range of approximately 105 miles for the Chassahowitzka NWR. Other than nighttime celestial objects, there are no line-of-sight vistas in the coastal Chassahowitzka NWR that are near this visual range. For example, the theoretical line-of-sight for a 6-ft-tall person on the shoreline of the Gulf of Mexico is 3.2 miles due to the curvature of the earth.
- The 20-percent best visibility over the 1994 to 1998 period for the Chassahowitzka NWR was 18 dv or a visual range of 40 miles. A comparison of maximum SCCT project regional haze impacts during oil firing with this actual background level results in a change in β_{ext} of 1.97 percent, which is well below perceptible levels.

10.7.3 DEPOSITION

Tables 10-9 and 10-10 summarize annual sulfur and nitrogen deposition rates, respectively. These tables provide the CALPUFF/POSTUTIL/CALPOST modeled total (wet and dry) deposition rates impact for nitrogen and sulfur in units of microgram per square meter per second ($\mu g/m^2/s$) and kg/ha/yr. The annual total nitrogen and sulfur deposition rate (conservatively assuming 2,500 hr/yr per CT of oil firing) of 0.0019 kg/ha/yr for each pollutant is well below the FLM guideline of 0.01 kg/ha/yr.

10.8 CONCLUSIONS

Comprehensive dispersion modeling using the CALMET/CALPUFF/CALPOST modeling suite demonstrates that the SCCT project will result in ambient air quality impacts below the PSD Class I significant impact levels for all pollutants and all averaging periods. Accordingly, a multisource interactive assessment of air quality impacts with respect to the PSD Class I increments is not required.

As discussed previously in Section 10.6, regional haze impacts are considered acceptable based on the conservative nature of the regional haze procedures and SCCT project assumptions. Annual total nitrogen and sulfur deposition rates due to the SCCT project, using conservative premises for annual oil firing hours, are well below the FLM guideline of 0.01 kg/ha/yr.

Table 10-11 provides a summary of maximum SCCT project Chassahowitzka NWR air quality impacts and the PSD Class I area EPA significant impact levels and FLM guidelines.

Table 10-9. CALPUFF Model Results: Total Nitrogen Deposition Impacts—
Chassahowitzka NWR

Maximum Annual Impacts	1900	1992	1996
Total dry and wet nitrogen deposition (µg/m^2/s)	1.22E-05	2.06E-05	8.15E-06
Total dry and wet nitrogen deposition (kg/ha/yr)	0.0011	0.0019	0.0007
PSD Class I significant impact (µg/m^3)	0.01	0.01	0.01
Exceed PSD Class I significant impact (Yes/No)	No	No	No
Percent of PSD significant impact (%)	11.0	18.5	7.3
Receptor UTM Easting (km)	339.9	342.5	339.9
Receptor UTM Northing (km)	3,166.0	3,175.2	3,166.0
Distance from PCGS (km)	126.3	133.0	126.3
Direction from PCGS (Vector °)	329	332	329

Source: ECT, 2004.

Table 10-10. CALPUFF Model Results: Total Sulfur Deposition Impacts—
Chassahowitzka NWR

Maximum Annual Impacts	1900	1992	1996
Total dry and wet nitrogen deposition (μg/m²/s)	1.25E-05	2.10E-05	9.38E-06
Total dry and wet nitrogen deposition (kg/ha/yr)	0.0011	0.0019	0.0008
PSD Class I significant impact (μg/m³)	0.01	0.01	0.01
Exceed PSD Class I significant impact (Yes/No)	No	No	No
Percent of PSD significant impact (%)	0.1	0.2	0.1
Receptor UTM Easting (km)	337.5	342.5	337.5
Receptor UTM Northing (km)	3,166.0	3,175.2	3,166.0
Distance from PCGS (km)	127.6	133.0	127.6
Direction from PCGS (Vector °)	328	332	328

Source: ECT, 2004.

Table 10-11. CALPUFF Model Chassahowitzka NWR Results

Pollutant	Averaging Time	Maximum Impact	Significant Impact
A. Criteria Pollutants		($\mu g/m^3$)	($\mu g/m^3$)
NO_x	Annual	0.0077	0.1
PM_{10}	Annual	0.0025	0.2
	24-hour	0.055	0.3
SO_2	Annual	0.0040	0.1
	24-hour	0.10	0.2
	3-hour	0.52	1.0
B. Deposition		kg/ha/yr	kg/ha/yr
Nitrogen	Annual	0.0019	0.01
Sulfur	Annual	0.0019	0.01
C. Regional Haze		% Change β_{ext}	% Change β_{ext}
Regional Haze	24-Hour	5.14	5.0

Source: ECT, 2004.

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ATTACHMENT A

APPLICATION FOR AIR PERMIT—LONG FORM

Department of Environmental Protection

RECEIVED
AUG 27 2004
BUREAU OF AIR REGULATION

Division of Air Resource Management

APPLICATION FOR AIR PERMIT - LONG FORM

I. APPLICATION INFORMATION

Air Construction Permit–Use this form to apply for an air construction permit for a proposed project:

- subject to prevention of significant deterioration (PSD) review, nonattainment area (NAA) new source review, or maximum achievable control technology (MACT) review; or
- where the applicant proposes to assume a restriction on the potential emissions of one or more pollutants to escape a federal program requirement such as PSD review, NAA new source review, Title V, or MACT; or
- at an existing federally enforceable state air operation permit (FESOP) or Title V permitted facility.

Air Operation Permit – Use this form to apply for:

- an initial federally enforceable state air operation permit (FESOP); or
- an initial/revised/renewal Title V air operation permit.

Air Construction Permit & Revised/Renewal Title V Air Operation Permit (Concurrent Processing Option) – Use this form to apply for both an air construction permit and a revised or renewal Title V air operation permit incorporating the proposed project.

To ensure accuracy, please see form instructions.

Identification of Facility

1. Facility Owner/Company Name: **Seminole Electric Cooperative, Inc.**
2. Site Name: **Payne Creek Generating Station**
3. Facility Identification Number: **0490340**
4. Facility Location:
   Street Address or Other Locator: **6697 County Road 663**
   City: **Bowling Green** County: **Hardee** Zip Code: **33834**
5. Relocatable Facility? ☐ Yes ☒ No
6. Existing Title V Permitted Facility? ☒ Yes ☐ No

Application Contact

1. Application Contact Name: **Mike Roddy**
2. Application Contact Mailing Address...
   Organization/Firm: **Seminole Electric Cooperative, Inc.**
   Street Address: **16313 North Dale Mabry Highway**
   City: **Tampa** State: **FL** Zip Code: **33688-2000**
3. Application Contact Telephone Numbers...
   Telephone: **(813) 963-0994 ext.1224** Fax: **(813) 264-7906**
4. Application Contact Email Address: **wmroddy@seminole-electric.com**

Application Processing Information (DEP Use)

1. Date of Receipt of Application:	8-27-04
2. Project Number(s):	0490340-003-AC
3. PSD Number (if applicable):	PSD-FL-344
4. Siting Number (if applicable):	PA 89-25

APPLICATION INFORMATION

Purpose of Application

This application for air permit is submitted to obtain: (Check one)

Air Construction Permit

☒ Air construction permit.

Air Operation Permit

☐ Initial Title V air operation permit.
☐ Title V air operation permit revision.
☐ Title V air operation permit renewal.
☐ Initial federally enforceable state air operation permit (FESOP) where professional engineer (PE) certification is required.
☐ Initial federally enforceable state air operation permit (FESOP) where professional engineer (PE) certification is not required.

Air Construction Permit and Revised/Renewal Title V Air Operation Permit (Concurrent Processing)

☐ Air construction permit and Title V permit revision, incorporating the proposed project.
☐ Air construction permit and Title V permit renewal, incorporating the proposed project.

Note: By checking one of the above two boxes, you, the applicant, are requesting concurrent processing pursuant to Rule 62-213.405, F.A.C. In such case, you must also check the following box:

☐ I hereby request that the department waive the processing time requirements of the air construction permit to accommodate the processing time frames of the Title V air operation permit.

Application Comment

The Payne Creek Generating Station Simple Cycle Combustion Turbine Project consists of five (5) Pratt & Whitney (P&W) FT8-3 Twin Pac aeroderivative CT units. Each P&W FT8-3 Twin Pac unit is comprised of two simple cycle combustion turbines (SCCTs) coupled to one common generator having a nominal generation capacity of 62-MW. The P&W FT8-3 SCCTs will be fired primarily with pipeline quality natural gas. Low-sulfur distillate fuel oil will serve as a back-up fuel source. The new SCCTs will operate in peaking service for up to 2,500 hours per year (with no oil-firing) and up to 2,000 hours per year (with 500 hours per year of oil-firing). The SCCTs will utilize water injection and oxidation catalyst technologies to control emissions of nitrogen oxides (NO_x) and carbon monoxide (CO), respectively. The proposed SCCTs are being licensed under the Florida Electrical Power Plant Siting Act.

APPLICATION INFORMATION

Scope of Application

Emissions Unit ID Number	Description of Emissions Unit	Air Permit Type	Air Permit Proc. Fee
EU-003 EU-004	Unit 4 P&W FT8-3 Twin Pac; CT-4A & CT-4B	N/A	N/A
EU-005 EU-006	Unit 5 P&W FT8-3 Twin Pac; CT-5A & CT-5B	N/A	N/A
EU-007 EU-008	Unit 6 P&W FT8-3 Twin Pac; CT-6A & CT-6B	N/A	N/A
EU-009 EU-010	Unit 7 P&W FT8-3 Twin Pac; CT-7A & CT-7B	N/A	N/A
EU-011 EU-012	Unit 8 P&W FT8-3 Twin Pac; CT-8A & CT-8B	N/A	N/A

Application Processing Fee

Check one: ☐ Attached - Amount: $__________ ☒ Not Applicable

APPLICATION INFORMATION

Owner/Authorized Representative Statement

Complete if applying for an air construction permit or an initial FESOP.

1.	Owner/Authorized Representative Name : **Michael P. Opalinski, Vice President of Technical Services**
2.	Owner/Authorized Representative Mailing Address... Organization/Firm: **Seminole Electric Cooperative, Inc.** Street Address: **16313 North Dale Mabry Highway** City: **Tampa** State: **FL** Zip Code: **33688-2000**
3.	Owner/Authorized Representative Telephone Numbers... Telephone: **(813) 963-0994** ext.**1233** Fax: **(813) 264-7906**
4.	Owner/Authorized Representative Email Address: **mopalinski@seminole-electric.com**
5.	Owner/Authorized Representative Statement: *I, the undersigned, am the owner or authorized representative of the facility addressed in this air permit application. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made in this application are true, accurate and complete and that, to the best of my knowledge, any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. The air pollutant emissions units and air pollution control equipment described in this application will be operated and maintained so as to comply with all applicable standards for control of air pollutant emissions found in the statutes of the State of Florida and rules of the Department of Environmental Protection and revisions thereof and all other requirements identified in this application to which the facility is subject. I understand that a permit, if granted by the department, cannot be transferred without authorization from the department, and I will promptly notify the department upon sale or legal transfer of the facility or any permitted emissions unit.* Michael P. Opalinski (signature) 8/25/04 Signature Date

APPLICATION INFORMATION

Application Responsible Official Certification N/A

Complete if applying for an initial/revised/renewal Title V permit or concurrent processing of an air construction permit and a revised/renewal Title V permit. If there are multiple responsible officials, the "application responsible official" need not be the "primary responsible official."

1. Application Responsible Official Name:
2. Application Responsible Official Qualification (Check one or more of the following options, as applicable): ☐ For a corporation, the president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or a duly authorized representative of such person if the representative is responsible for the overall operation of one or more manufacturing, production, or operating facilities applying for or subject to a permit under Chapter 62-213, F.A.C. ☐ For a partnership or sole proprietorship, a general partner or the proprietor, respectively. ☐ For a municipality, county, state, federal, or other public agency, either a principal executive officer or ranking elected official. ☐ The designated representative at an Acid Rain source.
3. Application Responsible Official Mailing Address... Organization/Firm: Street Address: City: State: Zip Code:
4. Application Responsible Official Telephone Numbers... Telephone: ext. Fax:
5. Application Responsible Official Email Address:
6. Application Responsible Official Certification: *I, the undersigned, am a responsible official of the Title V source addressed in this air permit application. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made in this application are true, accurate and complete and that, to the best of my knowledge, any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. The air pollutant emissions units and air pollution control equipment described in this application will be operated and maintained so as to comply with all applicable standards for control of air pollutant emissions found in the statutes of the State of Florida and rules of the Department of Environmental Protection and revisions thereof and all other applicable requirements identified in this application to which the Title V source is subject. I understand that a permit, if granted by the department, cannot be transferred without authorization from the department, and I will promptly notify the department upon sale or legal transfer of the facility or any permitted emissions unit. Finally, I certify that the facility and each emissions unit are in compliance with all applicable requirements to which they are subject, except as identified in compliance plan(s) submitted with this application.* ____________________ ____________________ Signature Date

APPLICATION INFORMATION

Professional Engineer Certification

1. Professional Engineer Name: **Thomas W. Davis**
   Registration Number: **36777**

2. Professional Engineer Mailing Address...
   Organization/Firm: **Environmental Consulting & Technology, Inc.**
   Street Address: **3701 Northwest 98th Street**
   City: **Gainesville** State: **FL** Zip Code: **32606-5004**

3. Professional Engineer Telephone Numbers...
   Telephone: **(352) 332-0444** ext. Fax: **(352) 332-6722**

4. Professional Engineer Email Address: **tdavis@ectinc.com**

5. Professional Engineer Statement:

I, the undersigned, hereby certify, except as particularly noted herein, that:*

(1) To the best of my knowledge, there is reasonable assurance that the air pollutant emissions unit(s) and the air pollution control equipment described in this application for air permit, when properly operated and maintained, will comply with all applicable standards for control of air pollutant emissions found in the Florida Statutes and rules of the Department of Environmental Protection; and

(2) To the best of my knowledge, any emission estimates reported or relied on in this application are true, accurate, and complete and are either based upon reasonable techniques available for calculating emissions or, for emission estimates of hazardous air pollutants not regulated for an emissions unit addressed in this application, based solely upon the materials, information and calculations submitted with this application.

(3) If the purpose of this application is to obtain a Title V air operation permit (check here ☐, if so), I further certify that each emissions unit described in this application for air permit, when properly operated and maintained, will comply with the applicable requirements identified in this application to which the unit is subject, except those emissions units for which a compliance plan and schedule is submitted with this application.

(4) If the purpose of this application is to obtain an air construction permit (check here ☒, if so) or concurrently process and obtain an air construction permit and a Title V air operation permit revision or renewal for one or more proposed new or modified emissions units (check here ☐, if so), I further certify that the engineering features of each such emissions unit described in this application have been designed or examined by me or individuals under my direct supervision and found to be in conformity with sound engineering principles applicable to the control of emissions of the air pollutants characterized in this application.

(5) If the purpose of this application is to obtain an initial air operation permit or operation permit revision or renewal for one or more newly constructed or modified emissions units (check here ☐, if so), I further certify that, with the exception of any changes detailed as part of this application, each such emissions unit has been constructed or modified in substantial accordance with the information given in the corresponding application for air construction permit and with all provisions contained in such permit.

Thomas W. Davis
Signature
(seal)

8/26/04
Date

* Attach any exception to certification statement.

II. FACILITY INFORMATION

A. GENERAL FACILITY INFORMATION

Facility Location and Type

1. Facility UTM Coordinates... Zone **17** East (km) **405.049** North (km) **3057.712**		2. Facility Latitude/Longitude... Latitude (DD/MM/SS) **27/38/30** Longitude (DD/MM/SS) **81/57/45**	
3. Governmental Facility Code: **0**	4. Facility Status Code: **A**	5. Facility Major Group SIC Code: **49**	6. Facility SIC(s): **4911**
7. Facility Comment :			

Facility Contact

1. Facility Contact Name: **Jim Pittman, Plant Manager**
2. Facility Contact Mailing Address... Organization/Firm: **Seminole Electric Cooperative, Inc.** Street Address: **6697 County Road 663** City: **Bowling Green** State: **FL** Zip Code: **33834**
3. Facility Contact Telephone Numbers: Telephone: **(813) 739-3101** ext. Fax: **(813) 739-3100**
4. Facility Contact Email Address: **jpittman@seminole-electric.com**

Facility Primary Responsible Official N/A

Complete if an "application responsible official" is identified in Section I. that is not the facility "primary responsible official."

1. Facility Primary Responsible Official Name:
2. Facility Primary Responsible Official Mailing Address... Organization/Firm: Street Address: City: State: Zip Code:
3. Facility Primary Responsible Official Telephone Numbers... Telephone: ( ) - ext. Fax: ( ) -
4. Facility Primary Responsible Official Email Address:

Facility Regulatory Classifications

Check all that would apply *following* completion of all projects and implementation of all other changes proposed in this application for air permit. Refer to instructions to distinguish between a "major source" and a "synthetic minor source."

1. ☐ Small Business Stationary Source	☐ Unknown
2. ☐ Synthetic Non-Title V Source	
3. ☒ Title V Source	
4. ☒ Major Source of Air Pollutants, Other than Hazardous Air Pollutants (HAPs)	
5. ☐ Synthetic Minor Source of Air Pollutants, Other than HAPs	
6. ☐ Major Source of Hazardous Air Pollutants (HAPs)	
7. ☒ Synthetic Minor Source of HAPs	
8. ☒ One or More Emissions Units Subject to NSPS (40 CFR Part 60)	
9. ☐ One or More Emissions Units Subject to Emission Guidelines (40 CFR Part 60)	
10. ☐ One or More Emissions Units Subject to NESHAP (40 CFR Part 61 or Part 63)	
11. ☐ Title V Source Solely by EPA Designation (40 CFR 70.3(a)(5))	
12. Facility Regulatory Classifications Comment:	

FACILITY INFORMATION

<u>List of Pollutants Emitted by Facility</u>

1. Pollutant Emitted	2. Pollutant Classification	3. Emissions Cap [Y or N]?
NOX	**A**	**N**
SO2	**A**	**N**
CO	**A**	**N**
PM10	**A**	**N**
PM	**A**	**N**
SAM	**B**	**N**
VOC	**B**	**N**
PB	**B**	**N**
H021 (Beryllium Compounds)	**B**	**N**
H015 (Arsenic Compounds)	**B**	**N**
HAPS (Total)	**SM**	**N**

B. EMISSIONS CAPS – Not Applicable

Facility-Wide or Multi-Unit Emissions Caps

1. Pollutant Subject to Emissions Cap	2. Facility Wide Cap [Y or N]? (all units)	3. Emissions Unit ID No.s Under Cap (if not all units)	4. Hourly Cap (lb/hr)	5. Annual Cap (ton/yr)	6. Basis for Emissions Cap

7. Facility-Wide or Multi-Unit Emissions Cap Comment:

C. FACILITY ADDITIONAL INFORMATION

Additional Requirements for All Applications, Except as Otherwise Stated

1.	Facility Plot Plan: (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought) ☒ Attached, Document ID:**Figure 2-2** ☐ Previously Submitted, Date:_____
2.	Process Flow Diagram(s): (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought) ☒ Attached, Document ID:**Figure 2-3** ☐ Previously Submitted, Date:_____
3.	Precautions to Prevent Emissions of Unconfined Particulate Matter: (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought) ☒ Attached, Document ID:**Att. A-1** ☐ Previously Submitted, Date:_____

Additional Requirements for Air Construction Permit Applications

1.	Area Map Showing Facility Location: ☒ Attached, Document ID:**Figure 2-1** ☐ Not Applicable
2.	Description of Proposed Construction or Modification: ☒ Attached, Document ID:**Section 2 of Air Construction Permit Application**
3.	Rule Applicability Analysis: ☒ Attached, Document ID:**Attachment A-2 of Air Construction Permit Application**
4.	List of Exempt Emissions Units (Rule 62-210.300(3)(a) or (b)1., F.A.C.): ☒ Attached, Document ID:**Attachment A-3 of Air Construction Permit Application**
5.	Fugitive Emissions Identification (Rule 62-212.400(2), F.A.C.): ☐ Attached, Document ID:_____ ☒ Not Applicable
6.	Preconstruction Air Quality Monitoring and Analysis (Rule 62-212.400(5)(f), F.A.C.): ☒ Attached, Document ID: **Section 8 of Air Construction Permit Application**
7.	Ambient Impact Analysis (Rule 62-212.400(5)(d), F.A.C.): ☒ Attached, Document ID: **Sections 7 and 10 of Air Construction Permit Application**
8.	Air Quality Impact since 1977 (Rule 62-212.400(5)(h)5., F.A.C.): ☒ Attached, Document ID: **Section 7 of Air Construction Permit Application**
9.	Additional Impact Analyses (Rules 62-212.400(5)(e)1. and 62-212.500(4)(e), F.A.C.): ☒ Attached, Document ID: **Section 9 of Air Construction Permit Application**
10.	Alternative Analysis Requirement (Rule 62-212.500(4)(g), F.A.C.): ☐ Attached, Document ID:_____ ☒ Not Applicable

FACILITY INFORMATION

Additional Requirements for FESOP Applications N/A

1. List of Exempt Emissions Units (Rule 62-210.300(3)(a) or (b)1., F.A.C.): ☐ Attached, Document ID: ☐ Not Applicable	

Additional Requirements for Title V Air Operation Permit Applications N/A

1.	List of Insignificant Activities (Required for initial/renewal applications only): ☐ Attached, Document ID: ____ ☐ Not Applicable
2.	Identification of Applicable Requirements (Required for initial/renewal applications, and for revision applications if this information would be changed as a result of the revision being sought): ☐ Attached, Document ID: ____ ☐ Not Applicable
3.	Compliance Report and Plan (Required for all initial/revision/renewal applications): ☐ Attached, Document ID: ____ Note: A compliance plan must be submitted for each emissions unit that is not in compliance with all applicable requirements at the time of application and/or at any time during application processing. The department must be notified of any changes in compliance status during application processing.
4.	List of Equipment/Activities Regulated under Title VI (If applicable, required for initial/renewal applications only): ☐ Attached, Document ID:____ ☐ Equipment/Activities On site but Not Required to be Individually Listed ☐ Not Applicable
5.	Verification of Risk Management Plan Submission to EPA (If applicable, required for initial/renewal applications only) : ☐ Attached, Document ID:____ ☐ Not Applicable
6.	Requested Changes to Current Title V Air Operation Permit: ☐ Attached, Document ID:____ ☐ Not Applicable

Additional Requirements Comment

A. GENERAL EMISSIONS UNIT INFORMATION

Title V Air Operation Permit Emissions Unit Classification

1. Regulated or Unregulated Emissions Unit? (Check one, if applying for an initial, revised or renewal Title V air operation permit. Skip this item if applying for an air construction permit or FESOP only.)

   ☒ The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit.
   ☐ The emissions unit addressed in this Emissions Unit Information Section is an unregulated emissions unit.

Emissions Unit Description and Status

1. Type of Emissions Unit Addressed in this Section: (Check one)

   ☒ This Emissions Unit Information Section addresses, as a single emissions unit, a single process or production unit, or activity, which produces one or more air pollutants and which has at least one definable emission point (stack or vent).

   ☐ This Emissions Unit Information Section addresses, as a single emissions unit, a group of process or production units and activities which has at least one definable emission point (stack or vent) but may also produce fugitive emissions.

   ☐ This Emissions Unit Information Section addresses, as a single emissions unit, one or more process or production units and activities which produce fugitive emissions only.

2. Description of Emissions Unit Addressed in this Section:
Simple cycle aeroderivative combustion turbine. CT-4A is part of Unit 4; a Pratt & Whitney (P&W) FT8-3 Twin Pac unit comprised of two simple cycle aeroderivative CTs and one common electrical generator.

3. Emissions Unit Identification Number: **EU-003 (CT-4A)**

4. Emissions Unit Status Code:	5. Commence Construction Date:	6. Initial Startup Date:	7. Emissions Unit Major Group SIC Code:	8. Acid Rain Unit?
C	**N/A**	**N/A**	**49**	☒ Yes ☐ No

9. Package Unit:
Manufacturer: **P&W** Model Number: **FT8-3 Twin Pac**

10. Generator Nameplate Rating: **62 MW**

11. Emissions Unit Comment:

Unit 4 P&W FT8-3 Twin Pac is comprised of two identical simple cycle aeroderivative combustion turbines (CT-4A and CT-4B) and one common electrical generator. The two simple cycle CTs may operate independently.

Emissions Unit Control Equipment

1. Control Equipment/Method(s) Description: **Water Injection – NO_x Pollution Prevention** **Oxidation Catalyst – CO Control**	
2. Control Device or Method Code(s): **028 (water injection), 080 (oxidation catalyst)**	

B. EMISSIONS UNIT CAPACITY INFORMATION

(Optional for unregulated emissions units.)

Emissions Unit Operating Capacity and Schedule

1. Maximum Process or Throughput Rate: **N/A**	
2. Maximum Production Rate: **N/A**	
3. Maximum Heat Input Rate: **317.8 million Btu/hr**	
4. Maximum Incineration Rate: pounds/hr tons/day	
5. Requested Maximum Operating Schedule: hours/day weeks/year	days/week **2,500** hours/year

6. Operating Capacity/Schedule Comment:

Maximum heat input rate is for natural gas-firing at rated load and 50°F ambient temperature. Heat input will vary with fuel type, load, and ambient conditions.

CT-4A will operate in peaking service for no more than 2,500 hours per year per SCCT, including no more than 500 hours per year per SCCT of oil-firing at rated load. Accordingly, maximum natural gas-firing annual hours at rated load will range from 2,500 hours per year (with no oil-firing) to 2,000 hours per year (with 500 hours per year of oil-firing).

C. EMISSION POINT (STACK/VENT) INFORMATION

(Optional for unregulated emissions units.)

Emission Point Description and Type

1. Identification of Point on Plot Plan or Flow Diagram: **CT-4A**	2. Emission Point Type Code: **1**

3. Descriptions of Emission Points Comprising this Emissions Unit for VE Tracking:

N/A

4. ID Numbers or Descriptions of Emission Units with this Emission Point in Common:

N/A

5. Discharge Type Code: **V**	6. Stack Height: **60 feet**	7. Exit Diameter: **9.5 feet**
8. Exit Temperature: **891** °F	9. Actual Volumetric Flow Rate: **428,933 acfm**	10. Water Vapor: **N/A** %

11. Maximum Dry Standard Flow Rate: N/A dscfm	12. Nonstack Emission Point Height: N/A feet
13. Emission Point UTM Coordinates... Zone: East (km): North (km):	14. Emission Point Latitude/Longitude... Latitude (DD/MM/SS) Longitude (DD/MM/SS)

15. Emission Point Comment:

Exit temperature and actual volumetric flow rate data are natural gas-firing at rated load and 50 °F. Temperature and exhaust flow rate will vary with fuel type, load, and ambient conditions.

D. SEGMENT (PROCESS/FUEL) INFORMATION

Segment Description and Rate: Segment 1 of 2

1. Segment Description (Process/Fuel Type): ***Pipeline quality natural gas burned in CT-4A***		
2. Source Classification Code (SCC): **2-01-002-01**	3. SCC Units: **Million cubic feet burned**	
4. Maximum Hourly Rate: **0.315**	5. Maximum Annual Rate: **787.5**	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit: **1,024**
10. Segment Comment: **Maximum hourly rate based on rated load and 50°F ambient temperature. Maximum annual rate based on 2,500 hr/yrs at rated load and 50°F ambient temperature.**		

Segment Description and Rate: Segment 2 of 2

1. Segment Description (Process/Fuel Type): **Distillate fuel oil burned in CT-4A**		
2. Source Classification Code (SCC): **2-01-001-01**	3. SCC Units: **1,000 Gallons Burned**	
4. Maximum Hourly Rate: **2.008**	5. Maximum Annual Rate: **1,004.0**	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur: **0.05**	8. Maximum % Ash: **0.01**	9. Million Btu per SCC Unit: **144**
10. Segment Comment: **Maximum hourly rate based on rated load and 78°F ambient temperature. Maximum annual rate based on 500 hr/yrs at rated load and 78°F ambient temperature.**		

E. EMISSIONS UNIT POLLUTANTS

List of Pollutants Emitted by Emissions Unit

1. Pollutant Emitted	2. Primary Control Device Code	3. Secondary Control Device Code	4. Pollutant Regulatory Code
NOX	**028**		**EL**
CO	**080**		**EL**
SO2			**EL**
PM			**EL**
PM10			**EL**
VOC			**NS**

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL/ESTIMATED FUGITIVE EMISSIONS

(Optional for unregulated emissions units.)

Potential/Estimated Fugitive Emissions

Complete for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

1. Pollutant Emitted: **NO_x**	2. Total Percent Efficiency of Control: **75**
3. Potential Emissions: **51.2** lb/hour **44.8** tons/year	4. Synthetically Limited? ☒ Yes ☐ No
5. Range of Estimated Fugitive Emissions (as applicable): **N/A** to tons/year	
6. Emission Factor: **N/A** Reference: **Pratt & Whitney Data**	7. Emissions Method Code: **5**
8. Calculation of Emissions: **Hourly emission rate based on oil-firing at rated load and 78°F ambient temperature.** **Annual rate based on natural gas-firing at rated load and 50°F ambient temperature for 2,000 hrs/yr and oil-firing at rated load and 78°F ambient temperature for 500 hrs/yr.**	
9. Pollutant Potential/Estimated Fugitive Emissions Comment:	

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions 1 of 2

1. Basis for Allowable Emissions Code: **RULE**	2. Future Effective Date of Allowable Emissions: **N/A**
3. Allowable Emissions and Units: **25 ppmvd @ 15% O_2**	4. Equivalent Allowable Emissions: **32.0** lb/hour **40.0** tons/year
5. Method of Compliance: **EPA Reference Method 7E**	
6. Allowable Emissions Comment (Description of Operating Method): **Rule 62-212.400(5), F.A.C. (BACT)** **Allowable and equivalent allowable emissions are for natural gas-firing at rated load, 50°F ambient temperature, and 2,500 hr/yr operation.**	

Allowable Emissions Allowable Emissions 2 of 2

1. Basis for Allowable Emissions Code: **RULE**	2. Future Effective Date of Allowable Emissions: **N/A**
3. Allowable Emissions and Units: **42 ppmvd @ 15% O_2**	4. Equivalent Allowable Emissions: **51.2** lb/hour **12.8** tons/year
5. Method of Compliance: **EPA Reference Method 7E**	
6. Allowable Emissions Comment (Description of Operating Method): **Rule 62-212.400(5), F.A.C. (BACT)** **Allowable and equivalent allowable emissions are for distillate fuel oil-firing at rated load, 50°F ambient temperature, and 500 hr/yr operation.**	

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL/ESTIMATED FUGITIVE EMISSIONS

(Optional for unregulated emissions units.)

Potential/Estimated Fugitive Emissions

Complete for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

1. Pollutant Emitted: **CO**	2. Total Percent Efficiency of Control: **85**
3. Potential Emissions: **12.2** lb/hour **8.8** tons/year	4. Synthetically Limited? ☒ Yes ☐ No
5. Range of Estimated Fugitive Emissions (as applicable): **N/A** to tons/year	
6. Emission Factor: **N/A** Reference: **Pratt & Whitney Data**	7. Emissions Method Code: **5**
8. Calculation of Emissions: **Hourly emission rate based on natural gas-firing at 50% load and 32°F ambient temperature.** **Annual rate based on natural gas-firing at rated load and 50°F ambient temperature for 2,500 hrs/yr.**	
9. Pollutant Potential/Estimated Fugitive Emissions Comment:	

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions 1 of 2

1. Basis for Allowable Emissions Code: **ESCPSD**	2. Future Effective Date of Allowable Emissions: N/A
3. Allowable Emissions and Units: **30 ppmvd @ 15% O_2**	4. Equivalent Allowable Emissions: **12.2** lb/hour **8.8** tons/year
5. Method of Compliance: **EPA Reference Method 10**	
6. Allowable Emissions Comment (Description of Operating Method): **Allowable and equivalent allowable hourly emissions are for natural gas-firing at 50% load and 32°F ambient temperature. Equivalent allowable annual emissions is for natural gas-firing at rated load, 50°F ambient temperature, and 2,500 hrs/yr.**	

Allowable Emissions Allowable Emissions 2 of 2

1. Basis for Allowable Emissions Code: **ESCPSD**	2. Future Effective Date of Allowable Emissions: N/A
3. Allowable Emissions and Units: **7 ppmvd @ 15% O_2**	4. Equivalent Allowable Emissions: **2.9** lb/hour **0.7** tons/year
5. Method of Compliance: **EPA Reference Method 7E**	
6. Allowable Emissions Comment (Description of Operating Method): **Allowable and equivalent allowable emissions are for distillate fuel oil-firing at 50% load and 32°F ambient temperature, and 500 hrs/yr operation.**	

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL/ESTIMATED FUGITIVE EMISSIONS

(Optional for unregulated emissions units.)

Potential/Estimated Fugitive Emissions

Complete for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

1. Pollutant Emitted: **SO_2**	2. Total Percent Efficiency of Control: **N/A**
3. Potential Emissions: **14.7** lb/hour **5.5** tons/year	4. Synthetically Limited? ☒ Yes ☐ No
5. Range of Estimated Fugitive Emissions (as applicable): **N/A** to tons/year	
6. Emission Factor: **N/A** Reference: **Pratt & Whitney Data**	7. Emissions Method Code: **5**
8. Calculation of Emissions: **Hourly emission rate based on distillate fuel oil-firing at rated load and 78°F ambient temperature.** **Annual rate based on natural gas-firing at rated load and 50°F ambient temperature for 2,000 hrs/yr and oil-firing at rated load and 78°F ambient temperature for 500 hrs/yr.**	
9. Pollutant Potential/Estimated Fugitive Emissions Comment:	

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions 1 of 2

1. Basis for Allowable Emissions Code: **RULE**	2. Future Effective Date of Allowable Emissions: **N/A**
3. Allowable Emissions and Units: **2.0 gr S / 100 scf natural gas**	4. Equivalent Allowable Emissions: **1.8** lb/hour **2.3** tons/year
5. Method of Compliance: **Fuel analysis per 40 CFR Part 75, Appendix D.**	
6. Allowable Emissions Comment (Description of Operating Method): **Rule 62-212.400(5), F.A.C. (BACT)** **Allowable and equivalent allowable emissions are for natural gas-firing at rated load, 50°F ambient temperature, and 2,500 hr/yr operation.**	

Allowable Emissions Allowable Emissions 2 of 2

1. Basis for Allowable Emissions Code: **RULE**	2. Future Effective Date of Allowable Emissions: **N/A**
3. Allowable Emissions and Units: **0.05 weight % sulfur fuel oil**	4. Equivalent Allowable Emissions: **14.7** lb/hour **3.7** tons/year
5. Method of Compliance: **Fuel analysis per 40 CFR Part 75, Appendix D.**	
6. Allowable Emissions Comment (Description of Operating Method): **Rule 62-212.400(5), F.A.C. (BACT)** **Allowable and equivalent allowable emissions are for distillate fuel oil-firing at rated load, 78°F ambient temperature, and 500 hr/yr operation.**	

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL/ESTIMATED FUGITIVE EMISSIONS

(Optional for unregulated emissions units.)

Potential/Estimated Fugitive Emissions

Complete for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

1. Pollutant Emitted: **PM**	2. Total Percent Efficiency of Control: **N/A**	
3. Potential Emissions: **7.0** lb/hour	**4.8** tons/year	4. Synthetically Limited? ☒ Yes ☐ No
5. Range of Estimated Fugitive Emissions (as applicable): **N/A** to tons/year		
6. Emission Factor: **N/A** Reference: **Pratt & Whitney Data**		7. Emissions Method Code: **5**
8. Calculation of Emissions: **Hourly emission rate based on oil-firing.** **Annual rate based on natural gas-firing for 2,000 hrs/yr and oil-firing for 500 hrs/yr.**		
9. Pollutant Potential/Estimated Fugitive Emissions Comment:		

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions 1 of 2

1. Basis for Allowable Emissions Code: **RULE**	2. Future Effective Date of Allowable Emissions: **N/A**
3. Allowable Emissions and Units: **10 % opacity (surrogate for PM)**	4. Equivalent Allowable Emissions: **3.0** lb/hour **3.8** tons/year
5. Method of Compliance: **EPA Reference Method 9**	
6. Allowable Emissions Comment (Description of Operating Method): **Rule 62-212.400(5), F.A.C. (BACT)** **Allowable and equivalent allowable emissions are for natural gas-firing for 2,500 hr/yr operation.**	

Allowable Emissions Allowable Emissions 2 of 2

1. Basis for Allowable Emissions Code: **RULE**	2. Future Effective Date of Allowable Emissions: **N/A**
3. Allowable Emissions and Units: **10 % opacity (surrogate for PM)**	4. Equivalent Allowable Emissions: **7.0** lb/hour **1.8** tons/year
5. Method of Compliance: **EPA Reference Method 9**	
6. Allowable Emissions Comment (Description of Operating Method): **Rule 62-212.400(5), F.A.C. (BACT)** **Allowable and equivalent allowable emissions are for distillate fuel oil-firing and 500 hr/yr operation.**	

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL/ESTIMATED FUGITIVE EMISSIONS

(Optional for unregulated emissions units.)

Potential/Estimated Fugitive Emissions

Complete for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

1. Pollutant Emitted: **PM_{10}**	2. Total Percent Efficiency of Control: **N/A**
3. Potential Emissions: **7.0** lb/hour **4.8** tons/year	4. Synthetically Limited? ☒ Yes ☐ No
5. Range of Estimated Fugitive Emissions (as applicable): **N/A** to tons/year	
6. Emission Factor: **N/A** Reference: **Pratt & Whitney Data**	7. Emissions Method Code: **5**
8. Calculation of Emissions: **Hourly emission rate based on oil-firing.** **Annual rate based on natural gas-firing for 2,000 hrs/yr and oil-firing for 500hrs/yr.** **PM_{10} emissions assumed equal to PM.**	
9. Pollutant Potential/Estimated Fugitive Emissions Comment:	

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions 1 of 2

1. Basis for Allowable Emissions Code: **RULE**	2. Future Effective Date of Allowable Emissions: **N/A**
3. Allowable Emissions and Units: **10 % opacity (surrogate for PM_{10})**	4. Equivalent Allowable Emissions: **3.0** lb/hour **3.8** tons/year
5. Method of Compliance: **EPA Reference Method 9**	
6. Allowable Emissions Comment (Description of Operating Method): **Rule 62-212.400(5), F.A.C. (BACT)** **Allowable and equivalent allowable emissions are for natural gas-firing and 2,500 hr/yr operation.**	

Allowable Emissions Allowable Emissions 2 of 2

1. Basis for Allowable Emissions Code: **RULE**	2. Future Effective Date of Allowable Emissions: **N/A**
3. Allowable Emissions and Units: **10 % opacity (surrogate for PM_{10})**	4. Equivalent Allowable Emissions: **7.0** lb/hour **1.8** tons/year
5. Method of Compliance: **EPA Reference Method 9**	
6. Allowable Emissions Comment (Description of Operating Method): **Rule 62-212.400(5), F.A.C. (BACT)** **Allowable and equivalent allowable emissions are for distillate fuel oil-firing and 500 hr/yr operation.**	

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL/ESTIMATED FUGITIVE EMISSIONS

(Optional for unregulated emissions units.)

Potential/Estimated Fugitive Emissions

Complete for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

1. Pollutant Emitted: **VOC**	2. Total Percent Efficiency of Control: **N/A**
3. Potential Emissions: **8.3** lb/hour **3.4** tons/year	4. Synthetically Limited? ☒ Yes ☐ No
5. Range of Estimated Fugitive Emissions (as applicable): **N/A** to tons/year	
6. Emission Factor: **N/A** Reference: **Pratt & Whitney Data**	7. Emissions Method Code: **5**
8. Calculation of Emissions: **Hourly emission rate based on gas-firing at 50% load and 32°F ambient temperature.** **Annual rate based on natural gas-firing at rated load and 50°F ambient temperature for 2,500 hrs/yr.**	
9. Pollutant Potential/Estimated Fugitive Emissions Comment:	

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation. Not Applicable

Allowable Emissions Allowable Emissions ____of ____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions ____of ____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

G. VISIBLE EMISSIONS INFORMATION

Complete if this emissions unit is or would be subject to a unit-specific visible emissions limitation.

Visible Emissions Limitation: Visible Emissions Limitation 1 of 2

1. Visible Emissions Subtype: **VE10**	2. Basis for Allowable Opacity: ☒ Rule ☐ Other
3. Allowable Opacity: Normal Conditions: 10 % Exceptional Conditions: % Maximum Period of Excess Opacity Allowed: min/hour	
4. Method of Compliance: **EPA Reference Method 9**	
5. Visible Emissions Comment: **Rule 62-212.400(5), F.A.C. (BACT)**	

Visible Emissions Limitation: Visible Emissions Limitation 2 of 4

1. Visible Emissions Subtype: **Best Operational Practice**	2. Basis for Allowable Opacity: ☒ Rule ☐ Other
3. Allowable Opacity: Normal Conditions: % Exceptional Conditions: **Best Practices** % Maximum Period of Excess Opacity Allowed: **60** min/hour	
4. Method of Compliance: **EPA Reference Method 9**	
5. Visible Emissions Comment: **Excess emissions resulting from startup, shutdown, or malfunction are permitted providing: (1) best operational practices to minimize emissions are adhered to, and (2) duration of excess emissions shall be minimized but in no case exceed two hours in any 24 hour period unless specifically authorized by the Department for a longer duration.** **Rule 62-210.700(1), F.A.C.**	

EMISSIONS UNIT INFORMATION
Section [1] of [10]

H. CONTINUOUS MONITOR INFORMATION

Complete if this emissions unit is or would be subject to continuous monitoring.

Continuous Monitoring System: Continuous Monitor 1 of 4

1. Parameter Code: **EM**	2. Pollutant(s): **NO_x**
3. CMS Requirement:	☒ Rule ☐ Other
4. Monitor Information... Manufacturer: Model Number:	Serial Number:
5. Installation Date:	6. Performance Specification Test Date:
7. Continuous Monitor Comment: **Required by 40 CFR Part 75 (Acid Rain Program).** **Monitoring will be conducted in accordance with the Part 75 procedures for low mass emission (LME) units.**	

Continuous Monitoring System: Continuous Monitor 2 of 4

1. Parameter Code: **EM**	2. Pollutant(s): **SO_2**
3. CMS Requirement:	☒ Rule ☐ Other
4. Monitor Information... Manufacturer: Model Number:	Serial Number:
5. Installation Date:	6. Performance Specification Test Date:
7. Continuous Monitor Comment: **Required by 40 CFR Part 75 (Acid Rain Program).** **Monitoring will be conducted in accordance with the Part 75 procedures for low mass emission (LME) units or Appendix D.**	

H. CONTINUOUS MONITOR INFORMATION

Complete if this emissions unit is or would be subject to continuous monitoring.

Continuous Monitoring System: Continuous Monitor 3 of 4

1. Parameter Code: **CO_2**	2. Pollutant(s): **N/A**
3. CMS Requirement:	☒ Rule ☐ Other
4. Monitor Information... Manufacturer: Model Number:	Serial Number:
5. Installation Date:	6. Performance Specification Test Date:
7. Continuous Monitor Comment: **Required by 40 CFR Part 75 (Acid Rain Program).** **Monitoring will be conducted in accordance with the Part 75 procedures for low mass emission (LME) units or Appendix G.**	

Continuous Monitoring System: Continuous Monitor 4 of 4

1. Parameter Code: **WTF**	2. Pollutant(s): **N/A**
3. CMS Requirement:	☒ Rule ☐ Other
4. Monitor Information... Manufacturer: Model Number:	Serial Number:
5. Installation Date:	6. Performance Specification Test Date:
7. Continuous Monitor Comment: **Water-to-fuel ratio monitoring required by 40 CFR Part 60, Subpart GG and 40 CFR Part 75 (Acid Rain Program) for low mass emission (LME) units.**	

I. EMISSIONS UNIT ADDITIONAL INFORMATION

Additional Requirements for All Applications, Except as Otherwise Stated

1. Process Flow Diagram (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought) ☒ Attached, Document ID:**Figure 2-3** ☐ Previously Submitted, Date:_____
2. Fuel Analysis or Specification (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought) ☒ Attached, Document ID:**Attachment A-4 of Air Construction Permit Application**
3. Detailed Description of Control Equipment (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought) ☒ Attached, Document ID:**Section 5.0 of Air Construction Permit Application**
4. Procedures for Startup and Shutdown (Required for all operation permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought) ☐ Attached, Document ID:_____ ☒ Not Applicable
5. Operation and Maintenance Plan (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought) ☐ Attached, Document ID: ☒ Not Applicable
6. Compliance Demonstration Reports/Records ☐ Attached, Document ID: _____ Test Date(s)/Pollutant(s) Tested: _____ _____ ☐ Previously Submitted, Date: _____ Test Date(s)/Pollutant(s) Tested: _____ ☐ To be Submitted, Date (if known):__________ Test Date(s)/Pollutant(s) Tested: _____ _____ ☒ Not Applicable Note: For FESOP applications, all required compliance demonstration records/reports must be submitted at the time of application. For Title V air operation permit applications, all required compliance demonstration reports/records must be submitted at the time of application, or a compliance plan must be submitted at the time of application.
7. Other Information Required by Rule or Statute ☐ Attached, Document ID: _____ ☒ Not Applicable

EMISSIONS UNIT INFORMATION
Section [1] of [10]

Additional Requirements for Air Construction Permit Applications

1. Control Technology Review and Analysis (Rules 62-212.400(6) and 62-212.500(7), F.A.C.; 40 CFR 63.43(d) and (e)) ☒ Attached, Document ID:**Section 5.0 of Air Construction Permit Application**
2. Good Engineering Practice Stack Height Analysis (Rule 62-212.400(5)(h)6., F.A.C., and Rule 62-212.500(4)(f), F.A.C.) ☒ Attached, Document ID:**Section 6.0 of Air Construction Permit Application**
3. Description of Stack Sampling Facilities (Required for proposed new stack sampling facilities only) ☐ Attached, Document ID: **To be provided** ☐ Not Applicable

Additional Requirements for Title V Air Operation Permit Applications N/A

1. Identification of Applicable Requirements ☐ Attached, Document ID:
2. Compliance Assurance Monitoring ☐ Attached, Document ID: _____ ☐ Not Applicable
3. Alternative Methods of Operation ☐ Attached, Document ID: _____ ☐ Not Applicable
4. Alternative Modes of Operation (Emissions Trading) ☐ Attached, Document ID: _____ ☐ Not Applicable
5. Acid Rain Part Application ☐ Certificate of Representation (EPA Form No. 7610-1) ☐ Copy Attached, Document ID:_____ ☐ Acid Rain Part (Form No. 62-210.900(1)(a)) ☐ Attached, Document ID:_____ ☐ Previously Submitted, Date:_____ ☐ Repowering Extension Plan (Form No. 62-210.900(1)(a)1.) ☐ Attached, Document ID:_____ ☐ Previously Submitted, Date:_____ ☐ New Unit Exemption (Form No. 62-210.900(1)(a)2.) ☐ Attached, Document ID:_____ ☐ Previously Submitted, Date:_____ ☐ Retired Unit Exemption (Form No. 62-210.900(1)(a)3.) ☐ Attached, Document ID:_____ ☐ Previously Submitted, Date:_____ ☐ Phase II NOx Compliance Plan (Form No. 62-210.900(1)(a)4.) ☐ Attached, Document ID:_____ ☐ Previously Submitted, Date:_____ ☐ Phase II NOx Averaging Plan (Form No. 62-210.900(1)(a)5.) ☐ Attached, Document ID:_____ ☐ Previously Submitted, Date:_____ ☐ Not Applicable

EMISSIONS UNIT INFORMATION
Section [1] of [10]

Additional Requirements Comment

NOTE:

EMISSION UNITS CT-4A, CT-4B, CT-5A, CT-5B, CT-6A, CT-6B, CT-7A, CT-7B, CT-8A, AND CT-8B ARE IDENTICAL UNITS.

SECTION III. EMISSIONS UNIT INFORMATION PROVIDED FOR EU-003 (CT-4A) IS ALSO APPLICABLE TO EU-004 (CT-4B), EU-005 (CT-5A), EU-006 (CT-5B), EU-007 (CT-6A), EU-008 (CT-6B), EU-009 (CT-7A), EU-010 (CT-7B), EU-011 (CT-8A), AND EU 012 (CT-8B).

EMISSIONS UNIT INFORMATION SECTIONS 2 THROUGH 10 ARE IDENTICAL TO SECTION 1, WITH THE EXCEPTION OF IDENTIFICATION NUMBERS.

ATTACHMENT A1

PRECAUTIONS TO PREVENT EMISSIONS OF UNCONFINED PARTICULATE MATTER

PRECAUTIONS TO PREVENT EMISSIONS OF UNCONFINED PARTICULATE MATTER

Unconfined particulate matter emissions that may result from Payne Creek Generating Station operations include:

- Vehicular traffic on paved and unpaved roads.
- Wind-blown dust from yard areas.
- Periodic abrasive blasting.

The following techniques may be used to control unconfined particulate matter emissions on an as needed basis:

- Chemical or water application to:
    - Unpaved roads
    - Unpaved yard areas
- Paving and maintenance of roads, parking areas and yards.
- Landscaping or planting of vegetation.
- Confining abrasive blasting where possible.
- Other techniques, as necessary.

ATTACHMENT A2

REGULATORY APPLICABILITY ANALYSES

Table A-1A. Summary of Federal EPA Regulatory Applicability and Corresponding Requirements—PCGS SCCTs

Regulation	Citation	Not Applicable	Applicable Emissions Units	Applicable Requirement or Nonapplicability Rationale
40 CFR Part 60—Standards of Performance for New Stationary Sources				
40 CFR Part 60 Subpart A—General Provisions				
Notification and Recordkeeping	60.7(a)		CT-4A through CT-8B	Notification requirements.
	60.7(b)—(h)		CT-4A through CT-8B	General recordkeeping and reporting requirements.
Performance Tests	60.8		CT-4A through CT-8B	Conduct initial performance tests as required by EPA.
Compliance with Standards	60.11(a) through (d), and (f)		CT-4A through CT-8B	General compliance requirements. Opacity observations are not required by Subpart GG.
Circumvention	60.12		CT-4A through CT-8B	Cannot conceal an emission that would otherwise constitute a violation of an applicable standard.
Monitoring Requirements	60.13		CT-4A through CT-8B	Requirements for CMS and monitoring devices.
Modification	60.14		CT-4A through CT-8B	General requirements regarding modifications **(potential future requirement)**.
Reconstruction	60.15		CT-4A through CT-8B	General requirements regarding reconstructions **(potential future requirement)**.
Incorporation by Reference	60.17		CT-4A through CT-8B	Specifies ASTM Methods for collecting and analyzing fuel samples.
General Notification and Reporting Requirements	60.19		CT-4A through CT-8B	General procedures regarding reporting deadlines.
40 CFR Part 60 Subpart GG—Standards of Performance for Stationary Gas Turbines				
Standard for Nitrogen Oxides	60.332		CT-4A through CT-8B	Specifies formula for allowable nitrogen oxide emission limit of 75 ppmv at 15% oxygen (with corrections for heat rate and fuel bound nitrogen) for electric utility stationary gas turbines with peak heat input greater than 100 MMBtu/hr.
Standard for Sulfur Dioxide	60.333		CT-4A through CT-8B	Establishes exhaust gas SO_2 limit of 0.015 % by volume (at 15% O2, dry) and maximum fuel sulfur content of 0.8 % by weight.

Table A-1A. Summary of Federal EPA Regulatory Applicability and Corresponding Requirements—PCGS SCCTs (Continued, Page 2 of 11)

Regulation	Citation	Not Applicable	Applicable Emissions Units	Applicable Requirement or Nonapplicability Rationale
Monitoring Requirements—NO_x	60.334(a), (d), and (g)		CT-4A through CT-8B	Requires continuous monitoring of fuel consumption and the ratio of water to fuel fired.
Monitoring Requirements—SO_2, Natural Gas	60.334(h)(1)	X		Monitoring of natural gas sulfur content is not required per §60.334(h)(3) since CT-4A through CT-8B will burn a gaseous fuel that meets the §60.331(u) definition of *natural gas*.
Monitoring Requirements—NO_x	60.334(h)(2)	X		Monitoring of fuel (either natural gas or distillate fuel oil) nitrogen content is not required since a NO_x emission allowance for fuel bound nitrogen (FBN) is not being claimed.
Monitoring Requirements—SO_2, Natural Gas	60.334(h)(3)		CT-4A through CT-8B	Monitoring of natural gas sulfur content is not required since CT-4A through CT-8B will burn a gaseous fuel that meets the §60.331(u) definition of *natural gas*.
Monitoring Requirements—SO_2, Distillate Fuel Oil	60.334(i)(1)		CT-4A through CT-8B	Monitoring of distillate fuel oil sulfur content will be conducted in accordance with 40 CFR Part 75, Appendix D (Acid Rain Program) requirements.
Excess Emissions Reporting—NO_x	60.334(j)(1)		CT-4A through CT-8B	Excess NO_x emissions reporting requirements for CTs using water to fuel ratio monitoring.
Excess Emissions Reporting—SO_2	60.334(j)(2)		CT-4A through CT-8B	Excess SO_2 emissions reporting requirements.
Excess Emissions Reporting	60.334(j)(5)		CT-4A through CT-8B	Excess emissions reports must be postmarked by the 30th day following the end of each calendar quarter.
Test Methods and Procedures	60.335(a), (b)(1), (2), and (4), and (c)		CT-4A through CT-8B	Specifies test methods and monitoring procedures.
40 CFR Part 60 Subpart Kb—Standards of Performance for Volatile Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984.		X		Subpart Kb does not apply to storage vessels with a capacity greater than or equal to 40,000 gallons storing a liquid with a maximum true vapor pressure less than 0.5 psi. The maximum true vapor pressures of distillate fuel oil are below this vapor pressure threshold. Accordingly, the Payne Creek Generating Station tanks that store distillate fuel oils are not subject to Subpart Kb.

Table A-1A. Summary of Federal EPA Regulatory Applicability and Corresponding Requirements—PCGS SCCTs (Continued, Page 3 of 11)

Regulation	Citation	Not Applicable	Applicable Emissions Units	Applicable Requirement or Nonapplicability Rationale
40 CFR Part 60—Subparts B, C, Cb, Cc, Cd, Ce, D, Da, Db, Dc, E, Ea, Eb, Ec, F, G, H, I, J, K, Ka, Kb, L, M, N, N, Na, O, P, Q, R, S, T, U, V, W, X, Y, Z, AA, AAa, BB, CC, DD, EE, HH, KK, LL, MM, NN, PP, QQ, RR, SS, TT, UU, VV, WW, XX, AAA, BBB, DDD, FFF, GGG, HHH, III, JJJ, KKK, LLL, NNN, OOO, PPP,QQQ, RRR, SSS, TTT, UUU, VVV, and WWW.		X		None of the listed NSPS' contain requirements that are applicable to the Payne Creek Generating Station.
40 CFR Part 61—National Emission Standards for Hazardous Air Pollutants for Source Categories: Subparts A, B, C, D, E, F, H, I, J, L, M, N, O, Q, R, T, V, W, Y, BB, and FF.		X		None of the listed NESHAPS' contain requirements that are applicable to the Payne Creek Generating Station.
40 CFR Part 63—National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines: Subpart YYYY.		X		The Payne Creek Generating Station is not a major source of hazardous air pollutants (HAPs). Accordingly, the simple cycle combustion turbines (CT-4A through CT-8B) are not subject to the requirements of Subpart YYYY.
40 CFR Part 63—National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines: Subpart ZZZZ.		X		The Payne Creek Generating Station does not contain any internal combustion engines that are subject to Subpart ZZZZ.
40 CFR Part 63—National Emission Standards for Hazardous Air Pollutants for Source Categories: Subparts A, B, C, D, E, F, G, H, I, J, L, M, N, N, O, Q, R, S, T, U, W, X, Y, AA, BB, CC, DD, EE, FF, HH, II, JJ, KK, LL, MM, OO, PP, QQ, RR, SS, TT, UU, VV, WW, YY, CCC, DDD, EEE, GGG, HHH, III, JJJ, LLL, MMM, NNN, OOO, PPP, QQQ, RRR, TTT, UUU, VVV, XXX, AAAA, CCCC, DDDD, EEEE, FFFF, GGGG, HHHH, IIII, JJJJ, KKKK, MMMM, NNNN, OOOO, PPPP, QQQQ, RRRR, SSSS, TTTT, UUUU, VVVV, XXXX, YYYY, ZZZZ, AAAAA, BBBBB, CCCCC, DDDDD, EEEEE, FFFFF, GGGGG, HHHHH, IIIII, JJJJJ, KKKKK, LLLLL, MMMMM, NNNNN, PPPPP, QQQQQ, RRRRR, SSSSS, TTTTT, and WWWWW.		X		None of the listed NESHAPS' contain requirements that are applicable to the Payne Creek Generating Station.

Regulation	Citation	Not Applicable	Applicable Emissions Units	Applicable Requirement or Nonapplicability Rationale
40 CFR Part 64—Compliance Assurance Monitoring		X		CAM is applicable to emission units that: (1) are subject to an emission standard, (2) use a control device to achieve compliance with that standard, and (3) have pre-control emissions greater than 100 tons per year. Water injection in CTs is not considered a *control device* as defined by 40 CFR §64.1. Water injection is a passive control measure that acts to prevent pollutants from forming; i.e., water injection neither destroys nor removes NO_x but rather prevents its formation. The simple cycle CTs may nevertheless be subject to the CAM rule for NO_x since the 40 CFR §64.1 definition of a control device specifically lists "injection systems (such as water, steam, ammonia, sorbent or limestone injection)" as examples of common control devices. However, the simple cycle CTs are exempt from CAM rule requirements pursuant to 40 CFR §64.2(1)(vi) since the units will employ a *continuous compliance determination method* (as defined by 40 CFR §64.1) with respect to permitted NO_x emission limits; i.e., the simple cycle CTs will utilize continuous NO_x monitoring in accordance with the 40 CFR Part 75 procedures for low mass emission (LME) units. Potential pre-control (i.e., without oxidation catalyst) CO and VOC emissions are each less than 100 tpy per simple cycle CT. Accordingly, CO and VOC CAM Plans are not required per 40 CFR §64.2(3). The simple cycle CTs are not equipped with a control device for any other emission-limited pollutants.
40 CFR Part 72—Acid Rain Program Permits				
40 CFR Part 72 Subpart A—Acid Rain Program General Provisions				
Standard Requirements	72.9		CT-4A through CT-8B	General acid rain requirements.
40 CFR Part 72 Subpart B—Designated Representative				
Designated Representative	72.20—72.24		CT-4A through CT-8B	General requirements pertaining to the designated representative.

Table A-1A. Summary of Federal EPA Regulatory Applicability and Corresponding Requirements—PCGS SCCTs (Continued, Page 5 of 11)

Regulation	Citation	Not Applicable	Applicable Emissions Units	Applicable Requirement or Nonapplicability Rationale
40 CFR Part 72 Subpart C—Acid Rain Application				
Requirements to Apply	72.30(a)		CT-4A through CT-8B	Requirements to submit a complete Acid Rain permit by the applicable deadline.
	72.30(b)(2) (ii)		CT-4A through CT-8B	Deadline to submit a complete Acid Rain permit application is at least 24 months before the later of January 1, 2000 or the date on which the unit commences commercial operation.
Requirements to Apply	72.30(c)		CT-4A through CT-8B	Duty to reapply—The designated representative shall submit a complete Acid Rain permit application for each source with an affected unit at least six months prior to the expiration of an existing Acid Rain permit governing the unit during Phase II or such longer time as may be approved under Part 70 of this chapter that ensures that the term of the existing permit will not expire before the effective date of the permit for which the application is submitted. **(future requirement)**
Requirements to Apply	72.30(d)		CT-4A through CT-8B	Requirements to submit an original and three copies of all Phase II permit applications to the State permitting authority where the administrator is not the permitting authority.
Information for Acid Rain Permit Applications	72.31		CT-4A through CT-8B	General permit application requirements.
Permit Application Shield	72.32		CT-4A through CT-8B	Permit application shield provisions for timely and complete Acid Rain permit applications. Application is binding pending issuance of Acid Rain Permit.
40 CFR Part 72 Subpart D—Acid Rain Compliance Plan and Compliance Options				
General	72.40(a)(1)		CT-4A through CT-8B	General Compliance Plan Requirements for SO_2.
General	72.40(a)(2)	X		The simple cycle CTs will not burn coal and therefore are not subject to the General Compliance Plan Requirements for NO_x.
40 CFR Part 72 Subpart E—Acid Rain Permit Contents				
Permit Shield	72.51		CT-4A through CT-8B	Permit shield provisions. Units operating in compliance with an Acid Rain Permit are deemed to be operating in compliance with the Acid Rain Program.

Table A-1A. Summary of Federal EPA Regulatory Applicability and Corresponding Requirements—PCGS SCCTs (Continued, Page 6 of 11)

Regulation	Citation	Not Applicable	Applicable Emissions Units	Applicable Requirement or Nonapplicability Rationale
40 CFR Part 72 Subpart H—Permit Revisions				
General, Additional Information	72.80(g)		CT-4A through CT-8B	Requirement to submit supplementary or corrected information upon becoming aware of a failure to submit relevant information or a prior incorrect submittal **(potential future requirement)**.
Fast-Track Modifications	72.82(a) and (c)		CT-4A through CT-8B	Procedures for fast-track modifications to Acid Rain Permits **(potential future requirement)**.
40 CFR Part 72 Subpart I—Compliance Certification				
Annual Compliance Certification Report	72.90		CT-4A through CT-8B	Requirement to submit an annual compliance report.
40 CFR Part 75—Continuous Emission Monitoring				
40 CFR Part 75 Subpart A—General				
Compliance Dates	75.4 (b)(2)		CT-4A through CT-8B	Requirement to complete all certification tests by the earlier of 90 unit operating days or 180 calendar days after the date the unit commences commercial operation.
Prohibitions	75.5		CT-4A through CT-8B	General monitoring prohibitions.
40 CFR Part 75 Subpart B—Monitoring Provisions				
General Operating Requirements	75.10		CT-4A through CT-8B	General acid rain monitoring requirements.
Specific Provisions for Monitoring SO_2 Emissions	75.11(d)(2)		CT-4A through CT-8B	SO_2 continuous monitoring requirements for gas and oil fired units using Appendix D.
Specific Provisions for Monitoring SO_2 Emissions	75.11(d)(3)		CT-4A through CT-8B	SO_2 continuous monitoring requirements for low mass emissions (LME) units.
Specific Provisions for Monitoring NO_x Emissions	75.12(e)(3)		CT-4A through CT-8B	NO_x excepted monitoring option of §75.19(c) for LME units.
Specific Provisions for Monitoring CO_2 Emissions	75.13(b)		CT-4A through CT-8B	CO_2 continuous monitoring requirements for gas and oil fired units using Appendix G.
Specific Provisions for Monitoring CO_2 Emissions	75.13(d)		CT-4A through CT-8B	CO_2 continuous monitoring requirements for LME units.
Specific Provisions for Monitoring Opacity	75.14(c)	X		Opacity continuous monitoring exemption for gas-fired units.

Table A-1A. Summary of Federal EPA Regulatory Applicability and Corresponding Requirements—PCGS SCCTs (Continued, Page 7 of 11)

Regulation	Citation	Not Applicable	Applicable Emissions Units	Applicable Requirement or Nonapplicability Rationale
Specific Provisions for Monitoring Opacity	75.14(c)	X		Opacity continuous monitoring exemption for gas-fired units.
Implementation Deadline for LME Units	75.19(a)(1)(ii)(A)		CT-4A through CT-8B	LME methodology must begin in the first unit operating hour in the year designated in the certification application.
Certification Application for LME Units	75.19(a)(2)		CT-4A through CT-8B	Certification application must be submitted no later than 45 days prior to the date on which use of the LME methodology is expected to commence.
LME Units Applicability Procedures	75.19(a)(3) (i)		CT-4A through CT-8B	Enforceable restrictions on the number of annual unit operating hours may be used to demonstrate LME applicability.
LME Units Procedures for Fuel-and-Unit-Specific NO_x Emission Rate	75.19(a)(4)		CT-4A through CT-8B	Procedures for using fuel-and-unit-specific NOx emission rates for LME applicability and initial reporting.
On-Going Qualification and Disqualification Provisions for LME Units	75.19(b)		CT-4A through CT-8B	Annual demonstration and recordkeeping of continuing qualification of LME units is required.
Monitoring SO_2 Emissions for LME Units	75.19(c)(1) (i)		CT-4A through CT-8B	SO_2 continuous monitoring requirements for LME units.
Monitoring NO_x Emissions for LME Units	75.19(c)(1) (ii) and (iv)		CT-4A through CT-8B	NO_x continuous monitoring requirements for LME units.
Monitoring CO_2 Emissions for Low Mass Emission (LME) Units	75.19(c)(1) (iii)		CT-4A through CT-8B	CO_2 continuous monitoring requirements for low mass emission (LME) units.
Recordkeeping for Low Mass Emission (LME) Units	75.19(c)(2)		CT-4A through CT-8B	Recordkeeping requirements for low mass emission (LME) units.
Monitoring Heat Input for LME Units	75.19(c)(3)		CT-4A through CT-8B	Heat input monitoring requirements for LME units.
SO_2 Mass Emission Rate Calculations for LME Units	75.19(c)(4) (i)		CT-4A through CT-8B	SO_2 mass emission rate calculations for LME units.
NO_x Mass Emission Rate Calculations for LME Units	75.19(c)(4) (ii)		CT-4A through CT-8B	NO_x mass emission rate calculations for LME units.
CO_2 Mass Emission Rate Calculations for LME Units	75.19(c)(4) (iii)		CT-4A through CT-8B	CO_2 mass emission rate calculations for LME units.
LME Units Recordkeeping and Reporting	75.19(d)		CT-4A through CT-8B	Recordkeeping and reporting requirements for LME units.

Table A-1A. Summary of Federal EPA Regulatory Applicability and Corresponding Requirements—PCGS SCCTs (Continued, Page 8 of 11)

Regulation	Citation	Not Applicable	Applicable Emissions Units	Applicable Requirement or Nonapplicability Rationale
LME Quality Control and Quality Assurance	75.19(e)		CT-4A through CT-8B	Quality control and quality assurance (QA/QC) requirements for LME units.
40 CFR Part 75 Subpart C—Operation and Maintenance Requirements				
Recertification Requirements	75.20(a)		CT-4A through CT-8B	Requires that monitoring systems meet initial certification requirements by the deadlines stipulated in 75.4.
	75.20(a)(1)		CT-4A through CT-8B	Requires notification of initial certification test dates at least 45 days prior to certification testing.
	75.20(a)(2)		CT-4A through CT-8B	Requires submittal of certification applications in accordance with 75.60 and 75.63.
	75.20(a)(5)		CT-4A through CT-8B	Procedures to be used in the event that the agency issues a disapproval of certification application or certification status. **(potential future requirement)**
	75.20(b)		CT-4A through CT-8B	Recertification procedures **(potential future requirement)**
	75.20(h)		CT-4A through CT-8B	Initial certification and recertification procedures for LME units.
Reference Test Methods	75.22		CT-4A through CT-8B	Specifies required test methods to be used for certification or recertification testing.
40 CFR Part 75 Subpart E—Alternative Monitoring Systems				
Alternative Monitoring Systems	75.40—75.48	X		Optional requirements for alternative monitoring systems.
40 CFR Part 75 Subpart F—Recordkeeping Requirements				
Monitoring Plan	75.53(a), (b), (e), and (f)(5)		CT-4A through CT-8B	Requirement to prepare and maintain a Monitoring Plan
General Recordkeeping Provisions	75.57		CT-4A through CT-8B	General recordkeeping provisions.
Specific Recordkeeping Provisions for LME Units	75.58(f)		CT-4A through CT-8B	Recordkeeping provisions for LME units.
Certification, Quality Assurance, and Quality Control Record Provisions	75.59(a) and (b)		CT-4A through CT-8B	General QA/QC recordkeeping requirements.

Table A-1A. Summary of Federal EPA Regulatory Applicability and Corresponding Requirements—PCGS SCCTs (Continued, Page 9 of 11)

Regulation	Citation	Not Applicable	Applicable Emissions Units	Applicable Requirement or Nonapplicability Rationale
40 CFR Part 75 Subpart G—Reporting Requirements				
General Provisions	75.60		CT-4A through CT-8B	General reporting requirements.
Notification of Certification and Recertification Test Dates	75.61		CT-4A through CT-8B	Requires written submittal of certification tests, recertification test, and revised test dates for CEMS. Notice of certification testing shall be submitted at least 45 days prior to the first day of certification for recertification testing. Notification of any proposed adjustment to certification testing dates must be provided at least 7 business days prior to the proposed date change.
Monitoring Plan	75.62		CT-4A through CT-8B	Monitoring Plan required to be submitted no later than 45 days prior to the certification test.
Certification or Recertification Application	75.63		CT-4A through CT-8B	Requires submittal of a certification application within 30 days after completing the certification test.
Quarterly Reports	75.64(a)		CT-4A through CT-8B	Requirement to submit quarterly data report.
	75.64(b), (c), (d), (f), and (g)		CT-4A through CT-8B	Requirement to submit compliance certification in support of each quarterly data report. Requirement to submit quarterly reports in an electronic format to be specified by EPA.
40 CFR Part 77—Excess Emissions				
Offset Plans for Excess Emissions of Sulfur Dioxide	77.3		CT-4A through CT-8B	Requirement to submit offset plans for excess SO_2 emissions not later than 60 days after the end of any calendar year during which an affected unit has excess SO_2 emissions. Required contents of offset plans are specified **(potential future requirement)**.
Offset Plans for Excess Emissions of Sulfur Dioxide	77.5(b)		CT-4A through CT-8B	Requirement for the Designated Representative to hold enough allowances in the appropriate compliance subaccount to cover deductions to be made by EPA if a timely and complete offset plan is not submitted or if EPA disapproves a proposed offset plan **(potential future requirement)**.
Penalties for Excess Emissions of Sulfur Dioxide	77.6		CT-4A through CT-8B	Requirement to pay a penalty if excess emissions of SO_2 occur at any affected unit during any year **(potential future requirement)**.

Table A-1A. Summary of Federal EPA Regulatory Applicability and Corresponding Requirements—PCGS SCCTs (Continued, Page 10 of 11)

Regulation	Citation	Not Appli-cable	Applicable Emis-sions Units	Applicable Requirement or Nonapplicability Rationale
40 CFR Part 78—Appeal Procedures for Acid Rain Program				
Appeal Procedures	78.1—78.20		CT-4A through CT-8B	Optional appeal procedures for EPA Acid Rain program decisions **(optional future requirement).**
40 CFR Part 82—Protection of Stratospheric Ozone				
Production and Consumption Controls	Subpart A	X		The Payne Creek Generating Station does not produce or consume ozone depleting substances.
Servicing of Motor Vehicle Air Conditioners	Subpart B	X		The Payne Creek Generating Station personnel do not perform servicing of motor vehicles, which involves refrigerant in the motor vehicle air conditioner. All such servicing is conducted off-site by persons who comply with Subpart B requirements.
Ban on Nonessential Products Containing Class I Substances and Ban on Nonessential Products Containing or Manufactured with Class II Substances	Subpart C	X		The Payne Creek Generating Station does not sell or distribute any banned nonessential substances.
The Labeling of Products Using Ozone-Depleting Substances	Subpart E	X		The Payne Creek Generating Station does not produce any products containing ozone depleting substances.
Subpart F—Recycling and Emissions Reduction				
Prohibitions	82.154	X		Payne Creek Generating Station personnel do not maintain, service, repair, or dispose of any appliances. All such activities will be performed by independent parties in compliance with 82.154.
Required Practices	82.156 except 82.156(i)(5), (6), (9), (10), and (11)		Appliances as defined by 82.152—any device which contains and uses a Class I or II substance as a refrigerant and which is used for household or commercial purposes including any air conditioner, refrigerator, chiller, or freezer.	Contractors will maintain, service, repair, and dispose of any appliances in compliance with 82.156 required practices.

Table A-1A. Summary of Federal EPA Regulatory Applicability and Corresponding Requirements—PCGS SCCTs (Continued, Page 11 of 11)

Regulation	Citation	Not Appli-cable	Applicable Emis-sions Units	Applicable Requirement or Nonapplicability Rationale
Technician Certification	82.161	X		Payne Creek Generating Station Personnel do not maintain, ser-vice, repair, or dispose of any appliances and therefore are not subject to technician certification requirements.
Certification By Owners of Recovery and Recycling Equipment	82.162	X		Payne Creek Generating Station Personnel do not maintain, ser-vice, repair, or dispose of any appliances and therefore do not use recovery and recycling equipment.
Reporting and Recordkeeping Requirements	82.166(k), (m), and (n)		Appliances as de-fined by 82.152.	Owners/operators of appliances normally containing 50 or more pounds of refrigerant must keep servicing records documenting the date and type of service, as well as the quantity of refrigerant added.
40 CFR Part 50—National Primary and Secondary Ambient Air Quality Standards Requirements		X		State agency requirements—not applicable to individual emis-sion sources.
40 CFR Part 51—Preparation, Adoption, and Submittal of Implementation Plans		X		State agency requirements—not applicable to individual emis-sion sources.
40 CFR Part 52—Approval and Promulgation of Implementation Plans		X		State agency requirements—not applicable to individual emis-sion sources.
40 CFR Part 62—Approval and Promulgation of State Plans for Designated Facilities and Pollutants		X		State agency requirements—not applicable to individual emis-sion sources.
40 CFR Part 70—State Operating Permit Pro-grams		X		State agency requirements—not applicable to individual emis-sion sources.
40 CFR Parts 53, 54, 55, 56, 58, 62, 66, 67, 68, 69, 71, 74, 76, 79, 80, 81, 85, 86, 87, 88, 89, and 90		X		The listed regulations do not contain any requirements that are applicable to the Payne Creek Generating Station.

Source: ECT, 2004.

Table A-1B. Summary of FDEP Regulatory Applicability and Corresponding Requirements—PCGS SCCTs

Regulation	Citation	Not Applicable	Applicable: Facility-Wide	Applicable Emission Units	Applicable Requirement or Non-Applicability Rationale
Chapter 62-4, F.A.C. - Permits: Part I General					
Scope of Part I	62-4.001, F.A.C.	X			Contains no applicable requirements.
Definitions	62-4.020, .021, F.A.C.	X			Contains no applicable requirements.
General Prohibition	62-4.030, F.A.C		X		All stationary air pollution sources must be permitted, unless otherwise exempted.
Exemptions	62-4.040(1)(a) and (b), F.A.C		X		Certain structural changes exempt from permitting. Other stationary sources exempt from permitting upon FDEP insignificance determination.
Procedures to Obtain Permits	62-4.050(1), (2), and (3), F.A.C.		X		General permitting procedures including filing in quadruplicate and PE certification.
Air Pollution Permit Processing Fees	62-4.050(4)(a)1., 4., 5., F.A.C.		X		Processing fees for air pollution permits. Permit processing fees are not required for operating permits or non-PSD construction permits for sources holding a Title V permit. **(potential future requirement)**
Permit Processing, Response to Requests for Additional Information	62-4.055(1), F.A.C.		X		If additional information is requested by FDEP, applicants have 90 days to submit the additional information. Upon request, FDEP will grant an additional 90 period to provided the requested information. Further extensions may be granted if the applicant shows good cause. **(potential future requirement)**
Permit Processing, Option to Request a Hearing	62-4.055(2), F.A.C.		X		If a FDEP request for additional information is not considered authorized by law or rule, the applicant may request a hearing. **(optional future requirement)**
Permit Processing, Option to Request Department Permit Processing	62-4.055(4), F.A.C.		X		If a FDEP request for additional information is not considered authorized by law or rule, the applicant may request that FDEP process the permit application without the requested information. **(optional future requirement)**

Table A-1B. Summary of FDEP Regulatory Applicability and Corresponding Requirements—PCGS SCCTs (Continued, Page 2 of 13)

Regulation	Citation	Not Applicable	Applicable: Facility-Wide	Applicable Emission Units	Applicable Requirement or Non-Applicability Rationale
Permit Processing	62-4.055(3), (5), and (6) F.A.C.	X			FDEP permit processing procedures. Contains no applicable requirements.
Consultation	62-4.060, F.A.C.	X			Consultation with FDEP is encouraged, not required.
Standards for Issuing or Denying Permits; Issuance; Denial	62-4.070, F.A.C	X			Establishes FDEP standard permitting procedures. Contains no applicable requirements.
Modification of Permit Conditions	62-4.080(1) F.A.C		X		For good cause, permittee may be required to conform to new or additional conditions. **(potential future requirement)**
Modification of Permit Conditions	62-4.080(2) and (3) F.A.C		X		Permittee may request a permit modification or permit extension. **(optional future requirement)**
Renewals	62-4.090, F.A.C.		X		Establishes permit renewal criteria. Requests for renewal of a Title V operating permit are due prior to 180 days before permit expiration. Applications submitted prior to the due date are considered timely and sufficient. For timely and sufficient applications, the existing permit shall remain in effect until the renewal application has been finally acted upon by FDEP. Additional criteria are cited at 62-213.430(3), F.A.C.
Suspension and Revocation	62-4.100, F.A.C.	X			Establishes FDEP permit suspension and revocation criteria. Contains no applicable requirements.
Financial Responsibility	62-4.110, F.A.C.	X			FDEP has not required proof of financial responsibility or posting of a bond for the Payne Creek Generating Station.
Transfer of Permits	62-4.120, F.A.C.	X			A sale or legal transfer of a permitted facility is not being requested for the Payne Creek Generating Station.
Plant Operation - Problems	62-4.130, F.A.C.		X		Immediate notification is required whenever the permittee is temporarily unable to comply with any permit condition. Notification content is specified. **(potential future requirement)**

Table A-1B. Summary of FDEP Regulatory Applicability and Corresponding Requirements—PCGS SCCTs (Continued, Page 3 of 13)

Regulation	*Citation*	Not Applicable	Applicable: Facility-Wide	Applicable Emission Units	Applicable Requirement or Non-Applicability Rationale
Permit Review	62-4.150, F.A.C.		X		Failure to request a hearing within 14 days of proposed or final Agency action on a permit application shall be deemed a waiver to the right to an administrative hearing. **(optional future requirement)**
Permit Conditions	62-4.160, F.A.C.	X			Lists general conditions that FDEP must include in permits. Contains no applicable requirements.
Chapter 62-4, F.A.C. - Part II Specific Permits; Requirements					
Construction Permits	62-4.210, F.A.C.		X		General requirements for construction permits.
Operation Permits for New Sources	62-4.220, F.A.C.		X		General requirements for new source operation permits. **(potential future requirement)**
Chapter 62-4, F.A.C. - Part III Procedures for General Permits	62-4.510 through 62-4.540, F.A.C.	X			Not applicable to the Payne Creek Generating Station.
Chapter 62-204, F.A.C. - Air Pollution Control - General Provisions					
State Implementation Plan	62-204.100, .200, .220(1)-(3), .240, .260, .320, .340, .360, .400, and .500, F.A.C.	X			Contains no applicable requirements.
Ambient Air Quality Protection	62-204.220(4), F.A.C.		X		Assessments of ambient air pollutant impacts must be made using applicable air quality models, data bases, and other requirements approved by FDEP and specified in 40 CFR Part 51, Appendix W.
Federal Regulations Adopted by Reference	62-204.800(8)(a), (b)39., (c), (d), and (e), F.A.C.			CT-4A through CT-8B	All Federal Regulations cited in the rules by the Department are adopted and incorporated by reference. Specifically, the new source performance standards contained in 40 CFR 60 Subpart A and Subpart GG are applicable to the Payne Creek Generating Station SCCTs.
Federal Regulations Adopted by Reference	62-204.800(12), F.A.C.	X			Compliance Assurance Monitoring (CAM) is not applicable to the SCCTs; see Table A-1A for detailed federal regulatory citations.

Table A-1B. Summary of FDEP Regulatory Applicability and Corresponding Requirements—PCGS SCCTs (Continued, Page 4 of 13)

Regulation	Citation	Not Applicable	Applicable: Facility-Wide	Applicable Emission Units	Applicable Requirement or Non-Applicability Rationale
Federal Regulations Adopted by Reference	62-204.800(15), F.A.C.		X		State (FDEP) Part 70 (Title V Permit) Program requirements; see Table A-1A for detailed federal regulatory citations. Contains no applicable requirements.
Federal Regulations Adopted by Reference	62-204.800(16), (17), (18), (20), and (21), F.A.C.			CT-4A through CT-8B	Acid Rain Program; Table A-1A for detailed federal regulatory citations.
Federal Regulations Adopted by Reference	62-204.800(23)(e), F.A.C.		X		Protection of Stratospheric Ozone; see Table A-1A for detailed federal regulatory citations.
Chapter 62-210, F.A.C. - Stationary Sources - General Requirements					
Purpose and Scope	62-210.100, F.A.C.	X			Contains no applicable requirements.
Definitions	62-210.200, F.A.C.	X			Contains no applicable requirements.
Permits Required, Air Construction	62-210.300(1), F.A.C.		X		Requirements for air construction permits.
Permits Required, Air Operation	62-210.300(2)(a), F.A.C.		X		Air operation permits required, including permit renewals. **(future requirement)**
Permits Required, Exemptions	62-210.300(3), F.A.C.		X		Permit exemptions for certain facilities and sources.
Emission Unit Startup, Reclassification, and Transfer of Air Permits	62-210.300(5), (6), and (7) F.A.C.		X		Startup notification required if a permitted source has been shut down for more than 1 year. Emission unit reclassification and air permit transfer procedures. **(potential future requirements).**
Public Notice and Comment	62-210.350(1), F.A.C.		X		All permit applicants, including those for renewals and revisions, are required to publish notice of proposed agency action.
Additional Notice Requirements for Sources Subject to Prevention of Significant Deterioration or Nonattainment Area New Source Review	62-210.350(2), F.A.C.		X		PSD permit application notice requirements.

Table A-1B. Summary of FDEP Regulatory Applicability and Corresponding Requirements—PCGS SCCTs (Continued, Page 5 of 13)

Regulation	Citation	Not Applicable	Applicable: Facility-Wide	Applicable Emission Units	Applicable Requirement or Non-Applicability Rationale
Additional Public Notice Requirements for Sources Subject to Operation Permits for Title V Sources	62-210.350(3), F.A.C.		X		Notice requirements for Title V operating permits, renewals, and revisions. **(future requirement)**
Administrative Permit Corrections	62-210.360(1), F.A.C.		X		Facility owner shall notify the FDEP by letter of minor corrections to information contained in a permit. **(potential future requirements).**
Annual Operating Report for Air Pollutant Emitting Facility	62-210.370(3)(a)1. and (c), F.A.C.		X		Title V sources are required to submit an annual operating report.
Stack Height Policy	62-210.550, F.A.C.		X		Limits credit in air dispersion studies to good engineering practice (GEP) stack heights.
Circumvention	62-210.650, F.A.C.		X		An applicable air pollution control device cannot be circumvented and must be operated whenever the emission unit is operating.
Excess Emissions	62-210.700(1), (4), (5), and (6) F.A.C.			CT-4A through CT-8B	Excess emissions due to startup, shutdown, and malfunction are permitted. Excess emissions due to malfunction must be reported. Excess emissions due to certain other causes are prohibited. **(potential future requirement)**
Excess Emissions	62-210.700(1), (4), and (5) F.A.C.		X		Excess emissions due to startup, shutdown, and malfunction are permitted. Excess emissions due to malfunction must be reported. Excess emissions due to certain other causes are prohibited. **(potential future requirement)**
Forms and Instructions	62-210.900, F.A.C.		X		List of required FDEP forms for stationary sources.
Notification Forms for Air General Permits	62-210.920, F.A.C.	X			Contains no applicable requirements.
Chapter 62-212, F.A.C. - Stationary Sources - Preconstruction Review					
Purpose and Scope	62-212.100, F.A.C.	X			Contains no applicable requirements.

Table A-1B. Summary of FDEP Regulatory Applicability and Corresponding Requirements—PCGS SCCTs (Continued, Page 6 of 13)

Regulation	Citation	Not Applicable	Applicable: Facility-Wide	Applicable Emission Units	Applicable Requirement or Non-Applicability Rationale
General Preconstruction Review Requirements	62-212.300, F.A.C.		X		Air construction permit requirements.
Prevention of Significant Deterioration	62-212.400, F.A.C.		X		PSD permit requirements.
Prevention of Significant Deterioration	62-212.400(7)(b), F.A.C.			CT-4A through CT-8B	The operation permit shall contain all operating conditions and provisions required under 62-212.400(7)(a) and set forth in the original or amended construction permit.
New Source Review for Nonattainment Areas	62-212.500, F.A.C.	X			The Payne Creek Generating Station is not located in any nonattainment area or nonattainment area of influence.
Sulfur Storage and Handling Facilities	62-212.600, F.A.C.	X			Applicable only to sulfur storage and handling facilities.
Air Emissions Bubble	62-212.710(2), (3), (5), and (6) F.A.C.		X		Applicant requirements for an air emissions bubble including permit applications, ambient impact analysis, monitoring, and recordkeeping. **(optional future requirement)**
Chapter 62-213, F.A.C. - Operation Permits for Major Sources of Air Pollution					
Purpose and Scope	62-213.100, F.A.C.	X			Contains no applicable requirements.
Responsible Official	62-213.202, F.A.C.		X		Title V sources must designate a responsible official.
Annual Emissions Fee	62-213.205, F.A.C.		X		Title V sources must pay an annual emissions fee.
Title V Air General Permits	62-213.300, F.A.C.	X			Not applicable to the Payne Creek Generating Station.
Permits Required	62-213.400(1), F.A.C.		X		Title V sources must operate in compliance with Chapter 62-213.
Permit Revisions Required	62-213.400(2), F.A.C.		X		Lists changes for which a permit revision is required. **(future requirement)**.

Table A-1B. Summary of FDEP Regulatory Applicability and Corresponding Requirements—PCGS SCCTs (Continued, Page 7 of 13)

Regulation	Citation	Not Applicable	Applicable: Facility-Wide	Applicable Emission Units	Applicable Requirement or Non-Applicability Rationale
Concurrent Processing of Permit Applications	62-213.405, F.A.C.		X		Applicant may request concurrent processing of a construction permit and Title V permit revision or renewal. **(optional requirement)**.
Changes Without Permit Revision	62-213.410, F.A.C.		X		Certain changes may be made if specific notice and recordkeeping requirements are met. **(potential future requirement)**
Immediate Implementation Pending Revision Process	62-213.412, F.A.C.		X		Certain modifications can be implemented pending permit revision if specific criteria are met.**(potential future requirement)**
Fast-Track Revisions of Acid Rain Parts	62-213.413, F.A.C.			CT-4A through CT-8B	Optional provisions for Acid Rain permit revisions. **(optional future requirement)**
Trading of Emissions within a Source	62-213.415, F.A.C.		X		Defines the conditions under which emissions trading is allowable. **(optional future requirement)**
Permit Applications, Timely Submittal	62-213.420(1)(a)3., F.A.C.		X		Title V operating permit renewal application is timely if submitted in accordance with Rule 62-4.090, F.A.C. (Prior to 180 days before permit expiration)
Permit Applications, New or Modified Emission Units	62-213.420(1)(a)4., F.A.C.		X		A Title V source that contains an emissions unit that commences operation or is modified after 10/25/95 is required to submit an application for Title V permit revision at least 90 days prior to the unit's air construction permit expiration , but no later than 180 days after the unit commences operation. **(future requirement)**
Permit Applications, Standard Information Required	62-213.420(1)(b)1., (3) and (4), F.A.C.		X		Title V operating permit renewal application must contain all the information specified by 62-213.420(3), F.A.C. and be certified by the responsible official.
Permit Applications, Additional Time to Provide Requested Information	62-213.420(1)(b)6., F.A.C.		X		If requested in writing by the applicant prior to the initial due date, FDEP will grant up to 60 additional days to respond to requests for additional information. FDEP may grant additional time beyond 60 days for good cause. **(optional future requirement)**

Table A-1B. Summary of FDEP Regulatory Applicability and Corresponding Requirements—PCGS SCCTs (Continued, Page 8 of 13)

Regulation	Citation	Not Applicable	Applicable: Facility-Wide	Applicable Emission Units	Applicable Requirement or Non-Applicability Rationale
Permit Applications, Certification by Responsible Official	62-213.420(4), F.A.C.		X		Requires submittal of a Responsible Official (RO) certification for any application form, report, compliance statement, compliance plan, and compliance schedule.
Permit Applications, Acid Rain Part	62-213.420(5), F.A.C.		X		Applicants may request separate processing of the Title V permit and Acid Rain Part. **(optional future requirement)**
Permit Issuance, Renewal, and Revision	62-213.430(3), F.A.C.		X		Permits being renewed are subject to the same requirements that apply to permit issuance. Permit renewal applications shall contain the information specified in 62-210.900(1) and 62-213.420(3), F.A.C.
Permit Issuance, Renewal, and Revision – Insignificant Emission Units and Activities	62-213.430(6), F.A.C.		X		Specifies criteria for insignificant emissions units and activities. Applicants may request FDEP determinations of insignificant emission units or activities. Such requests will be processed in conjunction with a permit renewal or revision application. Insignificant emission units added after issuance of a Title V permit shall be incorporated into the permit at its next renewal.
Permit Content	62-213.440, F.A.C.	X			FDEP standard permit requirements. Contains no applicable requirements.
Permit Review by EPA and Affected States	62-213.450, F.A.C.	X			Contains no applicable requirements.
Permit Shield	62-213.460, F.A.C.		X		Provides permit shield for facilities in compliance with permit terms and conditions.
Forms and Instructions	62-213.900(1), (7), and (8), F.A.C.		X		Lists applicable forms including "Major Air Pollution Source Annual Emissions Fee," Statement of Compliance," and "Responsible Official Notification" forms.

Table A-1B. Summary of FDEP Regulatory Applicability and Corresponding Requirements—PCGS SCCTs (Continued, Page 9 of 13)

Regulation	Citation	Not Applicable	Applicable: Facility-Wide	Applicable Emission Units	Applicable Requirement or Non-Applicability Rationale
Chapter 62-214 F.A.C. - Requirements for Sources Subject to the Federal Acid Rain Program					
Purpose and Scope	62-214.100, F.A.C.	X			Contains no applicable requirements.
Applicability	62-214.300, F.A.C.			CT-4A through CT-8B	Payne Creek Generating Station includes Acid Rain units. Therefore, facility compliance with 62-213 and 62-214, F.A.C., is required.
Applications, Renewals	62-214.320(1)(i), F.A.C.			CT-4A through CT-8B	Requires Title V sources having Acid Rain unit(s) to submit an Acid Rain Renewal Application to FDEP. Operation without a Title V permit that includes an Acid Rain Part is prohibited.
Applications, Information Requirements	62-214.320(2), F.A.C.			CT-4A through CT-8B	Specifies required contents of Acid Rain Part applications.
Acid Rain Compliance Plan and Compliance Options, SO_2	62-214.330(1)(a), F.A.C.			CT-4A through CT-8B	Acid rain compliance plan requirements for sulfur dioxide emissions.
Exemptions	62-214.340(2), F.A.C.			CT-4A through CT-8B	Notice may be submitted for retired exemptions (**potential future requirement**).
Certification	62-214.350(2), (3), (5), (6), F.A.C.			CT-4A through CT-8B	Submittal of a copy of the Certificate of Representation form to FDEP is required. Specifics required Designated Representative (DR) certifications.
Department Action on Applications	62-214.360, F.A.C.	X			FDEP application processing procedures. Contains no applicable requirements.
Revisions and Administrative Corrections	62-214.370(1), (3), (4), F.A.C.			CT-4A through CT-8B	Specifies applicant permit revision requirements. (**potential future requirement**).
Revisions and Administrative Corrections, Agency Procedures	62-214.370(2), (5), (6), and (7) F.A.C.	X			FDEP application processing procedures. Contains no applicable requirements.
Acid Rain Part Content	62-214.420, F.A.C.	X			FDEP requirements - defines content of Acid Rain Part. Contains no applicable requirements.

Table A-1B. Summary of FDEP Regulatory Applicability and Corresponding Requirements—PCGS SCCTs (Continued, Page 10 of 13)

Regulation	Citation	Not Applicable	Applicable: Facility-Wide	Applicable Emission Units	Applicable Requirement or Non-Applicability Rationale
Implementation and Termination of Compliance Options	62-214.430, F.A.C.			CT-4A through CT-8B	Defines permit activation and termination procedures. Presently not applicable to the Payne Creek Generating Station. **(potential future requirement)**.
Chapter 62-252 - Gasoline Vapor Control					
Rules for gasoline vapor control equipment	62-252, F.A.C.	X			The Payne Creek Generating Station is not located in an ozone nonattainment area or an air quality maintenance area for ozone.
Chapter 62-256, F.A.C. - Open Burning and Frost Protection Fires					
Declaration and Intent	62-256.100, F.A.C.	X			Contains no applicable requirements.
Definitions	62-256.200, F.A.C.	X			Contains no applicable requirements.
Prohibitions	62-256.300, F.A.C.*		X		Prohibits certain types of open burning.
Agricultural and Silvicultural Fires	62-256.400, F.A.C. (Transferred to Division of Forestry, Chapter 5I-2)	X			Contains no applicable requirements.
Burning for Cold and Frost Protection	62-256.450, F.A.C.	X			Limited to agricultural protection.
Land Clearing	62-256.500, F.A.C.*		X		Defines allowed open burning for non-rural land clearing and structure demolition.
Industrial, Commercial, Municipal, and Research Open Burning	62-256.600, F.A.C.*		X		Prohibits industrial open burning
Open Burning allowed	62-256.700(3), (5), and (6) F.A.C.		X		Defines allowed open burning. For recreational and training purposes.
Effective Date	62-256.800, F.A.C.	X			Contains no applicable requirements.
Chapter 62-257 - Asbestos Program		X			

Table A-1B. Summary of FDEP Regulatory Applicability and Corresponding Requirements—PCGS SCCTs (Continued, Page 11 of 13)

Regulation	Citation	Not Applicable	Applicable: Facility-Wide	Applicable Emission Units	Applicable Requirement or Non-Applicability Rationale
Chapter 62-281 - Motor Vehicle Air Conditioning Refrigerant Recovery and Recycling					
Establishes installation and proper use of motor vehicle refrigerant recycling equipment.	62-281.100, F.A.C.	X			Requirements for the installation and proper use of motor vehicle refrigerant recycling equipment. Adopts definitions of 40 CFR Part 82 with some exceptions. No vehicle maintenance involving air conditioning systems is conducted at the Payne Creek Generating Station.
Chapter 62-296 - Stationary Sources - Emission Standards					
Purpose and Scope	62-296.100, F.A.C.	X			Contains no applicable requirements
General Pollutant Emission Limiting Standard, Volatile Organic Compounds Emissions	62-296.320(1), F.A.C.		X		Known and existing vapor control devices must be applied as required by the Department.
General Pollutant Emission Limiting Standard, Objectionable Odor Prohibited	62-296.320(2), F.A.C.*		X		Objectionable odor release is prohibited.
General Pollutant Emission Limiting Standard, Industrial, Commercial, and Municipal Open Burning Prohibited	62-296.320(3), F.A.C.*		X		Open burning in connection with industrial, commercial, or municipal operations is prohibited. **(potential future requirement)**
General Particulate Emission Limiting Standard, Process Weight Table	62-296.320(4)(a), F.A.C.	X			Payne Creek Generating Station does not have any applicable emission units. Combustion emission units are exempt per 62-296.320(4)(a)1a.
General Particulate Emission Limiting Standard, General Visible Emission Standard	62-296.320(4)(b), F.A.C.		X		Opacity limited to 20 percent, unless otherwise permitted. Test methods specified.
General Particulate Emission Limiting Standard, Unconfined Emission of Particulate Matter	62-296.320(4)(c), F.A.C.		X		Reasonable precautions must be taken to prevent unconfined particulate matter emission.

Table A-1B. Summary of FDEP Regulatory Applicability and Corresponding Requirements—PCGS SCCTs (Continued, Page 12 of 13)

Regulation	Citation	Not Applicable	Applicable: Facility-Wide	Applicable Emission Units	Applicable Requirement or Non-Applicability Rationale
Specific Emission Limiting and Performance Standards	62-296.401 through 62-296.404 and 62-296.406 through 62-296.417, F.A.C.	X			Not applicable to the Payne Creek Generating Station SCCTs.
Reasonably Available Control Technology (RACT) Volatile Organic Compounds (VOC) and Nitrogen Oxides (NO_x) Emitting Facilities	62-296.500 through 62-296.516, F.A.C.	X			The Payne Creek Generating Station is not located in an ozone nonattainment area or an ozone air quality maintenance area.
Reasonably Available Control Technology (RACT) - Requirements for Major VOC- and NO_x-Emitting Facilities	62-296.570, F.A.C.	X			The Payne Creek Generating Station is not located in a specified ozone nonattainment area or a specified ozone air quality maintenance area (Broward, Dade and Palm Beach Counties).
Reasonably Available Control Technology (RACT) - Lead	62-296.600 through 62-296.605, F.A.C.	X			The Payne Creek Generating Station is not located in a lead nonattainment area or a lead air quality maintenance area.
Reasonably Available Control Technology (RACT)—Particulate Matter	62-296.700 through 62-296.712, F.A.C.	X			The Payne Creek Generating Station is not located in a PM nonattainment area or a PM air quality maintenance area.
Chapter 62-297, Stationary Sources - Emissions Monitoring					
Purpose and Scope	62-297.100, F.A.C.	X			Contains no applicable requirements.
General Test Requirements	62-297.310, F.A.C.			CT-4A through CT-8B	Specifies general compliance test requirements including the number of runs, operating rates, emission rate calculation, applicable test procedures, determination of process variables, required stack sampling facilities, frequency of tests, and content of test reports.
Standards for Visible Emissions Observations	62-297.320(1), F.A.C.			CT-4A through CT-8B	Specifies training and certification requirements for persons conducting the opacity of visible emissions.
Compliance Test Methods	62-297.401, F.A.C.		X		List methods to be used for compliance testing.
Supplementary Test Procedures	62-297.440, F.A.C.		X		Contains other test procedures adopted by reference.

Table A-1B. Summary of FDEP Regulatory Applicability and Corresponding Requirements—PCGS SCCTs (Continued, Page 13 of 13)

Regulation	Citation	Not Applicable	Applicable: Facility-Wide	Applicable Emission Units	Applicable Requirement or Non-Applicability Rationale
EPA VOC Capture Efficiency Test Procedures	62-297.450, F.A.C.	X			Not applicable to the Payne Creek Generating Station.
Exceptions and Approval of Alternate Procedures and Requirements	62-297.620, F.A.C.			CT-4A through CT-8B	Exceptions or alternate testing procedures may be requested. **(optional future requirement).**
Chapter 5I-2, Open Burning Rule					
Definitions	5I-2.003, F.A.C.	X			Contains no applicable requirements.
Open Burning Not Allowed	5I-2.004, F.A.C.		X		Prohibits certain types of open burning.
Open Burning Allowed	5I-2.006, F.A.C.		X		Requirements for agricultural, silvicultural, and rural land clearing open burning.

*State requirement only; not federally enforceable.

Source: ECT, 2004.

ATTACHMENT A3

LIST OF EXEMPT EMISSIONS UNITS

LIST OF EXEMPT EMISSIONS UNITS

The Payne Creek Generating Station (PCGS) simple-cycle combustion turbine (SCCT) project will include one emergency, 611-horsepower black-start diesel generator and one 1.35-million-gallon distillate fuel oil storage tank.

The emergency black-start generator will meet the following permit exemption criteria and therefore is exempt from permitting requirements pursuant to Rule 62-210.300(3)(a)20., Florida Administrative Code (F.A.C.):

- It will not be subject to the Acid Rain Program.
- Total PCGS fuel consumption for all emergency generators will not exceed 32,000 gallons per year of diesel fuel.

The 1.35-million-gallon distillate fuel oil storage tank will meet the following permit exemption criteria and therefore is exempt from permitting requirements pursuant to Rule 62-210.300(3)(b)1., F.A.C.:

- It will not be subject to any unit-specific applicable requirements.
- Potential volatile organic compound (VOC) emissions will be less than 5.0 tons per year.
- Storage tank emissions will not trigger Title V or New Source Review (NSR) since the PCGS is presently a Title V source and the SCCT peaker project is subject to Prevention of Significant Deterioration (PSD) preconstruction NSR excluding emissions from the 1.35-million-gallon distillate fuel oil storage tank.

ATTACHMENT A4

FUEL ANALYSES OR SPECIFICATIONS

Table 1 – Expected Natural Gas Analysis

Constituents	Percent by Volume
Methane (CH_4)	83.4%
Ethane (C_2H_6)	15.8%
Nitrogen (N_2)	0.8%
Sulfur (S), max.	0.2 grains/100 SCF

Table 2 – Expected Fuel Oil Analysis

Constituents	Percent by Weight
Carbon (C)	86.139%
Hydrogen (H)	13.8%
Sulfur (S)	0.05%
Fuel Bound Nitrogen (FBN)	0.015%
Ash	0.001%

ATTACHMENT B

SCCT EMISSIONS VENDOR DATA

FT8-3 [illegible] Pac
Estimated Performance and Emissions Data
Seminole Power

Natural Gas Fuel Data

Configuration: Simple Cycle Performance, Natural Gas per Cust. Spec — Generator 72290, 60 Ft. Stack with CO Converter, 85% Effective CO Converter

Performance Data

Condition		Winter - 32 Degrees F			100% Load, 50 Degrees F			Summer - 95 Degrees F		
Percent of Rated Load	%	100	80	48	100	80	50	100	80	50
Ambient Temperature	Deg F	32.0	32.0	32.0	50.0	50.0	50.0	95.0	95.0	95.0
Ambient Pressure	PSIA	14.63	14.63	14.63	14.63	14.63	14.63	14.63	14.63	14.63
Relative Humidity	%	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
Inlet Loss	in.H2O	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Exhaust Loss	in.H2O	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Fuel Lower Heating Value	BTU/lb	20778	20778	20778	20778	20778	20778	20778	20778	20778
Gross Power Output	kW	62476	49981	29988	62380	49904	31190	54181	43345	27091
Gross Heat Rate (LHV)	BTU/kWh	9162	9336	10532	9262	9444	10525	9590	9993	11253
Power Island Aux. Loads	kW	252	252	252	252	252	252	252	252	252
Net Power Output (3)	kW	62224	49729	29736	62128	49652	30938	53929	43093	26839
Net Heat Rate (LHV)	BTU/kWh	9199	9383	10621	9299	9492	10610	9830	10254	11588
Fuel Flow, per GT	PPH	13774	11228	7600	13903	11341	7899	12534	10448	7353
Water Injection Flow, per GT	GPM	29.9	22.3	13.1	31.1	23.3	14.4	28.4	22.3	14.1
GT Exhaust Flow, per GT	PPS	208.3	191.7	154.9	203.9	187.0	153.4	182.9	165.4	136.1
GT Exhaust Temperature	Deg F	853	783	721	891	823	763	935	899	841

Emissions at GT Exit (per GT)

NOx	PPMVD*	25	25	25	25	25	25	25	25	25
	PPH	31.7	25.8	17.7	32.0	26.1	18.1	28.8	24.0	16.9
CO, Post 85% CO Conv.	PPMVD*	12	20	29	9	15	22	9	12	21
Post 85% CO Conv.	PPH	9.3	12.2	12.2	1.0	9.8	9.8	6.3	7.0	8.6
VOC (as CH4)	PPMVD*	6	13	34	6	9	17	6	6	15
	PPH	2.6	4.8	8.3	2.7	3.2	4.4	2.4	2.0	3.6
Filterable Particulates	PPH	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
SO2	PPH	0.22	0.18	0.12	0.22	0.18	0.13	0.20	0.17	0.12
Opacity	%	<5	<5	<5	<5	<5	<5	<5	<5	<5

Exhaust Gas Composition at GT Exit

N2	Vol %	72.9	73.6	74.4	72.3	73.0	73.8	69.8	70.2	71.1
A	Vol %	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8
CO2	Vol %	3.2	2.8	2.4	3.3	2.9	2.5	3.3	3.0	2.6
H20	Vol %	9.8	8.5	6.9	10.6	9.3	7.8	13.8	12.9	11.5
O2	Vol %	13.3	14.2	15.3	13.0	13.9	14.9	12.3	13.0	14.0

Seminole_CustCpy_070303-R2.xls
R1, Added Perf Data for FT8-1, 07/03/03 Notes:
R2, Revised NG Part Pwr HR's, 07/07/03

FT8-3 Twin Pac
Estimated Performance and Emissions Data
Seminole Power

Liquid Fuel, No.-2 Fuel Oil

Configuration: Simple Cycle Performance, No.-2 Fuel Oil

Generator 72290,
60 Ft. Stack with CO Converter
85% Effective CO Converter

Performance Data										
Condition		Winter - 32 Degrees F			100% Load, 78 Degrees F			Summer - 95 Degrees F		
Percent of Rated Load	%	100	80	50.7	100	80	50	100	80	50
Ambient Temperature	Deg F	32.0	32.0	32.0	78.0	78.0	78.0	95.0	95.0	95.0
Ambient Pressure	PSIA	14.63	14.63	14.63	14.63	14.63	14.63	14.63	14.63	14.63
Relative Humidity	%	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
Inlet Loss	in.H2O	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Exhaust Loss	in.H2O	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Fuel Lower Heating Value	BTU/lb	18360	18360	18360	18360	18360	18360	18360	18360	18360
Gross Power Output	kW	56080	44864	28433	56068	44854	28034	52239	41600	26000
Gross Heat Rate (LHV)	BTU/kWh	9328	9677	10835	9598	9961	11167	9816	10232	11544
Power Island Aux. Loads	kW	277	277	277	277	277	277	277	277	277
Net Power Output (3)	kW	55803	44587	28156	55791	44577	27757	51962	41323	25723
Net Heat Rate (LHV)	BTU/kWh	9375	9737	10942	9645	10023	11278	10065	10506	11901
Fuel Flow, per GT	PPH	14259	11833	8397	14681	12189	8540	13960	11641	8208
Water Injection Flow, per GT	GPM	30.5	23.4	14.4	34.3	26.6	16.3	32.7	25.6	15.9
GT Exhaust Flow, per GT	PPS	201.7	183.4	151.9	190.3	172.3	141.6	179.9	162.9	134.0
GT Exhaust Temperature	Deg F	818	778	725	918	878	820	940	904	848
Emissions at GT Exit (per GT)										
NOx	PPMVD*	42	42	42	42	42	42	42	42	42
	PPH	49.7	41.2	29.2	51.2	42.5	29.7	48.7	40.6	28.6
CO, Post 85% CO Conv.	PPMVD*	3	4	7	2	3	5	2	2	4
Post 85% CO Conv.	PPH	2.0	2.4	2.9	1.3	1.6	2.0	1.2	1.4	1.8
VOC (as CH4)	PPMVD*	5	6	19	5	5	8	5	5	7
	PPH	2.1	1.9	4.6	2.1	1.8	2.0	2.0	1.7	1.6
Filterable Particulates	*PPH*	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
SO2	PPH	14.3	11.8	8.4	14.7	12.2	8.5	14.0	11.6	8.2
Opacity	%	<5	<5	<5	<5	<5	<5	<5	<5	<5
Exhaust Gas Composition at GT Exit										
N2	Vol %	73.7	74.2	75.0	71.6	72.1	73.0	70.2	70.7	71.5
A	Vol %	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.9
CO2	Vol %	4.1	3.7	3.2	4.4	4.1	3.5	4.4	4.1	3.5
H20	Vol %	7.4	6.6	5.4	10.2	9.4	8.0	12.0	11.2	9.9
O2	Vol %	13.9	14.6	15.5	12.9	13.5	14.6	12.5	13.1	14.2

Seminole_CustCpy_070303-R2.xls
R1, Added Perf Data for FT8-1, 07/03/03
R2, Revised NG Part Pwr HR's, 07/07/03

Notes:

ATTACHMENT C

CONTROL SYSTEM VENDOR QUOTE

	Five Swift Pacs
Options	
Deduct for elimination of CO Catalyst	**$785,500**
SCR/CO System	**$12,013,000**

Notes:

1. **All Prices subject to escalation starting in January 2004, per an escalation formula Exhibit 4.**
2. **The purchaser has the right to exercise an option to adjust the quantity of GTG units or options shown above by February 15, 2005.**
3. **Pricing for the GTG Units shown above, other than for 5 GTG Units, does not reflect the cost of a Performance Bond or Letter of Credit for that number of GTG Units.**
4. **Pricing for the GTG Units shown above includes a $500,000 credit towards the purchase of spare parts.**

ATTACHMENT D

EMISSIONS RATE CALCULATIONS

Table 1. SECI Simple Cycle Combustion Turbines, Payne Creek CT Operating Scenarios - Pratt & Whitney FT8-3 Twin Pac Units

Case	Ambient Temperature (°F)	Load (%)	Units 1 - 5	Annual Profile #1 (hrs/yr)	Annual Profile #2 (hrs/yr)	Natural Gas Firing	Fuel Oil Firing
1-G, 1-O	32	100	X			X	X
2-G, 2-O	32	80	X			X	X
3-G, 3-O	32	50	X			X	X
4-G, 4-O	50 / 78	100	X	2,500	2,000 / 500	X	X
5-G, 5-O	50 / 78	80	X			X	X
6-G, 6-O	50 / 78	50	X			X	X
7-G, 7-O	95	100	X			X	X
8-G, 8-O	95	80	X			X	X
9-G, 9-O	95	50	X			X	X

Note: Each FT8-3 Twin Pac Unit consists of two combustion turbines and one common generator.

Sources: P&W, 2003.
SECI, 2004.
ECT, 2004.

Table 2.B. SECI P&W FT8-3 Simple Cycle Combustion Turbines, Payne Creek
Hourly Criteria and Sulfuric Acid Mist Pollutant Emission Rates (Per CT)
Natural Gas-Firing

Temp. (°F)	Case	Load (%)	PM/PM_{10}[1]		SO_2[2]		H_2SO_4[3]		Lead[4]	
			lb/hr	g/sec	lb/hr	g/sec	lb/hr	g/sec	lb/hr	g/sec
32	1-Gas	100	3.0	0.38	1.8	0.22	0.20	0.026	0.00015	0.000019
	2-Gas	80	3.0	0.38	1.5	0.18	0.17	0.021	0.00013	0.000016
	3-Gas	50	3.0	0.38	1.0	0.12	0.11	0.014	0.00009	0.000011
50	4-Gas	100	3.0	0.38	1.8	0.23	0.21	0.026	0.00016	0.000020
	5-Gas	80	3.0	0.38	1.5	0.18	0.17	0.021	0.00013	0.000016
	6-Gas	50	3.0	0.38	1.0	0.13	0.12	0.015	0.00009	0.000011
95	7-Gas	100	3.0	0.38	1.6	0.20	0.19	0.023	0.00014	0.000018
	8-Gas	80	3.0	0.38	1.4	0.17	0.16	0.020	0.00012	0.000015
	9-Gas	50	3.0	0.38	1.0	0.12	0.11	0.014	0.00008	0.000010
		Maximums	**3.0**	**0.38**	**1.8**	**0.23**	**0.21**	**0.026**	**0.00016**	**0.000020**

Temp. (°F)	Case	Load (%)	NO_x			CO			VOC		
			ppmvd[5]	lb/hr	g/sec	ppmvd[5]	lb/hr	g/sec	ppmvd[5]	lb/hr[6]	g/sec[6]
32	1-Gas	100	25	31.7	3.99	12	9.2	1.16	6	2.6	0.33
	2-Gas	80	25	25.8	3.25	20	12.2	1.54	13	4.8	0.60
	3-Gas	50	25	17.7	2.23	29	12.2	1.54	34	8.3	1.05
50	4-Gas	100	25	32.0	4.03	9	7.0	0.88	6	2.7	0.34
	5-Gas	80	25	26.1	3.29	16	9.8	1.23	9	3.2	0.40
	6-Gas	50	25	18.1	2.28	22	9.8	1.24	17	4.4	0.55
95	7-Gas	100	25	28.8	3.63	9	6.3	0.79	6	2.4	0.30
	8-Gas	80	25	24.0	3.02	12	7.0	0.88	6	2.0	0.25
	9-Gas	50	25	16.9	2.13	21	8.6	1.09	15	3.6	0.45
		Maximums	**25**	**32.0**	**4.03**	**29**	**12.2**	**1.54**	**34**	**8.3**	**1.05**

[1] Filterable particulate matter as measured by EPA RM 5, 5B, or 17.
[2] Based on natural gas sulfur content of 2.0 gr/100 ft^3.
[3] Based on 7.5% conversion of SO_2 to H_2SO_4.
[4] Lead emission factor, EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-2., July 1998.
[5] Corrected to 15% O_2.
[6] Expressed as methane.

Sources: P&W, 2003.
ECT, 2004.

Table 3.B. SECI P&W FT8-3 Simple Cycle Combustion Turbines, Payne Creek
Hourly Criteria and Sulfuric Acid Mist Pollutant Emission Rates (Per CT)
Distillate Oil-Firing

Temp. (°F)	Case	Load (%)	PM/PM_{10}[1]		SO_2[2]		H_2SO_4[3]		Lead[4]	
			lb/hr	g/sec	lb/hr	g/sec	lb/hr	g/sec	lb/hr	g/sec
32	1-Oil	100	7.0	0.88	14.3	1.80	1.64	0.206	0.0039	0.00049
	2-Oil	80	7.0	0.88	11.8	1.49	1.36	0.171	0.0033	0.00041
	3-Oil	50	7.0	0.88	8.4	1.06	0.96	0.122	0.0023	0.00029
78	4-Oil	100	7.0	0.88	14.7	1.85	1.69	0.212	0.0040	0.00051
	5-Oil	80	7.0	0.88	12.2	1.54	1.40	0.176	0.0034	0.00042
	6-Oil	50	7.0	0.88	8.5	1.08	0.98	0.124	0.0023	0.00030
95	7-Oil	100	7.0	0.88	14.0	1.76	1.60	0.202	0.0038	0.00048
	8-Oil	80	7.0	0.88	11.6	1.47	1.34	0.168	0.0032	0.00040
	9-Oil	50	7.0	0.88	8.2	1.03	0.94	0.119	0.0023	0.00028
		Maximums	**7.0**	**0.88**	**14.7**	**1.85**	**1.69**	**0.212**	**0.0040**	**0.00051**

Temp. (°F)	Case	Load (%)	NO_x			CO			VOC		
			ppmvd[5]	lb/hr	g/sec	ppmvd[5]	lb/hr	g/sec	ppmvd[5]	lb/hr[6]	g/sec[6]
32	1-Oil	100	42	49.7	6.26	3	2.0	0.25	5	2.1	0.26
	2-Oil	80	42	41.2	5.19	4	2.3	0.29	6	1.9	0.24
	3-Oil	50	42	29.2	3.68	7	2.9	0.36	19	4.6	0.58
78	4-Oil	100	42	51.2	6.45	2	1.3	0.17	5	2.1	0.26
	5-Oil	80	42	42.5	5.36	2	1.6	0.20	5	1.8	0.23
	6-Oil	50	42	29.7	3.74	5	2.0	0.25	8	2.0	0.25
95	7-Oil	100	42	48.7	6.14	2	1.3	0.16	5	2.0	0.25
	8-Oil	80	42	40.6	5.12	2	1.4	0.18	5	1.7	0.21
	9-Oil	50	42	28.6	3.60	4	1.8	0.23	7	1.6	0.20
		Maximums	**42**	**51.2**	**6.45**	**7**	**2.9**	**0.36**	**19**	**4.6**	**0.58**

1 Filterable particulate matter as measured by EPA RM 5, 5B, or 17.
2 Based on distillate fuel oil content of 0.05 weight percent sulfur.
3 Based on 7.5% conversion of SO_2 to H_2SO_4.
4 Lead emission factor, EPA AP-42, Section 3.1 Stationary Gas Turbines, Table 3.1-2a., April 2000.
5 Corrected to 15% O_2, reflects use of oxidation catalyst controls.
6 Expressed as methane.

Sources: P&W, 2003.
ECT, 2004.

Table 4. SECI Simple Cycle Combustion Turbines, Payne Creek Hazardous Air Pollutant (HAP) Emission Rates Natural Gas-Firing

Parameter	Units	Per CT Case 4-Gas
Maximum CT Hourly Heat Input:	10^6 Btu/hr (HHV)	317.8
Maximum Annual Hours:	hrs/yr	2,500
Oxidation Catalyst Efficiency (Organ	%	30.0

Pollutant	Uncontrolled Emission Factor [a] (lb/10^6 Btu)	Controlled Emission Factor [b] (lb/10^6 Btu)	Emissions (Per CT) Case 4-Gas (lb/hr)	Emissions (Per CT) Annual (ton/yr)	Units 1-5 Annual (ton/yr)
1,3-Butadiene	4.30E-07	3.01E-07	0.0000956	0.0001196	0.0011956
Acetaldehyde	4.00E-05	2.80E-05	0.0088974	0.0111217	0.1112175
Acrolein	6.40E-06	4.48E-06	0.0014236	0.0017795	0.0177948
Arsenic [d]	1.96E-07	1.96E-07	0.0000623	0.0000779	0.0007788
Benzene	1.20E-05	8.40E-06	0.0026692	0.0033365	0.0333652
Beryllium [d]	1.18E-08	1.18E-08	0.0000037	0.0000047	0.0000467
Cadmium [d]	1.08E-06	1.08E-06	0.0003427	0.0004284	0.0042836
Chromium [d]	1.37E-06	1.37E-06	0.0004361	0.0005452	0.0054518
Ethylbenzene	3.20E-05	2.24E-05	0.0071179	0.0088974	0.0889740
Formaldehyde	7.10E-04	4.97E-04	0.1579288	0.1974110	1.9741100
Lead [c]	4.90E-07	4.90E-07	0.0001558	0.0001947	0.0019471
Manganese [d]	3.73E-07	3.73E-07	0.0001184	0.0001480	0.0014798
Mercury [d]	2.55E-07	2.55E-07	0.0000810	0.0001012	0.0010125
Naphthalene	1.30E-06	9.10E-07	0.0002892	0.0003615	0.0036146
Nickel [d]	2.06E-06	2.06E-06	0.0006542	0.0008178	0.0081778
Polycyclic Aromatic Hydrocarbons	2.20E-06	1.54E-06	0.0004894	0.0006117	0.0061170
Propylene Oxide	2.90E-05	2.03E-05	0.0064506	0.0080633	0.0806327
Selenium [d]	2.35E-08	2.35E-08	0.0000075	0.0000093	0.0000935
Toluene	1.30E-04	9.10E-05	0.0289165	0.0361457	0.3614568
Xylene	6.40E-05	4.48E-05	0.0142358	0.0177948	0.1779479
Maximum Individual HAP			**0.158**	**0.197**	**1.974**
Total HAPs			**0.230**	**0.288**	**2.880**

[a] - All emission factors except metals, EPA AP-42, Section 3.1 Stationary Gas Turbines, Table 3.1-3., April 2000.
[b] - Organic pollutant emission factors reduced by 30% percent due to use of oxidation catalyst.
[c] - Lead emission factor, EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-2., July 1998.
[d] - Metal emission factor, EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-4., July 1998.

Sources: P&W, 2003.
SECI, 2004.
ECT, 2004.

Table 5. SECI Simple Cycle Combustion Turbines, Payne Creek Hourly Hazardous Air Pollutant (HAP) Emission Rates Distillate Fuel Oil-Firing

Parameter	Units	Per CT Case 4-Oil
Maximum CT Hourly Heat Input:	10^6 Btu/hr (HHV)	288.4
Maximum Annual Hours:	hrs/yr	500
Oxidation Catalyst Efficiency (Organics	%	30.0

Pollutant	Uncontrolled Emission Factor ($lb/10^6$ Btu)	Controlled Emission Factor [a] ($lb/10^6$ Btu)	Emissions (Per CT) Case 4-Gas (lb/hr)	Emissions (Per CT) Annual (ton/yr)	Units 1-5 Annual (ton/yr)
1,3-Butadiene [b]	1.60E-05	1.12E-05	0.0032302	0.0008076	0.0080755
Acetaldehyde					
Acrolein					
Arsenic [c]	1.10E-05	1.10E-05	0.0031725	0.0007931	0.0079313
Benzene [b]	5.50E-05	3.85E-05	0.0111038	0.0027760	0.0277596
Beryllium [c]	3.10E-07	3.10E-07	0.0000894	0.0000224	0.0002235
Cadmium [c]	4.80E-06	4.80E-06	0.0013844	0.0003461	0.0034609
Chromium [c]	1.10E-05	1.10E-05	0.0031725	0.0007931	0.0079313
Ethylbenzene					
Formaldehyde [b]	2.80E-04	1.96E-04	0.0565286	0.0141321	0.1413215
Lead [c]	1.40E-05	1.40E-05	0.0040378	0.0010094	0.0100944
Manganese [c]	7.90E-04	7.90E-04	0.2278448	0.0569612	0.5696121
Mercury [c]	1.20E-06	1.20E-06	0.0003461	0.0000865	0.0008652
Naphthalene [b]	3.50E-05	2.45E-05	0.0070661	0.0017665	0.0176652
Nickel [c]	4.60E-06	4.60E-06	0.0013267	0.0003317	0.0033167
Polycyclic Aromatic Hydrocarbons [b]	4.00E-05	2.80E-05	0.0080755	0.0020189	0.0201888
Propylene Oxide					
Selenium [c]	2.50E-05	2.50E-05	0.0072103	0.0018026	0.0180257
Toluene					
Xylene					
Maximum Individual HAP			**0.228**	**0.057**	**0.570**
Total HAPs			**0.335**	**0.084**	**0.836**

[a] - Organic pollutant emission factors reduced by 30% percent due to use of oxidation catalyst.
[b] - Organic emission factor, EPA AP-42, Stationary Gas Turbines, Table 3.1-4., April 2000.
[c] - Metal emission factor, EPA AP-42, Stationary Gas Turbines, Table 3.1-5., April 2000.

Sources: P&W, 2003.
SECI, 2004.
ECT, 2004.

Table 6.A. SECI P&W FT8-3 Simple Cycle Combustion Turbines, Payne Creek
Annual Criteria and Sulfuric Acid Mist Pollutant Emission Rates
Pratt & Whitney FT8-3 Twin Pac Units
Annual Profile #1

Source	Case	No. of CTs	Annual Operations (hr/yr)	Emission Rates					
				NO_x		CO		VOC	
				lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Units 1-5	4-Gas	10	2,500	320.0	400.0	70.2	87.8	27.0	33.8
Units 1-5	4-Oil	10	0	512.0	0.0	13.2	0.0	21.0	0.0
		Totals	**2,500**	**N/A**	**400.0**	**N/A**	**87.8**	**N/A**	**33.8**

Source	Case	No. of CTs	Annual Operations (hr/yr)	Emission Rates							
				PM/PM_{10}		SO_2		H_2SO_4		Lead	
				lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Units 1-5	4-Gas	10	2,500	30.0	37.5	18.0	22.5	2.1	2.6	0.0016	0.00195
Units 1-5	4-Oil	10	0	70.0	0.0	146.8	0.0	16.9	0.0	0.0404	0.00000
		Totals	**2,500**	**N/A**	**37.5**	**N/A**	**22.5**	**N/A**	**2.6**	**N/A**	**0.0019**

Sources: P&W, 2003.
SECI, 2004.
ECT, 2004.

Table 6.B. SECI P&W FT8-3 Simple Cycle Combustion Turbines, Payne Creek Annual Criteria and Sulfuric Acid Mist Pollutant Emission Rates Pratt & Whitney FT8-3 Twin Pac Units Annual Profile #2

Source	Case	No. of CTs	Annual Operations (hr/yr)	Emission Rates					
				NO_x		CO		VOC	
				lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Units 1-5	4-Gas	10	2,000	320.0	320.0	70.2	70.2	27.0	27.0
Units 1-5	4-Oil	10	500	512.0	128.0	13.2	3.3	21.0	5.3
		Totals	**2,500**	**N/A**	**448.0**	**N/A**	**73.5**	**N/A**	**32.3**

Source	Case	No. of CTs	Annual Operations (hr/yr)	Emission Rates							
				PM/PM_{10}		SO_2		H_2SO_4		Lead	
				lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Units 1-5	4-Gas	10	2,000	30.0	30.0	18.0	18.0	2.1	2.1	0.0016	0.00156
Units 1-5	4-Oil	10	500	70.0	17.5	146.8	36.7	16.9	4.2	0.0404	0.01009
		Totals	**2,500**	**N/A**	**47.5**	**N/A**	**54.7**	**N/A**	**6.3**	**N/A**	**0.0117**

Sources: P&W, 2003.
SECI, 2004.
ECT, 2004.

Table 7. SECI Simple Cycle Combustion Turbines, Payne Creek Annual Hazardous Air Pollutant Emission Rates

Pollutant	HAP Emission Rates		
	Gas (ton/yr)	Oil (ton/yr)	Totals (ton/yr)
1,3-Butadiene	1.20E-03	8.08E-03	0.0093
Acetaldehyde	1.11E-01		0.1112
Acrolein	1.78E-02		0.0178
Arsenic	7.79E-04	7.93E-03	0.0087
Benzene	3.34E-02	2.78E-02	0.0611
Beryllium	4.67E-05	2.24E-04	0.0003
Cadmium	4.28E-03	3.46E-03	0.0077
Chromium	5.45E-03	7.93E-03	0.0134
Ethylbenzene	8.90E-02		0.0890
Formaldehyde	1.97E+00	1.41E-01	2.1154
Lead	1.95E-03	1.01E-02	0.0120
Manganese	1.48E-03	5.70E-01	0.5711
Mercury	1.01E-03	8.65E-04	0.0019
Naphthalene	3.61E-03	1.77E-02	0.0213
Nickel	8.18E-03	3.32E-03	0.0115
Polycyclic Aromatic Hydrocarbons	6.12E-03	2.02E-02	0.0263
Propylene Oxide	8.06E-02		0.0806
Selenium	9.35E-05	1.80E-02	0.0181
Toluene	3.61E-01		0.3615
Xylene	1.78E-01		0.1779
Maximum Individual HAP			**2.1154**
Total HAPs			**3.7162**

Source: ECT, 2004.

Table 8. SECI Simple Cycle Combustion Turbines, Payne Creek
Pratt & Whitney FT8-3 CT
NSPS GG NO_x Limits

Fuel	FT8-3 Gas Turbine ISO Heat Rate (LHV)		F	NO_x Std
	(Btu/kw-hr)	(kj/w-hr)		(ppmvd)
Gas	9,305	9.817	0.0	110.0
Distillate	9,477	9.999	0.0	108.0

Sources: P&W, 2003.
ECT, 2004.

Table 9.A. SECI FT8-3 Simple-Cycle Combustion Turbines, Payne Creek CT Exhaust Data, Natural Gas-Firing (Per CT)

A. Exhaust Molecular Weight (MW)

		Exhaust Gas Composition - Volume %								
		100 % Load			80 % Load			50 % Load		
Component	MW (lb/mole)	32 °F	50 °F	95 °F	32 °F	50 °F	95 °F	32 °F	50 °F	95 °F
	Case	1-Gas	4-Gas	7-Gas	2-Gas	5-Gas	8-Gas	3-Gas	6-Gas	9-Gas
Ar	39.944	0.9	0.9	0.8	0.9	0.9	0.8	0.9	0.9	0.8
N_2	28.013	72.9	72.3	69.8	73.6	73.0	70.2	74.4	73.8	71.1
O_2	31.999	13.3	13.0	12.3	14.2	13.9	13.0	15.3	14.9	14.0
CO_2	44.010	3.2	3.3	3.3	2.8	2.9	3.0	2.4	2.5	2.6
H_2O	18.015	9.8	10.6	13.8	8.5	9.3	12.9	6.9	7.8	11.5
	Totals	100.1	100.1	100.1	100.0	100.0	99.9	99.9	99.9	100.0
Exhaust MW (lb/mole)		28.21	28.12	27.77	28.28	28.19	27.80	28.40	28.29	27.94
Exhaust Flow (lb/sec)		208.3	203.9	182.9	191.7	187.0	165.4	154.9	153.4	136.1
Exhaust Temp. (°F)		853	891	935	783	823	899	721	763	841
(K)		729	750	775	690	713	755	656	679	723
Exhaust O_2 (Vol %, Dry)		14.75	14.54	14.29	15.52	15.33	14.93	16.43	16.16	15.82

Sources: ECT, 2004.
P&W, 2003.

Table 9.B. SECI FT8-3 Simple Cycle Combustion Turbines, Payne Creek CT Exhaust Data, Natural Gas-Firing (Per CT)

B. Exhaust Flow Rates

	Flow Rates (ft^3/min)								
	100 % Load			80 % Load			50 % Load		
	32 °F	50 °F	95 °F	32 °F	50 °F	95 °F	32 °F	50 °F	95 °F
Case	1-Gas	4-Gas	7-Gas	2-Gas	5-Gas	8-Gas	3-Gas	6-Gas	9-Gas
ACFM	424,476	428,933	402,344	368,856	372,602	354,005	282,067	290,352	277,427
Stack Dia. (ft)	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5
Velocity (fps)	99.8	100.9	94.6	86.7	87.6	83.2	66.3	68.3	65.2
Velocity (m/s)	30.4	30.7	28.8	26.4	26.7	25.4	20.2	20.8	19.9
SCFM, Dry[1]	153,967	149,867	131,270	143,364	139,079	119,796	117,405	115,575	99,643
ACFM (15% O_2, Dry)	399,425	413,273	388,419	307,807	319,320	312,239	198,780	215,048	211,432

[1] At 68 °F.

Sources: P&W, 2003.
ECT, 2004.

Table 10.A. SECI FT8-3 Simple Cycle Combustion Turbines, Payne Creek CT Exhaust Data, No. 2 Fuel Oil-Firing (Per CT)

A. Exhaust Molecular Weight (MW)

Component	MW (lb/mole)	Exhaust Gas Composition - Volume %								
		100 % Load			80 % Load			50 % Load		
		32 °F	78 °F	95 °F	32 °F	78 °F	95 °F	32 °F	78 °F	95 °F
	Case	1-Oil	4-Oil	7-Oil	2-Oil	5-Oil	8-Oil	3-Oil	6-Oil	9-Oil
Ar	39.944	0.9	0.9	0.8	0.9	0.9	0.8	0.9	0.9	0.9
N_2	28.013	73.7	71.6	70.2	74.2	72.1	70.7	75.0	73.0	71.5
O_2	31.999	13.9	12.9	12.5	14.6	13.5	13.1	15.5	14.6	14.2
CO_2	44.010	4.1	4.4	4.4	3.7	4.1	4.1	3.2	3.5	3.5
H_2O	18.015	7.4	10.2	12.0	6.6	9.4	11.2	5.4	8.0	9.9
	Totals	100.0	100.0	99.9	100.0	100.0	99.9	100.0	100.0	100.0
Exhaust MW (lb/mole)		28.59	28.30	28.10	28.63	28.36	28.15	28.71	28.45	28.26
Exhaust Flow (lb/sec)		201.7	190.3	179.9	183.4	172.3	162.9	151.9	141.6	134.0
Exhaust Temp. (°F)		818	918	940	778	878	904	725	820	848
(K)		710	765	778	688	743	758	658	711	726
Exhaust O_2 (Vol %, Dry)		15.01	14.37	14.20	15.63	14.90	14.75	16.38	15.87	15.76

Sources: P&W, 2003.
ECT, 2004.

Table 10.B. SECI FT8-3 Simple Cycle Combustion Turbines, Payne Creek CT Exhaust Data, No. 2 Fuel Oil-Firing (Per CT)

B. Exhaust Flow Rates

	Flow Rates (ft^3/min)								
	100 % Load			80 % Load			50 % Load		
	32 °F	78 °F	95 °F	32 °F	78 °F	95 °F	32 °F	78 °F	95 °F
Case	1-Oil	4-Oil	7-Oil	2-Oil	5-Oil	8-Oil	3-Oil	6-Oil	9-Oil
ACFM	394,755	405,670	392,505	347,172	355,934	345,588	274,506	278,970	271,585
Stack Dia. (ft)	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5
Velocity (fps)	92.8	95.4	92.3	81.6	83.7	81.3	64.5	65.6	63.9
Velocity (m/s)	28.3	29.1	28.1	24.9	25.5	24.8	19.7	20.0	19.5
SCFM, Dry[1]	151,023	139,583	130,267	138,294	127,255	118,793	115,707	105,869	98,777
ACFM (15% O_2, Dry)	364,874	403,483	391,973	289,541	327,905	319,768	198,733	218,826	213,167

[1] At 68 °F.

Sources: P&W, 2003.
ECT, 2004.

Table 11. SECI FT8-3 Simple Cycle Combustion Turbines, Payne Creek CT Fuel Flow Rate Data (Per CT)

A. Natural Gas-Firing

	100 % Load			80 % Load			50 % Load		
	32 °F	50 °F	95 °F	32 °F	50 °F	95 °F	32 °F	50 °F	95 °F
Case	1-Gas	4-Gas	7-Gas	2-Gas	5-Gas	8-Gas	3-Gas	6-Gas	9-Gas
Heat Input - LHV (MMBtu/hr)	286.2	288.9	260.4	233.3	235.6	217.1	157.9	164.1	152.8
Heat Input - HHV (MMBtu/hr)	314.8	317.8	286.5	256.6	259.2	238.8	173.7	180.5	168.1
Fuel Rate (lb/hr)	13,774	13,903	12,534	11,228	11,341	10,448	7,600	7,899	7,353
Fuel Rate (10^6 ft^3/hr)	0.312	0.315	0.284	0.254	0.257	0.236	0.172	0.179	0.166
Fuel Rate (lb/sec)	3.826	3.862	3.482	3.119	3.150	2.902	2.111	2.194	2.043

B. Distillate Fuel Oil-Firing

	100 % Load			80 % Load			50 % Load		
	32 °F	78 °F	95 °F	32 °F	78 °F	95 °F	32 °F	78 °F	95 °F
Case	1-Oil	4-Oil	7-Oil	2-Oil	5-Oil	8-Oil	3-Oil	6-Oil	9-Oil
Heat Input - LHV (MMBtu/hr)	261.8	269.5	256.3	217.3	223.8	213.7	154.2	156.8	150.7
Heat Input - HHV (MMBtu/hr)	280.1	288.4	274.2	232.5	239.5	228.7	165.0	167.8	161.2
Fuel Rate (lb/hr)	14,259	14,681	13,960	11,833	12,189	11,641	8,397	8,540	8,208
Fuel Rate (10^3 gal/hr)	1.951	2.008	1.910	1.619	1.667	1.592	1.149	1.168	1.123
Fuel Rate (lb/sec)	3.961	4.078	3.878	3.287	3.386	3.234	2.333	2.372	2.280

Sources: P&W, 2003.
ECT, 2004.

ATTACHMENT E

NATIONAL BACT DETERMINATIONS

ECT
Environmental Consulting & Technology, Inc.

Table E-1. EPA Region 4 Combustion Turbine Database - Simple Cycle Combustion Turbines, NO_x Determinations

State	Facility	# of New MW	Final Permit Issued	Permitting Status	# of CTs	Turbine Model	Fuel	Mode	Hours	NOx Limit	Control Method	Avg. Time	Comments
Region 1													
CT	PPL Wallingford Energy, LLC	250	final	Sip Approved	5	S & S LM 6000	NG	SC	4,000	2.5 ppm	SCR	1-hr	
Region 2													
NY	NYPA's Simple Cycle Turbines at 7 different locations in NYC	460	01/12/2001	Delegated	11	GE LM 6000	NG	SC	8,760	2.5 ppm NG	SCR	1 hour	These 11 turbines are not subject to NSR/PSD. The one located in Staten Island (#11) has not yet been issued. Installation will begin soon and operation will be in the summer of 2001.
NJ	PSEG Fossil LLC - Burlington	170	05/07/2000	Delegated	4	GE LM 6000	NG	SC	8,760	25 ppm	water injection	1 hour	Not subject to NSR/PSD. Unit started operation in May, 2000.
NJ	PSEG Fossil LLC - Kearney	170	applic. under review	Delegated	4	GE LM 6000	NG; FO	SC	8,760	25 ppm NG; 42 ppm FO	water injection	1 hour	Not subject to NSR/PSD.
VI	VIWAPA-St Thomas	24	01/03/2001	EPA-lead	1	UT FT8-1 Power Pac	FO	SC	8,760	42 ppm	WI	24 hours	UT = United Technologies
Region 3													
DE	NRG Energy	100	10/20/2000	SIP Approved	2	LM 6000	NG/FO	SC		73 lb/hr on oil	LNB	1 hour	SYNTHETIC MINOR - BASED ON DE DUAL DEFINITION EACH POLLUTANT LESS THAN 24.9 TONS EACH
VA	Commonwealth Chesapeake	350	10/05/2000	SIP Approved	4	LM6000	Fuel Oil	SC		42 ppm	WI	1 hour	
VA	COMMONWEALTH CHESAPEAKE	350	10/05/2000		7	LM6000	FO	CTSC		42 ppm	WI	1 hour	
VA	Doswell - Hanover Co., VA	190	04/01/2000	SIP Approved	2	LM 6000		SC					Expansion Existing Facility
VA	Wolf Hills - Washington Co., VA	250	05/01/2000	SIP Approved	10	Pratt & Whitney/F T8 (57MW)	NG	SC	Fuel limitation (4700 mmscf/year nat gas	25 ppm and 29.6 lb/hr at base/peak load	WI	1 hour	Synthetic Minor 249 tons/NOx - Each turbine limited to no more than 27 TPY
PA	Allegheny Harrison	88	pending	SIP Approved	2	LM 6000	NG/FO	SC	4050 hours / 450 diesel		SCR		
PA	ALLEGHENY WESTMORELAND	500	02/01/2001		0	LM6000	NG/FO	CTSC		3.5	DLC+SCR		
PA	Handsome Lake Energy	280	09/29/2000		10	Pratt and Whitney/ FT8 (57MW)	NG	SC	Fuel limitation (1871 mmscf/year nat gas	25 ppm and 30.1 lb/hr at base/peak load	Wi	1 hour	Synthetic Minor 95 tons/NOx - 12 month rolling CO 60.4 ton/year VOC 7.5 ton/year
WV	Big Sandy	330	07/10/2000		0	P&W FT8 T	NG	SC	1314	25ppm	water i	Subpar	
WV	MegaEnergy, Inc.	10	11/20/2000		1	Solar Mod	NG	CTSC	8760	25ppm	none	Subpar	

Table E-1. EPA Region 4 Combustion Turbine Database - Simple Cycle Combustion Turbines, NO_x Determinations

State	Facility	# of New MW	Final Permit Issued	Permitting Status	# of CTs	Turbine Model	Fuel	Mode	Hours	NOx Limit	Control Method	Avg. Time	Comments
Region 5													
IN	(Acadia Bay) Alleghany Energy Supply Company, LLC	630	12/07/2001	Delegated	4	2 Westinghouse 501 F& 2 General Electric LM2000(46MW)	NG	2 CC & 2 SC	8,760	2 CC @ 3.0ppmvd & 2 SC @ 25 ppmvd	DLN, SCR	2 CC = 3 hr block avg.& 2 SC = 24 hr avg.	BACT
IN	PSI - Cinergy Fayette Peaking Station	520	12/18/1998	Delegated	4	4@45 or 2@170 MW	NG	SC	peaking	25 ppm	either DLN or WI		Syn. Minor
IN	PSI-Wabash Peaking Station	169	01/19/1999	Delegated	3	LM 6000 (43 MW)	NG; FO	SC	3,000	25 ppm NG; 28 ppm FO	DLN and WI		Syn. Minor
IN	PSI Cinergy Corporation	169	07/15/1999	Delegated	3	GE LM6000	NG; FO	SC	3,000	25 ppm NG; 28 ppm FO	DLN and WI		Synth Minor
Region 6													
TX	So. Tx. Elec COOP	180	01/17/2002		3	LM6000	NG			5 ppm	SCR		
TX	Celanse	252	In Review		6	LM 6000				5 ppm	SCR		
TX	Celanse		Review			Six LM 6000 Comb.				Good Comb. Practice			
TX	City of Austin	500	In Review		4	LM6000/GE 7FA				5.5 ppm	SCR		
Region 7													
MO	Empire District - Energy Center	110	07/25/2002	SIP Approved	4	2 Pratt & Whitney FT8 Twinpacs, 27.5 MWe each	NG	SC	3,300	NOx: 25 ppm (15%O2) N.G., 3-hour; NOx: 42 ppm (15%O2) oil, 3-hour	WI	3-hr	BACT analysis based on limitation of 3,300 hours of operation per year
NE	Omaha Public Power - Sarpy Units 1, 2, 3, and 4	100	07/29/1999	SIP Approve	4	Pratt & Whitney FT-8 (25 MW, each)	NG; FO	SC	2,000 each	25 ppm NG; 42 ppm FO	WI		
NE	City of Grand Island, Burdick Station	80	01/08/2002	SIP Approve	2	2 GE PG6581 (B), 40 MWe each		SC	5,000	15ppm NG/65 ppm FO			BACT based on limit of 5,000 hrs/yr on NG and 240 hrs/yr on FO
Region 8													
CO	Colorado Springs Utilities/Nixon (66 MW)	66	04/19/1999	SIP Approved	2	GE PG6541(B) 33 MW each	NG	SC	8,660 (both CTs)	15 ppm	DLN	1-hr	*NOTE*: this project was permitted 3 times - first in 4/95, then 7/98, and finally 4/99. Each time, the applicant modified and/or extended the project due to availability of equipment, etc. It is our understanding that the 4/99 configuration is being/has been installed.

Table E-1. EPA Region 4 Combustion Turbine Database - Simple Cycle Combustion Turbines, NO_x Determinations

State	Facility	# of New MW	Final Permit Issued	Permitting Status	# of CTs	Turbine Model	Fuel	Mode	Hours	NOx Limit	Control Method	Avg. Time	Comments
CO	KN Energy/Front Range Energy Associates - Ft. Lupton (160 MW)	160	on hold	SIP Approved	4	GE LM6000	NG	SC	**	25 ppm (proposed)	WI		project originally PSD application; State drafted syn minor permit w/ operating hours restrictions in 7/99; EPA commented to State concerning single source issue w/ adjacent PSCo facility; PSCo appealed to US 10th circuit court - currently
SD	Black Hills Power & Light/Lange CT Facility (80 MW)	80	10/10/2000	Delegated	2	GE LM6000PD - 40 MW each	NG	SC	8,760	25ppm	DLN	24-hr	Characterized as peaking plant, but not restricted in operating hours. EPA commented negatively on the NOx BACT.
WY	Black Hills Power & Light/Niel Simpson II (80 MW)	80	final 3/00	SIP Approved	2	GE LM6000PD	NG	SC	8,760	25 ppm	DLN	24-hr	Region provided written comment disagreeing w/ NOx BACT determination; characterized as peaking plant, but not restricted in operating hours
WY	Two Elk Generation Partners (33 MW turbine)	33	02/27/1998	SIP Approved	1	GE LM5000	NG	SC	8,760	25 ppm	DLN	1-hr	Facility is 250 MW coal-fired steam electric plus 33 MW NG CT; characterized as peaking plant, but not restricted in operating hours
Region 9													
HI	Maui Electric	40	01/06/1998	Delegated	2	40 MW total	FO	SC		42 ppm	WI	?	
Region 10													
OR, Permit 37-0436	Klamath Expansion Project (PacifiCorp Power Marketing)	100	06/22/2001	SIP Approved	4	2 Pratt & Whitney FT-8 (Twin Pac)	NG	SC	8760	25 ppmvd	WI	24-hr	Operating, permit expires 24 months after start-up
WA, SCAPCA	Northeast Combustion Turbine (Avista - formerly Washington Water Power)	66	Initial NOC - 1/20/1978, NOC #1065 - 4/24/01, NOC #1092 - pending	Minor NSR (BACT)	2	2 - Pratt & Whitney FT4C-3F (Twin-Jet Power Pac)	NG/FO	SC	Initial NOC & SCAPCA Order #95-12 - 500, NOC #1065 none, NOC #1092 - ng (4000), FO (120)	NOC #1092 NG- 75.44 lb/MMft3, FO - 21.3 lb/1000 gal, SCAPCA Order #95-12 (VEL) - 95 ton/yr	DLN		Operating, Order #95-12, un-numbered, 1065, and 1092, peaking unit, NOC's #1065 and #1092 are for adding the DLN/CO control equipment to existing equipment, in order to allow Avista to operate the units more hours per year and remain a synthetic minor.
WA, SCAPCA Order 95-	Northeast Combustion Turbine (Avista - formerly Washington Water Power)	66		Minor NSR (BACT)	2	Pratt & Whitney FT4C-3F	NG; FO	SC					Operating
NWAPA Order 762a	Puget Sound Refining (previously Equillon)	35	04/11/01 with revision 02/22/02	Minor NSR (BACT)	7	Solar Taurus 60	NG	SC	8760 (changed to 2880 hour per turbine)	25 ppmvd	DLN	24-hr	Operated during energy crisis; turbines not presently in use..
WA, PSD	BP Cherry Point Refinery (previously Arco)	73		Delegated	14	Solar Taurus 60	NG	SC	8760	25 ppmvd	DLN	24-hr	Order to operate; operated during energy crisis but not in use presently, no final permit yet issued.

Payne Creek Generating Station
Simple Cycle Combustion Turbine Project
Dispersion Modeling Files

Directory Name	No. of Files	File Name	File Description
ISC Met Data	5	spgXX.asc	St.Petersburg/Clearwater< FL surface meteorological data
		XX = 92 - 96	Ruskin, FL upper air meteorological data
GEP Files	1	pc.bpi	Building Profile Input Program (BPIP) input file
	1	pc.bpo	Building Profile Input Program (BPIP) output file - brief
	1	pc.sum	Building Profile Input Program (BPIP) output file - detailed
Subtotal Files	3		
ISC Files	5	XX.inp	ISC input files, 1992-1996
	5	XX.out	ISC output files, 1992-1996
		XX = 92 - 96	
Subtotal Files	10		
CALPUFF Files	3	oilXXb.inp	CALPUFF input files for 1990, 1992, and 1996
	3	oilXXb.con	CALPUFF output concentration files for 1990, 1992, and 1996
	3	oilXXb.lst	CALPUFF output list files for 1990, 1992, and 1996
	3	oilXXbdf.dat	CALPUFF output dry deposition flux files for 1990, 1992, and 1996
	3	oilXXbwf.dat	CALPUFF output wet deposition flux files for 1990, 1992, and 1996
Subtotal Files	15		
POSTUTIL Files	3	postutilXXb.inp	POSTUTIL HNO_3/NO_3 partitioning input files for 1990, 1992, and 1996
	3	oilXXbp.lst	POSTUTIL HNO_3/NO_3 partitioning output list files for 1990, 1992, and 1996
	3	oilXXbp.con	CALPUFF output concentration files for 1990, 1992, and 1996 (processed for HNO_3/NO_3 partitioning)
	3	utilXXdep.inp	POSTUTIL total deposition flux input files for 1990, 1992, and 1996
	3	XXtflx.lst	POSTUTIL total deposition flux output list files for 1990, 1992, and 1996
	3	XXtflx.con	CALPUFF output total deposition flux files for 1990, 1992, and 1996 (processed for total S and N deposition)
		XX = 90, 92, 96	
Subtotal Files	18		
CALPOST Files	3	XXso2.poi	CALPOST SO_2 input files for 1990, 1992, and 1996
	3	XXso2.lst	CALPOST SO_2 output list files for 1990, 1992, and 1996
	3	XXno2.poi	CALPOST NO_2 input files for 1990, 1992, and 1996
	3	XXno2.lst	CALPOST NO_2 output list files for 1990, 1992, and 1996
	3	XXpm.poi	CALPOST PM input files for 1990, 1992, and 1996
	3	XXpm.lst	CALPOST PM output list files for 1990, 1992, and 1996
	3	XXvis.poi	CALPOST regional haze input files for 1990, 1992, and 1996
	3	XXvis.lst	CALPOST regional haze output list files for 1990, 1992, and 1996
	3	XXndep.poi	CALPOST nitrogen deposition input files for 1990, 1992, and 1996
	3	XXndep.pol	CALPOST nitrogen deposition output list files for 1990, 1992, and 1996
	3	XXsdep.poi	CALPOST nitrogen deposition input files for 1990, 1992, and 1996
	3	XXsdep.pol	CALPOST nitrogen deposition output list files for 1990, 1992, and 1996
Subtotal Files	36		
Relative Humidity Files	1	rh.zip	CALMET relative humidity files for 1990, 1992, and 1996 (compressed)
Total Files	88		

Source: ECT, 2004.

Table E-1. EPA Region 4 Combustion Turbine Database - Simple Cycle Combustion Turbines, NO_x Determinations

State	Facility	# of New MW	Final Permit Issued	Permitting Status	# of CTs	Turbine Model	Fuel	Mode	Hours	NOx Limit	Control Method	Avg. Time	Comments
NWAPA Order 770	Georgia-Pacific West (tissue plant)	20	05/31/2001	Minor NSR (BACT)	2	Solar Mars 100 & Solar Mars	NG	SC	8760	5 ppmvd	SCR	3-hr	Operated during energy crisis; turbines not presently in use.
WA, PSCAA NOC 8473	Pierce Power	160	07/03/2001	Minor NSR (BACT)	7	GE TM2500 (mobile LM2500)	NG	SC	8760	9 ppmvd	DLN, SCR	24-hr	Operating, startup August/September 2001, minor NSR BACT applies, permit expires April 2003
WA, Ecology Order No. 01AQIS-3151	Cliffs Energy Project (GNA Energy)	225	09/11/2001	Minor NSR (BACT)	5	GE LM6000	NG	SC	8760	4.5 ppmvd	DLN/SCR	3-hr	Minor NSR BACT applies
WA, BCAA No. 2001-0013	Finley Combustion Turbine Project (Benton County PUD)	27	10/26/2001	Minor NSR (BACT)	1	Pratt & Whitney FT8-1 (Power Pac)	NG	SC	8760	5.0 ppmvd	WI/SCR	Inst	Operating, minor NSR BACT

NG = Nat. Gas
FO = Fuel Oil

SC = Simple Cycle
CC = Combined Cycle

DLN = Dry-Low NOx
WI = Water Injection
SCR = Selective Catalytic Reduction

Source: EPA Region 4, 2004.

Table E-2. EPA RBLC Database - Simple Cycle Combustion Turbines, Natural Gas , NOx Determinations

EPA Region ID	RBLC ID	Facility	City	Permit Date	Process Description	Thruput	Thruput Units	Emission Limit 1	Emission Limit 1 Units	Emission Limit 1 Condition	Basis	Control Description
1	AL-0128	Theodore Cogeneration	Theodore	03/16/99	Cogeneration	210	MW	0.086	lb/MMBtu			GCP
1	AL-0167	CALHOUN POWER COMPANY I, LL	ANNISTON	01/26/01	CTs (4), NG	170	MW	0.033	lb/MMBtu		BACT-PSD	GCP, DLN. ALTERNATE LIMIT: PEAKING
2	AL-0187	Tenaska Alabama III Generating Station	OMAHA	01/29/01	3 SC CTs	170	MW	0.033	lb/MMBtu		BACT-PSD	DLN
2	AL-131	McIntosh Power Plant Units 2 and 3	Washington	09/18/00	SC	226	MW	0.07	lb/MMBtu		BACT-PSD	DLN
2	AL-94	Calhoun Power Co.		01/01/00	SC	680	MW	0.033	lb/MMBtu			DLN
2	AL-95	Tenaska Alabama 3		01/01/01	SC	510	MW	15	ppm			DLN
2	AR-0060	PINE BLUFF ENERGY CENTER	PINE BLUFF	02/27/01	CT - SC mode, NG only.	170	MW	0.0467	lb/MMBtu		BACT-PSD	DLN
2	CA-0951	INDIGO ENERGY FACILITY	North Plam Springs	07/13/01	CT, SC, NG, (3)	45	MW	5	ppmvd		LAER	SCR
3	CA-0952	LA DEPT OF WATER & POWER	SUN VALLEY	05/18/01	CT, SC, NG	47.4	MW	5	ppmvd		LAER	SCR
3	CA-0953	ALLIANCE COLTON--CENTURY	COLTON	10/18/01	CT, SC, NG, (4)	40	MW	5	ppmvd		LAER	SCR OR XONON
3	CA-201	Mcclellan Business Park	Sacramento	03/24/00	SC	77	MW	5	ppm		BACT-PSD	SCR
3	CA-202	Tracy Peaker Power Plant	San Joaquin	11/27/01	SC	169	MW	5	ppm		BACT-PSD	DLN,SCR
3	CO-005C	Tri-State Generation & Transmission - Limon Gen	DENVER	03/20/01	CTGs, SC (2)	82	MW	370.4	T/YR		BACT-PSD	Advanced DLN, WI for FO, Limits in tpy only.
3	CO-0051	Platte River Power Authority/Rawhide	Fort Collins	05/21/01	CT	82	MW	55.6	T/YR		BACT-PSD	DLN
3	FL-0083	Intercession City Facility	Intercession	12/01/99	SC	261	MW	25	ppmvd @ 15% O2		BACT-PSD	CT 11
3	FL-0083	Intercession City Facility	Intercession	12/01/99	SC	261	MW	25	ppmvd @ 15% O2		BACT-PSD	CT 7-10
3	FL-0132	UF Cogeneration Facility	Gainesville	08/17/92	Cogeneration	43	MW	25	ppmvd @ 15% O2			
3	FL-0209	PEACE RIVER POWER STATION		12/09/00	170 MW SC CTs (3)	1860	MMBtu/hr	9	ppmvd @ 15% O2		BACT-PSD	DLN, WI;" HOT" SCR rejected due to cost
3	FL-0218	MIDWAY ENERGY CENTER	Near Port St Lucie	02/14/01	CT, ELEC GENERATORS (3)	1700	MMBtu/hr	9	ppmvd @ 15% O2		BACT-PSD	DLN, WI. Primary limit = gas; alternate = oil.
3	FL-0228	DEERFIELD BEACH ENERGY CENT	Deerfield Beach	07/15/01	CT, SC, BACKUP OIL (3)	1.91	MMCF/H	36	ppmvd @ 15% O2		BACT-PSD	GE DLN SYSTEM, WI & LIMITED FUEL USE
3	FL-0228	DEERFIELD BEACH ENERGY CENT	Deerfield Beach	07/15/01	CT, SC, Ng (3)	1.91	MMCF/H	9	ppmvd @ 15% O2		BACT-PSD	GE DLN system, WI and limited fuel suage.
3	FL-0229	POMPANO BEACH ENERGY CENTE	Pompano Beach	08/15/01	CTs, SC Ng (3)	1.91	MMCF/H	9	ppmvd @ 15% O2		BACT-PSD	GE 2.6 DLN SYSTEM AND WI SYSTEM.
3	FL-0229	POMPANO BEACH ENERGY CENTE	Pompano Beach	08/15/01	CTs, SC, BACKUP OIL (3)	1.91	MMCF/H	42	ppmvd @ 15% O2		BACT-PSD	GE 2.6 DLN SYSTEM AND WI SYSTEM
3	FL-0232	Calpine/Auburndale Cogen Facility	AUBURNDALE	04/25/02	CT, SC, NG	1591	MMBtu/hr	25	ppmvd	NG	OTHER	WI
3	FL-100	Vandola Power Project		12/01/99	SC	680	MW	9	ppm			DLN
3	FL-101	Shady Hills		01/01/00	SC	510	MW	9	ppm			DLN
3	FL-102	Palmetto Power		06/01/00	SC	540	MW	15	ppm			DLN
3	FL-103	Desoto Power Project		06/01/00	SC	510	MW	9	ppm			DLN
4	FL-104	Martin Power Plant		07/01/00	SC	340	MW	9	ppm			DLN (normal)
4	FL-1050.	Auburndale Power Partners			SC	1040	MW	25	ppmvd @ 15% O2			
4	FL-132	Peace River Station	Ft. Meade	12/01/00	SC	510	MW	9	ppm			DLN
4	FL-136	Fort Myers Power Plant	Ft Myers	12/01/00	SC	340	MW	9	ppm			DLN
4	FL-138	Midway Development Center	Port St. Lucie	02/01/01	SC	510	MW	12	ppm			DLN (9ppm on startup)
4	FL-144	Auburndale Power Partners	Polk	05/25/01	SC	156	MW	25	ppm		BACT-PSD	WI
4	FL-146	Belle Glade Energy Center(SC)	Palm Beach		SC	350	MW	9	ppm		BACT-PSD	DLN
4	FL-148	Broward Energy Center(SC)	broward		SC	510	MW	9	ppm		BACT-PSD	DLN
4	FL-150	Deerfield Beach Energy Center	Broward		SC	510	MW	9	ppm		BACT-PSD	DLN,WI
4	FL-151	Deerfield Beach Energy center(CC)			SC	510	MW	9	ppm		BACT-PSD	DLN,WI
4	FL-152	FPL Martin Plant	Martin	07/24/00	SC	340	MW	9	ppm		BACT-PSD	DLN,WI
4	FL-154	Manatee Energy Center(SC)	Manatee	01/16/02	SC	600	MW	9	ppm		BACT-PSD	DLN
4	FL-155	North Pond Energy Park(SC)			SC	170	MW	10	ppm		BACT-PSD	DLN,WI
4	FL-157	South Pond Energy Park(SC)			SC	340	MW	10	ppm		BACT-PSD	DLN,WI
4	FL-284	DeSoto Power Project	Arcadia		SC	170	MW	9	ppmvd @ 15% O2		BACT-PSD	DLN
4	FL-308	Duke Energy Lake			SC	640	MW	9	ppmvd @ 15% O2			DLN
4	FL-308	Duke Energy Lake			SC	640	MW	12	ppmvd @ 15% O2			DLN
4	GA-312	Municipal Electric Authority of Georgia			SC	510	MW	12	ppm		BACT-PSD	DLN,WI
4	GA-313	Talbot Energy Facility	Talbot	08/09/01	SC	648	MW	12	ppm		BACT-PSD	DLN,WI
4	GA-314	Tenaska Georgia Partners LP		12/01/98	SC	960	MW	15	ppm		BACT-PSD	DLN,WI
4	IA-0058	Greater Des Moines Energy Center	Pleasant Hill	04/10/02	CTs, SC SW 501F (2)	0		0.09	lb/MMBtu	@15% O2	BACT-PSD	
4	IA-0060	HAWKEYE GENERATING, LLC	ORIENT	07/23/02	CT	33.77	billion cf/yr	9	ppmvd (equivalent)	SC	BACT-PSD	SC- DLN; CC- SCR
4	IA-0060	HAWKEYE GENERATING, LLC	ORIENT	07/23/02	CT	33.77	billion cf/yr	9	ppmvd (equivalent)	SC	BACT-PSD	SC DLN; CC SCR
4	IA-0062	Power Iowa Energy Center PIEC	MASON CITY	12/20/02	CTs, SC, GE 7FA (2)	170	MW	0.0342	lb/MMBtu	NG	BACT-Othe	DLN (NG), WI (FO)
4	IL-73	McDonell Energy		12/21/98	SC	680	MW	15	ppm		BACT-PSD	DLN

Table E-2. EPA RBLC Database - Simple Cycle Combustion Turbines, Natural Gas , NOx Determinations

EPA Region	RBLC	Facility	City	Permit Date	Process Description	Thruput	Thruput	Emission Limit 1	Emission Limit 1	Emission Limit 1	Basis	Control Description
4	IN-001	Cayuga Generation Station	Vermillion	06/25/92	SC	360	MW	25	ppm		BACT-PSD	WI
4	IN-002	Duke Energy Knox, LLC	Knox	05/29/01	SC	640	MW	9	ppm		BACT-PSD	DLN,WI
4	IN-0086	MIRANT SUGAR CREEK, LLC	West Terre Haute	05/09/01	CT, NG, SC, FOUR	170	MW	9	ppmvd @ 15% O2		BACT-PSD	Good combustion. Lb/hr limit for each CT.
4	IN-0088	DUKE ENERGY KNOX LLC	WHEATLAND	05/29/01	CT, NG, SC	1158	MMBtu/hr	9	ppmvd @ 15% O2		BACT-PSD	DNB. LB/H LIMIT FOR EACH CT
4	IN-0095	ALLEGHENY ENERGY SUPPLY CO. LLC		12/07/01	TWO SC CTs GE LM6000	469	MMBtu/hr	25	ppm @15% O2	24 hr ave	BACT-PSD	WI
4	IN-0096	Southern Indiana - AB Brown Generating Station	EVANSVILLE	11/16/01	ONE SC CT GE TFA	1145.8	MMBtu/hr	9	ppm @15% O2		BACT-PSD	DLN WITH NG AS SOLE FUEL.
4	KY-001	Bluegrass Generation Company, LLC	Oldham	06/05/01	SC	624	MW	0.428	lb/MMBtu		BACT-PSD	SCR
4	KY-002	Metcalf Generating Station	Metcalfe	04/25/01	SC	640	MW	12	ppm		BACT-PSD	DLN
4	KY-003	Riverside Generating Company, LLC	Lawrence	02/02/01	SC	1040	MW	20	ppm		BACT-PSD	DLN
4	LA-0093	Formosa Plastics Corp		03/07/97	Cogeneration	450	MMBtu/hr	9	ppmv		BACT-PSD	DLN
4	LA-0122	International Paper - Mansfield Mill	MANSFIELD	08/14/01	GAS CT	368	MMBtu/hr	25	ppmv @ 15% O2		BACT-PSD	DLN
4	LA-0145	Borden Chemicals & Plastics Operating, LP	GEISMAR	05/29/01	COGEN III UNIT	473.1	MMBtu/hr	105.1	lb/hr		RACT	SI (previous BACT). New BACT analysis not required for minor modification.
4	MA-21	Sithe West Medway Development, LLC	Medway		SC	540	MW	9	ppm			DLN
4	MA-21	Sithe West Medway Development, LLC	Medway		SC	540	MW	9	ppm			GCP
4	MD-002	Chalk Point Generating Station	Prince George	06/08/90	SC	380	MW	25	ppm		BACT-PSD	DLN,WI
4	MD-003	Chalk Point Generating Station	Prince George	06/08/90	SC (SW V84.2)	190	MW	25	ppm		BACT-PSD	DLN,WI
4	MD-89	ODEC Rock Springs		10/30/00	SC	1020	MW	9	ppm			Dry LNB
4	MI-0267	RENAISSANCE POWER LLC	HOUSTON, TX	06/07/01	Stationary gas CTs, SC 4 each	170	MW	15	ppmvd @ 15% O2		BACT-PSD	DLN. Limits do not apply during SUSD or malfunction. These epidodes are limited to 200 hr/yr total for 4 CTs.
4	MI-0295	DTE ENERGY SERVICES	East China Twp	07/10/01	CT - GENERATOR	82.4	MW (each)	21	ppmvd @ 15% O2		BACT-PSD	
4	MI-0295	DTE ENERGY SERVICES	East China Twp	07/10/01	CT - GENERATOR	82.4	MW (each)	230	T/YR		BACT-PSD	N/A
4	MI-0295	DTE ENERGY SERVICES	East China Twp	07/10/01	CT - GENERATOR	82.4	MW (each)	9	ppmvd @ 15% O2		BACT-PSD	DLN. Five technologies rejected for being too costly or unproven.
4	MI-0296	First Energy Corp - Sumpter Plant	Sumpter TWP	09/18/01	CTGs, SC, FOUR EACH	83	MW	9	ppmvd @ 15% O2		NSPS	DLN
4	MI-0319	Detroit Edison - Greenwood Energy Center	DETROIT	07/23/01	CTs, SC, NG, (4)	82.4	MW	9	ppmvd @ 15% O2		BACT-PSD	DLN. NG usage not to exceed 27300 million cf/yr (total 4)
4	MI-0321	Detroit Edison - Bell River Plant	CHINA TWP	07/23/01	GAS CT, SC, 3 EACH	82.4	MW	9	ppmvd @ 15% O2		BACT-PSD	DLN. SEE POLLUTANT NOTES.
4	MI-0327	INDECK-NILES, LLC	NILES	12/02/01	GAS CTs 4 EACH, SC	163	MW	15	ppmvd @ 15% O2		BACT-PSD	LNB. Limited to 2000 hr/yr. 15 ppm a calendar day average. 96 ton a rolling 12-mo average.
4	MI-0345	EL PASO MERCHANT ENERGY CO.	HOUSTON	07/01/02	CT, SC, NG, (3)	170	MW	9	ppmvd @ 15% O2	24 h rolling avg	BACT-PSD	DLN. CEM for NOX. Required testing per per NSPS-GG, 60-180 days
4	MO-001	Holden Power Plant	Johnson	02/13/01	SC	363	MW	15	ppm		BACT-PSD	DLN
4	MS-004	CALEDONIA POWER LLC	CALEDONIA	03/27/01	Electrical power gen, CT & DB	1700	MMBtu/hr	24.1	lb/hr		BACT-PSD	DLN, SCR.
5	NE-002	Sarpy County Station	Sarpy	05/10/93	SC	308	MW	25	ppm		BACT-PSD	WI
5	NJ-0001	PSEG Fossil LLC -Linden		02/10/00	SC	170	MW	12	ppm			DLN
5	NJ-0002	PSEG Fossil LLC - Burlington		05/07/00	SC	170	MW	25	ppm			WI
5	NJ-0048	PRIME ENERGY	Elmwood Park	08/29/01	CT- NG	670	MMBtu/hr	0.15	lb/MMBtu		OTHER	WI
5	NJ-0048	PRIME ENERGY	Elmwood Park	08/29/01	NG BREAKER (CT)	670	MMBtu/hr	0.15	lb/MMBtu		OTHER	N/A
5	NJ-0056	Consolidated Edison Development (CEI	NEW YORK	09/10/01	3 GE TFA CTs	1959	MMBtu/hr, 174.2 MW	0.34	LB/MW-H		BACT-PSD	DLN
5	NJ-88	Sithe Energy GPU-Reliant Energy			SC	520	MW	9	ppm			DLN
5	NM-004	DEMING ENERGY FACILITY	HOUSTON	12/29/00	1 & 2 GE PG7241 (FA) 170 MW CTs	1515	MMBtu/hr	21.4	lb/hr		BACT-PSD	SCR
5	NM-004	ENERGY SOUTHWEST	LAS CRUCES	01/08/01	ELECTRIC GENERATION, C	1500	MMBtu/hr	9	PPM	SC	BACT-PSD	SCR, Agency reviewing costs did not agree with analysis.
5	NM-004	CLOVIS ENERGY FACILITY	HOUSTON	06/27/02	GE PG7241 (FA) 170 MW (for CTG 1-4	1515	MMBtu/hr	24.6	lb/hr		BACT-PSD	Pipeline quality NG, SCR.
5	NV-001	Tri Center Power Plant	Storey	12/05/01	SC	360	MW	26.9	ppm		BACT-PSD	DLN,WI
5	OH-025	DAYTON POWER AND LIGHT CO.	MIAMISBURG	06/04/02	CTs (2), SC	1115	MMBtu/hr	113	lb/hr		BACT-PSD	WI
5	OH-025	DAYTON POWER AND LIGHT CO.	MIAMISBURG	06/04/02	CTs (1), SC	1115	MMBtu/hr	62	lb/hr	each	BACT-PSD	WI & DLN
5	OH-025	PSEG WATERFORD ENERGY LLC	COLUMBUS	03/29/01	CTs (3), SC	170	MW	64	lb/hr		BACT-PSD	DLN, Stage I
5	OH-025	JACKSON COUNTY GENERATING,	The Woodlands	09/11/01	CTs (4), SC	160	MW	66	lb/hr		BACT-PSD	DLN
5	OH-026	ANR	DETROIT	08/15/02	CTs (2), SC	122	MMBtu/hr	17.1	lb/hr		BACT-PSD	DLN, NG only.
5	PA-0005	Handsome Lake Energy		09/29/00	SC	280	MW	25	ppm			LNB

Table E-2. EPA RBLC Database - Simple Cycle Combustion Turbines, Natural Gas , NOx Determinations

EPA Region	RBLC	Facility	City	Permit Date	Process Description	Thruput	Thruput	Emission Limit 1	Emission Limit 1	Emission Limit 1	Basis	Control Description
5	PA-0171	Allegheny Energy Supply Co., LLC/Harrison City	Harrison City	07/10/01	CT, NG FIRED	44	MW	25	ppm @ 15% O2		BACT-othe	WI, SCR
5	PA-0205	DUKE YUKON ENERGY, LLC	HOUSTON	09/17/02	ELECTRIC GENERATION	0		349	TPY		LAER	
5	PA-108	Bethlehem A(SC)	Northhampton	01/16/02	SC	1100	MW	9	ppm		BACT-PSD	DLN, WI
5	PA-110	Hinckston Run Power Plant (SC)	Cambria		SC	1100	MW	9	ppm		BACT-PSD	DLN,WI
6	PA-93	Armstrong		12/07/00	SC	660	MW	9	ppm			LNB
6	SC-001	Broad River Energy (CA)	Cherokee	12/02/99	SC	510	MW	9	ppm		BACT-PSD	DLN,WI
6	SC-002	Broad River Energy LLC (CD)	Cherokee	12/21/00	SC	890	MW	9	ppm		BACT-PSD	DLN,WI
6	SC-003	Rainey Generating Station		04/01/00	SC	340	MW	9	ppm		BACT-PSD	DLN,WI
6	SC-004	Rainey Generating Station		04/01/00	SC	530	MW	9	ppm		BACT-PSD	DLN,WI
6	SC-0057	BROAD RIVER ENERGY LLC		12/21/00	(2) 193 MW CTs	386	MW	9	ppmvd	wo SI	BACT-othe	COMBUSTION CONTROLS (DLN)
6	SC-0065	BROAD RIVER INVESTORS - GAFF	GAFFNEY	12/21/00	CTs, NG (2)	193	MW (each)	144	lb/hr	Total	BACT-PSD	DLN, proper operation/maintenance - limits given are wo SI
7	SC-0069	Duke Energy Mill Creek Combustion CT Station	CHARLOTTE	11/08/01	8 SC CTs	81.7	MW (each)	9	ppm initial 10.5 reg		BACT-PSD	DRY LOW NOX COMBUSTOR
7	SC-0071	Columbia Energy Center I-26 & US Hwy 21 S	COLUMBIA	04/09/01	2 CT/cogen, NG w HRSG 585 MMBtu/hr	170	MW	12	ppmvd @ 15% O2		BACT-PSD	SCR WITH DLN COMBUSTOR TECHNOLOGY
7	SD-0002	LANGE COMBUSTION CTs	RAPID CITY	03/20/01	CT, SC, #2	325	MMBtu/hr	25	ppmvd		BACT-PSD	LNB
7	SD-0002	LANGE COMBUSTION CTs	RAPID CITY	03/20/01	CT, SC, #1	325	MMBtu/hr	25	ppmvd		BACT-PSD	LNB
7	TN-001	Lagoon Creek Combustion CT Plant	Haywood	04/26/00	SC	1280	MW	12	ppm		BACT-PSD	DLN,WI
7	VA-0001	Wolf Hills		05/01/00	SC	280	MW	25	lb/hr			Water Injection
8	VA-025	SPSA - REFUSE DERIVED FUEL PL	Portsmouth	02/23/01	ELECTRICAL GENERATION	1624	MMBtu/hr	9	PPMDV	@15% 02 as 30 day avg	BACT-othe	COMBUSTING NG - DLN
8	VA-025	WHITE OAK POWER	JUNO BEACH	08/29/02	CT, SC, NG, (4)	1731	MMBtu/hr	9	ppmvd @ 15% O2		BACT-PSD	LNB & CEM
8	VA-0261	CPV CUNNINGHAM CREEK	Silver Spring	09/06/02	CT, CC, (2)	2132	MMBtu/hr	20	lb/hr	70-100% load	BACT-PSD	LNB & GCP, SCR w NH3 injection, CEM device,
8	VA-026	MIRANT AIRSIDE INDUSTRIAL PA	ATLANTA	12/06/02	CT, SC, (4)	84	MW	9	ppmvd @ 15% O2	each unit	BACT-PSD	LEAN PRE-MIX LNB & GCP, SCR & CEM devic
9	VA-026	ODEC - LOUISA FACILITY	GLEN ALLEN	03/11/03	CT, SC, (1), NG	1624	MMBtu/hr	10.5	ppmvd @ 15% O2		NSPS	GCP AND A CEMS
9	VA-026	ODEC - LOUISA FACILITY	GLEN ALLEN	03/11/03	CT, SC, (4), NG	901	MMBtu/hr	10.5	ppmvd @ 15% O2	1-hr avg	NSPS	GCP AND A CEMS
9	VA-026	CHICKAHOMINY POWER		01/10/03	CT, SC, (4), NG	1862	MMBtu/hr	15	ppmvd	each unit	BACT-PSD	DLN & CEMS
9	VA-026	ODEC - MARSH RUN FACILITY		02/14/03	CT, SC, (4), NG	1624	MMBtu/hr	9	ppmvd @ 15% O2	30 day avg	NSPS	DLN
9	VA-90	Virginia Power	Remington	09/01/99	SC	550	MW	9	ppm			LBN/WI
9	VA-91	Dominion Energy			SC	550	MW	9	ppm			LNB/WI
10	WA-80	Wallula Combusion CT Project	Walla Walla	11/13/01	SC	225	MW	2.5	ppm		BACT-PSD	DLN,SCR,WI

Sources: ECT, 2004.
EPA, 2004.

Table E-3. EPA RBLC Database - Simple Cycle Combustion Turbines, Fuel Oil, NOx Determinations

EPA Region ID	RBLC ID	Facility	City	Permit Date	Process Description	Thruput	Thruput Units	Emission Limit 1	Emission Limit 1 Units	Emission Limit 1 Condition	Basis	Control Description
1	ME-0001	Androscoggin Energy, LLC		03/31/98	Cogeneration	150	MW	42	ppm			
2	NJ-0001	PSEG Fossil LLC -Linden		02/10/00	SC	170	MW	42	ppm			DLN
2	NJ-0048	Prime Energy	Elmwood Park	08/29/01	Cogen system (CT & STG)	65	MW-715MMBtu/hr	75	PPMVD@ 15% O2		OTHER	WI
2	NJ-0048	Prime Energy	Elmwood Park	08/29/01	CT- DISTILLATE OIL	715	MMBtu/hr	0.35	lb/MMBtu		OTHER	WI
3	DE-0002	NRG Energy		10/20/00	SC	100	MW	73	lb/hr			LNB
3	PA-93	Armstrong		12/07/00	SC	660	MW	42	ppm			LNB
3	VA-0002	Commonwealth Chesapeake		10/05/00	SC	350	MW	42	ppm			Water Injection
3	VA-0258	WHITE OAK POWER	Juno Beach	08/29/02	CT, SC, FO, (4)	1888	MMBtu/hr	50	ppmvd @ 15% O2		BACT-PSD	LNB, CEM
3	VA-0259	BUCHANAN GENERATION	Monroville	01/31/02	ELEC GENERATION	424.6	MMBtu/hr	25	ppmvd for	each unit	BACT-other	GCP, WI
3	VA-0263	ODEC - LOUISA FACILITY	Glen Allen	03/11/03	CTs, SC, (4), FO	967	MMBtu/hr	42	ppmvd @ 15% O2	1-hr ave	NSPS	GCP AND A CEMS
3	VA-0263	ODEC - LOUISA FACILITY	Glen Allen	03/11/03	CT, SC, (1), FO	1820	MMBtu/hr	42	ppmvd @ 15% O2	1-hr ave	NSPS	GCP AND A CEMS
3	VA-0265	CHICKAHOMINY POWER		01/10/03	CT, SC, (4), FO	1776	MMBtu/hr	42	ppmvd	each unit	BACT-PSD	WI AND CEM.
3	VA-0266	ODEC - March Run Facility		02/14/03	CT, SC, (4), FO	1803	MMBtu/hr	62	ppmvd @ 15% O2	1 hr av	NSPS	DLN, clean buring fuel, CEMS
3	VA-90	Virginia Power	Remington	09/01/99	SC	550	MW	42	ppm			LBN/WI
3	VA-91	Dominion Energy			SC	550	MW	42	ppm			LNB, WI
4	AL-0167	CALHOUN POWER CO I, LLC	Anniston	01/26/01	CTs (4), OIL	170	MW	0.163	lb/MMBtu		BACT-PSD	GCP, DLN
4	AL-0187	Tenaska Alabama III Gen Station	Omaha	01/29/01	3 SC CTs	170	MW	0.167	lb/MMBtu		BACT-PSD	WI
4	AL-94	Calhoun Power Co.		01/01/00	SC	680	MW	0.163	lb/MMBtu			WI
4	AL-95	Tenaska Alabama 3		01/01/01	SC	510	MW	42	ppm			WI
4	FL-0083	Intercession City Facility	Intercession	12/01/99	SC	261	MW	42	ppmvd @ 15% O2		BACT-PSD	CT 11
4	FL-0083	Intercession City Facility	Intercession	12/01/99	SC	261	MW	42	ppmvd @ 15% O2		BACT-PSD	CT 7-10
4	FL-0132	UF Cogeneration Facility	Gainesville	08/17/92	Cogeneration	43	MW	42	ppmvd @ 15% O2			
4	FL-100	Vandola Power Project		12/01/99	SC	680	MW	42	ppm			WI
4	FL-101	Shady Hills		01/01/00	SC	510	MW	42	ppm			WI
4	FL-103	Desoto Power Project		06/01/00	SC	510	MW	42	ppm			WI
4	FL-104	Martin Power Plant		07/01/00	SC	340	MW	42	ppm			WI
4	FL-105022	Auburndale Power Partners			SC	1040	MW	42	ppmvd @ 15% O2			
4	FL-132	Peace River Station	Ft. Meade	12/01/00	SC	510	MW	42	ppm			WI
4	FL-136	Fort Myers Power Plant	Ft Myers	12/01/00	SC	340	MW	42	ppm			WI
4	FL-138	Midway Development Center	Port St. Lucie	02/01/01	SC	510	MW	42	ppm			WI
4	FL-284	DeSoto Power Project	Arcadia		SC	170	MW	42	ppmvd @ 15% O2		BACT-PSD	DLN, WI
5	IN-0088	DUKE ENERGY KNOX LLC	Wheatland	05/29/01	CT, DIESEL FUEL, SC	1158	MMBtu/hr	42	ppmvd @ 15% O2		BACT-PSD	WI. Lb/hr limit for each CT.
5	OH-0253	Dayton Power & Light Co	Miamishurg	06/04/02	CTs (2), SC	1115	MMBtu/hr	195	lb/hr		BACT-PSD	WI
5	OH-0253	Dayton Power & Light Co	Miamisburg	06/04/02	CT (1), SC	1115	MMBtu/hr	195	lb/hr		BACT-PSD	WI, DLN

Sources: ECT, 2004.
EPA, 2004.

Table E-4. EPA RBLC Database - Simple Cycle Combustion Turbines, Natural Gas, PM Determinations

EPA Region ID	RBLC ID	Facility	City	Permit Date	Process Description	Thruput	Thruput Units	Emission Limit 1	Emission Limit 1 Units	Emission Limit 1 Condition	Basis	Control Description
1	CT-0002	PPL Wallingford Energy, LLC			Simple	250	MW	1.24	lb/hr			Oxidation catalyst
2	NJ-0044	Mantua Creek Gen Facility		06/26/01	CT wo DB			0.013	lb/MMBtu		NSPS	NONE
2	NJ-0044	Mantua Creek Gen Facility		06/26/01	CT wo DB			0.0154	lb/MMBtu		NSPS	NONE
2	NJ-0044	Mantua Creek Gen Facility		06/26/01	CT wo DB, 60% LOAD			20.9	lb/hr		NSPS	NONE
2	NJ-0044	Mantua Creek Generating Facility		06/26/01	CT wo DB			0.013	lb/MMBtu		NSPS	
2	NJ-0044	Mantua Creek Generating Facility		06/26/01	CT wo DB			0.0154	lb/MMBtu		NSPS	
2	NJ-0044	Mantua Creek Generating Facility		06/26/01	CT wo DB			20.9	lb/hr		NSPS	
2	NJ-0048	Prime Energy	Elmwood Park	08/29/01	CT - NG	670	MMBtu/hr	5	lb/hr		OTHER	WI
2	NJ-0056	CED - Lakewood Gen Fac	New York	09/10/01	3 GE TFA CTs	1959	MMBtu/hr, 174.2 MV	9	lb/hr		NSPS	
2	NJ-0056	CED - Lakewood Gen Fac	NEW YORK	09/10/01	3 GE TFA CTs	1959	MMBtu/hr, 174.2 MV	0.017	lb/MMBtu		BACT-PSD	
2	NY-0086	KEYSPAN RAVENSWOOD	Long Island City	09/07/01	CT wo DB	250	MW	0.021	lb/MMBtu		BACT-PSD	NG- LOW SULFUR FUEL (0.04%)
3	PA-108	Bethlehem A(SC)	Northhampton	01/16/02	Simple	1100	MW	0.0135	lb/MMBtu		BACT-PSD	Pipeline Quality NG
3	PA-110	Hinckston Run Power Plant (SC)	Cambria		Simple	1100	MW	0.0135	lb/MMBtu		BACT-PSD	Pipeline quality NG
3	VA-0253	SPSA - Refuse Derived Fuel Plt	PORTSMOUTH	02/23/01	ELECTRICAL GENERATION	1624	MMBtu/hr	18	lb/hr	per hour	BACT-other	Clean fuels & efficient combustion
3	VA-0255	VA POWER - POSSUM POINT	GLENN ALLEN	11/18/02	CT, NG, NO DB FIRING	1937	MMBtu/hr	18.3	lb/hr	each unit	BACT-PSD	
3	VA-0258	WHITE OAK POWER	JUNO BEACH	08/29/02	CT, SC, NG, (4)	1731	MMBtu/hr	13.8	lb/hr	each unit	BACT-PSD	
3	VA-0262	Mirant Airside Industrial Park	ATLANTA	12/06/02	CT, SC, (4)	84	MW	10	lb/hr	each unit	BACT-PSD	GCP, DRIFT ELIMINATORS.
3	VA-0263	ODEC - Louisa Facility	GLEN ALLEN	03/11/03	CT SC, (1), NG	1624	MMBtu/hr	18	lb/hr		NSPS	GCP
3	VA-0263	ODEC - Louisa Facility	GLEN ALLEN	03/11/03	CTs SC, (4), NG	901	MMBtu/hr	10	lb/hr		NSPS	GCP
3	VA-0265	Chickahominy Power		01/10/03	CT, SC, (4), NG	1862	MMBtu/hr	27	lb/hr	each unit	BACT-PSD	CLEAN BURNING FUELS AND GCP.
3	VA-0266	ODEC - Marsh Run Facility		02/14/03	CT, SC, (4), NG	1624	MMBtu/hr	18	lb/hr		NSPS	GCP AND CLEAN BURNING FUEL.
3	WV-0014	Panda Culloden Gen Station	CULLODEN	12/18/01	CT, 300 MW	300	MW	18	lb/hr	wo DB	BACT-other	USE OF LOW-ASH FUEL - NG.
4	AL-0166	Hillabee Energy Center	Alexander City	01/18/01	CTs	229	MW	0.012	lb/MMBtu		BACT-PSD	GCP
4	AL-0167	Calhoun Power Co I, LLC	Anniston	01/26/01	CTs (4), NG	170	MW	0.01	lb/MMBtu		BACT-PSD	GCP
4	AL-0169	Blount Megawatt Facility	Hayden	02/05/01	CTs	161	MW	0.013	lb/MMBtu		BACT-PSD	GCP
4	AL-0187	Tenaska Alabame III Gen Station	OMAHA	01/29/01	3 (3) SC CTs	170	MW	0.0092	lb/MMBtu		BACT-PSD	CLEAN FUELS FIRING
4	AL-131	McIntosh Power Plant Units 2 and 3	Washington	09/18/00	SC	226	MW	0.01	lb/MMBtu		BACT-PSD	Pipeline quality NG
4	FL-0083	Intercession City Facility	Intercession	12/01/99	SC	261	MW	7.5	lb/hr		BACT-PSD	CT 11
4	FL-0083	Intercession City Facility	Intercession	12/01/99	SC	261	MW	7.5	lb/hr		BACT-PSD	CT 7-10
4	FL-0209	Peace River Power Station		12/09/00	170 MW SC CTs (3)	1860	MMBtu/hr	9	lb/hr (gas)		BACT-PSD	GCP
4	FL-0214	CPV Gulfcoast Power Gen Station	SE of Piney Point	02/05/01	GAS CT	1700	MMBtu/hr	11	lb/hr		BACT-PSD	Combustion controls, low sulfur fuels
4	FL-0218	MIDWAY ENERGY CENTER	Near Port St Lucie	02/14/01	CT, electric generators (3)	1700	MMBtu/hr	10	lb/hr (gas)		BACT-PSD	PIPELINE NG GOOD COMBUSTION
4	FL-0225	El Paso Broward Energy Center	Deerfield Beach	08/17/01	CT, SC, NAT. GAS (3)	1.79	MMCF/H	20	lb/hr		BACT-PSD	PIPELINE NG COMBUSTION CONTROLS.
4	FL-0226	El Paso Broward Energy Center	PINEY POINT	09/11/01	CT, SC, NAT. GAS (2)	1.79	MMCF/H	20	lb/hr		BACT-PSD	NG COMBUSTION CONTROLS
4	FL-0227	El Paso Belle Glade Energy Center	BELLE GLADE	09/07/01	CT, SC, NAT. GAS (2)	1.79	MMCF/H				BACT-PSD	Pipeline NG (<1.5 gr/100 scf), combustion controls. No emiss rate limit.
4	FL-0228	Deerfield Beach Energy Center	Deerfield Beach	07/15/01	CT, SC, NG (3)	1.91	MMCF/H	10	lb/hr		BACT-PSD	PIPELINE NG, GOOD COMBUSTION.
4	FL-0228	Deerfield Beach Energy Center	Deerfield Beach	07/15/01	CTs, SC, BACKUP OIL (3)	1.91	MMCF/H	17	lb/hr		BACT-PSD	GOOD COMBUSTION.
4	FL-0229	Pompano Beach Energy Center	Pompano Beach	08/15/01	CTs, SC, BACKUP OIL (3)	1.91	MMCF/H	17	lb/hr		BACT-PSD	GOOD COMBUSTION
4	FL-0229	Pompano Beach Energy Center	Pompano Beach	08/15/01	CTs, SC NAT. GAS (3)	1.91	MMCF/H	10	lb/hr		BACT-PSD	PIPELINE NG, GOOD COMBUSTION.
4	FL-105022	Auburndale Power Partners			SC	1040	MW	2.9	lb/hr			
4	FL-144	Auburndale Power Partners	Polk	05/25/01	SC	156	MW	2.9	lb/hr		BACT-PSD	Fuel has sulfur content less than 2g/100scf
4	FL-146	Belle Glade Energy Center (SC)	Palm Beach		SC	350	MW	9	lb/hr		BACT-PSD	Pipeline Quality NG
4	FL-148	Broward Energy Center (SC)	broward		SC	510	MW	9	lb/hr		BACT-PSD	Pipeline quality NG
4	FL-150	Deerfield Beach Energy Center	Broward		SC	510	MW	10	lb/hr		BACT-PSD	Pipeline Quality NG
4	FL-152	FPL Martin Plant	Martin	07/24/00	SC	340	MW	38	tpy		BACT-PSD	Pipeline quality NG
4	FL-154	Manatee Energy Center (SC)	Manatee	01/16/02	Simple	600	MW	9	lb/hr		BACT-PSD	Fuel has sulfur less than 1.5 gr/100scf
4	FL-284	DeSoto Power Project	Arcadia		Simple	170	MW	10	lb/hr		BACT-PSD	Pipeline NG, GCP
4	GA-313	Talbot Energy Facility	Talbot	08/09/01	SC	648	MW	0.023	lb/MMBtu		BACT-PSD	Pipeline Quality NG
4	KY-002	Metcalf Generating Station	Metcalfe	04/25/01	SC	640	MW	11	lb/hr		BACT-PSD	GCP
4	SC-001	Broad River Energy (CA)	Cherokee	12/02/99	SC	510	MW	18	lb/hr		BACT-PSD	Pipeline Quality NG
4	SC-002	Broad River Energy LLC (CD)	Cherokee	12/21/00	SC	890	MW	18	lb/hr		BACT-PSD	Pipeline Quality NG
4	SC-0057	Broad River Energy LLC		12/21/00	(2) 193 MW CTs (2)	386	MW	18	lb/hr		BACT-PSD	Combustion controls (DLN) and clean fuels
4	SC-0058	Genpower Anderson, LLC		07/02/01	(2) 320 MW CTs	640	MW	30.1	lb/hr		BACT-PSD	GCP and clean burning fuel

Table E-4. EPA RBLC Database - Simple Cycle Combustion Turbines, Natural Gas, PM Determinations

EPA Region	RBLC	Facility	City	Permit Date	Process Description	Thruput	Thruput	Emission Limit 1	Emission Limit 1	Emission Limit 1	Basis	Control Description
4	SC-0064	SCE&G - Jasper Cnty Gen Facility	COLUMBIA	05/23/02	CT, GAS FIRED, (3) EACH	170	MW (EACH)	24	lb/hr		BACT-PSD	CLEAN FUELS (NG), GCP
4	SC-0065	Broad River Investors -Gaffney	GAFFNEY	12/21/00	CTs, NG (2)	193	MW (EACH)	18	lb/hr		BACT-PSD	GCP and clean burning
4	SC-0069	Duke Energy Mill Creek CT Station	CHARLOTTE	11/08/01	8 SC CTs	81.7	MW EACH	5	LB/HR NG		BACT-PSD	COMBUSTION CONTROLS
4	TN-001	Lagoon Creek CT Plant	Haywood	04/26/00	SC	1280	MW	7.3	lb/hr		BACT-PSD	Pipeline Quality NG
5	IN-002	Duke Energy Knox, LLC	Knox	05/29/01	SC	640	MW	11	lb/hr		BACT-PSD	Pipeline quality NG
5	IN-0086	Mirant Sugar Creek, LLC	West Terre Haute	05/09/01	CT, NG, SC, 4	170	MW	0.012	lb/MMBtu		BACT-PSD	Good combustion. Lh/hr limit for each CT.
5	IN-0088	DUKE ENERGY KNOX LLC	WHEATLAND	05/29/01	CT, NG, SC	1158	MMBtu/hr	0.0095	lb/MMBtu		BACT-PSD	Good combustion. Lb/hr limit for each CT.
5	IN-0095	Allegheny Energy Supply Co. LLC		12/07/01	2 SC CTs GELM6000	469	MMBtu/hr	0.0068	lb/MMBtu		BACT-PSD	GCP
5	IN-0096	Southern Indiana - AB Brown Gen Station	EVANSVILLE	11/16/01	ONE SC CT GE TFA	1145.8	MMBtu/hr	0.005	lb/MMBtu		BACT-PSD	GCP
5	MI-0267	Renaissance Power LLC	HOUSTON, TX	06/07/01	Stationary gas CTs, SC (4)	170	MW	9	lb/hr		BACT-PSD	GOOD COMBUSTION. 0.0036 LB/MMBTU
5	MI-0295	DTE ENERGY SERVICES	East China Twp	07/10/01	CT - GENERATOR	82.4	MW (EACH)	9	LB/H/D (EACH)		BACT-PSD	N/A
5	MI-0319	Detroit Edison -Greenwood Energy Center	DETROIT	07/23/01	CTs, SC, NG, (4)	82.4	MW	9	lb/hr		BACT-PSD	
5	MI-0321	Detroit Edison - Belle River Plant	CHINA TWP	07/23/01	GAS CT, SC, 3 EACH	82.4	MW	9	lb/hr		BACT-PSD	GOOD COMBUSTION. NO ADD-ON.
5	MI-0327	INDECK-NILES, LLC	NILES	12/02/01	GAS CTs, 4 EACH, SC	163	MW	6	lb/hr		BACT-PSD	
5	MI-0345	EL PASO MERCHANT ENERGY CO.	HOUSTON	07/01/02	CT, SC, NG, (3)	170	MW	18.4	lb/hr	each, 24-hr avg	BACT-PSD	NG ONLY
5	OH-0253	Dayton Power & Light Co.	MIAMISBURG	06/04/02	CTs (2), SC	1115	MMBtu/hr	8	lb/hr		BACT-PSD	
5	OH-0253	Dayton Power & Light Co.	MIAMISBURG	06/04/02	CT (1), SC	1115	MMBtu/hr	8	lb/hr		BACT-PSD	
5	OH-0255	PSEG WATERFORD ENERGY LLC	COLUMBUS	03/29/01	CTs (3), SC	170	MW	18	lb/hr		BACT-PSD	
5	OH-0259	Jackson Cnty Generating, LLC	The Woodlands	09/11/01	CTs (4), SC	160	MW	34.9	lb/hr		BACT-PSD	
5	OH-0262	ANR	DETROIT	08/15/02	COMPRESSOR CTs (2), SC	122	MMBtu/hr	3.2	lb/hr		BACT-PSD	NG ONLY FUEL, GOOD COMBUSTION
6	AR-0042	GENPOWER - KEO, LLC	KEO	05/04/01	CT, NG FIRED, 2	590	MW	0.021	lb/MMBtu		BACT-PSD	GCP
6	AR-0043	PINE BLUFF ENERGY LLC	PINE BLUFF	02/27/01	CT, COMBUSTION SC	170	MW	0.005	lb/MMBtu		BACT-PSD	CLEAN FUELS.
6	AR-0060	Pine Bluff Energy Center	PINE BLUFF	02/27/01	CT - SC MODE, NG ONLY	170	MW	0.005	lb/MMBtu		BACT-PSD	GOOD COMBUSTION
6	LA-0136	Plaquemine, Iberville Parish	COLUMBUS	12/26/01	GAS CT/DB (4, GT-500, 600, 700, 800)	2876	MMBtu/hr	33.5	lb/hr	EACH	BACT-PSD	USE OF CLEAN BURNING FUELS
6	LA-0153	CARVILLE ENERGY CENTER	Northbrook	05/16/01	GAS CTs- 2 (1-98A, 2-98A)	1908	MMBTU/H (EACH)	19.73	lb/hr	EACH	BACT-PSD	GCP, GOOD DESIGN, CLEAN BURNING NC
6	LA-0156	BIG CAJUN I POWER PLANT	BATON ROUGE	12/08/00	2 120 MW GAS CTs (CTG-1, 2)	1410	MMBTU/H EACH	19	lb/hr	EACH	BACT-PSD	USE OF PIPELINE QUALITY NG
6	LA-0157	PERRYVILLE POWER STATION	Alexandria	03/08/02	SC GAS CT			18	lb/hr		BACT-PSD	LNB and/or SCR, GOP and NG fuel
6	LA-0157	PERRYVILLE POWER STATION	Alexandria	03/08/02	GAS CTs			23	lb/hr		BACT-PSD	LNB and/or SCR, GOP and NG fuel
6	LA-0164	Acadia Power Station - Acadia Power Partners, LLC	HOUSTON	01/31/02	GAS CT UNITS 1, 2, 3, 4	183	MW EACH	20	lb/hr		BACT-PSD	Good design, proper operating/maintenance practices, & use of NG.
6	NM-0042	DEMING ENERGY FACILITY	HOUSTON	12/29/00	1 & 2 GE PG7241 (FA) 170 MW C GE PG7241 (FA) 170 MW for	1515	MMBtu/hr	19	lb/hr		BACT-PSD	NG only, pre-filtering. Limits for front & back half of sample train.
6	NM-0044	CLOVIS ENERGY FACILITY	HOUSTON	06/27/02	CTG 1-4	1515	MMBtu/hr	19	lb/hr		BACT-PSD	
6	OK-0043	Webers Falls Energy Facility	NORMAN	10/22/01	CTs			0.015	lb/MMBtu		BACT-PSD	Use of low as fuel and efficient combustion
6	OK-0044	Smith Pocola Energy Project	Oklahoma City	08/16/01	CTs, NG, (4)	171.5	MW	9	lb/hr	each	BACT-PSD	Use of low as fuel and efficient combustion
6	OK-0067	Lawton Energy Cogen Facility	Oklahoma City	05/29/02	CTs	308	MW	134	T/YR		BACT-PSD	GOOD COMBUSTION PRACTICES
6	OK-0070	GENOVA OK I POWER PROJECT		06/13/02	MHI CT & DBs	1767	MMBtu/hr	0.01	lb/MMBtu		BACT-PSD	Use of low as fuel and efficient combustion
6	OK-0070	GENOVA OK I POWER PROJECT		06/13/02	SW CT	1872	MMBtu/hr	0.0092	lb/MMBtu		BACT-PSD	Use of low as fuel and efficient combustion
6	OK-0070	GENOVA OK I POWER PROJECT		06/13/02	GE CT & DBs	1705	MMBtu/hr	0.019	lb/MMBtu		BACT-PSD	Low sulfur fuel and efficient combustion
6	OK-0072	REDBUD POWER PLT		05/06/02	CTs	1832	MMBtu/hr	0.012	lb/MMBtu		BACT-PSD	USE OF NG
6	OK-0074	KIAMICHI ENERGY FACILITY		05/01/01	CTs	181.6	MW EACH	0.1	lb/MMBtu		BACT-PSD	GCP & DESIGN; USE OF LOW ASH FUEL
7	IA-0058	Greater Des Moines Energy Center	Pleasant Hill	04/10/02	CTs -SC	0		0.0094	lb/MMBtu		BACT-PSD	
7	IA-0060	HAWKEYE GENERATING, LLC	ORIENT	07/23/02	CT	33.77	BILLION CF/YR	0.0051	lb/MMBtu	SC	BACT-PSD	
7	IA-0060	HAWKEYE GENERATING, LLC	ORIENT	07/23/02	CT	33.77	BILLION CF/YR	0.0051	lb/MMBtu	SC	BACT-PSD	
7	IA-0060	HAWKEYE GENERATING, LLC	ORIENT	07/23/02	CT	33.77	BILLION CF/YR	0.0098	lb/MMBtu	SC	BACT-PSD	
7	IA-0060	HAWKEYE GENERATING, LLC	ORIENT	07/23/02	CT	33.77	BILLION CF/YR	0.0098	lb/MMBtu		BACT-PSD	
7	IA-0062	Power Iowa Energy Center (PIEC)	MASON CITY	12/20/02	CT, SC, (2)	170	MW	0.0066	lb/MMBtu	NG	BACT-othe	USE OF LOW ASH FUEL, NG
7	IA-0062	Power Iowa Energy Center (PIEC)	MASON CITY	12/20/02	CT, SC, (2)	170	MW	0.0066	lb/MMBtu	NG	BACT-othe	LOW ASH FUEL, NG
7	MO-001	Holden Power Plant	Johnson	02/13/01	SC	363	MW	18	lb/hr		BACT-PSD	Pipeline Quality NG
7	NE-002	Sarpy County Station	Sarpy	05/10/93	SC	308	MW	6	lb/hr		BACT-PSD	Pipeline Quality NG

Table E-4. EPA RBLC Database - Simple Cycle Combustion Turbines, Natural Gas, PM Determinations

EPA Region	RBLC	Facility	City	Permit Date	Process Description	Thruput	Thruput	Emission Limit 1	Emission Limit 1	Emission Limit 1	Basis	Control Description
8	CO-0049	North American Power Gp - Kiowa Creek	Greenwood Village	01/17/01	CC GAS CTs (4) - GENERATORS	250	MW	0.0136	lb/MMBtu		BACT-PSD	Pipeline quality NG & GCP. Alt limit is rolling 12 mo total for each CT. Cntl option integral to design.
8	CO-0050	Limon Generation	DENVER	03/20/01	CTGs, SC (2)	82	MW	115.6	T/YR		BACT-PSD	GCP
8	CO-0051	Platte River Power Authority/Rawhide	FORT COLLINS	05/21/01	CT	82	MW	28.9	T/YR		BACT-PSD	Use of pipeline quality NG is BACT. Includes condensible PM.
8	SD-0002	LANGE CTs	RAPID CITY	03/20/01	CT, SC, #2	325	MMBtu/hr	6	lb/hr		BACT-PSD	
8	SD-0002	LANGE CTs	RAPID CITY	03/20/01	CT, SC, #1	325	MMBtu/hr	6	lb/hr		BACT-PSD	
9	CA-0952	LA DEPT OF WATER & POWER	SUN VALLEY	05/18/01	CT, SC, NG	47.4	MW	0.01	GR/DSCF		OTHER	
9	CA-201	Mcclellan Business Park	Sacramento	03/24/00	SC	77	MW	7	ppm		BACT-PSD	Pipeline quality NG
9	CA-202	Tracy Peaker Power Plant	San Joaquin	11/27/01	SC	169	MW	10	lb/hr		BACT-PSD	Front and Back Half
9	CA-202	Tracy Peaker Power Plant	San Joaquin	11/27/01	SC	169	MW	5	lb/hr			Front Half
9	NV-001	Tri Center Power Plant	Storey	12/05/01	SC	360	MW	16	ppm		BACT-PSD	Pipeline Quality NG
10	WA-0289	Transalta Centralia Gen LLC	CENTRALIA	02/22/02	CT	0	3.0 PPM	0.009	lb/MMBtu		BACT-other	
10	WA-80	Wallula Combustion CT Project	Walla Walla	11/13/01	SC	225	MW	9.25	lb/hr		BACT-PSD	pipeline quality NG

Table E-5. EPA RBLC Database - Simple Cycle Combustion Turbines, Fuel Oil, PM Determinations

EPA Region ID	RBLC ID	Facility	City	Permit Date	Process Description	Thruput	Thruput Units	Emission Limit 1	Emission Limit 1 Units	Emission Limit 1 Condition	Basis	Control Description
2	NJ-0048	Prime Energy	NJ	GAS CT	715	MMBtu/h	25	lb/hr		OTHER		Oxidation catalyst
2	NY-0086	Keyspan Ravenswood	NY	CT FOR CO	250	MW	0.057	lb/MMBtu		BACT-PSD		NONE
3	VA-0238	Commonwealth Chesapeake Corp	VA		0		96.3	tpy				NONE
3	VA-0258	WHITE OAK POWER	VA	FOUR SC C	1888	MMBtu/h	33.6	lb/hr		BACT-PSD		NONE
3	VA-0263	ODEC - LOUISA FACILITY	VA		967	MMBtu/h	21	lb/hr	each unit	NSPS		
3	VA-0263	ODEC - LOUISA FACILITY	VA		1820	MMBtu/h	36	lb/hr		NSPS		
3	VA-0265	Chickahominy Power	VA	FOUR 501 F	1776	MMBtu/h	27	lb/hr	each unit	BACT-PSD	41.6	
3	VA-0266	ODEC - Marsh Run Facility	VA		1803	MMBtu/h	36	lb/hr		NSPS		WI
4	FL-284	DeSoto Power Project	FL		170	MW	17	lb/hr		BACT-PSD		
4	SC-0064	SCE&G - Jasper Cnty Gen Facility	SC	CTs (3)	170	MW (EA	72	lb/hr		BACT-PSD	100.8	
4	FL-0083	Intercession City Facility	FL		261	MW	0.01	lb/MMBtu		BACT-PSD		NG- LOW SULFUR FUEL (0.04%)
4	FL-0083	Intercession City Facility	FL		261	MW	0.01	lb/MMBtu		BACT-PSD		Pipeline Quality NG
4	AL-0167	Calhoun Power Co. 1, LLC	AL	CTs SC CON	170	MW	0.015	lb/MMBtu		BACT-PSD	17	Pipeline quality NG
4	AL-0187	Tenaska Alabama III Gen Station	AL	SC CTs	170	MW	0.0172	lb/MMBtu		BACT-PSD	34.8	Clean fuels & efficient combustion
4	FL-105022	Auburndale Power Partners	FL		1040	MW	58.5	lb/hr				
4	FL-144	Auburndale Power Partners	FL		156	MW	58.5	lb/hr		BACT-PSD		
4	TN-001	Lagoon Creek CT Plant	TN		1280	MW	15.80000019	lb/hr		BACT-PSD		GCP. DRIFT ELIMINATORS.
5	IN-0088	Duke Energy Knox LLC	IN		1158	MMBtu/h	0.017	lb/MMBtu		BACT-PSD	13.55	GCP
5	IN-0088	Duke Energy Knox LLC	IN		1158	MMBtu/h	0.0363	lb/MMBtu		BACT-PSD	42.04	GCP
5	IN-0088	Duke Energy Knox LLC	IN		1158	MMBtu/h	0.0216	lb/MMBtu		BACT-PSD	25.01	CLEAN BURNING FUELS AND GCP.
5	IN-002	Duke Energy Knox, LLC	IN		640	MW	25.01000023	lb/hr				GCP AND CLEAN BURNING FUEL.
5	OH-0253	Dayton Power & Light Co.	OH	3 NG SC CT	1115	MMBtu/h	15	lb/hr		BACT-PSD	0.013	USE OF LOW-ASH FUEL - NG.
5	OH-0253	Dayton Power & Light Co.	OH	3 NG SC CT	1115	MMBtu/h	15	lb/hr		BACT-PSD	0.013	GCP
9	HI-0020	Hawaii Electric Light Co.	HI		20	MW	0.045000002	gr/dscf@15% O2		BACT-PSD		GCP

Table E-6. EPA RBLC Database - Simple Cycle Combustion Turbines, Natural Gas, SO2 Determinations

EPA Region ID	RBLC ID	Facility	City	Permit Date	Process Description	Thruput	Thruput Units	Emission Limit 1	Emission Limit 1 Units	Emission Limit 1 Condition	Basis	Control Description
1	CT-0143	PPL Wallingford Energy, LLC	WALLINGFORD	06/10/01	SC TURBINES (5)	461.2	MMBtu/hr	1.26	lb/hr		OTHER	
2	NJ-0044	Mantua Creek Generating Facility		06/26/01	CT wo DB, 75% LOAD			0.0025	lb/MMBtu		NSPS	NG WITH 0.8% SULFUR BY WEIGHT
2	NJ-0044	Mantua Creek Generating Facility		06/26/01	CT wo DB, 60% load			0.0025	lb/MMBtu		NSPS	NG WITH 0.8% SULFUR BY WEIGHT
2	NJ-0044	Mantua Creek Generating Facility		06/26/01	CT wo DB			0.0025	lb/MMBtu		NSPS	NG WITH <= 0.8% SULFUR BY WEIGHT
2	NJ-0048	PRIME ENERGY	Elmwood Park	08/29/01	CT- NG	670	MMBtu/hr	0.37	lb/hr		OTHER	WI; SULFUR <= 0.8% BY WEIGHT
2	NJ-0056	Consolidated Edison Development (CED)	NEW YORK	09/10/01	3 GE TFA CTs	1959	MMBtu/hr, 174.2 MV	5.4	lb/hr		BACT-PSD	N/A
2	NY-0086	KEYSPAN RAVENSWOOD	Long Island City	09/07/01	CT wo DB	250	MW	0.0071	lb/MMBtu		BACT-PSD	LOW SULFUR FUEL- .04%
2	NJ-0056	Lakeview Gen facility	NEW YORK	09/10/01	3 GE TFA CTs	1959	MMBtu/hr	1.7	lb/hr		BACT-PSD	N/A
2	NJ-128	Bergen Generating Station	Bergen	05/27/93	CC	1300	MW	0.4	lb/hr		BACT-PSD	Pipeline Quality NG
3	PA-0171	Allegheny Energy Supply Co, LLC/Harrison City	HARRISON CITY	07/10/01	TURBINE, NG FIRED	44	MW				BACT-othe	Low sulfur fuel
3	PA-0179	SWEC LLC		08/07/01	CT, NG FIRED	0		0.0071	lb/MMBtu		OTHER	
3	VA-0250	TENASKA BEAR GARDEN STATION	NEW CANTON	04/30/02	GE 7 FA DUAL FUEL CTs	1887	MMBtu/hr	0.6	GR/100 dscf		BACT-PSD	Low sulfur fuels and CEM devices
3	VA-0255	VA POWER - POSSUM POINT	GLENN ALLEN	11/18/02	CT, NG, wo DB firing	1937	MMBtu/hr	1.74	lb/hr	each unit	BACT-PSD	
3	VA-0258	WHITE OAK POWER	JUNO BEACH	08/29/02	TURBINE, SC, NG, (4)	1731	MMBtu/hr	0.77	ppmvd @ 15% O2		BACT-PSD	Low sulfur fuel
3	VA-0262	MIRANT AIRSIDE INDUSTRIAL PARI	ATLANTA	12/06/02	TURBINE, SC, (4)	84	MW	0.8	GR/100 DS	fuel limit	BACT-PSD	GCP AND LOW SULFUR FUEL.
3	VA-0265	CHICKAHOMINY POWER		01/10/03	TURBINE, SC, (4), NG	1862	MMBtu/hr	1.1	lb/hr	each unit	BACT-PSD	LOW SULFUR FUELS AND GCP.
3	WV-0014	PANDA Culloden Gen Station	CULLODEN	12/18/01	CT, 300 MW	300	MW	5.4	lb/hr	wo DB	BACT-PSD	USE OF LOW-SULFUR FUEL - NG
3	PA-0205	DUKE YUKON ENERGY, LLC	HOUSTON	09/17/02	ELECTRIC GENERATION	0		60	TPY		BACT-PSD	
4	AL-0167	CALHOUN POWER COMPANY I, LLC	ANNISTON	01/26/01	CTs (4), NG	170	MW	0.006	lb/MMBtu		BACT-PSD	GCP
4	AL-0169	BLOUNT MEGAWATT FACILITY	HAYDEN	02/05/01	CTs	161	MW	0.006	lb/MMBtu		BACT-PSD	GCP
4	FL-0209	PEACE RIVER POWER STATION		12/09/00	170 MW SC CTs (3)	1860	MMBtu/hr	2	gr/100 scf gas		BACT-PSD	Low S fuels: pipeline NG & FO containing no more than 0.05% by wt is permit limit.
4	FL-0214	CPV Gulfcoast Power Gen Station	SE of Piney Point	02/05/01	GAS TURBINE	1700	MMBtu/hr	10	lb/hr		BACT-PSD	Permit limit is inherently clean fuels < 0.0065 % S NG; 0.05 % S FO. Combustion controls primary limit = NG, Alt limit = oil. No limits in ppm. NH3 slip < 5 ppmvd
4	FL-0218	MIDWAY ENERGY CENTER	Near Port St Lucie	02/14/01	CTs, ELECTRICAL GENs (3)	1700	MMBtu/hr				BACT-othe	Permit limit is natural gas 2 gr/100 scf, low sulfur (< 0.05%) distillate fuel oil. No emission limits apply.
4	FL-0225	EL PASO BROWARD ENERGY CENTI	Deerfield Beach	08/17/01	TURBINE, SC, NG (3)	1.79	MMCF/H				BACT-PSD	NG only. Permit limit is 1.5 GR S/100 scf. No emission limit.
4	FL-0226	EL PASO MANATEE ENERGY CENTE	PINEY POINT	09/11/01	CT, SC, NG (2)	1.79	MMCF/H				BACT-PSD	NG only. Permit limit is 1.5 GR S/100 scf. No emission limit.
4	FL-0228	DEERFIELD BEACH ENERGY CENTE	Deerfield Beach	07/15/01	CT, SC, BACKUP OIL (3)	1.91	MMCF/H				BACT-PSD	Good combustion. Fuel sulfur limit.
4	FL-0228	DEERFIELD BEACH ENERGY CENTE	Deerfield Beach	07/15/01	TURBINE, SC, NG (3)	1.91	MMCF/H				BACT-PSD	Pipeline natural gas, good combustion. Fuel sulfur limit.
4	FL-0229	POMPANO BEACH ENERGY CENTER	Pompano Beach	08/15/01	CTs SC, BACKUP OIL (3)	1.91	MMCF/H				BACT-PSD	Good combustion. Fuel sulfur limit.
4	FL-0229	POMPANO BEACH ENERGY CENTER	Pompano Beach	08/15/01	CTs SC NG (3)	1.91	MMCF/H				BACT-PSD	Pipeline natural gas, good combustion. Fuel sulfur limit.
4	FL-0232	Calpine/Auburndale Cogen Fac	AUBURNDALE	04/25/02	TURBINE, SC, NG	1591	MMBtu/hr	2	gr S/100 sc	fuel limit: gr S/100 scf	OTHER	FUEL S LIMIT
4	SC-0057	BROAD RIVER ENERGY LLC		12/21/00	2 193 MW CTs	386	MW	1.1	lb/hr		BACT-PSD	COMBUSTION OF CLEAN FUELS
4	SC-0064	SCE&G - Jasper Cnty Gen Fac	COLUMBIA	05/23/02	TURBINE, GAS FIRED, (3) EACI	170	MW each	6.4	lb/hr		BACT-PSD	CLEAN FUELS (NG)
4	SC-0065	BROAD RIVER INVESTORS - GAFFNI	GAFFNEY	12/21/00	CTs, NG (2)	193	MW each	1.1	lb/hr	EACH	BACT-othe	Low sulfur fuel
4	SC-0069	Duke Energy Mill Creek CT Station	CHARLOTTE	11/08/01	8 SC TURBINES	81.7	MW each	1.1	LB/HR NG		BACT-PSD	Low sulfur fuel
4	FL-0083	Intercession City Facility	Intercession	12/01/99	SC	261	MW	1	grain/100dscf		BACT-PSD	CT 7-10
4	FL-0083	Intercession City Facility	Intercession	12/01/99	SC	261	MW	1	grain/100dscf		BACT-PSD	CT 11
4	FL-0209	Peace River Power Station		12/09/00	170 MW SC TURBINES (3)	1860	MMBtu/hr				BACT-PSD	Low S fuels: pipline NG <= 2 gr/100 scf & DFO <= 0.05% by wt.
4	FL-0227	EL PASO BELLE GLADE ENERGY CE	BELLE GLADE	09/07/01	CT, SC, NG (2)	1.79	MMCF/H				BACT-PSD	Pipeline NG. Permit limit for NG <= 1.5 gr S/100 dscf. No emission rate limits. Combustion controls.
4	FL-105022	Auburndale Power Partners			SC	1040	MW	2	grains/100 SCF			
4	FL-152	FPL Martin Plant	Martin	07/24/00	SC	340	MW	9	ppm		BACT-PSD	Pipeline quality natural gas

Table E-6. EPA RBLC Database - Simple Cycle Combustion Turbines, Natural Gas, SO2 Determinations

EPA Region	RBLC	Facility	City	Permit Date	Process Description	Thruput	Thruput	Emission Limit 1	Emission Limit 1	Emission Limit 1	Basis	Control Description
4	FL-284	DeSoto Power Project	Arcadia		SC	170	MW	1	gr S/100 cf		BACT-PSD	PIPELINE NG, GCP
4	TN-001	Lagoon Creek Combustion Turbine Plant	Haywood	04/26/00	SC	1280	MW	0.0006	lb/MMBtu		BACT-PSD	Pipeline Quality NG
5	IN-0086	MIRANT SUGAR CREEK, LLC	West Terre Haute	05/09/01	CT NG, SC, FOUR	170	MW	0.0028	lb/MMBtu		BACT-PSD	Good combustion. Low S NG (< 0.8% by wt). Lb/hr limit for each CT.
5	IN-0088	DUKE ENERGY KNOX LLC	WHEATLAND	05/29/01	CT NG, SC	1158	MMBtu/hr	0.0052	lb/MMBtu		BACT-PSD	Low sulfur NG (< 0.8% by wt). Lb/hr limit for each CT.
5	IN-0095	ALLEGHENY ENERGY SUPPLY CO. LLC		12/07/01	TWO SC CTs GELM6000	469	MMBtu/hr	0.0035	lb/MMBtu		BACT-PSD	USE OF LOW SULFUR NG
5	MI-0267	RENAISSANCE POWER LLC	HOUSTON, TX	06/07/01	CTs (4), SC STATIONARY GAS	170	MW	0.0014	lb/MMBtu		BACT-PSD	'Fuel restricted to pipeline quality NG @ 0.5 gr/100 scf. 0.0014 lb/MMBtu. No emission limit until CC is added.
5	OH-0253	DAYTON POWER AND LIGHT CO.	MIAMISBURG	06/04/02	CT (1), SC	1115	MMBtu/hr	0.0006	lb/MMBtu		BACT-PSD	LOW SULFUR FUEL
5	OH-0253	DAYTON POWER AND LIGHT CO.	MIAMISBURG	06/04/02	CTs (2), SC	1115	MMBtu/hr	0.0006	lb/MMBtu		BACT-PSD	LOW S FUEL
5	OH-0255	PSEG WATERFORD ENERGY LLC	COLUMBUS	03/29/01	CTs (3), SC	170	MW	12	lb/hr		BACT-PSD	
5	OH-0259	JACKSON COUNTY GENERATING, LI	The Woodlands	09/11/01	CTs (4), SC	160	MW	5.43	lb/hr		BACT-PSD	
5	OH-0262	ANR	DETROIT	08/15/02	COMPRESSOR CTs (2), SC	122	MMBtu/hr	0.8	lb/hr		BACT-PSD	NG ONLY FUEL, GOOD COMBUSTION
5	IN-002	Duke Energy Knox, LLC	Knox	05/29/01	SC	640	MW	6.02	lb/MMBtu		BACT-PSD	pipeline quality natural gas
5	MI-0345	EL PASO MERCHANT ENERGY CO.	HOUSTON	07/01/02	CT, SC, NG, (3)	170	MW	97.4	T/YR	combined, 12	BACT-PSD	PIPELINE QUALITY NG ONLY.
6	AR-0040	DUKE ENERGY HOT SPRINGS	MALVERN	12/29/00	CT, DB, (4), GE 7FA CT/HRSG	580	MMBtu/hr	0.006	lb/MMBtu		BACT-PSD	NG fuel sulfur content is 0.05% by weight
6	AR-0042	GENPOWER - KEO, LLC	KEO	05/04/01	TURBINE, NG FIRED, 2	590	MW	0.002	lb/MMBtu		BACT-PSD	Low sulfur fuel. SO2 emission in RBLC standard unit (ppm @15% O2) is not available for this process.
6	AR-0043	PINE BLUFF ENERGY LLC	PINE BLUFF	02/27/01	TURBINE, COMBUSTION SC	170	MW	0.0006	lb/MMBtu		BACT-PSD	LOW SULFUR FUELS
6	LA-0136	PLAQUEMINE, IBERVILLE PARISH	COLUMBUS	12/26/01	GAS CT/DB (4, GT-500, 600, 700,	2876	MMBtu/hr	40.7	lb/hr	EACH	BACT-PSD	Low sulfur fuels w max S content of 5 gr/100 scf.
6	NM-0044	CLOVIS ENERGY FACILITY	HOUSTON	06/27/02	GE PG7241 (FA) 170 MW, CTG 1	1515	MMBtu/hr	4.3	lb/hr		BACT-other	
6	OK-0043	WEBERS FALLS ENERGY FACILITY	NORMAN	10/22/01	CTs			0.006	lb/MMBtu		BACT-PSD	USE OF NG
6	OK-0044	SMITH POCOLA ENERGY PROJECT	Oklahoma City	08/16/01	TURBINES, NG, (4)	171.5	MW	10.59	lb/hr	each	BACT-PSD	Use of pipeline NG. Sulfur content < 2 gr/100 scf 65 ppmw
6	OK-0072	REDBUD POWER PLT		05/06/02	CTs	1832	MMBtu/hr	0.003	lb/MMBtu		BACT-PSD	USE OF PIPELINE QUALITY NG
6	TX-0261	BELL ENERGY FACILITY	TEMPLE	06/26/01	CTs	175	MW	10	lb/hr		BACT-PSD	Low sulfur fuel
6	AR-0060	PINE BLUFF ENERGY CENTER	PINE BLUFF	02/27/01	CT - SC MODE, NG ONLY	170	MW	0.0006	lb/MMBtu		BACT-PSD	
6	OK-0074	KIAMICHI ENERGY FACILITY		05/01/01	CTs	181.6	MW each	2	GR/100 SCF		BACT-PSD	USE OF NG
7	IA-0062	POWER IOWA ENERGY CENTER (PIE	MASON CITY	12/20/02	TURBINE, SC, (2)	170	MW	0.0022	lb/MMBtu	natural gas	BACT-othei	Low sulfur fuels, NG < 0.8 gr/100scf; FO < 0.05% S by wt
8	CO-0051	Platte River Power Authority/Rawhide	FORT COLLINS	05/21/01	CT	82	MW	3.8	T/YR		OTHER	
8	CO-0050	LIMON GEN.	DENVER	03/20/01	CTs, SC (2)	82	MW	49.2	T/YR		BACT-PSD	Pipeline quality NG, low sulfur distillate FO (limited operation - .05 wt % S and 1,000 hrs per CT/yr)
9	CA-201	McClellan Business Park	Sacramento	03/24/00	SC	77	MW	0.56	lb/hr		BACT-PSD	Pipeline quality NG
9	CA-202	Tracy Peaker Power Plant	San Joaquin	11/27/01	SC	169	MW	0.78	lb/hr		BACT-PSD	Pipeline Quality NG
9	NV-001	Tri Center Power Plant	Storey	12/05/01	SC	360	MW	71	lb/hr		BACT-PSD	Pipeline Quality NG
10	WA-80	Wallula Combusion Turbine Project	Walla Walla	11/13/01	SC	225	MW	0.64	lb/hr		BACT-PSD	pipeline quality NG

Sources: ECT, 2004.
EPA, 2004.

ATTACHMENT F

DISPERSION MODELING FILES

Table E-7. EPA RBLC Database - Simple Cycle Combustion Turbines, Fuel Oil, SO2 Determinations

EPA Region ID	RBLC ID	Facility	City	Permit Date	Process Description	Thruput	Thruput Units	Emission Limit 1	Emission Limit 1 Units	Emission Limit 1 Condition	Basis	Control Description
2	NJ-0048	Prime Energy	Elmwood Park	08/29/01	CT- DISTILLATE OIL	715	MMBtu/hr	111	lb/hr		OTHER	SULFUR CONTENT OF FUEL
2	NJ-0048	Prime Energy	Elmwood Park	08/29/01	Cogen system (CT & STG)	65	MW/715mmBtu/hr	111	lb/hr		OTHER	SULFUR <= 0.15% by wt, WI
2	NY-0086	Keyspan Ravenswood	Long Island City	09/07/01	CT wo DB (KEROSENE)	250	MW	0.044	lb/MMBtu		BACT-PSD	LOW SULFUR FUEL (0.04%)
3	VA-0250	Tenaska Bear Garden Station	NEW CANTON	04/30/02	GE 7 FA DUAL FUEL CTs	2029	MMBTU			.01% on oil	BACT-PSD	LOW SULFER FUELS AND CEM DEVICES
3	VA-0258	WHITE OAK POWER	JUNO BEACH	08/29/02	CTs, SC, FO, (4)	1888	MMBtu/hr	8.5	ppmvd @ 15% O2		BACT-PSD	LOW SULFUR FUELS
3	VA-0265	CHICKAHOMINY POWER		01/10/03	TURBINE, SC, (4), FO	1776	MMBtu/hr	91.1	lb/hr	each unit	BACT-PSD	CLEAN BURNING FUELS AND GCP.
4	AL-0167	Calhoun Power Co. I, LLC	ANNISTON	01/26/01	CTs (4), OIL	170	MW	0.06	lb/MMBtu		BACT-PSD	GOOD COMBUSTION PRACTICES
4	AL-0187	Tenaska Alabama III Gen Station	Omaha	01/29/01	(3) SC CTs	170	MW	0.05	%sulfur		BACT-PSD	LOW SULFUR DIESEL
4	SC-0064	SCE&G - Jasper Cnty Gen Facility	COLUMBIA	05/23/02	CT, OIL FIRED, 3 EACH	170	MW (EACH)	106.5	lb/hr		BACT-PSD	CLEAN FUELS (LOW SULFUR NO. 2 FO)
4	FL-0083	Intercession City Facility	Intercession	12/01/99	SC	261	MW	0.2	% S by wt		BACT-PSD	CT 11
4	FL-0083	Intercession City Facility	Intercession	12/01/99	SC	261	MW	0.2	% S by wt		BACT-PSD	CT 7-10
4	FL-105022	Auburndale Power Partners			SC	1040	MW	74.9	lb/hr/.05% S			
4	FL-284	DeSoto Power Project	Arcadia		SC	170	MW	0.05	% sulfur		BACT-PSD	PIPELINE NG, GCP, 1000 hr/yr
5	OH-0253	Dayton Power & Light Co.	Miamisburg	06/04/02	CTs (2), SC	1115	MMBtu/hr	0.055	lb/MMBtu		BACT-PSD	LOW S FUEL
5	OH-0253	Dayton Power & Light Co.	Miamisburg	06/04/02	CT (1), SC	1115	MMBtu/hr	0.055	lb/MMBtu		BACT-PSD	LOW SULFUR FUEL
5	IN-0088	DUKE ENERGY KNOX LLC	Wheatland	05/29/01	CT, DIESEL FUEL, SC	1158	MMBtu/hr	0.0363	lb/MMBtu		BACT-PSD	Diesel fuel limit 0.05 wt %. Lb/hr limit for each CT.
6	AR-0051	Duke Energy - Jackson Facility	Houston	04/01/02	Generator, DIESEL-FIRED	671	HP			see notes	BACT-PSD	FUELS LIMIT: 0.05% S BY WT
9	HI-0020	Hawaii Electric Light Co.		10/28/97	SC	20	MW	79	ppmvd @ 15% O2		BACT-PSD	Fuel less than .4 sulfur

Sources: ECT, 2004.
EPA, 2004.

ATTACHMENT F1

CALMET OUTPUT LIST FILE

```
Chasshowitzka Class I Area
Domain: 72 x 88 x 5 km; Period: 01/06 - 01/31, 1990
9 surface, 4 upper air, 32 precip, and 5 overwater stations
---------------- Run title (3 lines) ------------------------------------------

                    CALMET MODEL CONTROL FILE
                    --------------------------

-------------------------------------------------------------------------------

INPUT GROUP: 0 -- Input and Output File Names


Subgroup (a)
------------
Default Name  Type          File Name
------------  ----          ---------
GEO.DAT       input    ! GEODAT=..\GEO\GEOSP.DAT       !
SURF.DAT      input    ! SRFDAT=.\SURF90.DAT      !
CLOUD.DAT     input    * CLDDAT=                 *
PRECIP.DAT    input    ! PRCDAT=.\PRECIP90.DAT    !
MM4.DAT       input    ! MM4DAT=G:\CALPUFF\METDATA\MM4\FLPEN90.MM4   !
WT.DAT        input    * WTDAT=                  *

CALMET.LST    output   ! METLST=G:\CALPUFF\PROJ\CHASS\MET90\CHASS9001.LST     !
CALMET.DAT    output   ! METDAT=G:\CALPUFF\PROJ\CHASS\MET90\CHASS9001.MET    !
PACOUT.DAT    output   * PACDAT=                 *

All file names will be converted to lower case if LCFILES = T
Otherwise, if LCFILES = F, file names will be converted to UPPER CASE
         T = lower case      ! LCFILES = T !
         F = UPPER CASE

NUMBER OF UPPER AIR & OVERWATER STATIONS:

    Number of upper air stations (NUSTA)  No default     ! NUSTA =  4  !
    Number of overwater met stations
                                 (NOWSTA) No default     ! NOWSTA =  5  !

                        !END!
-------------------------------------------------------------------------------
Subgroup (b)
---------------------------------
Upper air files (one per station)
---------------------------------
Default Name  Type       File Name
------------  ----       ---------
UP1.DAT       input     1  ! UPDAT=\CALPUFF\METDATA\UP\1990\12842U.DAT!    !END!
UP2.DAT       input     2  ! UPDAT=\CALPUFF\METDATA\UP\1990\12844U.DAT!    !END!
UP3.DAT       input     3  ! UPDAT=\CALPUFF\METDATA\UP\1990\12832U.DAT!    !END!
UP4.DAT       input     4  ! UPDAT=\CALPUFF\METDATA\UP\1990\13861U.DAT!    !END!
-------------------------------------------------------------------------------
Subgroup (c)
-----------------------------------------
Overwater station files (one per station)
-----------------------------------------
Default Name  Type       File Name
------------  ----       ---------
SEA1.DAT       input     1  ! SEADAT=\CALPUFF\METDATA\SEA\1990\SAUF1.SEA!    !END!
SEA2.DAT       input     2  ! SEADAT=\CALPUFF\METDATA\SEA\1990\41009.SEA!    !END!
SEA3.DAT       input     3  ! SEADAT=\CALPUFF\METDATA\SEA\1990\VENF1.SEA!    !END!
SEA4.DAT       input     4  ! SEADAT=\CALPUFF\METDATA\SEA\1990\LKWF1.SEA!    !END!
SEA5.DAT       input     5  ! SEADAT=\CALPUFF\METDATA\SEA\1990\CSBF1.SEA!    !END!
-------------------------------------------------------------------------------
Subgroup (d)
```

```
----------------
Other file names
----------------

Default Name  Type       File Name
------------  ----       ---------
DIAG.DAT      input      * DIADAT=                    *
PROG.DAT      input      * PRGDAT=                    *

TEST.PRT      output     * TSTPRT=                    *
TEST.OUT      output     * TSTOUT=                    *
TEST.KIN      output     * TSTKIN=                    *
TEST.FRD      output     * TSTFRD=                    *
TEST.SLP      output     * TSTSLP=                    *

--------------------------------------------------------------------------------
NOTES: (1) File/path names can be up to 70 characters in length
       (2) Subgroups (a) and (d) must have ONE 'END' (surround by
           delimiters) at the end of the group
       (3) Subgroups (b) and (c) must have an 'END' (surround by
           delimiters) at the end of EACH LINE

                          !END!


--------------------------------------------------------------------------------

INPUT GROUP: 1 -- General run control parameters
--------------

     Starting date:   Year (IBYR) -- No default       ! IBYR=  1990  !
                     Month (IBMO) -- No default       ! IBMO=  1  !
                       Day (IBDY) -- No default       ! IBDY=  6  !
                      Hour (IBHR) -- No default       ! IBHR=  0  !

     Base time zone        (IBTZ) -- No default       ! IBTZ=  5  !
        PST = 08, MST = 07
        CST = 06, EST = 05

     Length of run (hours) (IRLG) -- No default       ! IRLG=  624  !

     Run type            (IRTYPE) -- Default: 1       ! IRTYPE=  1  !

        0 = Computes wind fields only
        1 = Computes wind fields and micrometeorological variables
            (u*, w*, L, zi, etc.)
        (IRTYPE must be 1 to run CALPUFF or CALGRID)

     Compute special data fields required
     by CALGRID (i.e., 3-D fields of W wind
     components and temperature)
     in additional to regular            Default: T    ! LCALGRD = T !
     fields ? (LCALGRD)
     (LCALGRD must be T to run CALGRID)

      Flag to stop run after
      SETUP phase (ITEST)             Default: 2       ! ITEST=  2   !
      (Used to allow checking
      of the model inputs, files, etc.)
      ITEST = 1 - STOPS program after SETUP phase
      ITEST = 2 - Continues with execution of
                  COMPUTATIONAL phase after SETUP

!END!

```

```
------------------------------------------------------------------------------

INPUT GROUP: 2 -- Map Projection and Grid control parameters
--------------

     Projection for all (X,Y):
     -------------------------

     Map projection
     (PMAP)                      Default: UTM    ! PMAP = UTM  !

         UTM :  Universal Transverse Mercator
         TTM :  Tangential Transverse Mercator
         LCC :  Lambert Conformal Conic
          PS :  Polar Stereographic
          EM :  Equatorial Mercator
        LAZA :  Lambert Azimuthal Equal Area

     False Easting and Northing (km) at the projection origin
     (Used only if PMAP= TTM, LCC, or LAZA)
     (FEAST)                     Default=0.0     ! FEAST  = 0.000  !
     (FNORTH)                    Default=0.0     ! FNORTH = 0.000  !

     UTM zone (1 to 60)
     (Used only if PMAP=UTM)
     (IUTMZN)                    No Default      ! IUTMZN =  17   !

     Hemisphere for UTM projection?
     (Used only if PMAP=UTM)
     (UTMHEM)                    Default: N      ! UTMHEM = N  !
         N   :  Northern hemisphere projection
         S   :  Southern hemisphere projection

     Latitude and Longitude (decimal degrees) of projection origin
     (Used only if PMAP= TTM, LCC, PS, EM, or LAZA)
     (RLAT0)                     No Default      ! RLAT0 = 40N  !
     (RLON0)                     No Default      ! RLON0 = 74W  !

         TTM :  RLON0 identifies central (true N/S) meridian of projection
                RLAT0 selected for convenience
         LCC :  RLON0 identifies central (true N/S) meridian of projection
                RLAT0 selected for convenience
         PS  :  RLON0 identifies central (grid N/S) meridian of projection
                RLAT0 selected for convenience
         EM  :  RLON0 identifies central meridian of projection
                RLAT0 is REPLACED by 0.0N (Equator)
         LAZA:  RLON0 identifies longitude of tangent-point of mapping plane
                RLAT0 identifies latitude of tangent-point of mapping plane

     Matching parallel(s) of latitude (decimal degrees) for projection
     (Used only if PMAP= LCC or PS)
     (XLAT1)                     No Default      ! XLAT1 = 35N  !
     (XLAT2)                     No Default      ! XLAT2 = 45N  !

         LCC :  Projection cone slices through Earth's surface at XLAT1 and XLAT2
         PS  :  Projection plane slices through Earth at XLAT1
                (XLAT2 is not used)

     ----------
     Note:  Latitudes and longitudes should be positive, and include a
            letter N,S,E, or W indicating north or south latitude, and
            east or west longitude.  For example,
            35.9  N Latitude  =  35.9N
            118.7 E Longitude = 118.7E
```

```

     Datum-region
     ------------

     The Datum-Region for the coordinates is identified by a character
     string.  Many mapping products currently available use the model of the
     Earth known as the World Geodetic System 1984 (WGS-G ).  Other local
     models may be in use, and their selection in CALMET will make its output
     consistent with local mapping products.  The list of Datum-Regions with
     official transformation parameters provided by the National Imagery and
     Mapping Agency (NIMA).

     NIMA Datum - Regions(Examples)
     ------------------------------------------------------------------------------
     WGS-G     WGS-84 GRS 80, Global coverage
     NAS-C     NORTH AMERICAN 1927 Clarke 1866, MEAN FOR (CONUS)
     NWS-27    NWS 6370KM Radius, Global Sphere (NAD27)
     NWS-84    NWS 6370KM Radius, Global Sphere (WGS84)
     ESR-S     ESRI REFERENCE Normal Sphere (6371KM Radius), Global Reference Sphere

     Datum-region for output coordinates
     (DATUM)                    Default: WGS-G     ! DATUM = NAS-C  !


     Horizontal grid definition:
     ---------------------------

     Rectangular grid defined for projection PMAP,
     with X the Easting and Y the Northing coordinate

            No. X grid cells (NX)      No default     ! NX =   72  !
            No. Y grid cells (NY)      No default     ! NY =   88  !

     Grid spacing (DGRIDKM)            No default     ! DGRIDKM = 5. !
                                       Units: km

     Reference grid coordinate of
     SOUTHWEST corner of grid cell (1,1)

        X coordinate (XORIGKM)         No default     ! XORIGKM = 250.000 !
        Y coordinate (YORIGKM)         No default     ! YORIGKM = 2940.000 !
                                       Units: km


     Vertical grid definition:
     -------------------------

        No. of vertical layers (NZ)    No default     ! NZ =  10  !

        Cell face heights in arbitrary
        vertical grid (ZFACE(NZ+1))    No defaults
                                       Units: m
        ! ZFACE = 0.,20.,40.,80.,160.,320.,500.,1000.,1500.,2500.,3500. !

!END!


-------------------------------------------------------------------------------

INPUT GROUP: 3 -- Output Options
--------------


    DISK OUTPUT OPTION

```

```
    Save met. fields in an unformatted
    output file ?             (LSAVE)  Default: T     ! LSAVE = T !
    (F = Do not save, T = Save)

    Type of unformatted output file:
    (IFORMO)                           Default: 1    ! IFORMO =  1  !

         1 = CALPUFF/CALGRID type file (CALMET.DAT)
         2 = MESOPUFF-II type file     (PACOUT.DAT)


 LINE PRINTER OUTPUT OPTIONS:

    Print met. fields ?  (LPRINT)      Default: F     ! LPRINT = T !
    (F = Do not print, T = Print)
    (NOTE: parameters below control which
           met. variables are printed)

    Print interval
    (IPRINF) in hours                  Default: 1     ! IPRINF =  72  !
    (Meteorological fields are printed
     every  72  hours)


    Specify which layers of U, V wind component
    to print (IUVOUT(NZ)) -- NOTE: NZ values must be entered
    (0=Do not print, 1=Print)
    (used only if LPRINT=T)        Defaults: NZ*0
    ! IUVOUT =  1 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0  !
    -----------------------


    Specify which levels of the W wind component to print
    (NOTE: W defined at TOP cell face --  10  values)
    (IWOUT(NZ)) -- NOTE: NZ values must be entered
    (0=Do not print, 1=Print)
    (used only if LPRINT=T & LCALGRD=T)
    -----------------------------------
                                        Defaults: NZ*0
     ! IWOUT =  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0  !


    Specify which levels of the 3-D temperature field to print
    (ITOUT(NZ)) -- NOTE: NZ values must be entered
    (0=Do not print, 1=Print)
    (used only if LPRINT=T & LCALGRD=T)
    -----------------------------------
                                        Defaults: NZ*0
     ! ITOUT =  1 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0  !

    Specify which meteorological fields
    to print
    (used only if LPRINT=T)            Defaults: 0 (all variables)
    -----------------------


      Variable            Print ?
                       (0 = do not print,
                        1 = print)
      --------         ------------------

   !  STABILITY  =          1           ! - PGT stability class
   !  USTAR      =          1           ! - Friction velocity
   !  MONIN      =          1           ! - Monin-Obukhov length
   !  MIXHT      =          1           ! - Mixing height
```

```
! WSTAR     =          1          ! - Convective velocity scale
! PRECIP    =          1          ! - Precipitation rate
! SENSHEAT  =          1          ! - Sensible heat flux
! CONVZI    =          1          ! - Convective mixing ht.


 Testing and debug print options for micrometeorological module

    Print input meteorological data and
    internal variables (LDB)          Default: F        ! LDB = F !
    (F = Do not print, T = print)
    (NOTE: this option produces large amounts of output)

    First time step for which debug data
    are printed (NN1)                 Default: 1        ! NN1 =  1  !

    Last time step for which debug data
    are printed (NN2)                 Default: 1        ! NN2 =  1  !


 Testing and debug print options for wind field module
 (all of the following print options control output to
  wind field module's output files: TEST.PRT, TEST.OUT,
  TEST.KIN, TEST.FRD, and TEST.SLP)

    Control variable for writing the test/debug
    wind fields to disk files (IOUTD)
    (0=Do not write, 1=write)         Default: 0        ! IOUTD =  0  !

    Number of levels, starting at the surface,
    to print (NZPRN2)                 Default: 1        ! NZPRN2 =  0  !

    Print the INTERPOLATED wind components ?
    (IPR0) (0=no, 1=yes)              Default: 0        !  IPR0 =  0  !

    Print the TERRAIN ADJUSTED surface wind
    components ?
    (IPR1) (0=no, 1=yes)              Default: 0        !  IPR1 =  0  !

    Print the SMOOTHED wind components and
    the INITIAL DIVERGENCE fields ?
    (IPR2) (0=no, 1=yes)              Default: 0        !  IPR2 =  0  !

    Print the FINAL wind speed and direction
    fields ?
    (IPR3) (0=no, 1=yes)              Default: 0        !  IPR3 =  0  !

    Print the FINAL DIVERGENCE fields ?
    (IPR4) (0=no, 1=yes)              Default: 0        !  IPR4 =  0  !

    Print the winds after KINEMATIC effects
    are added ?
    (IPR5) (0=no, 1=yes)              Default: 0        !  IPR5 =  0  !

    Print the winds after the FROUDE NUMBER
    adjustment is made ?
    (IPR6) (0=no, 1=yes)              Default: 0        !  IPR6 =  0  !

    Print the winds after SLOPE FLOWS
    are added ?
    (IPR7) (0=no, 1=yes)              Default: 0        !  IPR7 =  0  !

    Print the FINAL wind field components ?
    (IPR8) (0=no, 1=yes)              Default: 0        !  IPR8 =  0  !
```

```
!END!


-------------------------------------------------------------------------------

INPUT GROUP: 4 -- Meteorological data options
--------------

     NO OBSERVATION MODE              (NOOBS)  Default: 0     ! NOOBS =  0   !
          0 = Use surface, overwater, and upper air stations
          1 = Use surface and overwater stations (no upper air observations)
              Use MM5 for upper air data
          2 = No surface, overwater, or upper air observations
              Use MM5 for surface, overwater, and upper air data

     NUMBER OF SURFACE & PRECIP. METEOROLOGICAL STATIONS

        Number of surface stations   (NSSTA)  No default     ! NSSTA =  9  !

        Number of precipitation stations
        (NPSTA=-1: flag for use of MM5 precip data)
                                     (NPSTA)  No default     ! NPSTA =  32  !

     CLOUD DATA OPTIONS
        Gridded cloud fields:
                                    (ICLOUD)  Default: 0     ! ICLOUD =  0  !
        ICLOUD = 0 - Gridded clouds not used
        ICLOUD = 1 - Gridded CLOUD.DAT generated as OUTPUT
        ICLOUD = 2 - Gridded CLOUD.DAT read as INPUT
        ICLOUD = 3 - Gridded cloud cover from Prognostic Rel. Humidity

     FILE FORMATS

        Surface meteorological data file format
                                    (IFORMS)  Default: 2     ! IFORMS =  2  !
        (1 = unformatted (e.g., SMERGE output))
        (2 = formatted   (free-formatted user input))

        Precipitation data file format
                                    (IFORMP)  Default: 2     ! IFORMP =  2  !
        (1 = unformatted (e.g., PMERGE output))
        (2 = formatted   (free-formatted user input))

        Cloud data file format
                                    (IFORMC)  Default: 2     ! IFORMC =  2  !
        (1 = unformatted - CALMET unformatted output)
        (2 = formatted   - free-formatted CALMET output or user input)

!END!


-------------------------------------------------------------------------------

INPUT GROUP: 5 -- Wind Field Options and Parameters
--------------


     WIND FIELD MODEL OPTIONS
        Model selection variable (IWFCOD)     Default: 1      ! IWFCOD =  1  !
           0 = Objective analysis only
           1 = Diagnostic wind module

        Compute Froude number adjustment
        effects ? (IFRADJ)                    Default: 1      ! IFRADJ =  1  !
        (0 = NO, 1 = YES)
```

```

     Compute kinematic effects ? (IKINE)   Default: 0      ! IKINE  =  0  !
     (0 = NO, 1 = YES)

     Use O'Brien procedure for adjustment
     of the vertical velocity ? (IOBR)     Default: 0      ! IOBR =  0  !
     (0 = NO, 1 = YES)

     Compute slope flow effects ? (ISLOPE) Default: 1      ! ISLOPE  =  1  !
     (0 = NO, 1 = YES)

     Extrapolate surface wind observations
     to upper layers ? (IEXTRP)            Default: -4     ! IEXTRP = 4  !
     (1 = no extrapolation is done,
      2 = power law extrapolation used,
      3 = user input multiplicative factors
          for layers 2 - NZ used (see FEXTRP array)
      4 = similarity theory used
      -1, -2, -3, -4 = same as above except layer 1 data
          at upper air stations are ignored

     Extrapolate surface winds even
     if calm? (ICALM)                      Default: 0      ! ICALM  =  0  !
     (0 = NO, 1 = YES)

     Layer-dependent biases modifying the weights of
     surface and upper air stations (BIAS(NZ))
       -1<=BIAS<=1
     Negative BIAS reduces the weight of upper air stations
       (e.g. BIAS=-0.1 reduces the weight of upper air stations
     by 10%; BIAS= -1, reduces their weight by 100 %)
     Positive BIAS reduces the weight of surface stations
       (e.g. BIAS= 0.2 reduces the weight of surface stations
     by 20%; BIAS=1 reduces their weight by 100%)
     Zero BIAS leaves weights unchanged (1/R**2 interpolation)
     Default: NZ*0
                             ! BIAS = -1 , -1 , -.8 , -.5 ,  0 ,  .5 ,  .8 ,  1 ,  1 ,  1  !

     Minimum distance from nearest upper air station
     to surface station for which extrapolation
     of surface winds at surface station will be allowed
     (RMIN2: Set to -1 for IEXTRP = 4 or other situations
      where all surface stations should be extrapolated)
                                            Default: 4.    ! RMIN2 = 4.0 !

     Use gridded prognostic wind field model
     output fields as input to the diagnostic
     wind field model (IPROG)              Default: 0      ! IPROG =  4  !
     (0 = No, [IWFCOD = 0 or 1]
      1 = Yes, use CSUMM prog. winds as Step 1 field, [IWFCOD = 0]
      2 = Yes, use CSUMM prog. winds as initial guess field [IWFCOD = 1]
      3 = Yes, use winds from MM4.DAT file as Step 1 field [IWFCOD = 0]
      4 = Yes, use winds from MM4.DAT file as initial guess field [IWFCOD = 1]
      5 = Yes, use winds from MM4.DAT file as observations [IWFCOD = 1]
      13 = Yes, use winds from MM5.DAT file as Step 1 field [IWFCOD = 0]
      14 = Yes, use winds from MM5.DAT file as initial guess field [IWFCOD = 1]
      15 = Yes, use winds from MM5.DAT file as observations [IWFCOD = 1]

     Timestep (hours) of the prognostic
     model input data   (ISTEPPG)          Default: 1      ! ISTEPPG =  1   !

   RADIUS OF INFLUENCE PARAMETERS

     Use varying radius of influence       Default: F      ! LVARY =  F!
     (if no stations are found within RMAX1,RMAX2,
```

```
     or RMAX3, then the closest station will be used)

    Maximum radius of influence over land
    in the surface layer (RMAX1)          No default      ! RMAX1 = 100. !
                                          Units: km
    Maximum radius of influence over land
    aloft (RMAX2)                         No default      ! RMAX2 = 300. !
                                          Units: km
    Maximum radius of influence over water
    (RMAX3)                               No default      ! RMAX3 = 500. !
                                          Units: km


 OTHER WIND FIELD INPUT PARAMETERS

    Minimum radius of influence used in
    the wind field interpolation (RMIN)   Default: 0.1    ! RMIN = 0.1 !
                                          Units: km
    Radius of influence of terrain
    features (TERRAD)                     No default      ! TERRAD = 10. !

                                          Units: km
    Relative weighting of the first
    guess field and observations in the
    SURFACE layer (R1)                    No default      ! R1 = 10. !
    (R1 is the distance from an           Units: km
    observational station at which the
    observation and first guess field are
    equally weighted)

    Relative weighting of the first
    guess field and observations in the
    layers ALOFT (R2)                     No default      ! R2 = 50. !
    (R2 is applied in the upper layers    Units: km
    in the same manner as R1 is used in
    the surface layer).

    Relative weighting parameter of the
    prognostic wind field data (RPROG)    No default      ! RPROG = 0. !
    (Used only if IPROG = 1)              Units: km
    ------------------------

    Maximum acceptable divergence in the
    divergence minimization procedure
    (DIVLIM)                              Default: 5.E-6  ! DIVLIM= 5.0E-06 !

    Maximum number of iterations in the
    divergence min. procedure (NITER)     Default: 50     ! NITER =  50  !

    Number of passes in the smoothing
    procedure (NSMTH(NZ))
    NOTE: NZ values must be entered
         Default: 2,(mxnz-1)*4 ! NSMTH =
2 ,  4 ,  4 ,  4 ,  4 ,  4 ,  4 ,  4 ,  4 ,  4  !

    Maximum number of stations used in
    each layer for the interpolation of
    data to a grid point (NINTR2(NZ))
    NOTE: NZ values must be entered       Default: 99.    ! NINTR2 =
99 ,  99 ,  99 ,  99 ,  99 ,  99 ,  99 ,  99 ,  99 ,  99  !

    Critical Froude number (CRITFN)       Default: 1.0    ! CRITFN = 1. !

    Empirical factor controlling the
    influence of kinematic effects
```

```
     (ALPHA)                              Default: 0.1     ! ALPHA = 0.1 !

     Multiplicative scaling factor for
     extrapolation of surface observations
     to upper layers (FEXTR2(NZ))         Default: NZ*0.0
     ! FEXTR2 = 0., 0., 0., 0., 0., 0., 0., 0., 0., 0. !
     (Used only if IEXTRP = 3 or -3)


  BARRIER INFORMATION

     Number of barriers to interpolation
     of the wind fields (NBAR)            Default: 0       ! NBAR =  0  !

     THE FOLLOWING 4 VARIABLES ARE INCLUDED
     ONLY IF NBAR > 0
     NOTE: NBAR values must be entered    No defaults
           for each variable              Units: km

        X coordinate of BEGINNING
        of each barrier (XBBAR(NBAR))     ! XBBAR = 0. !
        Y coordinate of BEGINNING
        of each barrier (YBBAR(NBAR))     ! YBBAR = 0. !

        X coordinate of ENDING
        of each barrier (XEBAR(NBAR))     ! XEBAR = 0. !
        Y coordinate of ENDING
        of each barrier (YEBAR(NBAR))     ! YEBAR = 0. !


  DIAGNOSTIC MODULE DATA INPUT OPTIONS

     Surface temperature (IDIOPT1)        Default: 0       ! IDIOPT1 =  0  !
        0 = Compute internally from
            hourly surface observations
        1 = Read preprocessed values from
            a data file (DIAG.DAT)

        Surface met. station to use for
        the surface temperature (ISURFT)  No default      ! ISURFT =  1  !
        (Must be a value from 1 to NSSTA)
        (Used only if IDIOPT1 = 0)
        --------------------------

     Domain-averaged temperature lapse
     rate (IDIOPT2)                       Default: 0      ! IDIOPT2 =  0  !
        0 = Compute internally from
            twice-daily upper air observations
        1 = Read hourly preprocessed values
            from a data file (DIAG.DAT)

        Upper air station to use for
        the domain-scale lapse rate (IUPT) No default     ! IUPT   =  1  !
        (Must be a value from 1 to NUSTA)
        (Used only if IDIOPT2 = 0)
        --------------------------

        Depth through which the domain-scale
        lapse rate is computed (ZUPT)     Default: 200.  ! ZUPT = 200. !
        (Used only if IDIOPT2 = 0)        Units: meters
        --------------------------

     Domain-averaged wind components
     (IDIOPT3)                            Default: 0      ! IDIOPT3 =  0  !
        0 = Compute internally from
```

```
                 twice-daily upper air observations
             1 = Read hourly preprocessed values
                 a data file (DIAG.DAT)

             Upper air station to use for
             the domain-scale winds (IUPWND)     Default: -1     ! IUPWND = -1  !
             (Must be a value from -1 to NUSTA)
             (Used only if IDIOPT3 = 0)
             --------------------------


             Bottom and top of layer through
             which the domain-scale winds
             are computed
             (ZUPWND(1), ZUPWND(2))        Defaults: 1., 1000. ! ZUPWND= 1., 5000. !
             (Used only if IDIOPT3 = 0)    Units: meters
             --------------------------

          Observed surface wind components
          for wind field module (IDIOPT4)  Default: 0     ! IDIOPT4 =  0  !
             0 = Read WS, WD from a surface
                 data file (SURF.DAT)
             1 = Read hourly preprocessed U, V from
                 a data file (DIAG.DAT)

          Observed upper air wind components
          for wind field module (IDIOPT5)  Default: 0     ! IDIOPT5 =  0  !
             0 = Read WS, WD from an upper
                 air data file (UP1.DAT, UP2.DAT, etc.)
             1 = Read hourly preprocessed U, V from
                 a data file (DIAG.DAT)

          LAKE BREEZE INFORMATION

             Use Lake Breeze Module  (LLBREZE)
                                            Default: F      ! LLBREZE = F !

              Number of lake breeze regions (NBOX)           ! NBOX =  0  !

           X Grid line 1 defining the region of interest
                                                       ! XG1 = 0. !
           X Grid line 2 defining the region of interest
                                                       ! XG2 = 0. !
           Y Grid line 1 defining the region of interest
                                                       ! YG1 = 0. !
           Y Grid line 2 defining the region of interest
                                                       ! YG2 = 0. !

            X Point defining the coastline (Straight line)
                       (XBCST)  (KM)   Default: none    ! XBCST = 0. !

            Y Point defining the coastline (Straight line)
                       (YBCST)  (KM)   Default: none    ! YBCST = 0. !

            X Point defining the coastline (Straight line)
                       (XECST)  (KM)   Default: none    ! XECST = 0. !

            Y Point defining the coastline (Straight line)
                       (YECST)  (KM)   Default: none    ! YECST = 0. !


          Number of stations in the region     Default: none ! NLB =  0 !
          (Surface stations + upper air stations)

          Station ID's  in the region   (METBXID(NLB))
          (Surface stations first, then upper air stations)
```

```
        ! METBXID =  0 !

!END!


-------------------------------------------------------------------------------

INPUT GROUP: 6 -- Mixing Height, Temperature and Precipitation Parameters
--------------

    EMPIRICAL MIXING HEIGHT CONSTANTS

       Neutral, mechanical equation
       (CONSTB)                              Default: 1.41    ! CONSTB = 1.41 !
       Convective mixing ht. equation
       (CONSTE)                              Default: 0.15    ! CONSTE = 0.15 !
       Stable mixing ht. equation
       (CONSTN)                              Default: 2400.   ! CONSTN = 2400.!
       Overwater mixing ht. equation
       (CONSTW)                              Default: 0.16    ! CONSTW = 0.16 !
       Absolute value of Coriolis
       parameter (FCORIOL)                   Default: 1.E-4   ! FCORIOL = 7.0E-05!
                                             Units: (1/s)

    SPATIAL AVERAGING OF MIXING HEIGHTS

       Conduct spatial averaging
       (IAVEZI)  (0=no, 1=yes)               Default: 1       ! IAVEZI =  1  !

       Max. search radius in averaging
       process (MNMDAV)                      Default: 1       ! MNMDAV =  3  !
                                             Units: Grid
                                                    cells
       Half-angle of upwind looking cone
       for averaging (HAFANG)                Default: 30.     ! HAFANG = 30. !
                                             Units: deg.
       Layer of winds used in upwind
       averaging (ILEVZI)                    Default: 1       ! ILEVZI =  1  !
       (must be between 1 and NZ)

    OTHER MIXING HEIGHT VARIABLES

       Minimum potential temperature lapse
       rate in the stable layer above the
       current convective mixing ht.         Default: 0.001   ! DPTMIN = 0.001 !
       (DPTMIN)                              Units: deg. K/m
       Depth of layer above current conv.
       mixing height through which lapse     Default: 200.    ! DZZI = 200. !
       rate is computed (DZZI)               Units: meters

       Minimum overland mixing height        Default:  50.    ! ZIMIN = 60. !
       (ZIMIN)                               Units: meters
       Maximum overland mixing height        Default: 3000.   ! ZIMAX = 3300. !
       (ZIMAX)                               Units: meters
       Minimum overwater mixing height       Default:   50.   ! ZIMINW = 50. !
       (ZIMINW) -- (Not used if observed     Units: meters
       overwater mixing hts. are used)
       Maximum overwater mixing height       Default: 3000.   ! ZIMAXW = 3000. !
       (ZIMAXW) -- (Not used if observed     Units: meters
       overwater mixing hts. are used)


    TEMPERATURE PARAMETERS

       3D temperature from observations or
```

```
      from prognostic data? (ITPROG)       Default:0        !ITPROG =  0   !

         0 = Use Surface and upper air stations
             (only if NOOBS = 0)
         1 = Use Surface stations (no upper air observations)
             Use MM5 for upper air data
             (only if NOOBS = 0,1)
         2 = No surface or upper air observations
             Use MM5 for surface and upper air data
             (only if NOOBS = 0,1,2)

      Interpolation type
      (1 = 1/R ; 2 = 1/R**2)               Default:1        ! IRAD =  1  !

      Radius of influence for temperature
      interpolation (TRADKM)               Default: 500.    ! TRADKM = 100. !
                                           Units: km

      Maximum Number of stations to include
      in temperature interpolation (NUMTS) Default: 5       ! NUMTS = 4  !

      Conduct spatial averaging of temp-
      eratures (IAVET)  (0=no, 1=yes)        Default: 1    ! IAVET =  1  !
      (will use mixing ht MNMDAV,HAFANG
       so make sure they are correct)

      Default temperature gradient       Default: -.0098 ! TGDEFB = -0.0098 !
      below the mixing height over
      water (K/m) (TGDEFB)

      Default temperature gradient       Default: -.0045 ! TGDEFA = -0.0045 !
      above the mixing height over
      water (K/m) (TGDEFA)

      Beginning (JWAT1) and ending (JWAT2)
      land use categories for temperature                   ! JWAT1 =  54  !
      interpolation over water -- Make                      ! JWAT2 =  55  !
      bigger than largest land use to disable

  PRECIP INTERPOLATION PARAMETERS

      Method of interpolation (NFLAGP)     Default = 2    ! NFLAGP =  2  !
       (1=1/R,2=1/R**2,3=EXP/R**2)
      Radius of Influence (km) (SIGMAP)    Default = 100.0  ! SIGMAP = 25. !
       (0.0 => use half dist. btwn
        nearest stns w & w/out
        precip when NFLAGP = 3)
      Minimum Precip. Rate Cutoff (mm/hr)  Default = 0.01  ! CUTP = 0.01 !
       (values < CUTP = 0.0 mm/hr)
!END!


-------------------------------------------------------------------------------

INPUT GROUP: 7 -- Surface meteorological station parameters
--------------

     SURFACE STATION VARIABLES
     (One record per station --  9  records in all)


            1      2
        Name    ID            X coord.   Y coord.   Time   Anem.
                                (km)       (km)     zone   Ht.(m)
      ----------------------------------------------------------
```

```
! SS1  ='TLH'   93805      176.423     3366.038    5    7.62  !
! SS2  ='JAX'   13889      432.840     3374.430    5    6.1  !
! SS3  ='DTN'   12834      495.160     3228.290    5    9.1  !
! SS4  ='TPA'   12842      349.230     3094.530    5    6.7  !
! SS5  ='WPB'   12844      589.570     2951.680    5    7  !
! SS6  ='GNV'   12816      377.430     3284.360    5    7  !
! SS7  ='ORL'   12815      468.980     3147.130    5    10  !
! SS8  ='VRB'   12843      557.530     3058.600    5    6  !
! SS9  ='FTM'   12835      433.600     2940.460    5    7  !
-------------------
       1
         Four character string for station name
         (MUST START IN COLUMN 9)

       2
         Five digit integer for station ID

!END!


--------------------------------------------------------------------------------

INPUT GROUP: 8 -- Upper air meteorological station parameters
--------------

     UPPER AIR STATION VARIABLES
     (One record per station --  4  records in all)

              1      2
         Name     ID      X coord.   Y coord.  Time zone
                            (km)       (km)
        ----------------------------------------------
! US1  ='TPA'   12842    361.961   3064.616    5  !
! US2  ='WPB'   12844    587.557   2951.295    5  !
! US3  ='APL'   12832    110.103   3295.675    5  !
! US4  ='AYS'   13861    366.691   3458.154    5  !
-------------------
       1
         Four character string for station name
         (MUST START IN COLUMN 9)

       2
         Five digit integer for station ID

!END!


--------------------------------------------------------------------------------

INPUT GROUP: 9 -- Precipitation station parameters
--------------

     PRECIPITATION STATION VARIABLES
     (One record per station --  32  records in all)
     (NOT INCLUDED IF NPSTA = 0)

             1           2
         Name   Station    X coord.  Y coord.
                 Code        (km)      (km)
         ------------------------------------

! PS1  ='0616'   80616    528.152   2953.240      !
! PS2  ='0975'   80975    313.455   3314.816      !
! PS3  ='1048'   81048    358.043   3149.793      !
! PS4  ='1271'   81271    536.455   2971.757      !
```

```
! PS5  ='1654'   81654    508.253   2958.749      !
! PS6  ='2008'   82008    290.243   3281.967      !
! PS7  ='2158'   82158    495.139   3228.262      !
! PS8  ='2229'   82229    470.785   3209.906      !
! PS9  ='2391'   82391    283.511   3348.630      !
! PS10 ='3186'   83186    413.663   2940.542      !
! PS11 ='3322'   83322    354.862   3284.601      !
! PS12 ='4273'   84273    334.355   3205.520      !
! PS13 ='4358'   84358    432.827   3374.400      !
! PS14 ='4797'   84797    409.850   3099.425      !
! PS15 ='5076'   85076    423.637   3193.503      !
! PS16 ='5237'   85237    409.299   3230.505      !
! PS17 ='5391'   85391    479.001   3281.907      !
! PS18 ='5612'   85612    534.376   3110.213      !
! PS19 ='5895'   85895    491.753   2967.941      !
! PS20 ='6628'   86628    468.962   3147.094      !
! PS21 ='6657'   86657    470.178   2962.436      !
! PS22 ='6880'   86880    358.536   3050.057      !
! PS23 ='7293'   87293    538.005   2984.610      !
! PS24 ='7440'   87440    385.975   3326.799      !
! PS25 ='7851'   87851    375.805   3134.743      !
! PS26 ='7859'   87859    571.065   2999.597      !
! PS27 ='7886'   87886    339.083   3072.461      !
! PS28 ='8788'   88788    349.216   3094.493      !
! PS29 ='9176'   89176    357.942   2998.321      !
! PS30 ='9184'   89184    466.986   2995.672      !
! PS31 ='9219'   89219    554.260   3056.670      !
! PS32 ='9525'   89525    587.853   2951.629      !

-------------------
      1
        Four character string for station name
        (MUST START IN COLUMN 9)

      2
        Six digit station code composed of state
        code (first 2 digits) and station ID (last
        4 digits)

!END!
```

ATTACHMENT F2

CALPUFF OUTPUT LIST FILE

```
                                             CALPUFF       Version: 5.7          Level: 030402
****************************************************************************************************************************************



 Clock time: 13:17:02
       Date: 07-30-2004


 Run Title:
    SECI Payne Creek - P&W SCCTS; Case 4, Oil-Firing
    Chassahowitzka NWR Class I Impacts; AERMOD Type Dispersion
    Refined CALMET Data Provided by FDEP, 1990


--------------------------------------------------------------------------------

INPUT GROUP: 1 -- General run control parameters
--------------

    Option to run all periods found
    in the met. file     (METRUN)   Default: 0       ! METRUN =   0  !

         METRUN = 0 - Run period explicitly defined below
         METRUN = 1 - Run all periods in met. file

     Starting date:   Year (IBYR) -- No default       ! IBYR =  1990  !
     (used only if   Month (IBMO) -- No default       ! IBMO =  1  !
      METRUN = 0)      Day (IBDY) -- No default       ! IBDY =  6  !
                      Hour (IBHR) -- No default       ! IBHR =  0  !

     Base time zone        (XBTZ) -- No default       ! XBTZ = 5.0  !
        PST = 8., MST = 7.
        CST = 6., EST = 5.

     Length of run (hours) (IRLG) -- No default       ! IRLG =  8616  !

     Number of chemical species (NSPEC)
                                 Default: 5       ! NSPEC =  6   !

     Number of chemical species
     to be emitted  (NSE)        Default: 3       ! NSE =  4   !

     Flag to stop run after
     SETUP phase (ITEST)         Default: 2       ! ITEST =  2   !
     (Used to allow checking
     of the model inputs, files, etc.)
           ITEST = 1 - STOPS program after SETUP phase
           ITEST = 2 - Continues with execution of program
                       after SETUP
     Restart Configuration:

        Control flag (MRESTART)      Default: 0       ! MRESTART =  0   !

           0 = Do not read or write a restart file
           1 = Read a restart file at the beginning of
               the run
           2 = Write a restart file during run
           3 = Read a restart file at beginning of run
               and write a restart file during run

        Number of periods in Restart
        output cycle (NRESPD)        Default: 0       ! NRESPD =  0   !

           0 = File written only at last period
```

```
            >0 = File updated every NRESPD periods

      Meteorological Data Format (METFM)
                                       Default: 1       ! METFM =  1   !

             METFM = 1 - CALMET binary file (CALMET.MET)
             METFM = 2 - ISC ASCII file (ISCMET.MET)
             METFM = 3 - AUSPLUME ASCII file (PLMMET.MET)
             METFM = 4 - CTDM plus tower file (PROFILE.DAT) and
                         surface parameters file (SURFACE.DAT)

      PG sigma-y is adjusted by the factor (AVET/PGTIME)**0.2
      Averaging Time (minutes) (AVET)
                                       Default: 60.0    ! AVET = 60. !
      PG Averaging Time (minutes) (PGTIME)
                                       Default: 60.0    ! PGTIME = 60. !


!END!

--------------------------------------------------
NOTICE: Starting year in control file sets the
        expected century for the simulation.  All
        YY years are converted to YYYY years in
        the range:  1940 2039
--------------------------------------------------



---------------------------------------------------------------------------

INPUT GROUP: 2 -- Technical options
--------------


      Vertical distribution used in the
      near field (MGAUSS)                   Default: 1     ! MGAUSS =  1   !
         0 = uniform
         1 = Gaussian

      Terrain adjustment method
      (MCTADJ)                              Default: 3     ! MCTADJ =  3   !
         0 = no adjustment
         1 = ISC-type of terrain adjustment
         2 = simple, CALPUFF-type of terrain
             adjustment
         3 = partial plume path adjustment

      Subgrid-scale complex terrain
      flag (MCTSG)                          Default: 0     ! MCTSG =  0   !
         0 = not modeled
         1 = modeled

      Near-field puffs modeled as
      elongated 0 (MSLUG)                   Default: 0     ! MSLUG =  0   !
         0 = no
         1 = yes (slug model used)

      Transitional plume rise modeled ?
      (MTRANS)                              Default: 1     ! MTRANS =  1   !
         0 = no  (i.e., final rise only)
         1 = yes (i.e., transitional rise computed)

      Stack tip downwash? (MTIP)            Default: 1     ! MTIP =  1  !
         0 = no  (i.e., no stack tip downwash)
```

```
          1 = yes (i.e., use stack tip downwash)

       Vertical wind shear modeled above
       stack top? (MSHEAR)                 Default: 0     ! MSHEAR =  0  !
          0 = no  (i.e., vertical wind shear not modeled)
          1 = yes (i.e., vertical wind shear modeled)

       Puff splitting allowed? (MSPLIT)    Default: 0     ! MSPLIT =  0  !
          0 = no (i.e., puffs not split)
          1 = yes (i.e., puffs are split)

       Chemical mechanism flag (MCHEM)     Default: 1     ! MCHEM =  1   !
          0 = chemical transformation not
              modeled
          1 = transformation rates computed
              internally (MESOPUFF II scheme)
          2 = user-specified transformation
              rates used
          3 = transformation rates computed
              internally (RIVAD/ARM3 scheme)
          4 = secondary organic aerosol formation
              computed (MESOPUFF II scheme for OH)

       Aqueous phase transformation flag (MAQCHEM)
       (Used only if MCHEM = 1, or 3)      Default: 0     ! MAQCHEM =  0   !
          0 = aqueous phase transformation
              not modeled
          1 = transformation rates adjusted
              for aqueous phase reactions

       Wet removal modeled ? (MWET)        Default: 1     ! MWET =  1   !
          0 = no
          1 = yes

       Dry deposition modeled ? (MDRY)     Default: 1     ! MDRY =  1   !
          0 = no
          1 = yes
          (dry deposition method specified
           for each species in Input Group 3)

       Method used to compute dispersion
       coefficients (MDISP)                Default: 3     ! MDISP =  2   !

          1 = dispersion coefficients computed from measured values
              of turbulence, sigma v, sigma w
          2 = dispersion coefficients from internally calculated
              sigma v, sigma w using micrometeorological variables
              (u*, w*, L, etc.)
          3 = PG dispersion coefficients for RURAL areas (computed using
              the ISCST multi-segment approximation) and MP coefficients in
              urban areas
          4 = same as 3 except PG coefficients computed using
              the MESOPUFF II eqns.
          5 = CTDM sigmas used for stable and neutral conditions.
              For unstable conditions, sigmas are computed as in
              MDISP = 3, described above.  MDISP = 5 assumes that
              measured values are read

       Sigma-v/sigma-theta, sigma-w measurements used? (MTURBVW)
       (Used only if MDISP = 1 or 5)       Default: 3     ! MTURBVW =  3  !
          1 = use sigma-v or sigma-theta measurements
              from PROFILE.DAT to compute sigma-y
              (valid for METFM = 1, 2, 3, 4)
          2 = use sigma-w measurements
              from PROFILE.DAT to compute sigma-z
```

```
             (valid for METFM = 1, 2, 3, 4)
         3 = use both sigma-(v/theta) and sigma-w
             from PROFILE.DAT to compute sigma-y and sigma-z
             (valid for METFM = 1, 2, 3, 4)
         4 = use sigma-theta measurements
             from PLMMET.DAT to compute sigma-y
             (valid only if METFM = 3)

      Back-up method used to compute dispersion
      when measured turbulence data are
      missing (MDISP2)                      Default: 3     ! MDISP2 =  3  !
      (used only if MDISP = 1 or 5)
         2 = dispersion coefficients from internally calculated
             sigma v, sigma w using micrometeorological variables
             (u*, w*, L, etc.)
         3 = PG dispersion coefficients for RURAL areas (computed using
             the ISCST multi-segment approximation) and MP coefficients in
             urban areas
         4 = same as 3 except PG coefficients computed using
             the MESOPUFF II eqns.

      PG sigma-y,z adj. for roughness?      Default: 0     ! MROUGH =  0  !
      (MROUGH)
         0 = no
         1 = yes

      Partial plume penetration of          Default: 1     ! MPARTL =  1  !
      elevated inversion?
      (MPARTL)
         0 = no
         1 = yes

      Strength of temperature inversion     Default: 0     ! MTINV =  0  !
      provided in PROFILE.DAT extended records?
      (MTINV)
         0 = no (computed from measured/default gradients)
         1 = yes

      PDF used for dispersion under convective conditions?
                                            Default: 0     ! MPDF =  1  !
      (MPDF)
         0 = no
         1 = yes

      Sub-Grid TIBL module used for shore line?
                                            Default: 0     ! MSGTIBL = 0  !
      (MSGTIBL)
         0 = no
         1 = yes

      Boundary conditions (concentration) modeled?
                                            Default: 0     ! MBCON = 0  !
      (MBCON)
         0 = no
         1 = yes


      Analyses of fogging and icing impacts due to emissions from
      arrays of mechanically-forced cooling towers can be performed
      using CALPUFF in conjunction with a cooling tower emissions
      processor (CTEMISS) and its associated postprocessors.  Hourly
      emissions of water vapor and temperature from each cooling tower
      cell are computed for the current cell configuration and ambient
      conditions by CTEMISS. CALPUFF models the dispersion of these
      emissions and provides cloud information in a specialized format
```

```
     for further analysis. Output to FOG.DAT is provided in either
     'plume mode' or 'receptor mode' format.

     Configure for FOG Model output?
                                      Default: 0     ! MFOG =  0   !
     (MFOG)
        0 = no
        1 = yes  - report results in PLUME Mode format
        2 = yes  - report results in RECEPTOR Mode format


     Test options specified to see if
     they conform to regulatory
     values? (MREG)                   Default: 1     ! MREG =  0   !

        0 = NO checks are made
        1 = Technical options must conform to USEPA
            Long Range Transport (LRT) guidance
                       METFM    1 or 2
                       AVET     60. (min)
                       PGTIME   60. (min)
                       MGAUSS   1
                       MCTADJ   3
                       MTRANS   1
                       MTIP     1
                       MCHEM    1 or 3 (if modeling SOx, NOx)
                       MWET     1
                       MDRY     1
                       MDISP    2 or 3
                       MPDF     0 if MDISP=3
                                1 if MDISP=2
                       MROUGH   0
                       MPARTL   1
                       SYTDEP   550. (m)
                       MHFTSZ   0


!END!


--------------------------------------------------------------------------------

INPUT GROUP: 3a, 3b -- Species list
-------------------

------------
Subgroup (3a)
------------

  The following species are modeled:

! CSPEC =          SO2 !         !END!
! CSPEC =          SO4 !         !END!
! CSPEC =          NOX !         !END!
! CSPEC =         HNO3 !         !END!
! CSPEC =          NO3 !         !END!
! CSPEC =         PM10 !         !END!

                                                          Dry                 OUTPUT GROUP
    SPECIES          MODELED          EMITTED          DEPOSITED                 NUMBER
     NAME          (0=NO, 1=YES)    (0=NO, 1=YES)      (0=NO,                  (0=NONE,
   (Limit: 12                                           1=COMPUTED-GAS          1=1st CGRUP,
    Characters                                          2=COMPUTED-PARTICLE     2=2nd CGRUP,
    in length)                                          3=USER-SPECIFIED)       3= etc.)

```

```
!         SO2  =         1,                 1,           1,               0    !
!         SO4  =         1,                 1,           2,               0    !
!         NOX  =         1,                 1,           1,               0    !
!        HNO3  =         1,                 0,           1,               0    !
!         NO3  =         1,                 0,           2,               0    !
!        PM10  =         1,                 1,           2,               0    !

!END!

-------------
Subgroup (3b)
-------------
  The following names are used for Species-Groups in which results
  for certain species are combined (added) prior to output.  The
  CGRUP name will be used as the species name in output files.
  Use this feature to model specific particle-size distributions
  by treating each size-range as a separate species.
  Order must be consistent with 3(a) above.



-------------------------------------------------------------------------------


INPUT GROUP: 4 -- Map Projection and Grid control parameters
--------------

     Projection for all (X,Y):
     -------------------------

     Map projection
     (PMAP)                     Default: UTM    ! PMAP = UTM  !

         UTM :  Universal Transverse Mercator
         TTM :  Tangential Transverse Mercator
         LCC :  Lambert Conformal Conic
          PS :  Polar Stereographic
          EM :  Equatorial Mercator
        LAZA :  Lambert Azimuthal Equal Area

     False Easting and Northing (km) at the projection origin
     (Used only if PMAP= TTM, LCC, or LAZA)
     (FEAST)                    Default=0.0     ! FEAST  = 0.000  !
     (FNORTH)                   Default=0.0     ! FNORTH = 0.000  !

     UTM zone (1 to 60)
     (Used only if PMAP=UTM)
     (IUTMZN)                   No Default      ! IUTMZN =  17   !

     Hemisphere for UTM projection?
     (Used only if PMAP=UTM)
     (UTMHEM)                   Default: N      ! UTMHEM = N  !
         N   :  Northern hemisphere projection
         S   :  Southern hemisphere projection

     Latitude and Longitude (decimal degrees) of projection origin
     (Used only if PMAP= TTM, LCC, PS, EM, or LAZA)
     (RLAT0)                    No Default      ! RLAT0 =  0N  !
     (RLON0)                    No Default      ! RLON0 =  0E  !

         TTM :  RLON0 identifies central (true N/S) meridian of projection
                RLAT0 selected for convenience
         LCC :  RLON0 identifies central (true N/S) meridian of projection
                RLAT0 selected for convenience
         PS  :  RLON0 identifies central (grid N/S) meridian of projection
```

```
                 RLAT0 selected for convenience
          EM  :  RLON0 identifies central meridian of projection
                 RLAT0 is REPLACED by 0.0N (Equator)
          LAZA:  RLON0 identifies longitude of tangent-point of mapping plane
                 RLAT0 identifies latitude of tangent-point of mapping plane

      Matching parallel(s) of latitude (decimal degrees) for projection
      (Used only if PMAP= LCC or PS)
      (XLAT1)                   No Default      ! XLAT1 =  0N  !
      (XLAT2)                   No Default      ! XLAT2 =  0N  !

          LCC :  Projection cone slices through Earth's surface at XLAT1 and XLAT2
          PS  :  Projection plane slices through Earth at XLAT1
                 (XLAT2 is not used)

      ----------
      Note:  Latitudes and longitudes should be positive, and include a
             letter N,S,E, or W indicating north or south latitude, and
             east or west longitude.  For example,
             35.9  N Latitude  =  35.9N
             118.7 E Longitude = 118.7E


      Datum-region
      ------------

      The Datum-Region for the coordinates is identified by a character
      string.  Many mapping products currently available use the model of the
      Earth known as the World Geodetic System 1984 (WGS-G ).  Other local
      models may be in use, and their selection in CALMET will make its output
      consistent with local mapping products.  The list of Datum-Regions with
      official transformation parameters provided by the National Imagery and
      Mapping Agency (NIMA).

      NIMA Datum - Regions(Examples)
      ------------------------------------------------------------------------------
      WGS-G     WGS-84 GRS 80, Global coverage
      NAS-C     NORTH AMERICAN 1927 Clarke 1866, MEAN FOR (CONUS)
      NWS-27    NWS 6370KM Radius, Global Sphere (NAD27)
      NWS-84    NWS 6370KM Radius, Global Sphere (WGS84)
      ESR-S     ESRI REFERENCE Normal Sphere (6371KM Radius), Global Reference Sphere

      Datum-region for output coordinates
      (DATUM)                   Default: WGS-G     ! DATUM = NAS-C  !


METEOROLOGICAL Grid:

      Rectangular grid defined for projection PMAP,
      with X the Easting and Y the Northing coordinate

             No. X grid cells (NX)      No default     ! NX =  72   !
             No. Y grid cells (NY)      No default     ! NY =  88   !
          No. vertical layers (NZ)      No default     ! NZ =  10   !

            Grid spacing (DGRIDKM)      No default     ! DGRIDKM = 5. !
                                        Units: km

                 Cell face heights
                     (ZFACE(nz+1))      No defaults
                                        Units: m
         ! ZFACE = 0.,20.,40.,80.,160.,320.,500.,1000.,1500.,2500.,3500. !

             Reference Coordinates
            of SOUTHWEST corner of
```

```
                grid cell(1, 1):

           X coordinate (XORIGKM)     No default     ! XORIGKM = 250.  !
           Y coordinate (YORIGKM)     No default     ! YORIGKM = 2940. !
                                     Units: km


COMPUTATIONAL Grid:

     The computational grid is identical to or a subset of the MET. grid.
     The lower left (LL) corner of the computational grid is at grid point
     (IBCOMP, JBCOMP) of the MET. grid.  The upper right (UR) corner of the
     computational grid is at grid point (IECOMP, JECOMP) of the MET. grid.
     The grid spacing of the computational grid is the same as the MET. grid.

        X index of LL corner (IBCOMP)      No default     ! IBCOMP =  1   !
                  (1 <= IBCOMP <= NX)

        Y index of LL corner (JBCOMP)      No default     ! JBCOMP =  1   !
                  (1 <= JBCOMP <= NY)


        X index of UR corner (IECOMP)      No default     ! IECOMP =  72   !
                  (1 <= IECOMP <= NX)

        Y index of UR corner (JECOMP)      No default     ! JECOMP =  88   !
                  (1 <= JECOMP <= NY)



SAMPLING Grid (GRIDDED RECEPTORS):

     The lower left (LL) corner of the sampling grid is at grid point
     (IBSAMP, JBSAMP) of the MET. grid.  The upper right (UR) corner of the
     sampling grid is at grid point (IESAMP, JESAMP) of the MET. grid.
     The sampling grid must be identical to or a subset of the computational
     grid.  It may be a nested grid inside the computational grid.
     The grid spacing of the sampling grid is DGRIDKM/MESHDN.

        Logical flag indicating if gridded
        receptors are used (LSAMP)         Default: T     ! LSAMP = F !
        (T=yes, F=no)

        X index of LL corner (IBSAMP)      No default     ! IBSAMP =  0   !
         (IBCOMP <= IBSAMP <= IECOMP)

        Y index of LL corner (JBSAMP)      No default     ! JBSAMP =  0   !
         (JBCOMP <= JBSAMP <= JECOMP)


        X index of UR corner (IESAMP)      No default     ! IESAMP =  0   !
         (IBCOMP <= IESAMP <= IECOMP)

        Y index of UR corner (JESAMP)      No default     ! JESAMP =  0   !
         (JBCOMP <= JESAMP <= JECOMP)


       Nesting factor of the sampling
        grid (MESHDN)                      Default: 1     ! MESHDN =  1  !
        (MESHDN is an integer >= 1)

!END!


-------------------------------------------------------------------------------
```

```
INPUT GROUP: 5 -- Output Options
--------------
                                           *                            *
     FILE                          DEFAULT VALUE            VALUE THIS RUN
     ----                          -------------            --------------

   Concentrations (ICON)                 1                  !  ICON =  1   !
   Dry Fluxes (IDRY)                     1                  !  IDRY =  1   !
   Wet Fluxes (IWET)                     1                  !  IWET =  1   !
   Relative Humidity (IVIS)              1                  !  IVIS =  1   !
    (relative humidity file is
     required for visibility
     analysis)
   Use data compression option in output file?
   (LCOMPRS)                           Default: T           ! LCOMPRS = T !

   *
    0 = Do not create file, 1 = create file


    DIAGNOSTIC MASS FLUX OUTPUT OPTIONS:

       Mass flux across specified boundaries
       for selected species reported hourly?
       (IMFLX)                         Default: 0           ! IMFLX =  0  !
         0 = no
         1 = yes (FLUXBDY.DAT and MASSFLX.DAT filenames
                  are specified in Input Group 0)

       Mass balance for each species
       reported hourly?
       (IMBAL)                         Default: 0           ! IMBAL =  0  !
         0 = no
         1 = yes (MASSBAL.DAT filename is
              specified in Input Group 0)


    LINE PRINTER OUTPUT OPTIONS:

       Print concentrations (ICPRT)    Default: 0           ! ICPRT =  0   !
       Print dry fluxes (IDPRT)        Default: 0           ! IDPRT =  0   !
       Print wet fluxes (IWPRT)        Default: 0           ! IWPRT =  0   !
       (0 = Do not print, 1 = Print)

       Concentration print interval
       (ICFRQ) in hours                Default: 1           ! ICFRQ =  1   !
       Dry flux print interval
       (IDFRQ) in hours                Default: 1           ! IDFRQ =  1   !
       Wet flux print interval
       (IWFRQ) in hours                Default: 1           ! IWFRQ =  1   !

       Units for Line Printer Output
       (IPRTU)                         Default: 1           ! IPRTU =  3   !
                         for            for
                    Concentration    Deposition
           1 =        g/m**3          g/m**2/s
           2 =       mg/m**3         mg/m**2/s
           3 =       ug/m**3         ug/m**2/s
           4 =       ng/m**3         ng/m**2/s
           5 =      Odour Units

       Messages tracking progress of run
       written to the screen ?
```

```
        (IMESG)                          Default: 2         ! IMESG =  2   !
          0 = no
          1 = yes (advection step, puff ID)
          2 = yes (YYYYJJJHH, # old puffs, # emitted puffs)


     SPECIES (or GROUP for combined species) LIST FOR OUTPUT OPTIONS

                  ---- CONCENTRATIONS ----   ------ DRY FLUXES ------   ------ WET FLUXES ------   -- MASS FLUX --
   SPECIES
   /GROUP         PRINTED?  SAVED ON DISK?   PRINTED?  SAVED ON DISK?   PRINTED?  SAVED ON DISK?   SAVED ON DISK?
   -------        ------------------------   ------------------------   ------------------------   ---------------
!          SO2 =     0,           1,             0,          1,             0,          1,             0   !
!          SO4 =     0,           1,             0,          1,             0,          1,             0   !
!          NOX =     0,           1,             0,          1,             0,          0,             0   !
!         HNO3 =     0,           1,             0,          1,             0,          1,             0   !
!          NO3 =     0,           1,             0,          1,             0,          1,             0   !
!         PM10 =     0,           1,             0,          1,             0,          1,             0   !

     OPTIONS FOR PRINTING "DEBUG" QUANTITIES (much output)

        Logical for debug output
        (LDEBUG)                                 Default: F     ! LDEBUG = F !

        First puff to track
        (IPFDEB)                                 Default: 1     ! IPFDEB =  1  !

        Number of puffs to track
        (NPFDEB)                                 Default: 1     ! NPFDEB =  1  !

        Met. period to start output
        (NN1)                                    Default: 1     ! NN1 =  1   !

        Met. period to end output
        (NN2)                                    Default: 10    ! NN2 =  10  !

!END!



--------------------------------------------------------------------------------


INPUT GROUP: 6a, 6b, & 6c -- Subgrid scale complex terrain inputs
-------------------------


---------------
Subgroup (6a)
---------------
        Number of terrain features (NHILL)       Default: 0     ! NHILL =  0   !

        Number of special complex terrain
        receptors  (NCTREC)                      Default: 0     ! NCTREC =  0   !

        Terrain and CTSG Receptor data for
        CTSG hills input in CTDM format ?
        (MHILL)                                  No Default     ! MHILL =  2   !
        1 = Hill and Receptor data created
            by CTDM processors & read from
            HILL.DAT and HILLRCT.DAT files
        2 = Hill data created by OPTHILL &
            input below in Subgroup (6b);
            Receptor data in Subgroup (6c)

        Factor to convert horizontal dimensions  Default: 1.0   ! XHILL2M = 1. !
        to meters (MHILL=1)
```

```

      Factor to convert vertical dimensions    Default: 1.0    ! ZHILL2M = 1. !
      to meters (MHILL=1)

      X-origin of CTDM system relative to      No Default      ! XCTDMKM = 0.0E00 !
      CALPUFF coordinate system, in Kilometers (MHILL=1)

      Y-origin of CTDM system relative to      No Default      ! YCTDMKM = 0.0E00 !
      CALPUFF coordinate system, in Kilometers (MHILL=1)

! END !

---------------
Subgroup (6b)
---------------

                       1 **
    HILL information


HILL          XC        YC        THETAH  ZGRID  RELIEF     EXPO 1     EXPO 2    SCALE 1    SCALE 2    AMAX1      AMAX2
 NO.         (km)      (km)      (deg.)   (m)     (m)        (m)        (m)        (m)        (m)        (m)        (m)
----          ----      ----      ------  -----  ------     ------     ------    -------    -------    -----      -----

---------------
Subgroup (6c)
---------------

    COMPLEX TERRAIN RECEPTOR INFORMATION

                       XRCT         YRCT        ZRCT         XHH
                       (km)         (km)         (m)
                      ------       -----       ------        ----


-------------------
1
     Description of Complex Terrain Variables:
          XC, YC  = Coordinates of center of hill
          THETAH  = Orientation of major axis of hill (clockwise from
                    North)
          ZGRID   = Height of the  0  of the grid above mean sea
                    level
          RELIEF  = Height of the crest of the hill above the grid elevation
          EXPO 1  = Hill-shape exponent for the major axis
          EXPO 2  = Hill-shape exponent for the major axis
          SCALE 1 = Horizontal length scale along the major axis
          SCALE 2 = Horizontal length scale along the minor axis
          AMAX    = Maximum allowed axis length for the major axis
          BMAX    = Maximum allowed axis length for the major axis

          XRCT, YRCT = Coordinates of the complex terrain receptors
          ZRCT    = Height of the ground (MSL) at the complex terrain
                    Receptor
          XHH     = Hill number associated with each complex terrain receptor
                    (NOTE: MUST BE ENTERED AS A REAL NUMBER)

   **
     NOTE: DATA for each hill and CTSG receptor are treated as a separate
           input subgroup and therefore must end with an input group terminator.

-------------------------------------------------------------------------------


INPUT GROUP: 7 -- Chemical parameters for dry deposition of gases
```

```
--------------

      SPECIES     DIFFUSIVITY      ALPHA STAR      REACTIVITY    MESOPHYLL RESISTANCE      HENRY'S LAW COEFFICIENT
       NAME        (cm**2/s)                                             (s/cm)                 (dimensionless)
      -------     -----------      ----------      ----------    --------------------      ----------------------

!          SO2 =     0.1509,          1000.,            8.,              0.,                      0.04 !
!          NOX =     0.1656,             1.,            8.,              5.,                       3.5 !
!         HNO3 =     0.1628,             1.,           18.,              0.,                0.00000008 !

!END!


-------------------------------------------------------------------------------


INPUT GROUP: 8 -- Size parameters for dry deposition of particles
--------------

     For SINGLE SPECIES, the mean and standard deviation are used to
     compute a deposition velocity for NINT (see group 9) size-ranges,
     and these are then averaged to obtain a mean deposition velocity.

     For GROUPED SPECIES, the size distribution should be explicitly
     specified (by the 'species' in the group), and the standard deviation
     for each should be entered as 0.  The model will then use the
     deposition velocity for the stated mean diameter.

      SPECIES      GEOMETRIC MASS MEAN        GEOMETRIC STANDARD
       NAME              DIAMETER                 DEVIATION
                         (microns)                (microns)
      -------      -------------------        ------------------
!          SO4 =          0.48,                     0.5  !
!          NO3 =          0.48,                     0.5  !
!         PM10 =          0.10,                     0.0  !

!END!


-------------------------------------------------------------------------------


INPUT GROUP: 9 -- Miscellaneous dry deposition parameters
--------------

     Reference cuticle resistance (s/cm)
     (RCUTR)                          Default: 30    !  RCUTR = 30.0 !
     Reference ground resistance  (s/cm)
     (RGR)                            Default: 10    !    RGR = 10.0 !
     Reference pollutant reactivity
     (REACTR)                         Default: 8     ! REACTR = 8.0 !

     Number of particle-size intervals used to
     evaluate effective particle deposition velocity
     (NINT)                           Default: 9     !   NINT =  9   !

     Vegetation state in unirrigated areas
     (IVEG)                           Default: 1     !   IVEG =  1   !
        IVEG=1 for active and unstressed vegetation
        IVEG=2 for active and stressed vegetation
        IVEG=3 for inactive vegetation

!END!
```

```
--------------------------------------------------------------------------------


INPUT GROUP: 10 -- Wet Deposition Parameters
---------------


                      Scavenging Coefficient -- Units: (sec)**(-1)

       Pollutant      Liquid Precip.       Frozen Precip.
       ---------      --------------       --------------
!           SO2 =        3.0E-05,             0.0E00 !
!           SO4 =        1.0E-04,            3.0E-05 !
!          HNO3 =        6.0E-05,             0.0E00 !
!           NO3 =        1.0E-04,            3.0E-05 !
!          PM10 =        1.0E-04,            3.0E-05 !

!END!


--------------------------------------------------------------------------------


INPUT GROUP: 11 -- Chemistry Parameters
---------------

     Ozone data input option (MOZ)     Default: 1            ! MOZ =  1   !
     (Used only if MCHEM = 1, 3, or 4)
        0 = use a monthly background ozone value
        1 = read hourly ozone concentrations from
            the OZONE.DAT data file

     Monthly ozone concentrations
     (Used only if MCHEM = 1, 3, or 4 and
      MOZ = 0 or MOZ = 1 and all hourly O3 data missing)
     (BCKO3) in ppb                    Default: 12*80.
     !  BCKO3 = 80.00, 80.00, 80.00, 80.00, 80.00, 80.00, 80.00, 80.00, 80.00, 80.00, 80.00, 80.00 !

     Monthly ammonia concentrations
     (Used only if MCHEM = 1, or 3)
     (BCKNH3) in ppb                   Default: 12*10.
     !  BCKNH3 =  1.00,  1.00,  1.00,  1.00,  1.00,  1.00,  1.00,  1.00,  1.00,  1.00,  1.00,  1.00 !

     Nighttime SO2 loss rate (RNITE1)
     in percent/hour                   Default: 0.2          ! RNITE1 = 0.2 !

     Nighttime NOx loss rate (RNITE2)
     in percent/hour                   Default: 2.0          ! RNITE2 = 2.0 !

     Nighttime HNO3 formation rate (RNITE3)
     in percent/hour                   Default: 2.0          ! RNITE3 = 2.0 !

     H2O2 data input option (MH2O2)    Default: 1            ! MH2O2 =  1   !
     (Used only if MAQCHEM = 1)
        0 = use a monthly background H2O2 value
        1 = read hourly H2O2 concentrations from
            the H2O2.DAT data file

     Monthly H2O2 concentrations
     (Used only if MQACHEM = 1 and
      MH2O2 = 0 or MH2O2 = 1 and all hourly H2O2 data missing)
     (BCKH2O2) in ppb                  Default: 12*1.
     !  BCKH2O2 = 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00 !
```

```
--- Data for SECONDARY ORGANIC AEROSOL (SOA) Option
    (used only if MCHEM = 4)

    The SOA module uses monthly values of:
         Fine particulate concentration in ug/m^3 (BCKPMF)
         Organic fraction of fine particulate     (OFRAC)
         VOC / NOX ratio (after reaction)         (VCNX)
    to characterize the air mass when computing
    the formation of SOA from VOC emissions.
    Typical values for several distinct air mass types are:

       Month    1    2    3    4    5    6    7    8    9   10   11   12
               Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec

    Clean Continental
       BCKPMF   1.   1.   1.   1.   1.   1.   1.   1.   1.   1.   1.   1.
       OFRAC  .15  .15  .20  .20  .20  .20  .20  .20  .20  .20  .20  .15
       VCNX    50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.

    Clean Marine (surface)
       BCKPMF  .5   .5   .5   .5   .5   .5   .5   .5   .5   .5   .5   .5
       OFRAC  .25  .25  .30  .30  .30  .30  .30  .30  .30  .30  .30  .25
       VCNX    50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.

    Urban - low biogenic (controls present)
       BCKPMF  30.  30.  30.  30.  30.  30.  30.  30.  30.  30.  30.  30.
       OFRAC  .20  .20  .25  .25  .25  .25  .25  .25  .20  .20  .20  .20
       VCNX     4.   4.   4.   4.   4.   4.   4.   4.   4.   4.   4.   4.

    Urban - high biogenic (controls present)
       BCKPMF  60.  60.  60.  60.  60.  60.  60.  60.  60.  60.  60.  60.
       OFRAC  .25  .25  .30  .30  .30  .55  .55  .55  .35  .35  .35  .25
       VCNX    15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.

    Regional Plume
       BCKPMF  20.  20.  20.  20.  20.  20.  20.  20.  20.  20.  20.  20.
       OFRAC  .20  .20  .25  .35  .25  .40  .40  .40  .30  .30  .30  .20
       VCNX    15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.

    Urban - no controls present
       BCKPMF 100. 100. 100. 100. 100. 100. 100. 100. 100. 100. 100. 100.
       OFRAC  .30  .30  .35  .35  .35  .55  .55  .55  .35  .35  .35  .30
       VCNX     2.   2.   2.   2.   2.   2.   2.   2.   2.   2.   2.   2.

    Default: Clean Continental
    !  BCKPMF = 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00 !
    !  OFRAC  = 0.15, 0.15, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.15 !
    !  VCNX   = 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00 !


!END!


-------------------------------------------------------------------------------


INPUT GROUP: 12 -- Misc. Dispersion and Computational Parameters
---------------

    Horizontal size of puff (m) beyond which
    time-dependent dispersion equations (Heffter)
    are used to determine sigma-y and
    sigma-z (SYTDEP)                           Default: 550.   ! SYTDEP = 5.5E02 !

    Switch for using Heffter equation for sigma z
```

```
as above (0 = Not use Heffter; 1 = use Heffter
(MHFTSZ)                                  Default: 0       ! MHFTSZ =  0   !

Stability class used to determine plume
growth rates for puffs above the boundary
layer (JSUP)                              Default: 5       ! JSUP =  5   !

Vertical dispersion constant for stable
conditions (k1 in Eqn. 2.7-3)  (CONK1)    Default: 0.01    ! CONK1 = .01 !

Vertical dispersion constant for neutral/
unstable conditions (k2 in Eqn. 2.7-4)
(CONK2)                                   Default: 0.1     ! CONK2 = .1 !

Factor for determining Transition-point from
Schulman-Scire to Huber-Snyder Building Downwash
scheme (SS used for Hs < Hb + TBD * HL)
(TBD)                                     Default: 0.5     ! TBD = .5 !
   TBD < 0   ==> always use Huber-Snyder
   TBD = 1.5 ==> always use Schulman-Scire
   TBD = 0.5 ==> ISC Transition-point

Range of land use categories for which
urban dispersion is assumed
(IURB1, IURB2)                            Default: 10      ! IURB1 =  10  !
                                                   19      ! IURB2 =  19  !

Site characterization parameters for single-point Met data files ---------
(needed for METFM = 2,3,4)

   Land use category for modeling domain
   (ILANDUIN)                             Default: 20      ! ILANDUIN =  20  !

   Roughness length (m) for modeling domain
   (Z0IN)                                 Default: 0.25    ! Z0IN = .25 !

   Leaf area index for modeling domain
   (XLAIIN)                               Default: 3.0     ! XLAIIN = 3.0 !

   Elevation above sea level (m)
   (ELEVIN)                               Default: 0.0     ! ELEVIN = .0 !

   Latitude (degrees) for met location
   (XLATIN)                               Default: -999.   ! XLATIN = -999.0 !

   Longitude (degrees) for met location
   (XLONIN)                               Default: -999.   ! XLONIN = -999.0 !

Specialized information for interpreting single-point Met data files -----

   Anemometer height (m) (Used only if METFM = 2,3)
   (ANEMHT)                               Default: 10.     ! ANEMHT = 10.0 !

   Form of lateral turbulance data in PROFILE.DAT file
   (Used only if METFM = 4 or MTURBVW = 1 or 3)
   (ISIGMAV)                              Default: 1       ! ISIGMAV =  1  !
       0 = read sigma-theta
       1 = read sigma-v

   Choice of mixing heights (Used only if METFM = 4)
   (IMIXCTDM)                             Default: 0       ! IMIXCTDM =  0  !
       0 = read PREDICTED mixing heights
       1 = read OBSERVED mixing heights

Maximum length of a slug (met. grid units)
```

```
        (XMXLEN)                                   Default: 1.0     ! XMXLEN = 1.0 !

        Maximum travel distance of a puff/slug (in
        grid units) during one sampling step
        (XSAMLEN)                                  Default: 1.0     ! XSAMLEN = 1.0 !

        Maximum Number of slugs/puffs release from
        one source during one time step
        (MXNEW)                                    Default: 99      ! MXNEW =  99   !

        Maximum Number of sampling steps for
        one puff/slug during one time step
        (MXSAM)                                    Default: 99      ! MXSAM =  99   !

        Number of iterations used when computing
        the transport wind for a sampling step
        that includes gradual rise (for CALMET
        and PROFILE winds)
        (NCOUNT)                                   Default: 2       ! NCOUNT =  2   !

        Minimum sigma y for a new puff/slug (m)
        (SYMIN)                                    Default: 1.0     ! SYMIN = 1.0  !

        Minimum sigma z for a new puff/slug (m)
        (SZMIN)                                    Default: 1.0     ! SZMIN = 1.0  !

        Default minimum turbulence velocities
        sigma-v and sigma-w for each
        stability class (m/s)
        (SVMIN(6) and SWMIN(6))       Default SVMIN : .50,  .50,  .50,  .50,  .50,  .50
                                      Default SWMIN : .20,  .12,  .08,  .06,  .03,  .016

                                    Stability Class :  A     B     C     D     E     F
                                                      ---   ---   ---   ---   ---   ---
                                            ! SVMIN = 0.500, 0.500, 0.500, 0.500, 0.500, 0.500!
                                            ! SWMIN = 0.200, 0.120, 0.080, 0.060, 0.030, 0.016!

        Divergence criterion for dw/dz across puff
        used to initiate adjustment for horizontal
        convergence (1/s)
        Partial adjustment starts at CDIV(1), and
        full adjustment is reached at CDIV(2)
        (CDIV(2))                                  Default: 0.0,0.0  ! CDIV = .0, .0 !

        Minimum wind speed (m/s) allowed for
        non-calm conditions. Also used as minimum
        speed returned when using power-law
        extrapolation toward surface
        (WSCALM)                                   Default: 0.5     ! WSCALM = .5 !

        Maximum mixing height (m)
        (XMAXZI)                                   Default: 3000.   ! XMAXZI = 3000.0 !

        Minimum mixing height (m)
        (XMINZI)                                   Default: 50.     ! XMINZI = 50.0 !

        Default wind speed classes --
        5 upper bounds (m/s) are entered;
        the 6th class has no upper limit
        (WSCAT(5))                        Default    :
                                          ISC RURAL : 1.54, 3.09, 5.14, 8.23, 10.8 (10.8+)

                                   Wind Speed Class :  1     2     3     4     5
                                                      ---   ---   ---   ---   ---
                                            ! WSCAT = 1.54, 3.09, 5.14, 8.23, 10.80 !
```

```

     Default wind speed profile power-law
     exponents for stabilities 1-6
     (PLX0(6))                       Default    : ISC RURAL values
                                     ISC RURAL : .07, .07, .10, .15, .35, .55
                                     ISC URBAN : .15, .15, .20, .25, .30, .30

                               Stability Class :  A     B     C     D     E     F
                                                 ---   ---   ---   ---   ---   ---
                                        ! PLX0 = 0.07, 0.07, 0.10, 0.15, 0.35, 0.55 !

     Default potential temperature gradient
     for stable classes E, F (degK/m)
     (PTG0(2))                       Default: 0.020, 0.035
                                        ! PTG0 = 0.020,  0.035 !

     Default plume path coefficients for
     each stability class (used when option
     for partial plume height terrain adjustment
     is selected -- MCTADJ=3)
     (PPC(6))                  Stability Class :  A     B     C     D     E     F
                                   Default  PPC : .50,  .50,  .50,  .50,  .35,  .35
                                                 ---   ---   ---   ---   ---   ---
                                        !  PPC = 0.50, 0.50, 0.50, 0.50, 0.35, 0.35 !

     Slug-to-puff transition criterion factor
     equal to sigma-y/length of slug
     (SL2PF)                               Default: 10.        ! SL2PF = 10.0 !

     Puff-splitting control variables ------------------------

       VERTICAL SPLIT
       --------------

       Number of puffs that result every time a puff
       is split - nsplit=2 means that 1 puff splits
       into 2
       (NSPLIT)                            Default:   3        ! NSPLIT =  3  !

       Time(s) of a day when split puffs are eligible to
       be split once again; this is typically set once
       per day, around sunset before nocturnal shear develops.
       24 values: 0 is midnight (00:00) and 23 is 11 PM (23:00)
       0=do not re-split    1=eligible for re-split
       (IRESPLIT(24))                      Default:  Hour 17 = 1
       !  IRESPLIT = 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0 !

       Split is allowed only if last hour's mixing
       height (m) exceeds a minimum value
       (ZISPLIT)                           Default: 100.       ! ZISPLIT = 100.0 !

       Split is allowed only if ratio of last hour's
       mixing ht to the maximum mixing ht experienced
       by the puff is less than a maximum value (this
       postpones a split until a nocturnal layer develops)
       (ROLDMAX)                           Default: 0.25       ! ROLDMAX = 0.25 !


       HORIZONTAL SPLIT
       ----------------

       Number of puffs that result every time a puff
       is split - nsplith=5 means that 1 puff splits
       into 5
       (NSPLITH)                           Default:   5        ! NSPLITH =  5  !
```

```

       Minimum sigma-y (Grid Cells Units) of puff
       before it may be split
       (SYSPLITH)                        Default:  1.0       ! SYSPLITH = 1.0 !

       Minimum puff elongation rate (SYSPLITH/hr) due to
       wind shear, before it may be split
       (SHSPLITH)                        Default:  2.        ! SHSPLITH = 2.0 !

       Minimum concentration (g/m^3) of each
       species in puff before it may be split
       Enter array of NSPEC values; if a single value is
       entered, it will be used for ALL species
       (CNSPLITH)                        Default:  1.0E-07   ! CNSPLITH = 1.0E-07 !

     Integration control variables ------------------------

       Fractional convergence criterion for numerical SLUG
       sampling integration
       (EPSSLUG)                         Default:   1.0e-04  ! EPSSLUG = 1.0E-04 !

       Fractional convergence criterion for numerical AREA
       source integration
       (EPSAREA)                         Default:   1.0e-06  ! EPSAREA = 1.0E-06 !

       Trajectory step-length (m) used for numerical rise
       integration
       (DSRISE)                          Default:   1.0      ! DSRISE = 1.0 !

!END!


--------------------------------------------------------------------------------


INPUT GROUPS: 13a, 13b, 13c, 13d -- Point source parameters
--------------------------------

---------------
Subgroup (13a)
---------------

     Number of point sources with
     parameters provided below      (NPT1)  No default  !  NPT1 =  10 !

     Units used for point source
     emissions below                (IPTU)  Default: 1  !  IPTU =   1  !
           1 =       g/s
           2 =      kg/hr
           3 =      lb/hr
           4 =    tons/yr
           5 =    Odour Unit * m**3/s  (vol. flux of odour compound)
           6 =    Odour Unit * m**3/min
           7 =    metric tons/yr

     Number of source-species
     combinations with variable
     emissions scaling factors
     provided below in (13d)        (NSPT1) Default: 0  !  NSPT1 =  0  !

     Number of point sources with
     variable emission parameters
     provided in external file      (NPT2)  No default  !  NPT2 =  0  !

     (If NPT2 > 0, these point
```

```
       source emissions are read from
       the file: PTEMARB.DAT)

!END!

---------------
Subgroup (13b)
---------------
                                     a
          POINT SOURCE: CONSTANT DATA
          ----------------------------
                                                                                b          c
  Source      X UTM      Y UTM      Stack   Base      Stack    Exit  Exit     Bldg.  Emission
   No.     Coordinate Coordinate Height Elevation Diameter  Vel.  Temp.    Dwash   Rates
              (km)       (km)      (m)     (m)       (m)   (m/s) (deg. K)
  ------   ---------- ---------- ------  ------    -------- ----- -------- ----- --------
     1 ! SRCNAM = CT4A !
     1 ! X = 405.3573,3057.5536,  18.288,   36.6,      2.9,  29.1,  765.0,  1.0,1.71E00, 2.12E-01, 6.45E00,
       0.0E00,  0.0E00, 8.8E-01 !
     1 ! FMFAC  =       1.0 !   !END!
     2 ! SRCNAM = CT4B !
     2 ! X = 405.3573,3057.5458,  18.288,   36.6,      2.9,  29.1,  765.0,  1.0,1.71E00, 2.12E-01, 6.45E00,
       0.0E00,  0.0E00, 8.8E-01 !
     2 ! FMFAC  =       1.0 !   !END!
     3 ! SRCNAM = CT5A !
     3 ! X = 405.3573,3057.5103,  18.288,   36.6,      2.9,  29.1,  765.0,  1.0,1.71E00, 2.12E-01, 6.45E00,
       0.0E00,  0.0E00, 8.8E-01 !
     3 ! FMFAC  =       1.0 !   !END!
     4 ! SRCNAM = CT5B !
     4 ! X = 405.3573,3057.5025,  18.288,   36.6,      2.9,  29.1,  765.0,  1.0,1.71E00, 2.12E-01, 6.45E00,
       0.0E00,  0.0E00, 8.8E-01 !
     4 ! FMFAC  =       1.0 !   !END!
     5 ! SRCNAM = CT6A !
     5 ! X = 405.3573,3057.4670,  18.288,   36.6,      2.9,  29.1,  765.0,  1.0,1.71E00, 2.12E-01, 6.45E00,
       0.0E00,  0.0E00, 8.8E-01 !
     5 ! FMFAC  =       1.0 !   !END!
     6 ! SRCNAM = CT6B !
     6 ! X = 405.3573,3057.4593,  18.288,   36.6,      2.9,  29.1,  765.0,  1.0,1.71E00, 2.12E-01, 6.45E00,
       0.0E00,  0.0E00, 8.8E-01 !
     6 ! FMFAC  =       1.0 !   !END!
     7 ! SRCNAM = CT7A !
     7 ! X = 405.3573,3057.4237,  18.288,   36.6,      2.9,  29.1,  765.0,  1.0,1.71E00, 2.12E-01, 6.45E00,
       0.0E00,  0.0E00, 8.8E-01 !
     7 ! FMFAC  =       1.0 !   !END!
     8 ! SRCNAM = CT7B !
     8 ! X = 405.3573,3057.4160,  18.288,   36.6,      2.9,  29.1,  765.0,  1.0,1.71E00, 2.12E-01, 6.45E00,
       0.0E00,  0.0E00, 8.8E-01 !
     8 ! FMFAC  =       1.0 !   !END!
     9 ! SRCNAM = CT8A !
     9 ! X = 405.3573,3057.3804,  18.288,   36.6,      2.9,  29.1,  765.0,  1.0,1.71E00, 2.12E-01, 6.45E00,
       0.0E00,  0.0E00, 8.8E-01 !
     9 ! FMFAC  =       1.0 !   !END!
    10 ! SRCNAM = CT8B !
    10 ! X = 405.3573,3057.3727,  18.288,   36.6,      2.9,  29.1,  765.0,  1.0,1.71E00, 2.12E-01, 6.45E00,
       0.0E00,  0.0E00, 8.8E-01 !
    10 ! FMFAC  =       1.0 !   !END!

--------
      a
       Data for each source are treated as a separate input subgroup
       and therefore must end with an input group terminator.

       SRCNAM  is a 12-character name for a source
               (No default)
       X       is an array holding the source data listed by the column headings
```

```
                (No default)
        SIGYZI  is an array holding the initial sigma-y and sigma-z (m)
                (Default: 0.,0.)
        FMFAC   is a vertical momentum flux factor (0. or 1.0) used to represent
                the effect of rain-caps or other physical configurations that
                reduce momentum rise associated with the actual exit velocity.
                (Default: 1.0  -- full momentum used)

       b
        0. = No building downwash modeled, 1. = downwash modeled
        NOTE: must be entered as a REAL number (i.e., with decimal point)

       c
        An emission rate must be entered for every pollutant modeled.
        Enter emission rate of zero for secondary pollutants that are
        modeled, but not emitted.  Units are specified by IPTU
        (e.g. 1 for g/s).

---------------
Subgroup (13c)
---------------

           BUILDING DIMENSION DATA FOR SOURCES SUBJECT TO DOWNWASH
           -------------------------------------------------------
Source                                                                  a
 No.       Effective building width and height (in meters) every 10 degrees
------     ----------------------------------------------------------------

 1     ! SRCNAM  =   CT4A !
 1     ! HEIGHT  =    5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                      5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                      5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                      5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                      5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                      5.03,    5.03,    5.03,    5.03,    5.03,    5.03!
 1     ! WIDTH   =    5.39,    5.75,    6.00,    5.88,    5.75,    5.50,
                     12.25,    8.25,    7.00,    8.00,   12.25,    5.25,
                      5.75,    6.00,    5.88,    5.75,    5.38,    7.47,
                      5.39,    5.75,    5.88,    5.88,    5.75,    5.50,
                     12.25,    8.00,    7.25,    8.00,   12.25,    5.50,
                      5.75,    5.75,    5.88,    5.75,    5.38,    7.47!
!END!
 2     ! SRCNAM  =   CT4B !
 2     ! HEIGHT  =    5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                      5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                      5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                      5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                      5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                      5.03,    5.03,    5.03,    5.03,    5.03,    5.03!
 2     ! WIDTH   =    5.39,    5.75,    6.00,    5.88,    5.75,    5.50,
                     12.25,    8.25,    7.00,    8.00,   12.25,    5.25,
                      5.75,    6.00,    5.88,    5.75,    5.38,    7.47,
                      5.39,    5.75,    5.88,    5.88,    5.75,    5.50,
                     12.25,    8.00,    7.25,    8.00,   12.25,    5.50,
                      5.75,    5.75,    5.88,    5.75,    5.38,    7.47!
!END!
 3     ! SRCNAM  =   CT5A !
 3     ! HEIGHT  =    5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                      5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                      5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                      5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                      5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                      5.03,    5.03,    5.03,    5.03,    5.03,    5.03!
 3     ! WIDTH   =    5.41,    5.75,    6.00,    6.00,   15.00,   15.75,
                      8.75,    8.00,    7.00,    8.00,   16.00,   15.75,
```

```
                       14.75,   6.00,   5.88,   5.75,   5.38,   7.47,
                        5.39,   5.75,   5.88,   6.00,  15.00,  15.50,
                       15.75,   8.00,   7.25,   8.25,   8.75,  15.75,
                       15.00,   6.00,   5.88,   5.75,   5.44,   7.47!
!END!
 4     ! SRCNAM  =   CT5B !
 4     ! HEIGHT  =    5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03!
 4     ! WIDTH  =     5.41,   5.75,   6.00,   6.00,   5.75,   5.50,
                      8.75,   8.00,   7.00,   8.00,  16.00,   5.50,
                      5.75,   6.00,   5.88,   5.75,   5.38,   7.47,
                      5.39,   5.75,   5.88,   6.00,   5.75,   5.50,
                     15.75,   8.00,   7.25,   8.25,   8.75,   5.25,
                      5.75,   6.00,   5.88,   5.75,   5.44,   7.47!
!END!
 5     ! SRCNAM  =   CT6A !
 5     ! HEIGHT  =    5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03!
 5     ! WIDTH  =     5.39,   5.75,   5.88,   5.88,   5.75,   5.50,
                     12.25,   8.25,   7.00,   8.00,  12.00,   5.50,
                      5.75,   6.00,   5.88,   5.75,   5.38,   7.47,
                      5.39,   5.75,   5.88,   5.88,   5.75,   5.50,
                     12.25,   8.00,   7.00,   8.00,  19.25,   5.25,
                      5.75,   6.00,   5.88,   5.75,   5.38,   7.47!
!END!
 6     ! SRCNAM  =   CT6B !
 6     ! HEIGHT  =    5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03!
 6     ! WIDTH  =     5.39,   5.75,   5.88,   5.88,   5.75,   5.50,
                     12.25,   8.25,   7.00,   8.00,  12.00,   5.50,
                      5.75,   6.00,   5.88,   5.75,   5.38,   7.47,
                      5.39,   5.75,   5.88,   5.88,   5.75,   5.50,
                     12.25,   8.00,   7.00,   8.00,  19.25,   5.25,
                      6.00,   6.00,   5.88,   5.75,   5.38,   7.47!
!END!
 7     ! SRCNAM  =   CT7A !
 7     ! HEIGHT  =    5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03!
 7     ! WIDTH  =     5.39,   5.75,   5.88,   6.00,   5.88,   5.50,
                     12.25,   8.00,   7.00,   8.00,  12.25,   5.50,
                      5.75,   5.75,   6.00,   5.75,   5.38,   7.47,
                      5.39,   5.75,   5.88,   5.88,   5.75,   5.50,
                     12.25,   8.00,   7.00,   8.25,  12.25,   5.25,
                      5.75,   6.00,   6.00,   5.75,   5.38,   7.47!
!END!
 8     ! SRCNAM  =   CT7B !
 8     ! HEIGHT  =    5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
                      5.03,   5.03,   5.03,   5.03,   5.03,   5.03,
```

```
                        5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                        5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                        5.03,    5.03,    5.03,    5.03,    5.03,    5.03!
 8      ! WIDTH  =      5.39,    5.75,    5.88,    6.00,    5.75,    5.50,
                       12.25,    8.00,    7.00,    8.00,   12.25,    5.50,
                        5.75,    5.75,    6.00,    5.75,    5.38,    7.47,
                        5.39,    5.75,    5.88,    5.88,    5.75,    5.25,
                       12.25,    8.00,    7.00,    8.25,   12.25,    5.25,
                        5.75,    6.00,    6.00,    5.75,    5.38,    7.47!
!END!
 9      ! SRCNAM  =    CT8A !
 9      ! HEIGHT  =     5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                        5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                        5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                        5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                        5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                        5.03,    5.03,    5.03,    5.03,    5.03,    5.03!
 9      ! WIDTH  =      5.39,    5.75,    5.88,    5.88,    5.75,    5.50,
                       12.00,    8.25,    7.25,    8.00,   12.25,    5.50,
                        5.75,    6.00,    6.00,    5.75,    5.38,    7.47,
                        5.39,    5.75,    5.88,    6.00,    5.75,    5.25,
                       12.25,    8.00,    7.00,    8.00,   12.25,    5.25,
                        5.75,    5.75,    6.00,    5.75,    5.38,    7.47!
!END!
 10      ! SRCNAM  =   CT8B !
 10      ! HEIGHT  =    5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                        5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                        5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                        5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                        5.03,    5.03,    5.03,    5.03,    5.03,    5.03,
                        5.03,    5.03,    5.03,    5.03,    5.03,    5.03!
 10      ! WIDTH  =     5.39,    5.75,    5.88,    5.88,    5.75,    5.50,
                       12.00,    8.25,    7.25,    8.00,   12.25,    5.50,
                        5.75,    6.00,    6.00,    5.75,    5.38,    7.47,
                        5.39,    5.75,    5.88,    6.00,    5.75,    5.25,
                       12.25,    8.00,    7.00,    8.00,   12.25,    5.25,
                        5.75,    5.75,    6.00,    5.75,    5.38,    7.47!
!END!

--------

    a
     Each pair of width and height values is treated as a separate input
     subgroup and therefore must end with an input group terminator.

---------------
Subgroup (13d)
---------------
                                                  a
          POINT SOURCE: VARIABLE EMISSIONS DATA
          ---------------------------------------


     Use this subgroup to describe temporal variations in the emission
     rates given in 13b.  Factors entered multiply the rates in 13b.
     Skip sources here that have constant emissions.  For more elaborate
     variation in source parameters, use PTEMARB.DAT and NPT2 > 0.

     IVARY determines the type of variation, and is source-specific:
     (IVARY)                                 Default: 0
          0 =       Constant
          1 =       Diurnal cycle (24 scaling factors: hours 1-24)
          2 =       Monthly cycle (12 scaling factors: months 1-12)
          3 =       Hour & Season (4 groups of 24 hourly scaling factors,
                                   where first group is DEC-JAN-FEB)
          4 =       Speed & Stab. (6 groups of 6 scaling factors, where
```

```
                                     first group is Stability Class A,
                                     and the speed classes have upper
                                     bounds (m/s) defined in Group 12
           5 =       Temperature    (12 scaling factors, where temperature
                                     classes have upper bounds (C) of:
                                     0, 5, 10, 15, 20, 25, 30, 35, 40,
                                     45, 50, 50+)



--------
    a
     Data for each species are treated as a separate input subgroup
     and therefore must end with an input group terminator.


--------------------------------------------------------------------------------


INPUT GROUPS: 14a, 14b, 14c, 14d -- Area source parameters
--------------------------------

---------------
Subgroup (14a)
---------------

     Number of polygon area sources with
     parameters specified below (NAR1)       No default  !  NAR1 =  0   !

     Units used for area source
     emissions below           (IARU)       Default: 1  !  IARU =   1  !
           1 =        g/m**2/s
           2 =       kg/m**2/hr
           3 =       lb/m**2/hr
           4 =     tons/m**2/yr
           5 =     Odour Unit * m/s  (vol. flux/m**2 of odour compound)
           6 =     Odour Unit * m/min
           7 =     metric tons/m**2/yr

     Number of source-species
     combinations with variable
     emissions scaling factors
     provided below in (14d)        (NSAR1) Default: 0  !  NSAR1 =  0  !

     Number of buoyant polygon area sources
     with variable location and emission
     parameters (NAR2)                      No default  !  NAR2 =  0   !
     (If NAR2 > 0, ALL parameter data for
     these sources are read from the file: BAEMARB.DAT)

!END!

---------------
Subgroup (14b)
---------------
                                     a
          AREA SOURCE: CONSTANT DATA
          ----------------------------
                                                        b
Source           Effect.   Base      Initial    Emission
 No.             Height   Elevation  Sigma z     Rates
                   (m)       (m)       (m)
-------          ------    ------    --------   ---------


```

```
--------
    a
     Data for each source are treated as a separate input subgroup
     and therefore must end with an input group terminator.
    b
     An emission rate must be entered for every pollutant modeled.
     Enter emission rate of zero for secondary pollutants that are
     modeled, but not emitted.  Units are specified by IARU
     (e.g. 1 for g/m**2/s).

---------------
Subgroup (14c)
---------------

           COORDINATES (UTM-km) FOR EACH VERTEX(4) OF EACH POLYGON
           --------------------------------------------------------
Source                                                             a
 No.       Ordered list of X followed by list of Y, grouped by source
------     ------------------------------------------------------------


--------
    a
     Data for each source are treated as a separate input subgroup
     and therefore must end with an input group terminator.


---------------
Subgroup (14d)
---------------
                                                     a
          AREA SOURCE: VARIABLE EMISSIONS DATA
          --------------------------------------

     Use this subgroup to describe temporal variations in the emission
     rates given in 14b.  Factors entered multiply the rates in 14b.
     Skip sources here that have constant emissions.  For more elaborate
     variation in source parameters, use BAEMARB.DAT and NAR2 > 0.

     IVARY determines the type of variation, and is source-specific:
     (IVARY)                               Default: 0
           0 =       Constant
           1 =       Diurnal cycle (24 scaling factors: hours 1-24)
           2 =       Monthly cycle (12 scaling factors: months 1-12)
           3 =       Hour & Season (4 groups of 24 hourly scaling factors,
                                    where first group is DEC-JAN-FEB)
           4 =       Speed & Stab. (6 groups of 6 scaling factors, where
                                    first group is Stability Class A,
                                    and the speed classes have upper
                                    bounds (m/s) defined in Group 12
           5 =       Temperature   (12 scaling factors, where temperature
                                    classes have upper bounds (C) of:
                                    0, 5, 10, 15, 20, 25, 30, 35, 40,
                                    45, 50, 50+)



--------
    a
     Data for each species are treated as a separate input subgroup
     and therefore must end with an input group terminator.


------------------------------------------------------------------------------
```

```
INPUT GROUPS: 15a, 15b, 15c -- Line source parameters
---------------------------

---------------
Subgroup (15a)
---------------

     Number of buoyant line sources
     with variable location and emission
     parameters (NLN2)                              No default  !  NLN2 =  0   !

     (If NLN2 > 0, ALL parameter data for
      these sources are read from the file: LNEMARB.DAT)

     Number of buoyant line sources (NLINES)        No default   ! NLINES =  0  !

     Units used for line source
     emissions below               (ILNU)           Default: 1  !  ILNU =   1  !
           1 =        g/s
           2 =       kg/hr
           3 =       lb/hr
           4 =     tons/yr
           5 =     Odour Unit * m**3/s  (vol. flux of odour compound)
           6 =     Odour Unit * m**3/min
           7 =     metric tons/yr

     Number of source-species
     combinations with variable
     emissions scaling factors
     provided below in (15c)       (NSLN1) Default: 0  !  NSLN1 =  0  !

     Maximum number of segments used to model
     each line (MXNSEG)                             Default: 7   ! MXNSEG =  7  !

     The following variables are required only if NLINES > 0.  They are
     used in the buoyant line source plume rise calculations.

        Number of distances at which                Default: 6   ! NLRISE =  6  !
        transitional rise is computed

        Average building length (XL)                No default   ! XL = .0 !
                                                    (in meters)

        Average building height (HBL)               No default   ! HBL = .0 !
                                                    (in meters)

        Average building width (WBL)                No default   ! WBL = .0 !
                                                    (in meters)

        Average line source width (WML)             No default   ! WML = .0 !
                                                    (in meters)

        Average separation between buildings (DXL)  No default   ! DXL = .0 !
                                                    (in meters)

        Average buoyancy parameter (FPRIMEL)        No default   ! FPRIMEL = .0 !
                                                    (in m**4/s**3)

!END!

---------------
Subgroup (15b)
---------------

          BUOYANT LINE SOURCE: CONSTANT DATA
```

```
            ----------------------------------
                                                                                                    a
Source      Beg. X      Beg. Y      End. X     End. Y     Release    Base        Emission
 No.     Coordinate  Coordinate  Coordinate Coordinate   Height   Elevation       Rates
            (km)        (km)        (km)       (km)        (m)       (m)
------   ----------  ----------  ---------  ----------  -------   ---------    ---------

--------

    a
     Data for each source are treated as a separate input subgroup
     and therefore must end with an input group terminator.

    b
     An emission rate must be entered for every pollutant modeled.
     Enter emission rate of zero for secondary pollutants that are
     modeled, but not emitted.  Units are specified by ILNTU
     (e.g. 1 for g/s).

---------------
Subgroup (15c)
---------------
                                                      a
          BUOYANT LINE SOURCE: VARIABLE EMISSIONS DATA
          --------------------------------------------

     Use this subgroup to describe temporal variations in the emission
     rates given in 15b.  Factors entered multiply the rates in 15b.
     Skip sources here that have constant emissions.

     IVARY determines the type of variation, and is source-specific:
     (IVARY)                                 Default: 0
           0 =       Constant
           1 =       Diurnal cycle (24 scaling factors: hours 1-24)
           2 =       Monthly cycle (12 scaling factors: months 1-12)
           3 =       Hour & Season (4 groups of 24 hourly scaling factors,
                                    where first group is DEC-JAN-FEB)
           4 =       Speed & Stab. (6 groups of 6 scaling factors, where
                                    first group is Stability Class A,
                                    and the speed classes have upper
                                    bounds (m/s) defined in Group 12
           5 =       Temperature   (12 scaling factors, where temperature
                                    classes have upper bounds (C) of:
                                    0, 5, 10, 15, 20, 25, 30, 35, 40,
                                    45, 50, 50+)



--------
    a
     Data for each species are treated as a separate input subgroup
     and therefore must end with an input group terminator.


-------------------------------------------------------------------------------


INPUT GROUPS: 16a, 16b, 16c -- Volume source parameters
---------------------------

---------------
Subgroup (16a)
---------------

     Number of volume sources with
```

```
     parameters provided in 16b,c (NVL1)     No default  !  NVL1 =  0   !

     Units used for volume source
     emissions below in 16b       (IVLU)     Default: 1  !  IVLU =   1  !
           1 =       g/s
           2 =      kg/hr
           3 =      lb/hr
           4 =    tons/yr
           5 =    Odour Unit * m**3/s  (vol. flux of odour compound)
           6 =    Odour Unit * m**3/min
           7 =    metric tons/yr

     Number of source-species
     combinations with variable
     emissions scaling factors
     provided below in (16c)      (NSVL1)    Default: 0  !  NSVL1 =  0  !

     Number of volume sources with
     variable location and emission
     parameters                   (NVL2)     No default  !  NVL2 =   0   !

     (If NVL2 > 0, ALL parameter data for
      these sources are read from the VOLEMARB.DAT file(s) )

!END!

---------------
Subgroup (16b)
---------------
                                       a
           VOLUME SOURCE: CONSTANT DATA
           ------------------------------
                                                                                 b
        X UTM      Y UTM      Effect.    Base     Initial     Initial    Emission
     Coordinate Coordinate    Height  Elevation  Sigma y     Sigma z      Rates
        (km)       (km)         (m)       (m)        (m)        (m)
     ---------- ----------    ------    ------    --------    --------    --------


--------
    a
     Data for each source are treated as a separate input subgroup
     and therefore must end with an input group terminator.

    b
     An emission rate must be entered for every pollutant modeled.
     Enter emission rate of zero for secondary pollutants that are
     modeled, but not emitted.  Units are specified by IVLU
     (e.g. 1 for g/s).

---------------
Subgroup (16c)
---------------
                                                a
          VOLUME SOURCE: VARIABLE EMISSIONS DATA
          ----------------------------------------

     Use this subgroup to describe temporal variations in the emission
     rates given in 16b.  Factors entered multiply the rates in 16b.
     Skip sources here that have constant emissions.  For more elaborate
     variation in source parameters, use VOLEMARB.DAT and NVL2 > 0.

     IVARY determines the type of variation, and is source-specific:
     (IVARY)                                 Default: 0
           0 =       Constant
```

```
            1 =       Diurnal cycle (24 scaling factors: hours 1-24)
            2 =       Monthly cycle (12 scaling factors: months 1-12)
            3 =       Hour & Season (4 groups of 24 hourly scaling factors,
                                     where first group is DEC-JAN-FEB)
            4 =       Speed & Stab. (6 groups of 6 scaling factors, where
                                     first group is Stability Class A,
                                     and the speed classes have upper
                                     bounds (m/s) defined in Group 12
            5 =       Temperature   (12 scaling factors, where temperature
                                     classes have upper bounds (C) of:
                                     0, 5, 10, 15, 20, 25, 30, 35, 40,
                                     45, 50, 50+)



--------
    a
     Data for each species are treated as a separate input subgroup
     and therefore must end with an input group terminator.


-------------------------------------------------------------------------------

INPUT GROUPS: 17a & 17b -- Non-gridded (discrete) receptor information
-----------------------

---------------
Subgroup (17a)
---------------

     Number of non-gridded receptors (NREC)  No default  !  NREC = 113   !

!END!

---------------
Subgroup (17b)
---------------
                                                    a
           NON-GRIDDED (DISCRETE) RECEPTOR DATA
           ------------------------------------

                X UTM         Y UTM         Ground       Height   b
Receptor      Coordinate    Coordinate     Elevation   Above Ground
  No.            (km)          (km)           (m)           (m)
--------      ----------    ----------     ---------   ------------
     1 ! X =    337.457,    3166.010,       0.000,        0.000!   !END!
     2 ! X =    338.272,    3165.999,       1.000,        0.000!   !END!
     3 ! X =    339.087,    3165.988,       1.000,        0.000!   !END!
     4 ! X =    339.901,    3165.977,       3.000,        0.000!   !END!
     5 ! X =    336.655,    3166.945,       0.000,        0.000!   !END!
     6 ! X =    337.470,    3166.934,       0.000,        0.000!   !END!
     7 ! X =    338.284,    3166.922,       1.000,        0.000!   !END!
     8 ! X =    339.099,    3166.911,       1.000,        0.000!   !END!
     9 ! X =    339.914,    3166.900,       2.000,        0.000!   !END!
    10 ! X =    335.853,    3167.880,       0.000,        0.000!   !END!
    11 ! X =    336.668,    3167.868,       0.000,        0.000!   !END!
    12 ! X =    337.482,    3167.857,       0.000,        0.000!   !END!
    13 ! X =    338.297,    3167.846,       1.000,        0.000!   !END!
    14 ! X =    339.112,    3167.835,       1.000,        0.000!   !END!
    15 ! X =    339.927,    3167.823,       2.000,        0.000!   !END!
    16 ! X =    335.866,    3168.803,       0.000,        0.000!   !END!
    17 ! X =    336.681,    3168.792,       0.000,        0.000!   !END!
    18 ! X =    337.495,    3168.781,       1.000,        0.000!   !END!
    19 ! X =    338.310,    3168.769,       1.000,        0.000!   !END!
    20 ! X =    339.125,    3168.758,       1.000,        0.000!   !END!
```

21	! X =	339.939,	3168.747,	2.000,	0.000!	!END!
22	! X =	336.694,	3169.715,	0.000,	0.000!	!END!
23	! X =	337.508,	3169.704,	1.000,	0.000!	!END!
24	! X =	338.323,	3169.693,	1.000,	0.000!	!END!
25	! X =	339.137,	3169.681,	1.000,	0.000!	!END!
26	! X =	339.952,	3169.670,	2.000,	0.000!	!END!
27	! X =	336.706,	3170.639,	0.000,	0.000!	!END!
28	! X =	337.521,	3170.627,	0.000,	0.000!	!END!
29	! X =	338.336,	3170.616,	1.000,	0.000!	!END!
30	! X =	339.150,	3170.605,	1.000,	0.000!	!END!
31	! X =	339.965,	3170.594,	3.000,	0.000!	!END!
32	! X =	336.719,	3171.562,	0.000,	0.000!	!END!
33	! X =	337.534,	3171.551,	1.000,	0.000!	!END!
34	! X =	338.348,	3171.539,	1.000,	0.000!	!END!
35	! X =	339.163,	3171.528,	1.000,	0.000!	!END!
36	! X =	339.977,	3171.517,	2.000,	0.000!	!END!
37	! X =	336.732,	3172.485,	0.000,	0.000!	!END!
38	! X =	337.547,	3172.474,	0.000,	0.000!	!END!
39	! X =	338.361,	3172.463,	0.000,	0.000!	!END!
40	! X =	339.176,	3172.452,	1.000,	0.000!	!END!
41	! X =	339.990,	3172.440,	1.000,	0.000!	!END!
42	! X =	340.817,	3173.353,	2.000,	0.000!	!END!
43	! X =	340.830,	3174.276,	1.000,	0.000!	!END!
44	! X =	341.644,	3174.265,	2.000,	0.000!	!END!
45	! X =	335.143,	3175.279,	0.000,	0.000!	!END!
46	! X =	335.957,	3175.267,	0.000,	0.000!	!END!
47	! X =	336.771,	3175.256,	0.000,	0.000!	!END!
48	! X =	337.585,	3175.244,	0.000,	0.000!	!END!
49	! X =	338.400,	3175.233,	0.000,	0.000!	!END!
50	! X =	340.842,	3175.199,	1.000,	0.000!	!END!
51	! X =	341.656,	3175.188,	1.000,	0.000!	!END!
52	! X =	342.471,	3175.177,	1.000,	0.000!	!END!
53	! X =	334.341,	3176.214,	0.000,	0.000!	!END!
54	! X =	335.156,	3176.202,	0.000,	0.000!	!END!
55	! X =	335.970,	3176.190,	0.000,	0.000!	!END!
56	! X =	336.784,	3176.179,	0.000,	0.000!	!END!
57	! X =	337.598,	3176.168,	0.000,	0.000!	!END!
58	! X =	338.412,	3176.156,	0.000,	0.000!	!END!
59	! X =	342.483,	3176.101,	1.000,	0.000!	!END!
60	! X =	333.541,	3177.149,	0.000,	0.000!	!END!
61	! X =	334.355,	3177.137,	0.000,	0.000!	!END!
62	! X =	335.169,	3177.125,	0.000,	0.000!	!END!
63	! X =	335.983,	3177.114,	1.000,	0.000!	!END!
64	! X =	336.797,	3177.102,	1.000,	0.000!	!END!
65	! X =	337.611,	3177.091,	1.000,	0.000!	!END!
66	! X =	338.425,	3177.080,	0.000,	0.000!	!END!
67	! X =	331.926,	3178.095,	0.000,	0.000!	!END!
68	! X =	332.740,	3178.084,	0.000,	0.000!	!END!
69	! X =	333.554,	3178.072,	1.000,	0.000!	!END!
70	! X =	334.368,	3178.060,	0.000,	0.000!	!END!
71	! X =	335.182,	3178.049,	1.000,	0.000!	!END!
72	! X =	335.996,	3178.037,	1.000,	0.000!	!END!
73	! X =	336.810,	3178.026,	1.000,	0.000!	!END!
74	! X =	337.624,	3178.014,	1.000,	0.000!	!END!
75	! X =	338.438,	3178.003,	1.000,	0.000!	!END!
76	! X =	333.567,	3178.995,	0.000,	0.000!	!END!
77	! X =	334.381,	3178.984,	1.000,	0.000!	!END!
78	! X =	335.195,	3178.972,	1.000,	0.000!	!END!
79	! X =	336.009,	3178.961,	1.000,	0.000!	!END!
80	! X =	336.823,	3178.949,	1.000,	0.000!	!END!
81	! X =	337.637,	3178.938,	1.000,	0.000!	!END!
82	! X =	338.451,	3178.927,	1.000,	0.000!	!END!
83	! X =	334.394,	3179.907,	0.000,	0.000!	!END!
84	! X =	335.208,	3179.896,	0.000,	0.000!	!END!
85	! X =	336.022,	3179.884,	1.000,	0.000!	!END!

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   86 ! X =     336.836,   3179.873,       1.000,        0.000!   !END!
   87 ! X =     337.650,   3179.861,       1.000,        0.000!   !END!
   88 ! X =     338.464,   3179.850,       1.000,        0.000!   !END!
   89 ! X =     339.278,   3179.839,       1.000,        0.000!   !END!
   90 ! X =     334.407,   3180.831,       0.000,        0.000!   !END!
   91 ! X =     335.221,   3180.819,       0.000,        0.000!   !END!
   92 ! X =     336.035,   3180.807,       1.000,        0.000!   !END!
   93 ! X =     336.849,   3180.796,       1.000,        0.000!   !END!
   94 ! X =     337.663,   3180.785,       1.000,        0.000!   !END!
   95 ! X =     338.476,   3180.773,       0.000,        0.000!   !END!
   96 ! X =     334.420,   3181.754,       0.000,        0.000!   !END!
   97 ! X =     335.234,   3181.742,       1.000,        0.000!   !END!
   98 ! X =     336.048,   3181.731,       1.000,        0.000!   !END!
   99 ! X =     336.862,   3181.719,       0.000,        0.000!   !END!
  100 ! X =     337.675,   3181.708,       0.000,        0.000!   !END!
  101 ! X =     338.489,   3181.697,       1.000,        0.000!   !END!
  102 ! X =     334.433,   3182.677,       0.000,        0.000!   !END!
  103 ! X =     335.247,   3182.666,       1.000,        0.000!   !END!
  104 ! X =     336.061,   3182.654,       1.000,        0.000!   !END!
  105 ! X =     336.875,   3182.643,       1.000,        0.000!   !END!
  106 ! X =     337.688,   3182.631,       1.000,        0.000!   !END!
  107 ! X =     338.502,   3182.620,       1.000,        0.000!   !END!
  108 ! X =     334.447,   3183.601,       0.000,        0.000!   !END!
  109 ! X =     335.260,   3183.589,       1.000,        0.000!   !END!
  110 ! X =     336.074,   3183.578,       1.000,        0.000!   !END!
  111 ! X =     336.888,   3183.566,       2.000,        0.000!   !END!
  112 ! X =     337.701,   3183.555,       2.000,        0.000!   !END!
  113 ! X =     338.515,   3183.544,       2.000,        0.000!   !END!


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         INPUT FILES

Default Name     Unit No.     File Name and Path
------------     --------     ------------------
 CALPUFF.INP         1        c:\projects\seci\payne\scct\modeling\calpuff\puff-inp\oil90B.inp
  CALMET.DAT         7        D:\CHAS\1990\CHAS9001.MET
     (----)          7        D:\CHAS\1990\CHAS9002.MET
     (----)          7        D:\CHAS\1990\CHAS9003.MET
     (----)          7        D:\CHAS\1990\CHAS9004.MET
     (----)          7        D:\CHAS\1990\CHAS9005.MET
     (----)          7        D:\CHAS\1990\CHAS9006.MET
     (----)          7        D:\CHAS\1990\CHAS9007.MET
     (----)          7        D:\CHAS\1990\CHAS9008.MET
     (----)          7        D:\CHAS\1990\CHAS9009.MET
     (----)          7        D:\CHAS\1990\CHAS9010.MET
     (----)          7        D:\CHAS\1990\CHAS9011.MET
     (----)          7        D:\CHAS\1990\CHAS9012.MET
   OZONE.DAT        22        C:\PROJECTS\SECI\PAYNE\SCCT\MODELING\CALPUFF\PUFF-INP\OZON90FL.DAT


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         OUTPUT FILES

Default Name     Unit No.     File Name and Path
------------     --------     ------------------
 CALPUFF.LST         2        C:\PROJECTS\SECI\PAYNE\SCCT\MODELING\CALPUFF\PUFF-OUT\OIL90B.LST
    CONC.DAT         8        C:\PROJECTS\SECI\PAYNE\SCCT\MODELING\CALPUFF\PUFF-OUT\OIL90B.CON
    DFLX.DAT         9        C:\PROJECTS\SECI\PAYNE\SCCT\MODELING\CALPUFF\PUFF-OUT\OIL90BDF.DAT
    WFLX.DAT        10        C:\PROJECTS\SECI\PAYNE\SCCT\MODELING\CALPUFF\PUFF-OUT\OIL90BWF.DAT
    VISB.DAT        11        VISB.DAT



CALMET Control file information:
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CALMET.DAT      2.0            No-Obs file structure with embedded control file

 Produced by CALMET Version: 5.5  Level: 030402
 Chasshowitzka Class I Area
 Domain: 72 x 88 x 5 km; Period: 01/06 - 01/31, 1990
 9 surface, 4 upper air, 32 precip, and 5 overwater stations



  IBYR     =  1990
  IBMO     =  1
  IBDY     =  6
  IBHR     =  0
  IBTZM    =  5
  IRLG     =  624
  IRTYPE   =  1
  LCALGRD  =  T
  PMAP     = UTM
  DATUM    = NAS-C
  NIMADATE= 10-10-2002
  FEASTM   =  0.00000000E+00
  FNORTHM  =  0.00000000E+00
  IUTMZN   =  17
  UTMHEM   = N
  NXM      =  72
  NYM      =  88
  NZM      =  10
  XGRIDM   =  5000.00000
  XORIGM   =  250000.000
  YORIGM   =  2940000.00
  IWFCOD   =  1
  NSSTA    =  9
  NUSTA    =  4
  NPSTA    =  32
  NOWSTA   =  5
  NLU      =  14
  IWAT1    =  50
  IWAT2    =  55
 ZFACEM  =     0.000,    20.000,    40.000,    80.000,   160.000,   320.000,   500.000,  1000.000,  1500.000,  2500.000,

 3500.000,
 Met Station Locations (Met Grid meters)
 XSSTA    =  -73576.9922 182840.000 245160.000 99230.0078 339570.000 127429.992 218980.016 307530.031 183600.000
 YSSTA    =  426038.094 434429.938 288290.031 154530.031 11679.9316 344360.094 207129.875 118600.094 459.960938
 XUSTA    =  111961.000 337557.000 -139897.000 116691.008
 YUSTA    =  124615.969 11294.9219 355675.063 518154.063
 XPSTA    =  278151.969 63454.9883 108043.000 286455.031 258252.984 40243.0117 245139.000 220785.000 33510.9844 163663.000 104862.000 84355.0078
182827.000 159850.000 173637.000 159299.016 229001.000 284375.969 241752.984 218962.000 220178.016 108536.008 288005.000 135975.000 125804.992 321065.000
89083.0078 99216.0000 107941.984 216986.000 304260.000 337853.031
 YPSTA    =  13239.9902 374815.906 209792.969 31757.0801 18749.0234 341967.031 288261.969 269906.000 408629.875 541.992188 344601.063 265520.031
434399.906 159425.047 253502.938 290504.875 341906.969 170212.891 27940.9180 207094.000 22436.0352 110056.883 44610.1094 386799.063 194742.922 59596.9219
132460.938 154492.922 58321.0469 55672.1172 116669.922 11628.9063

 Surface roughness lengths (m)                                  Z0

 Multiply all values by 10 **  -3

  88 I  267   561   360   210   258   163   309   457   263   161   347   185   356   690   710   867  1062   948   747   788
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  87 I  231   448   289   250   258   140   146   410  1067   314   580   426   421  1004   661   711   280   868  1085   995
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  86 I  442   402   281   500   345   211   294   612   655   504   496   607   451   691   974   556   495   921  1132  1079
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
```

2012	85	I	624	260	341	928	577	274	493	1137	584	299	165	231	599	634	641	350	959	782	832	1076
2013		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2014	84	I	801	676	868	968	887	567	992	991	489	265	110	165	188	260	494	572	856	629	738	1002
2015		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2016	83	I	1109	1118	987	816	862	951	1126	489	208	100	380	354	178	227	350	304	367	450	798	1131
2017		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2018	82	I	995	1054	1003	987	980	974	531	167	150	117	170	201	339	352	470	374	203	522	997	1033
2019		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2020	81	I	914	1051	1157	1147	780	614	371	149	116	116	209	365	284	843	430	237	141	466	797	1061
2021		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2022	80	I	392	1091	1090	740	756	263	196	274	300	116	209	178	290	342	239	239	162	374	366	572
2023		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2024	79	I	579	695	1199	1003	828	269	98	565	527	264	161	338	330	107	327	376	412	213	138	375
2025		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2026	78	I	575	586	1108	843	1015	892	517	192	174	156	380	299	166	339	157	151	199	171	191	280
2027		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2028	77	I	337	628	995	986	1060	893	905	815	821	444	239	491	94	115	421	386	354	194	121	188
2029		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2030	76	I	505	472	979	987	1058	1018	677	559	716	816	417	197	186	176	114	315	307	599	317	150
2031		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2032	75	I	779	685	707	1079	950	975	414	626	702	633	697	727	469	108	250	493	282	383	328	313
2033		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2034	74	I	1051	793	881	730	834	756	886	763	702	687	924	710	336	400	258	732	558	211	119	450
2035		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2036	73	I	890	749	634	628	858	769	947	906	807	574	713	751	361	270	307	911	479	290	262	192
2037		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2038	72	I	489	1029	913	716	1222	1138	818	604	613	670	725	394	349	184	495	1130	762	556	95	138
2039		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2040	71	I	35	486	816	971	1101	1007	1193	890	1216	1041	750	356	359	139	514	856	697	505	201	104
2041		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2042	70	I	1	133	518	711	1011	1170	912	688	1202	593	1038	368	242	85	195	771	387	384	130	107
2043		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2044	69	I	1	1	1	132	742	1136	755	722	800	807	1088	1112	154	88	264	862	525	228	132	133
2045		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2046	68	I	1	1	1	305	995	1046	938	731	625	867	475	377	147	84	140	277	853	409	111	90
2047		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2048	67	I	1	1	1	372	1253	1274	754	727	558	575	1016	820	470	184	94	92	280	381	248	225
2049		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2050	66	I	1	1	1	24	401	1133	664	572	509	634	851	655	383	144	97	105	282	972	522	518
2051		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2052	65	I	1	1	1	1	52	490	530	984	538	739	813	583	868	273	97	146	515	1039	384	851
2053		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2054	64	I	1	1	1	1	1	387	128	352	589	802	612	846	252	96	404	1244	931	1232	374	715
2055		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2056	63	I	1	1	1	1	1	1	1	157	507	773	474	796	225	102	822	1239	910	1268	400	735
2057		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2058	62	I	1	1	1	1	1	1	1	23	242	328	562	674	251	329	896	937	1080	1118	821	499
2059		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2060	61	I	1	1	1	1	1	1	1	23	89	254	654	634	587	607	674	767	1128	1065	761	587
2061		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2062	60	I	1	1	1	1	1	1	1	1	1	61	506	856	835	579	505	532	587	931	871	596
2063		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2064	59	I	1	1	1	1	1	1	1	1	1	38	357	537	495	508	564	503	613	872	834	526
2065		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2066	58	I	1	1	1	1	1	1	1	1	1	2	15	31	212	254	166	328	782	892	883	321
2067		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2068	57	I	1	1	1	1	1	1	1	1	1	2	2	1	1	1	101	255	1124	1171	616	718
2069		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2070	56	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	17	50	792	1275	979	909
2071		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2072	55	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	476	515	317	101
2073		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2074	54	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	177	143	88	255
2075		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2076	53	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100	336	590	668

2077		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2078	52	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	14	253	687
2079		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2080	51	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	36	42	253	435
2081		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2082	50	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	7	4	87	227	644
2083		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2084	49	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	51	371	358
2085		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2086	48	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	27	201	577
2087		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2088	47	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	6	406	543
2089		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2090	46	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	36	473	513
2091		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2092	45	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	12	522	561
2093		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2094	44	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	29	564	405
2095		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2096	43	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	72	493	622
2097		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2098	42	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	60	201	258	238
2099		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2100	41	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	207	401	400	162
2101		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2102	40	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	358	373	126	72
2103		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2104	39	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	223	361	141	111
2105		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2106	38	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	63	487	205	116	182
2107		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2108	37	I	1	1	1	1	1	1	1	1	1	1	1	1	1	4	1	402	243	107	111	127
2109		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2110	36	I	1	1	1	1	1	1	1	1	1	1	1	1	1	3	4	352	159	60	59	87
2111		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2112	35	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	397	36	124	43	73
2113		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2114	34	I	1	1	1	1	1	1	1	1	1	1	1	1	1	5	2	177	52	117	57	102
2115		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2116	33	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	9	344	68	99	173	164
2117		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2118	32	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	40	435	148	2	43	662
2119		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2120	31	I	1	1	1	1	1	1	1	1	1	1	1	1	1	42	86	816	8	1	1	11
2121		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2122	30	I	1	1	1	1	1	1	1	1	1	1	1	1	1	84	574	572	333	15	1	3
2123		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2124	29	I	1	1	1	1	1	1	1	1	1	1	1	1	1	773	318	400	477	251	12	6
2125		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2126	28	I	1	1	1	1	1	1	1	1	1	1	1	1	1	440	81	138	1000	818	24	1
2127		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2128	27	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	75	72	911	684	1	1
2129		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2130	26	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	30	19	145	1	1
2131		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2132	25	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	7	2	1	1	3
2133		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2134	24	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	2	1	1	35
2135		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2136	23	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	6	57
2137		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2138	22	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	1	2	19	128
2139		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2140	21	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	473	13	48	119	82
2141		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

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 20 I     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1    18    30   349   279
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 19 I     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1  1000     3     5   306
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 18 I     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1   309     2   158
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 17 I     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1    36    72
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 16 I     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     8   260
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 15 I     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1    65
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 14 I     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 13 I     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 12 I     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 11 I     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 10 I     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  9 I     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  8 I     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  7 I     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  6 I     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  5 I     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  4 I     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  3 I     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  2 I     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  1 I     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
    -------------------------------------------------------------------------------------------------------------------------
          1     2     3     4     5     6     7     8     9    10    11    12    13    14    15    16    17    18    19    20

Surface roughness lengths (m)                                Z0

Multiply all values by 10 **  -3

 88 I   855   641   471   699   884   752   971   882  1066  1105   934  1173  1085   704   480   505  1115   787   548    99
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 87 I   987  1031   507   645   981   879   981  1017  1007  1187  1016  1128  1211  1038   664   851   849   715  1002   592
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 86 I   920   744   767   957   991   929   667  1117  1112  1116  1060  1126  1132  1022   603   543   591   593   496   606
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 85 I   849   580   892   974  1060  1043   780   914  1085  1150   970   985   990   773   368   509   772   162    15    35
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 84 I  1135   917   613  1054   957  1041   968   930   786  1082  1038   951   792  1008   818   755   997   862   227   214
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 83 I  1071   956  1049  1051  1028   720   988   719   757  1067   994   452   452   894   820  1006   150    86   566   728
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 82 I   933   936   479  1133  1011   897   852   453   875  1157   927   865  1139  1186   887   849    76    22   623   546
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 81 I  1110  1189   277   969  1118   703   706   675   992  1086   963  1123  1072  1053   973   444   445     4   742   912
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 80 I  1193  1139  1121  1069   840   957   975  1067   889  1002   929  1157  1166  1084   651   684    24    64  1106   812
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
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79	I	1101	1004	417	928	697	626	663	811	1047	949	1130	1093	1080	1062	660	83	45	18	683	840
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
78	I	844	793	1135	875	868	973	441	409	631	516	762	1080	626	753	716	362	83	75	1155	1044
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
77	I	398	1002	895	441	499	536	343	213	420	602	947	1145	1137	897	726	479	34	81	1131	1023
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
76	I	239	524	461	500	936	359	1117	553	581	865	451	1109	1247	875	347	829	412	17	23	254
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
75	I	134	214	367	351	249	650	545	79	853	576	325	1177	1081	1048	951	814	163	645	10	642
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
74	I	123	162	210	424	224	1206	1109	530	828	708	316	691	864	1096	691	912	817	652	15	990
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
73	I	141	181	227	135	115	678	656	238	766	609	338	1059	515	1126	1064	975	948	799	5	81
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
72	I	94	114	235	185	373	832	1126	478	503	363	233	162	560	296	854	1097	1042	419	154	31
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
71	I	84	140	232	959	1129	708	1221	637	104	58	69	585	310	392	1020	507	643	329	343	9
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
70	I	102	260	598	826	1102	811	932	1023	236	115	249	325	280	390	384	371	245	140	50	22
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
69	I	91	252	335	963	979	475	38	745	538	112	303	513	317	208	559	820	464	85	96	454
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
68	I	154	449	523	451	333	393	54	647	305	289	361	197	246	236	315	861	662	512	193	861
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
67	I	118	195	363	159	100	234	699	975	934	179	342	516	853	559	742	1089	253	188	396	775
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
66	I	155	342	300	228	232	366	746	221	38	649	626	592	683	128	252	308	133	198	660	135
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
65	I	177	366	268	111	407	200	24	60	136	652	388	264	446	1009	568	530	230	712	139	10
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
64	I	294	236	202	598	340	218	33	22	208	201	588	896	1008	1300	1154	932	157	330	159	99
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
63	I	194	90	118	420	400	157	83	70	170	431	766	620	815	1300	1265	1158	662	63	472	324
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
62	I	326	108	123	800	357	185	108	61	90	269	879	354	658	1300	150	154	733	12	9	771
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
61	I	351	150	194	232	295	142	102	66	73	105	1280	523	802	731	1300	1150	540	2	1	33
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
60	I	195	156	124	214	240	128	98	97	105	500	1031	896	763	793	1300	1286	816	72	1	14
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
59	I	233	88	321	230	192	181	119	256	548	937	893	763	297	470	1300	1273	880	669	2	15
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
58	I	99	78	641	144	128	120	214	282	548	182	848	688	299	301	1222	1300	1076	666	744	396
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
57	I	145	299	283	86	234	87	90	139	237	89	335	410	221	123	1231	1269	946	379	723	743
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
56	I	577	684	234	149	475	132	151	161	176	78	97	248	99	261	1034	1296	1232	1102	781	954
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
55	I	217	254	144	178	477	963	487	267	111	118	82	22	65	375	719	1248	1272	1121	1293	987
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
54	I	1030	551	514	451	160	178	558	237	94	91	89	11	43	121	266	348	510	82	595	424
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
53	I	1184	1066	242	66	278	391	566	882	251	72	54	64	46	96	27	44	39	61	269	128
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
52	I	620	417	172	147	172	218	177	221	65	60	55	78	62	10	69	7	150	68	158	167
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
51	I	416	537	405	140	118	256	175	211	293	113	54	47	77	7	95	13	41	48	55	82
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
50	I	354	965	1289	604	295	186	217	70	117	139	86	105	290	32	15	30	33	54	60	89
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
49	I	313	321	1300	415	152	177	193	224	92	115	116	104	94	3	2	54	21	19	81	66
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
48	I	531	207	1201	173	100	106	301	137	79	128	242	23	36	32	38	17	81	63	69	79
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
47	I	196	175	465	203	493	144	233	102	89	121	102	52	32	20	32	145	48	9	28	105

File: C:\Projects\SECI\Payne\SCCT\Modeling\CALPUFF\PUFF-OUT\OIL90B.LST 7/30/2004, 2:05:12PM

	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
46	I	474	363	556	268	396	364	177	90	62	55	69	63	43	20	43	42	16	1	2	34
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
45	I	340	316	356	217	901	1192	496	189	112	59	118	148	47	55	28	31	75	2	6	105
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
44	I	344	229	318	273	159	415	153	228	234	246	394	164	58	62	41	34	50	18	102	58
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
43	I	870	395	449	238	101	77	205	225	428	475	512	334	112	67	40	17	53	49	53	13
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
42	I	244	207	273	128	91	76	82	390	423	553	482	163	127	94	48	31	36	42	78	26
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
41	I	88	68	138	82	70	65	97	305	258	320	273	102	134	149	161	149	55	55	231	140
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
40	I	70	56	70	85	77	72	207	82	125	209	244	72	160	123	134	166	97	82	176	168
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
39	I	154	70	120	116	53	71	65	52	145	217	171	266	81	122	119	171	149	124	114	217
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
38	I	151	58	163	147	46	56	107	125	177	223	101	57	86	99	153	168	140	75	130	261
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
37	I	55	53	148	77	60	76	253	192	96	127	72	54	65	97	124	226	189	100	86	259
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
36	I	61	51	106	73	50	59	114	136	67	92	132	95	103	59	142	219	147	76	130	238
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
35	I	86	104	184	68	118	227	159	71	80	118	189	223	15	63	24	86	69	69	96	346
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
34	I	96	362	359	177	240	72	51	68	58	157	132	63	26	29	17	36	47	79	77	41
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
33	I	324	792	571	184	76	67	82	133	92	107	408	147	261	394	288	86	41	24	62	85
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
32	I	850	1000	463	231	265	100	110	329	83	89	151	278	294	99	88	147	47	78	57	95
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
31	I	986	351	290	161	262	100	115	89	70	109	167	80	59	12	176	127	39	38	66	72
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
30	I	205	5	106	97	242	200	161	118	138	171	164	81	79	235	74	70	117	90	138	134
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
29	I	310	1	17	162	262	261	271	243	287	153	108	105	126	102	135	58	64	83	84	62
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
28	I	5	1	15	87	111	126	93	79	127	212	65	90	113	72	198	82	48	88	25	33
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
27	I	1	4	83	122	84	130	73	127	91	105	116	73	153	98	193	66	60	95	37	35
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
26	I	3	117	78	104	79	60	59	70	255	145	138	60	140	204	271	103	79	72	87	24
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
25	I	60	83	96	98	63	95	81	82	65	287	400	112	247	357	124	84	68	74	71	60
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
24	I	77	73	68	87	112	113	61	52	64	59	142	46	122	167	103	65	53	75	79	62
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
23	I	78	84	102	75	57	81	68	54	61	64	89	127	119	88	100	58	57	125	58	90
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
22	I	58	70	82	50	50	64	78	52	56	57	97	165	96	91	137	58	65	125	76	58
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
21	I	54	72	66	33	61	50	101	68	55	64	87	63	49	73	147	56	59	175	73	236
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
20	I	95	56	56	49	44	78	66	85	79	84	92	65	78	166	70	71	89	135	95	413
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
19	I	98	58	56	55	50	66	105	88	52	57	77	76	71	116	65	97	76	75	67	148
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
18	I	243	84	58	54	51	54	81	93	52	62	80	60	53	117	74	67	65	52	56	76
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
17	I	771	146	70	72	59	150	103	70	54	60	81	80	50	99	51	59	63	50	60	55
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
16	I	326	168	102	114	86	115	58	61	58	56	62	86	80	93	56	65	53	50	42	59
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
15	I	65	60	80	84	122	62	57	80	87	74	67	63	138	72	63	72	50	49	49	55
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

```
 14 I   79   61  136  124   64   67   58   50   56   63  133   55  215  104   59   57   95   68   52   52
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
 13 I   90  119   65   59   87   98   60   54  166   65   89  170   79   53   58   67   56   58   92   60
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
 12 I  192  410   72   61   77  169  117   94  110   83  167   56   45   49   54   55   56   63   63   65
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
 11 I    1  534  136   55   69  250  112  220  432   88  155   54   58   58   63   50   50   63   68   67
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
 10 I    1  806  196   56   53   39   90  142  225   55   77   50   61  172   55   53   52   81   91   98
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  9 I    1    1   26  133   54   39   27  138   42   16   64   67   70  155   82  102   56   72  101  529
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  8 I    1    1  124   41   69   60   23    2   23  292  100   58   61   73   76  144   78   74   80   77
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  7 I    1    1    1   26   63   56   67    1    2  233   84   73   72   68   66  129  107   55   65   75
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  6 I    1    1    1    1    7   56  102    2    1  256   86   91  102   85   70   83  196   61   66   82
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  5 I    1    1    1    1   13    2    4    2    2  212  100   62   65   61   71   52  101  101   64   71
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  4 I    1    1    1    1  443    1    1    1    7  365   73   79   61   60   92   71   73   77   56   66
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  3 I    1    1    1    1    3    6    6   20   33  318   94   77  269   38  107   89   80   90   66   50
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  2 I    1    1    1    1    1    5    2   45   19  142   81  125   22  240  132  100   65   96   92   64
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  1 I    1    1    1    1    1    7    1   11   90   76  121   46  153  106  240   66   92  167   99   76
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
      ----------------------------------------------------------------------------------------------------
        21   22   23   24   25   26   27   28   29   30   31   32   33   34   35   36   37   38   39   40

Surface roughness lengths (m)                        Z0

Multiply all values by 10 **  -3

 88 I   62   31    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
 87 I  561  135  209    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
 86 I  263  177  202    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
 85 I   96   73   47    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
 84 I  951  395  649    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
 83 I  944  540 1009    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
 82 I 1109  514  528    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
 81 I 1161  703  749    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
 80 I 1022  983  576  615    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
 79 I 1024  904  669  226    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
 78 I 1058  911  550  141    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
 77 I  804  756  743  143    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
 76 I  175  456  839  184  208    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
 75 I  250  680  802  416   90    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
 74 I  905  658  831  707   30    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1
    I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
```

73	I	452	899	630	784	221	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
72	I	274	424	622	988	339	86	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
71	I	315	200	1058	1102	600	129	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
70	I	193	232	1085	1036	1178	200	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
69	I	90	159	1099	1131	1116	266	1300	1	1	1	1	1	1	1	1	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
68	I	256	142	950	1293	926	498	544	1	1	1	1	1	1	1	1	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
67	I	984	831	858	938	993	749	537	1	1	1	1	1	1	1	1	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
66	I	1277	990	731	833	1021	1108	709	593	1	1	1	1	1	1	1	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
65	I	39	515	188	517	1011	1071	709	742	1	1	1	1	1	1	1	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
64	I	4	733	284	218	923	747	1031	451	1111	1	1	1	1	1	1	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
63	I	15	74	313	959	1011	845	817	422	302	1	1	1	1	1	1	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
62	I	101	229	664	383	690	791	863	938	50	1	1	1	1	1	1	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
61	I	202	245	295	147	1046	882	729	684	243	638	1	1	1	1	1	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
60	I	655	591	126	501	901	822	905	876	917	154	1	1	1	1	1	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
59	I	247	309	868	606	943	851	816	1049	1028	311	1000	1	1	1	1	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
58	I	309	516	534	176	503	989	700	771	886	753	38	1	1	1	1	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
57	I	126	311	159	382	254	837	666	660	677	706	153	172	1	1	1	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
56	I	185	78	164	394	273	504	351	442	254	426	275	81	1	1	1	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
55	I	873	570	410	203	372	248	253	391	421	138	554	317	811	1	1	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
54	I	590	475	293	221	927	190	136	135	579	695	641	482	127	1	1	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
53	I	512	309	553	452	936	319	231	347	136	692	871	434	67	61	1	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
52	I	412	520	565	711	462	163	125	40	93	454	616	643	81	24	50	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
51	I	250	581	503	81	15	71	56	58	433	923	784	627	222	6	7	1	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
50	I	303	417	306	152	27	39	211	173	220	870	649	731	385	35	4	34	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
49	I	670	599	199	73	373	160	98	389	49	58	358	306	105	3	5	9	1	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
48	I	458	499	153	315	118	5	75	189	84	75	209	374	84	2	2	2	7	1	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
47	I	470	330	569	485	325	235	306	460	294	47	207	281	206	7	17	68	5	56	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
46	I	82	120	144	318	109	197	456	251	304	220	165	46	159	48	13	98	49	29	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
45	I	119	433	394	317	222	473	327	107	96	451	134	112	68	254	1	14	42	27	491	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
44	I	88	467	617	536	565	164	77	138	122	184	280	148	124	166	3	17	122	20	86	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
43	I	141	263	232	174	259	85	87	69	65	88	360	333	132	93	9	32	82	2	512	1000
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
42	I	151	846	341	90	95	116	100	73	75	96	267	475	125	86	34	16	25	2	1000	1000
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
41	I	92	79	111	153	41	50	124	112	144	81	113	212	152	85	105	18	19	17	908	1

	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
40	I	107	83	72	81	61	33	42	101	122	130	77	144	89	62	343	71	16	6	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
39	I	110	115	130	42	6	45	58	64	177	78	54	72	151	26	197	56	7	43	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
38	I	207	194	22	41	5	67	34	115	100	79	54	65	72	85	116	88	4	2	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
37	I	113	35	3	52	119	32	23	22	127	106	58	71	104	119	128	82	19	21	1	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
36	I	152	73	3	18	94	31	64	151	107	60	58	68	89	144	193	141	100	27	1017	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
35	I	85	59	28	32	171	59	142	155	89	83	69	65	59	52	41	75	458	21	592	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
34	I	258	80	145	17	73	126	69	56	63	102	97	158	114	60	83	72	427	118	37	1
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
33	I	250	23	70	43	58	64	73	72	66	95	82	100	242	272	112	66	483	325	11	671
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
32	I	252	53	23	59	30	73	110	94	79	76	67	74	108	145	217	65	164	111	27	11
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
31	I	101	87	62	7	7	15	70	79	70	77	57	66	102	109	326	64	66	78	122	11
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
30	I	42	77	22	18	1	7	33	42	68	108	71	67	76	98	396	113	70	75	87	23
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
29	I	126	100	83	44	6	3	49	27	12	66	68	55	61	178	377	289	60	55	102	73
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
28	I	260	14	25	124	71	31	50	59	61	66	58	84	56	224	500	385	61	51	64	65
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
27	I	228	154	164	413	77	66	87	69	54	63	78	91	84	114	221	101	50	125	99	83
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
26	I	21	186	181	160	88	62	78	54	51	55	56	73	60	93	9	54	52	53	68	66
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
25	I	148	128	31	91	86	71	64	61	53	55	72	74	87	117	100	374	115	128	65	83
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
24	I	52	138	204	107	105	56	68	67	51	51	71	54	71	64	69	379	281	86	94	101
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
23	I	57	67	87	244	119	278	76	80	59	59	58	38	47	64	114	204	384	55	65	78
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
22	I	32	63	168	73	90	92	124	66	57	41	61	53	82	71	114	56	105	220	76	50
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
21	I	103	68	91	81	55	61	99	58	57	50	55	55	64	51	66	53	52	99	81	77
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
20	I	55	106	62	148	41	50	143	72	110	79	52	64	49	52	62	125	51	53	65	50
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
19	I	55	28	71	12	2	63	141	152	55	60	64	52	51	51	61	83	98	69	65	51
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
18	I	63	103	59	21	3	12	61	79	89	74	65	50	78	68	58	68	89	64	69	58
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
17	I	74	40	22	35	3	41	71	47	53	79	59	85	85	97	84	61	113	88	55	52
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
16	I	98	38	37	34	129	168	51	52	50	76	80	143	191	111	53	55	116	91	56	51
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
15	I	70	51	18	51	114	90	50	54	50	64	52	49	85	189	68	54	66	89	80	54
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
14	I	55	57	55	104	55	54	59	59	52	61	76	67	45	8	4	42	65	77	68	54
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
13	I	64	93	70	45	56	60	61	52	76	71	63	60	36	2	1	3	58	155	112	65
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
12	I	55	93	67	53	127	90	98	51	53	58	50	117	65	7	1	1	12	108	69	59
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
11	I	50	102	54	54	79	144	99	79	69	55	105	50	2	1	1	1	1	97	92	59
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
10	I	58	103	64	58	96	522	99	83	65	58	34	1	1	1	1	1	1	14	112	67
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
9	I	81	140	90	68	74	208	104	118	32	2	1	1	1	1	1	1	1	3	268	274
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

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  8 I   83    66    66    97    93   103   119    93   182   142     7     1     1     1     1     1     1     3    73   302
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  7 I  109    56    78   218    68    70    60    73   199   216    85     1     1     1     1     1     1    11    50    63
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  6 I   93    73    85   142    70    52    49    56   118   150   157     1     1     1     1     1     5    57    52    50
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  5 I   73   116   102    76    82    48    61    80    52    50    76     7     1     1     1     2    53    50    50    50
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  4 I   67   128    79    69    54    56    57    51    53    55    65   119    13     2     1    33    66    50    50    50
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  3 I   53    90    88    55    52   154   284   116   139    50    50    50    51    45    16    25   141    54    50    50
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  2 I   67    82    97   121   156   567   656   209   182    94    50    50    50    50    51    61    56    53    54    50
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  1 I   76    67   221   433   216   457   637   198   193   300    50    50    50    50    50    50    50    52    50    50
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
    ------------------------------------------------------------------------------------------------------------------------
        41    42    43    44    45    46    47    48    49    50    51    52    53    54    55    56    57    58    59    60

Surface roughness lengths (m)                                 Z0

Multiply all values by 10 **  -3

 88 I    1     1     1     1     1     1     1     1     1     1     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
 87 I    1     1     1     1     1     1     1     1     1     1     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
 86 I    1     1     1     1     1     1     1     1     1     1     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
 85 I    1     1     1     1     1     1     1     1     1     1     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
 84 I    1     1     1     1     1     1     1     1     1     1     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
 83 I    1     1     1     1     1     1     1     1     1     1     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
 82 I    1     1     1     1     1     1     1     1     1     1     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
 81 I    1     1     1     1     1     1     1     1     1     1     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
 80 I    1     1     1     1     1     1     1     1     1     1     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
 79 I    1     1     1     1     1     1     1     1     1     1     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
 78 I    1     1     1     1     1     1     1     1     1     1     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
 77 I    1     1     1     1     1     1     1     1     1     1     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
 76 I    1     1     1     1     1     1     1     1     1     1     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
 75 I    1     1     1     1     1     1     1     1     1     1     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
 74 I    1     1     1     1     1     1     1     1     1     1     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
 73 I    1     1     1     1     1     1     1     1     1     1     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
 72 I    1     1     1     1     1     1     1     1     1     1     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
 71 I    1     1     1     1     1     1     1     1     1     1     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
 70 I    1     1     1     1     1     1     1     1     1     1     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
 69 I    1     1     1     1     1     1     1     1     1     1     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
 68 I    1     1     1     1     1     1     1     1     1     1     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
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 67 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 66 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 65 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 64 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 63 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 62 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 61 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 60 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 59 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 58 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 57 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 56 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 55 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 54 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 53 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 52 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 51 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 50 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 49 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 48 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 47 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 46 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 45 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 44 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 43 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 42 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 41 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 40 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 39 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 38 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 37 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 36 I   1     1     1     1     1     1     1     1     1     1     1     1
    I   +     +     +     +     +     +     +     +     +     +     +     +
 35 I   1     1     1     1     1     1     1     1     1     1     1     1
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2662		I	+	+	+	+	+	+	+	+	+	+	+	+
2663	34	I	1	1	1	1	1	1	1	1	1	1	1	1
2664		I	+	+	+	+	+	+	+	+	+	+	+	+
2665	33	I	1	1	1	1	1	1	1	1	1	1	1	1
2666		I	+	+	+	+	+	+	+	+	+	+	+	+
2667	32	I	1	1	1	1	1	1	1	1	1	1	1	1
2668		I	+	+	+	+	+	+	+	+	+	+	+	+
2669	31	I	1300	1	1	1	1	1	1	1	1	1	1	1
2670		I	+	+	+	+	+	+	+	+	+	+	+	+
2671	30	I	15	1	1	1	1	1	1	1	1	1	1	1
2672		I	+	+	+	+	+	+	+	+	+	+	+	+
2673	29	I	6	1300	1	1	1	1	1	1	1	1	1	1
2674		I	+	+	+	+	+	+	+	+	+	+	+	+
2675	28	I	15	47	1	1	1	1	1	1	1	1	1	1
2676		I	+	+	+	+	+	+	+	+	+	+	+	+
2677	27	I	61	23	1	1	1	1	1	1	1	1	1	1
2678		I	+	+	+	+	+	+	+	+	+	+	+	+
2679	26	I	57	47	237	1	1	1	1	1	1	1	1	1
2680		I	+	+	+	+	+	+	+	+	+	+	+	+
2681	25	I	73	86	132	1	1	1	1	1	1	1	1	1
2682		I	+	+	+	+	+	+	+	+	+	+	+	+
2683	24	I	64	581	117	1	1	1	1	1	1	1	1	1
2684		I	+	+	+	+	+	+	+	+	+	+	+	+
2685	23	I	59	119	25	84	1	1	1	1	1	1	1	1
2686		I	+	+	+	+	+	+	+	+	+	+	+	+
2687	22	I	56	109	58	29	1	1	1	1	1	1	1	1
2688		I	+	+	+	+	+	+	+	+	+	+	+	+
2689	21	I	66	60	143	38	1	1	1	1	1	1	1	1
2690		I	+	+	+	+	+	+	+	+	+	+	+	+
2691	20	I	62	67	237	29	247	1	1	1	1	1	1	1
2692		I	+	+	+	+	+	+	+	+	+	+	+	+
2693	19	I	51	88	244	90	12	1	1	1	1	1	1	1
2694		I	+	+	+	+	+	+	+	+	+	+	+	+
2695	18	I	53	52	75	195	7	500	1	1	1	1	1	1
2696		I	+	+	+	+	+	+	+	+	+	+	+	+
2697	17	I	58	52	90	173	9	8	1	1	1	1	1	1
2698		I	+	+	+	+	+	+	+	+	+	+	+	+
2699	16	I	76	64	101	203	39	11	1	1	1	1	1	1
2700		I	+	+	+	+	+	+	+	+	+	+	+	+
2701	15	I	50	56	65	43	51	14	30	1	1	1	1	1
2702		I	+	+	+	+	+	+	+	+	+	+	+	+
2703	14	I	49	56	54	64	45	85	4	1	1	1	1	1
2704		I	+	+	+	+	+	+	+	+	+	+	+	+
2705	13	I	57	67	62	105	69	132	213	1	1	1	1	1
2706		I	+	+	+	+	+	+	+	+	+	+	+	+
2707	12	I	52	55	58	67	65	55	111	236	1	1	1	1
2708		I	+	+	+	+	+	+	+	+	+	+	+	+
2709	11	I	59	56	46	49	50	78	69	345	1	1	1	1
2710		I	+	+	+	+	+	+	+	+	+	+	+	+
2711	10	I	81	56	52	39	37	52	153	556	169	1	1	1
2712		I	+	+	+	+	+	+	+	+	+	+	+	+
2713	9	I	99	34	19	25	41	56	195	277	210	1	1	1
2714		I	+	+	+	+	+	+	+	+	+	+	+	+
2715	8	I	272	106	54	38	33	86	132	127	382	1	1	1
2716		I	+	+	+	+	+	+	+	+	+	+	+	+
2717	7	I	511	703	155	170	62	48	130	65	726	1	1	1
2718		I	+	+	+	+	+	+	+	+	+	+	+	+
2719	6	I	149	335	241	82	77	41	166	215	252	26	1	1
2720		I	+	+	+	+	+	+	+	+	+	+	+	+
2721	5	I	56	83	53	85	114	63	138	177	362	67	1	1
2722		I	+	+	+	+	+	+	+	+	+	+	+	+
2723	4	I	59	69	54	68	61	65	150	228	218	97	1	1
2724		I	+	+	+	+	+	+	+	+	+	+	+	+
2725	3	I	52	53	87	62	499	92	276	888	453	69	1	1
2726		I	+	+	+	+	+	+	+	+	+	+	+	+

```
  2 I   52    61   265   104   154    95   454   833   922     6     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
  1 I   50   149   203   221   150   185   187   479   570    14     1     1
    I    +     +     +     +     +     +     +     +     +     +     +     +
     ---------------------------------------------------------------------
        61    62    63    64    65    66    67    68    69    70    71    72

Land use categories                                              ILANDU

Multiply all values by 10 **  -2

 88 I 2000  4000  4000  2000  2000  2000  4000  4000  2000  2000  2000  2000  4000  4000  6100  4000  4000  4000  6100  4000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 87 I 6100  6100  4000  2000  2000  2000  2000  4000  4000  4000  4000  4000  4000  4000  6100  4000  7000  4000  4000  4000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 86 I 6100  4000  2000  4000  4000  2000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 85 I 4000  2000  4000  4000  4000  4000  4000  4000  4000  4000  2000  2000  4000  4000  4000  4000  4000  4000  4000  4000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 84 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  2000  2000  2000  2000  2000  4000  4000  4000  4000  4000  4000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 83 I 4000  4000  4000  4000  4000  4000  4000  4000  2000  2000  4000  2000  2000  2000  4000  4000  4000  4000  4000  4000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 82 I 4000  4000  4000  4000  4000  4000  4000  2000  2000  2000  2000  2000  4000  4000  4000  4000  2000  4000  4000  4000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 81 I 4000  4000  4000  4000  6100  4000  2000  2000  2000  2000  2000  4000  4000  4000  4000  4000  2000  4000  4000  4000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 80 I 4000  4000  4000  6100  6100  2000  2000  2000  4000  2000  2000  2000  4000  4000  2000  2000  2000  4000  4000  4000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 79 I 4000  4000  4000  4000  4000  2000  2000  4000  4000  2000  2000  4000  4000  2000  4000  4000  4000  2000  2000  4000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 78 I 4000  4000  4000  4000  4000  4000  4000  2000  2000  2000  4000  4000  2000  4000  2000  2000  2000  2000  2000  4000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 77 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  2000  4000  2000  2000  4000  4000  4000  2000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 76 I 6100  6100  4000  4000  4000  4000  6100  6100  6100  4000  4000  2000  2000  2000  2000  4000  4000  4000  4000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 75 I 4000  6100  4000  4000  4000  4000  6100  6100  6100  6100  6100  4000  4000  2000  2000  4000  4000  4000  4000  4000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 74 I 4000  4000  4000  4000  4000  6100  4000  6100  6100  6100  4000  6100  4000  4000  4000  4000  4000  2000  2000  4000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 73 I 4000  4000  6100  6100  4000  6100  4000  4000  4000  6100  6100  4000  4000  4000  4000  4000  4000  2000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 72 I 6100  4000  4000  6100  4000  4000  4000  6100  6100  6100  4000  4000  4000  2000  4000  4000  4000  4000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 71 I 6100  6100  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  2000  4000  4000  4000  4000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 70 I 5500  6200  4000  4000  4000  4000  4000  6100  4000  6100  4000  4000  4000  2000  2000  4000  4000  4000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 69 I 5500  5500  5500  6200  6100  4000  6100  6100  4000  4000  4000  4000  2000  2000  4000  4000  4000  2000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 68 I 5500  5500  5500  6200  4000  4000  4000  6100  6100  4000  4000  4000  2000  2000  2000  4000  4000  4000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 67 I 5500  5500  5500  6200  4000  4000  6100  6100  6100  6100  4000  4000  4000  2000  2000  2000  4000  4000  4000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 66 I 5500  5500  5500  6200  4000  4000  4000  6100  6100  6100  4000  4000  4000  2000  2000  2000  4000  4000  4000  4000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 65 I 5500  5500  5500  5400  6200  4000  6100  4000  6100  6100  4000  4000  4000  4000  2000  2000  4000  4000  4000  4000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 64 I 5500  5500  5500  5500  5500  6200  6200  6100  6100  6100  4000  4000  4000  2000  4000  4000  4000  4000  4000  4000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 63 I 5500  5500  5500  5500  5500  5500  5500  6200  6100  4000  6100  4000  2000  2000  4000  4000  4000  4000  4000  4000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 62 I 5500  5500  5500  5500  5500  5500  5500  6200  6200  6100  6100  4000  6100  4000  4000  4000  4000  4000  4000  4000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
```

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61 I 5500 5500 5500 5500 5500 5500 5500 6200 6200 6200 6100 6100 6100 6100 6100 4000 4000 4000 6100 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
60 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 6200 6100 4000 4000 6100 6100 6100 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
59 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 6200 6100 6100 6100 6100 6100 6100 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
58 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5400 5400 6200 6200 6200 6200 6200 4000 4000 4000 6100
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
57 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5400 5400 5500 5500 5500 6200 6200 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
56 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 6200 6200 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
55 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5400 4000 4000 4000 2000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
54 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 6200 6200 3000 3000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
53 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 6200 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
52 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5400 5400 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
51 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 6200 6200 6200 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
50 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5400 5400 6100 6200 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
49 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5400 6100 6100 6100
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
48 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5400 6200 6200 6100
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
47 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5400 5400 6100 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
46 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 6200 6100 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
45 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5400 6100 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
44 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 6200 6100 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
43 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 6100 6100 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
42 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 7000 6100 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
41 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 6200 1000 4000 7000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
40 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 1000 1000 2000 3000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
39 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 7000 6200 1000 7000 3000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
38 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 6100 1000 6100 3000 3000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
37 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5400 5400 1000 1000 2000 3000 3000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
36 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5400 5400 1000 2000 2000 2000 2000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
35 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5400 5400 1000 2000 2000 2000 2000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
34 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5400 5400 2000 2000 3000 2000 2000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
33 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5400 1000 3000 3000 2000 1000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
32 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 1000 1000 1000 5400 6200 1000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
31 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 1000 1000 1000 5400 5400 5400 5400
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
30 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 1000 1000 1000 1000 6100 5400 5400
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
29 I 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 5500 1000 1000 1000 1000 1000 5400 5400
```

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     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  28 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  1000  1000  1000  1000  1000  5400  5400
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  27 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  1000  1000  1000  1000  5400  5400
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  26 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  1000  5400  1000  5400  5400
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  25 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5400  5400  5400  5400  5400
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  24 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5400  5400  5400  5400  2000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  23 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5400  5400  5400  5400  2000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  22 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5400  5400  5400  1000  2000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  21 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  1000  5400  1000  1000  1000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  20 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5400  2000  1000  1000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  19 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  1000  5400  5400  2000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  18 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  6100  5400  1000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  17 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  1000  1000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  16 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5400  1000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  15 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  1000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  14 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  13 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  12 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  11 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  10 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   9 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   8 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   7 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   6 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   5 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   4 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   3 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   2 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   1 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
      -------------------------------------------------------------------------------------------------------------------
         1     2     3     4     5     6     7     8     9    10    11    12    13    14    15    16    17    18    19    20

Land use categories                                         ILANDU

Multiply all values by 10 **  -2

  88 I 4000  6100  6100  6100  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  6200
```

```
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 87 I 4000  4000  6100  6100  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 86 I 4000  6100  6100  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 85 I 4000  6100  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  1000  1000  5000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 84 I 4000  4000  6100  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  1000  1000  1000  1000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 83 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  1000  1000  1000  1000  1000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 82 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  1000  1000  5000  1000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 81 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  1000  5000  4000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 80 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  5000  1000  4000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 79 I 4000  4000  4000  4000  4000  4000  6100  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  5000  4000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 78 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 77 I 4000  4000  4000  4000  4000  4000  4000  2000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 76 I 2000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  5000  5000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 75 I 2000  2000  4000  4000  2000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  2000  4000  5000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 74 I 2000  2000  2000  4000  2000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  5000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 73 I 2000  2000  2000  2000  2000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  5000  2000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 72 I 2000  2000  2000  2000  4000  4000  4000  4000  6100  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 71 I 2000  2000  2000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  6100  4000  4000  4000  4000  4000  5000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 70 I 2000  2000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  6100  6100  4000  2000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 69 I 2000  2000  2000  1000  1000  4000  4000  4000  4000  2000  4000  4000  4000  7000  4000  4000  4000  1000  2000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 68 I 2000  4000  4000  4000  2000  4000  4000  4000  4000  4000  4000  7000  4000  4000  6100  4000  1000  1000  4000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 67 I 2000  2000  4000  2000  6200  6200  4000  4000  4000  4000  4000  4000  4000  4000  6100  4000  6100  6100  6100  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 66 I 2000  4000  4000  6200  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  6100  2000  4000  6100
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 65 I 2000  4000  4000  4000  4000  4000  2000  4000  4000  4000  4000  4000  4000  4000  4000  4000  6100  4000  4000  5000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 64 I 4000  2000  2000  4000  4000  2000  2000  6200  6200  6100  4000  4000  4000  4000  4000  4000  4000  4000  4000  2000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 63 I 2000  2000  2000  4000  4000  2000  2000  2000  2000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 62 I 4000  2000  2000  4000  4000  2000  2000  2000  2000  4000  4000  6100  4000  4000  4000  4000  4000  5000  5000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 61 I 4000  2000  2000  2000  4000  2000  2000  2000  2000  2000  4000  4000  4000  4000  4000  4000  4000  5000  5000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 60 I 2000  2000  2000  2000  4000  2000  2000  2000  2000  4000  4000  4000  4000  4000  4000  4000  4000  4000  5000  5000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 59 I 4000  2000  4000  4000  2000  2000  2000  2000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  5000  5000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 58 I 7000  2000  4000  7000  2000  2000  2000  2000  1000  2000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 57 I 7000  7000  4000  2000  4000  2000  2000  2000  2000  7000  6100  4000  4000  4000  4000  4000  4000  4000  4000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 56 I 4000  4000  2000  2000  4000  2000  2000  2000  2000  2000  7000  6100  2000  4000  4000  4000  4000  4000  4000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
```

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 55 I 4000  4000  2000  2000  4000  4000  4000  4000  2000  2000  2000  2000  2000  4000  4000  4000  4000  4000  4000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 54 I 4000  4000  4000  4000  2000  7000  4000  2000  2000  2000  2000  2000  2000  4000  4000  4000  4000  4000  4000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 53 I 4000  4000  4000  6200  6100  6100  4000  4000  2000  2000  2000  2000  2000  6200  2000  2000  2000  2000  2000  6100
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 52 I 4000  4000  7000  6200  6200  6100  3000  2000  2000  2000  2000  2000  2000  2000  2000  5000  4000  2000  2000  6100
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 51 I 4000  4000  4000  7000  1000  6100  6100  6100  6100  2000  2000  2000  2000  5000  2000  5000  1000  2000  2000  2000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 50 I 4000  4000  4000  4000  1000  6200  6100  6100  6100  2000  2000  2000  1000  2000  5000  1000  2000  2000  2000  2000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 49 I 7000  4000  4000  4000  2000  6200  6100  6100  2000  2000  2000  2000  2000  5000  5000  2000  2000  2000  2000  2000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 48 I 4000  2000  4000  2000  2000  6100  6100  2000  2000  2000  4000  2000  2000  2000  2000  2000  2000  2000  2000  2000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 47 I 2000  2000  4000  2000  4000  2000  6100  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 46 I 4000  4000  4000  4000  4000  4000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  5000  5000  2000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 45 I 4000  4000  4000  2000  4000  4000  4000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  5000  5000  2000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 44 I 4000  4000  2000  2000  2000  4000  6100  6100  6100  6100  6100  2000  2000  2000  2000  2000  2000  2000  2000  2000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 43 I 4000  4000  4000  6100  2000  2000  2000  6100  6100  6100  6100  6100  6100  2000  2000  2000  2000  2000  2000  2000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 42 I 4000  2000  4000  2000  2000  2000  2000  6100  6100  6100  6100  6100  2000  6100  2000  2000  2000  2000  2000  2000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 41 I 2000  2000  2000  2000  2000  2000  2000  6100  6100  6100  6100  3000  6100  6100  6100  6100  2000  2000  6100  6100
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 40 I 2000  3000  2000  2000  2000  2000  1000  2000  3000  6100  6100  3000  6100  2000  6100  6100  2000  2000  6100  6100
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 39 I 2000  2000  6100  2000  2000  2000  2000  2000  6100  6100  3000  6100  2000  2000  6100  6100  6100  6100  2000  6100
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 38 I 2000  2000  6100  6100  2000  2000  2000  2000  6100  6100  3000  3000  2000  2000  6100  6100  6100  2000  2000  6100
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 37 I 2000  2000  2000  3000  3000  2000  1000  2000  3000  2000  3000  3000  2000  2000  2000  6100  6100  2000  6200  6100
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 36 I 3000  2000  2000  3000  3000  2000  3000  3000  3000  2000  2000  2000  2000  2000  6100  6100  6200  2000  2000  6100
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 35 I 2000  2000  6100  3000  3000  6100  2000  2000  2000  2000  1000  1000  2000  2000  2000  2000  6200  2000  2000  6100
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 34 I 2000  1000  6100  6100  6100  2000  2000  2000  2000  2000  2000  1000  2000  2000  2000  2000  2000  2000  2000  6100
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 33 I 1000  1000  1000  1000  2000  2000  2000  2000  2000  2000  1000  1000  1000  4000  1000  1000  2000  2000  2000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 32 I 1000  1000  1000  2000  1000  2000  2000  2000  2000  3000  7000  1000  4000  4000  2000  1000  2000  2000  2000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 31 I 1000  1000  1000  2000  1000  2000  2000  2000  2000  3000  2000  2000  2000  5000  7000  2000  2000  2000  2000  4000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 30 I 1000  5400  3000  2000  2000  2000  7000  4000  2000  2000  7000  7000  7000  2000  2000  2000  2000  2000  2000  2000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 29 I 1000  5400  5400  3000  4000  4000  4000  6100  4000  2000  3000  7000  7000  7000  6100  2000  2000  2000  2000  2000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 28 I 5400  5400  2000  2000  2000  2000  2000  2000  2000  3000  3000  3000  3000  7000  7000  2000  2000  2000  3000  2000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 27 I 5400  5400  2000  2000  2000  4000  2000  2000  2000  3000  3000  3000  7000  7000  7000  2000  2000  2000  3000  2000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 26 I 5400  2000  2000  3000  2000  2000  2000  2000  4000  4000  3000  3000  7000  7000  4000  2000  2000  2000  3000  2000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 25 I 2000  2000  2000  2000  3000  2000  2000  2000  2000  4000  4000  7000  4000  4000  2000  3000  3000  2000  2000  6100
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 24 I 2000  3000  3000  3000  3000  2000  3000  2000  3000  3000  3000  3000  2000  2000  2000  2000  2000  3000  3000  2000
    I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 23 I 2000  2000  2000  2000  3000  3000  3000  3000  3000  3000  3000  2000  3000  2000  2000  2000  2000  2000  2000  2000
```

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     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  22 I 2000   2000   3000   3000   3000   3000   3000   3000   2000   2000   3000   6100   3000   2000   2000   2000   2000   6100   3000   3000
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  21 I 2000   2000   2000   3000   2000   3000   3000   2000   3000   2000   2000   3000   2000   2000   2000   2000   2000   6100   2000   4000
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  20 I 2000   3000   2000   3000   3000   2000   3000   2000   2000   2000   2000   3000   2000   6100   2000   2000   2000   2000   2000   4000
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  19 I 2000   3000   2000   3000   3000   3000   3000   2000   3000   2000   2000   2000   2000   3000   2000   2000   2000   2000   2000   6100
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  18 I 1000   3000   3000   2000   2000   2000   3000   3000   3000   3000   2000   3000   3000   3000   2000   2000   2000   2000   2000   3000
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  17 I 1000   2000   2000   2000   2000   6200   2000   2000   2000   3000   2000   3000   2000   2000   3000   3000   3000   2000   3000   3000
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  16 I 1000   2000   2000   2000   3000   3000   2000   3000   3000   3000   2000   2000   2000   2000   2000   3000   2000   2000   2000   3000
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  15 I 3000   3000   2000   3000   3000   3000   3000   3000   2000   3000   2000   2000   2000   2000   2000   2000   2000   2000   2000   3000
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  14 I 3000   3000   3000   3000   3000   3000   3000   2000   2000   3000   6100   2000   6100   2000   2000   3000   3000   2000   2000   3000
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  13 I 1000   3000   3000   3000   3000   3000   3000   2000   3000   3000   2000   6100   2000   2000   2000   3000   3000   3000   6200   3000
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  12 I 1000   1000   2000   3000   3000   7000   7000   3000   3000   3000   6100   2000   3000   2000   2000   2000   3000   3000   3000   2000
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  11 I 5500   1000   3000   3000   3000   7000   7000   7000   4000   3000   6100   2000   3000   2000   2000   2000   3000   3000   3000   3000
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  10 I 5500   1000   1000   3000   3000   7000   7000   7000   7000   3000   3000   3000   3000   3000   3000   3000   3000   3000   3000   3000
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
   9 I 5500   5500   5400   3000   3000   7000   6100   6100   1000   3000   2000   2000   2000   4000   3000   3000   3000   3000   3000   4000
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
   8 I 5500   5500   1000   1000   3000   3000   3000   5400   1000   1000   7000   3000   3000   3000   3000   3000   2000   3000   3000   3000
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
   7 I 5500   5500   5500   4000   3000   3000   3000   5400   5400   6100   3000   3000   3000   3000   3000   2000   3000   3000   3000   3000
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
   6 I 5500   5500   5500   5500   5400   6100   6100   5400   5400   4000   3000   3000   6200   3000   3000   3000   6100   3000   3000   2000
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
   5 I 5500   5500   5500   5500   5400   5400   5400   5400   5400   6100   3000   3000   3000   3000   3000   2000   3000   3000   3000   3000
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
   4 I 5500   5500   5500   5500   1000   5400   5400   5400   5400   4000   3000   3000   3000   2000   2000   2000   3000   3000   2000   2000
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
   3 I 5500   5500   5500   5500   5400   5400   5400   6100   6100   7000   7000   7000   1000   1000   3000   2000   3000   3000   7000   2000
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
   2 I 5500   5500   5500   5500   5500   5400   5400   6100   5400   7000   7000   7000   5400   1000   2000   2000   3000   7000   7000   3000
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
   1 I 5500   5500   5500   5500   5500   5400   5400   5400   6100   3000   7000   1000   1000   3000   4000   2000   3000   7000   7000   3000
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
     ----------------------------------------------------------------------------------------------------------------------------------------
         21     22     23     24     25     26     27     28     29     30     31     32     33     34     35     36     37     38     39     40

Land use categories                                                 ILANDU

Multiply all values by 10 **  -2

  88 I 6200   6200   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  87 I 4000   6200   7000   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  86 I 6200   6200   4000   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  85 I 6200   6200   1000   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  84 I 4000   4000   1000   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  83 I 4000   4000   1000   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500
     I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  82 I 4000   4000   4000   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500   5500
```

	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
81	I	4000	4000	4000	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
80	I	4000	4000	4000	4000	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
79	I	4000	4000	4000	4000	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
78	I	4000	4000	4000	4000	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
77	I	4000	6100	4000	6200	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
76	I	2000	6100	4000	6200	7000	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
75	I	2000	4000	4000	4000	4000	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
74	I	4000	4000	4000	1000	7000	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
73	I	4000	4000	4000	4000	6200	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
72	I	4000	4000	4000	4000	4000	7000	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
71	I	6100	2000	4000	4000	4000	6200	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
70	I	2000	2000	4000	4000	4000	6200	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
69	I	2000	2000	4000	4000	4000	4000	4000	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
68	I	4000	3000	4000	4000	4000	4000	4000	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
67	I	4000	4000	4000	4000	4000	4000	4000	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
66	I	4000	4000	6100	4000	4000	4000	4000	4000	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
65	I	4000	4000	2000	4000	4000	4000	4000	4000	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
64	I	5000	4000	4000	2000	4000	4000	4000	4000	1000	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
63	I	2000	6100	4000	4000	4000	4000	4000	4000	6200	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
62	I	2000	6100	4000	4000	4000	6100	4000	4000	6200	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
61	I	6100	2000	4000	2000	4000	4000	6100	4000	1000	1000	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
60	I	4000	4000	4000	6100	4000	4000	4000	4000	4000	1000	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
59	I	6100	4000	4000	4000	4000	4000	4000	4000	4000	1000	1000	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
58	I	4000	4000	4000	4000	6100	4000	6100	6100	4000	1000	1000	5500	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
57	I	6100	6200	6100	4000	4000	4000	6100	6100	4000	4000	1000	7000	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
56	I	6100	6200	6200	4000	4000	6100	6100	6100	6100	4000	4000	6100	5500	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
55	I	4000	4000	6100	2000	1000	6100	6100	6100	4000	2000	4000	6100	1000	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
54	I	4000	4000	6100	4000	4000	2000	3000	3000	4000	4000	4000	4000	6100	5500	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
53	I	6100	6100	6100	4000	4000	4000	7000	4000	3000	4000	4000	4000	6100	6100	5500	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
52	I	6100	6100	6100	4000	4000	7000	7000	4000	2000	6100	6100	4000	3000	6200	7000	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
51	I	6100	4000	4000	4000	5000	4000	3000	4000	4000	4000	4000	4000	3000	5400	5400	5500	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
50	I	6100	4000	4000	2000	1000	2000	4000	4000	4000	4000	4000	4000	4000	3000	5400	6100	5500	5500	5500	5500
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

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 49 I 6100  6100  4000  2000  1000  2000  6200  4000  4000  4000  6100  4000  3000  5400  5400  5400  5500  5500  5500  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 48 I 4000  6100  2000  4000  6100  5000  4000  4000  4000  3000  6200  4000  3000  5400  5400  5400  5400  5500  5500  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 47 I 1000  4000  1000  1000  7000  2000  4000  4000  4000  6200  6200  4000  3000  5400  6200  6100  5400  7000  5500  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 46 I 2000  2000  1000  1000  2000  2000  4000  4000  4000  4000  6200  6200  4000  1000  5000  3000  3000  3000  5500  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 45 I 2000  1000  1000  1000  6100  4000  4000  4000  3000  4000  6200  3000  3000  1000  5400  6100  3000  3000  4000  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 44 I 2000  1000  1000  1000  6100  3000  3000  2000  3000  3000  4000  6200  6200  3000  5400  6200  3000  3000  1000  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 43 I 2000  3000  1000  1000  6100  3000  3000  3000  3000  3000  4000  6100  6200  3000  5400  3000  3000  5400  1000  1000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 42 I 2000  4000  1000  1000  2000  3000  3000  3000  3000  3000  6100  6100  6200  3000  3000  2000  3000  5400  1000  1000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 41 I 3000  3000  2000  3000  3000  2000  6100  3000  6100  3000  3000  6200  6200  7000  3000  2000  3000  5400  1000  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 40 I 3000  3000  3000  3000  3000  2000  3000  3000  3000  3000  2000  3000  6200  3000  1000  1000  5400  5400  5500  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 39 I 2000  2000  2000  2000  5000  2000  3000  3000  6100  3000  2000  2000  6200  6200  6200  3000  5400  1000  5500  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 38 I 6100  2000  2000  2000  5000  2000  3000  3000  2000  2000  2000  2000  3000  6200  2000  2000  5400  5400  5500  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 37 I 2000  2000  5000  2000  3000  2000  3000  3000  2000  2000  2000  2000  6200  2000  2000  2000  3000  5400  5500  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 36 I 6100  2000  5000  2000  3000  2000  2000  6100  2000  2000  2000  2000  2000  6200  6200  2000  3000  5400  1000  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 35 I 3000  3000  2000  3000  4000  6100  3000  6100  3000  2000  2000  2000  2000  2000  2000  6200  1000  5400  1000  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 34 I 6100  3000  2000  2000  2000  6100  3000  3000  3000  3000  3000  6100  2000  2000  6200  6200  1000  1000  1000  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 33 I 4000  2000  2000  2000  2000  3000  3000  3000  3000  3000  3000  3000  6100  6100  6200  3000  4000  3000  5400  4000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 32 I 4000  2000  2000  3000  2000  2000  3000  3000  3000  3000  3000  3000  3000  6100  6100  2000  7000  3000  3000  5400
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 31 I 4000  2000  4000  5000  5000  2000  3000  3000  3000  3000  2000  2000  2000  2000  6100  3000  3000  3000  3000  5400
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 30 I 2000  3000  3000  3000  5000  5000  3000  3000  3000  2000  2000  2000  3000  2000  6100  2000  2000  3000  3000  3000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 29 I 2000  3000  3000  3000  5000  5000  3000  3000  2000  2000  2000  3000  3000  2000  6100  6100  2000  3000  3000  3000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 28 I 6100  5000  1000  3000  3000  2000  3000  3000  2000  3000  2000  3000  2000  4000  6100  6100  2000  3000  3000  3000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 27 I 6100  6100  3000  4000  3000  2000  3000  2000  3000  2000  3000  3000  2000  2000  6100  2000  2000  3000  3000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 26 I 2000  6100  2000  3000  2000  2000  3000  2000  2000  2000  2000  3000  3000  3000  5000  6100  2000  3000  3000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 25 I 6100  3000  3000  3000  2000  2000  2000  3000  2000  3000  2000  3000  3000  3000  6100  6100  2000  6200  3000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 24 I 2000  2000  6100  2000  2000  2000  2000  3000  3000  3000  3000  3000  3000  3000  2000  6100  6100  2000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 23 I 2000  2000  2000  6100  2000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  6100  6100  2000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 22 I 2000  2000  2000  2000  2000  3000  3000  3000  3000  3000  3000  3000  2000  2000  2000  2000  2000  6100  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 21 I 1000  2000  3000  2000  2000  2000  3000  3000  3000  2000  3000  2000  2000  2000  2000  2000  2000  2000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 20 I 3000  2000  3000  2000  2000  2000  6100  2000  2000  2000  2000  2000  2000  2000  2000  3000  2000  2000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 19 I 2000  2000  2000  2000  5000  2000  6100  6100  2000  2000  2000  2000  2000  2000  2000  3000  3000  2000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 18 I 3000  3000  2000  3000  5000  2000  3000  3000  2000  2000  2000  3000  2000  2000  2000  3000  2000  3000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 17 I 2000  3000  2000  7000  5000  2000  3000  3000  3000  3000  2000  2000  2000  2000  2000  2000  3000  2000  2000  2000
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    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 16 I 2000  3000  2000  2000  6100  6100  3000  3000  3000  2000  3000  6100  2000  2000  2000  2000  2000  2000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 15 I 2000  3000  3000  2000  2000  2000  2000  3000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  3000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 14 I 3000  3000  3000  3000  2000  2000  2000  3000  2000  2000  2000  6200  2000  5000  5000  2000  3000  2000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 13 I 3000  3000  3000  2000  2000  2000  2000  3000  2000  2000  2000  2000  2000  5000  5000  5000  3000  6100  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 12 I 2000  3000  2000  3000  3000  3000  3000  3000  3000  3000  2000  6200  6200  5000  5000  5000  2000  3000  3000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 11 I 2000  2000  2000  3000  3000  3000  3000  3000  2000  3000  6200  6200  5000  5000  5000  5000  5000  2000  3000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 10 I 3000  3000  3000  3000  3000  4000  3000  3000  2000  6200  6200  5000  5000  5000  5000  5000  5000  2000  4000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  9 I 3000  3000  3000  3000  3000  6200  3000  6200  6200  5000  5000  5000  5000  5000  5000  5000  5000  5000  4000  4000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  8 I 3000  3000  3000  3000  3000  3000  3000  3000  6200  6200  5000  5000  5000  5000  5000  5000  5000  5000  2000  4000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  7 I 3000  3000  3000  3000  3000  3000  2000  2000  6200  6200  6200  5000  5000  5000  5000  5000  5000  2000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  6 I 3000  2000  3000  2000  3000  3000  2000  2000  2000  6200  6200  5000  5000  5000  5000  5000  5000  2000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  5 I 3000  3000  2000  3000  2000  2000  2000  6200  2000  2000  2000  5000  5000  5000  5000  5000  2000  2000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  4 I 2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  5000  5000  6200  2000  2000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  3 I 2000  2000  2000  2000  2000  3000  4000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  2 I 3000  2000  2000  2000  4000  4000  4000  7000  7000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  1 I 3000  3000  6200  4000  4000  4000  4000  3000  4000  4000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
    ----------------------------------------------------------------------------------------------------------------------
        41    42    43    44    45    46    47    48    49    50    51    52    53    54    55    56    57    58    59    60

Land use categories                                           ILANDU

Multiply all values by 10 **  -2

 88 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +
 87 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +
 86 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +
 85 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +
 84 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +
 83 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +
 82 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +
 81 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +
 80 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +
 79 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +
 78 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +
 77 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I    +     +     +     +     +     +     +     +     +     +     +     +
 76 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
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    I   +     +     +     +     +     +     +     +     +     +     +     +
 75 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 74 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 73 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 72 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 71 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 70 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 69 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 68 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 67 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 66 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 65 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 64 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 63 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 62 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 61 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 60 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 59 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 58 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 57 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 56 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 55 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 54 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 53 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 52 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 51 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 50 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 49 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 48 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 47 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 46 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 45 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
 44 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
    I   +     +     +     +     +     +     +     +     +     +     +     +
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43 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
42 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
41 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
40 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
39 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
38 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
37 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
36 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
35 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
34 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
33 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
32 I 5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
31 I 4000  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
30 I 5400  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
29 I 5400  4000  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
28 I 5400  6100  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
27 I 7000  2000  5500  5500  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
26 I 2000  2000  4000  5500  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
25 I 2000  2000  6100  5500  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
24 I 2000  1000  1000  5500  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
23 I 2000  2000  6100  7000  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
22 I 2000  2000  7000  4000  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
21 I 2000  2000  3000  6100  5500  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
20 I 2000  2000  1000  1000  1000  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
19 I 2000  2000  1000  1000  5400  5500  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
18 I 2000  3000  3000  1000  5400  6100  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
17 I 2000  3000  7000  3000  5400  5400  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
16 I 2000  3000  7000  7000  3000  5400  5500  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
15 I 2000  3000  2000  3000  3000  5400  6100  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
14 I 3000  3000  3000  3000  3000  1000  5400  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
13 I 3000  3000  3000  3000  3000  3000  6100  5500  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
12 I 2000  2000  2000  2000  3000  3000  3000  6100  5500  5500  5500  5500
   I    +     +     +     +     +     +     +     +     +     +     +     +
11 I 2000  2000  2000  2000  2000  3000  3000  1000  5500  5500  5500  5500
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     I   +     +     +     +     +     +     +     +     +     +     +     +
  10 I 2000  2000  2000  2000  3000  2000  3000  4000  1000  5500  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +
   9 I 2000  3000  3000  3000  3000  3000  4000  1000  4000  5500  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +
   8 I 6100  3000  3000  3000  3000  7000  7000  3000  4000  5500  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +
   7 I 4000  4000  4000  4000  3000  3000  3000  3000  4000  5500  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +
   6 I 2000  4000  4000  4000  3000  3000  6200  3000  1000  6100  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +
   5 I 2000  2000  2000  7000  7000  3000  6200  3000  1000  1000  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +
   4 I 2000  2000  2000  3000  2000  3000  6200  3000  1000  1000  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +
   3 I 2000  2000  2000  2000  4000  3000  4000  1000  1000  1000  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +
   2 I 2000  2000  6200  6200  2000  2000  4000  1000  1000  5000  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +
   1 I 2000  6200  6200  6200  6200  2000  2000  1000  1000  5000  5500  5500
     I   +     +     +     +     +     +     +     +     +     +     +     +
     -----------------------------------------------------------------------
         61    62    63    64    65    66    67    68    69    70    71    72

Terrain heights (m)                                          ELEV

Multiply all values by 10 **  -2

  88 I 3570  3850  3950  3480  2850  3400  3110  2560  3380  3510  2880  2810  4200  3670  3030  2680  3070  3020  3530  3510
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  87 I 3130  3490  4140  4390  3280  3240  3500  2180  2220  1960  2410  3650  3990  4180  2970  2530  3020  2840  3530  3620
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  86 I 3250  4350  4650  3850  2850  2570  2510  1950  1600  2660  2690  2430  3360  3700  3610  2500  3190  3470  3110  3630
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  85 I 3620  3810  3780  3010  2820  2170  2210  2060  2000  3170  3500  3710  2750  1980  2950  2180  2580  2670  2610  3260
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  84 I 2920  3290  2960  2840  2800  2210  1990  1830  2360  3040  3420  4040  4300  3260  2110  1750  2360  2480  3130  3530
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  83 I 2230  2640  2760  2800  2300  1750  1420  2230  2940  3220  3280  3290  3850  4120  3610  2740  2610  2960  3540  4200
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  82 I 2460  2610  2750  2760  2400  1840  1360  2550  3030  3080  3000  3470  3750  5060  5330  4560  4230  3730  3910  4260
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  81 I 1920  2520  2690  2700  2480  1710  1660  2560  2790  2810  2720  3040  3910  5190  5110  4770  4100  4040  5110  4990
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  80 I 1450  2270  2530  2570  2590  2520  2480  2210  2290  2140  2330  2990  4240  4680  4960  3630  3570  3720  3490  4190
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  79 I 1520  1850  2090  2550  2830  2810  3170  2120  1610  1620  1750  2490  3450  3700  4100  3470  2960  3010  3420  4250
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  78 I 1420  1650  2100  2990  3090  2480  2830  3080  2450  1790  1350  1790  2460  2680  2940  2750  2400  2700  3670  4190
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  77 I 1380  1600  1940  2870  3200  2840  2660  2670  2460  2090  1410  1320  1600  1500  1940  2190  1720  2530  3080  3380
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  76 I 1150  1280  1710  1920  1960  2160  2190  2300  2320  2140  1840  1390  1050  1110  1310  1320  1640  2260  2700  3350
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  75 I 1120  1200  1310  1420  1300  1470  1690  2030  2100  2100  2050  1720  1210  1020  1070  1060  1850  2380  3320  3770
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  74 I  820   920  1130  1030  1020  1020  1300  1780  2010  2100  2090  1800  1390   810  1060  1190  1630  2250  2380  2200
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  73 I  580   810   820   830   810   780  1020  1540  1820  2050  2010  1770  1300   940  1840  1580  1380  1570  1650  2060
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  72 I  140   640   880   810   690   740   940  1380  1740  1730  1710  1610   860  1130  1880  2010  1850  1570  2180  2380
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  71 I   20   190   590   770   610   760  1040  1220  1570  1790  1600  1210   660  1600  2060  2140  2160  2190  2250  2720
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  70 I    0     0   110   430   600   780  1100  1200  1380  1490  1280   960   640  1660  1790  2350  2380  2890  2660  2420
```

I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
69 I	0	0	0	50	500	680	1080	1190	1200	1200	1130	800	520	1080	1750	2050	2460	2530	2340	2080
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
68 I	0	0	0	60	350	540	830	1030	980	1080	990	580	710	1280	1600	1960	2510	2980	2720	2750
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
67 I	0	0	0	30	210	430	610	760	650	730	890	610	640	1140	1570	1800	2170	2680	2420	2640
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
66 I	0	0	0	0	150	280	470	520	480	530	670	520	720	1170	1760	2230	1840	1690	2510	2640
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
65 I	0	0	0	0	20	140	180	200	230	400	530	450	710	960	1410	1710	1500	1700	2840	2890
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
64 I	0	0	0	0	0	10	10	80	170	330	440	530	730	790	900	1220	1190	1610	2270	2600
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
63 I	0	0	0	0	0	0	0	20	120	210	310	530	760	830	820	1000	1040	1420	1900	2550
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
62 I	0	0	0	0	0	0	0	0	80	130	220	370	670	800	780	720	860	1160	1820	3280
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
61 I	0	0	0	0	0	0	0	0	0	120	200	200	520	610	630	590	630	950	1500	3020
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
60 I	0	0	0	0	0	0	0	0	0	10	180	200	430	370	310	350	490	960	1640	2440
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
59 I	0	0	0	0	0	0	0	0	0	0	170	200	220	210	200	210	270	640	1360	2430
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
58 I	0	0	0	0	0	0	0	0	0	0	70	20	40	70	70	160	210	410	1240	1940
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
57 I	0	0	0	0	0	0	0	0	0	0	10	0	0	0	10	170	230	360	1280	2080
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
56 I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	90	240	450	1240	1650
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
55 I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	190	500	900	1170
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
54 I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	170	310	740	1400
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
53 I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	70	190	330	780
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
52 I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	150	380
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
51 I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	130	200	400
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
50 I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	50	180	210	270
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
49 I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	120	210	240
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
48 I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	90	140	300
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
47 I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	200	400
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
46 I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	70	210	510
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
45 I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	220	550
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
44 I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	290	930
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
43 I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	470	1090
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
42 I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	180	840	1250
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
41 I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	500	1140	1410
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
40 I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	130	600	970	1450
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
39 I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	270	640	1030	1530
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
38 I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	440	660	990	1460
I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

3572	37	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	140	550	760	1110	1360
3573		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3574	36	I	0	0	0	0	0	0	0	0	0	0	0	0	0	10	40	200	500	900	1260	1700
3575		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3576	35	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	390	500	690	1130	1640
3577		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3578	34	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	950	480	530	920	1240
3579		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3580	33	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	1210	960	250	430	730
3581		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3582	32	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	140	1630	850	30	130	390
3583		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3584	31	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	670	1060	110	0	0	80
3585		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3586	30	I	0	0	0	0	0	0	0	0	0	0	0	0	0	40	1040	250	180	40	0	20
3587		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3588	29	I	0	0	0	0	0	0	0	0	0	0	0	0	0	150	1010	190	270	190	0	40
3589		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3590	28	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	130	230	930	700	20	0
3591		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3592	27	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	900	760	0	0
3593		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3594	26	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	50	140	0	0
3595		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3596	25	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3597		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3598	24	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	160
3599		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3600	23	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	10	270
3601		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3602	22	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	440
3603		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3604	21	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	240	310	180
3605		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3606	20	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	150	560	680
3607		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3608	19	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	540
3609		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3610	18	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	440
3611		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3612	17	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	250
3613		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3614	16	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	150
3615		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3616	15	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3617		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3618	14	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3619		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3620	13	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3621		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3622	12	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3623		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3624	11	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3625		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3626	10	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3627		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3628	9	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3629		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3630	8	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3631		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3632	7	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3633		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3634	6	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3635		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3636	5	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 4 I    0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 3 I    0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 2 I    0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 1 I    0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   -------------------------------------------------------------------------------------------------------------------------
        1     2     3     4     5     6     7     8     9    10    11    12    13    14    15    16    17    18    19    20

Terrain heights (m)                                        ELEV

Multiply all values by 10 **  -2

88 I 3130  2860  2840  2850  3410  3600  3570  3700  4530  2550  1720  2180  2180  1380   490   320   400   500   460    40
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
87 I 3260  2900  2830  2960  3450  3700  3470  3570  4230  2750  1870  2450  2160  1670   530   570   530   620   710   600
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
86 I 3380  2890  3060  3340  3690  3430  3160  3540  4130  2900  2020  2430  2030  1630   730   440   390   450   350   350
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
85 I 3280  2900  3200  3330  3710  4000  3330  3040  3250  2700  1990  2020  2270  2330  1170   590   390   160   130    50
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
84 I 3510  3110  3140  3880  4800  4670  3190  2860  2990  2510  2040  2250  2540  2540  1560   600   660   450   800   940
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
83 I 4080  3140  3760  4520  4920  4630  3790  3580  3810  3580  2200  2450  2650  2240  2140   740   390   250   330  1270
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
82 I 4380  4100  4540  4860  5040  4720  3970  3490  3750  4290  2490  2380  2340  2360  2040  1100   160   230   520  1000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
81 I 4850  4740  4610  4770  4750  4250  3240  3790  4190  4560  2630  2460  2010  2240  1730   800   340    70   610   940
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
80 I 4510  4280  4600  4540  4440  4510  3780  4080  4170  4850  2690  1940  2050  2270  1090  1090   140   250   710   710
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
79 I 4180  3910  4170  4260  4140  4170  3900  3940  4130  5040  3390  2590  1510  1790   900   530   110   130   430   540
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
78 I 3770  3870  3850  3390  4410  4540  3820  3790  4150  5130  4430  3330  1770   850   680   420   120   340   710   640
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
77 I 3460  3740  3700  3930  3600  3530  3790  3880  4360  5470  5180  3300  1720  1500  2190  1580   180   330   740   660
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
76 I 3280  4250  4050  3240  2980  3470  4430  4250  4640  5530  5970  4240  2800  1800  2590  2370   960    80   210   550
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
75 I 2990  3160  2940  2590  3460  4420  4320  4090  4640  5390  6540  4430  2800  2510  2340  2980  1910   430    10    90
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
74 I 3510  4500  3600  3120  3760  4370  4280  4470  4750  5500  5900  4910  3250  3260  2470  3400  2720   730    10   210
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
73 I 2880  4220  4380  3120  3100  3710  4210  4160  4560  5100  4990  5860  4170  3310  3020  3360  2910  1280    50   140
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
72 I 3090  3650  4430  4400  3810  4350  4600  4500  4510  4340  4290  3440  3310  3660  2740  2880  2230  1140   190    50
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
71 I 3130  3950  4580  5300  4790  4670  4450  4080  4660  4200  3600  3270  2660  3450  2730  2170  1240  1200   350     0
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
70 I 3100  3990  4420  5070  4980  4170  2940  3560  4650  4350  3610  3040  2990  3730  2770   990   640   830   130    90
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
69 I 2570  3410  3250  3290  4540  2970  2170  3150  3890  4220  3550  3670  3880  3450  1640   490   620   320   230   430
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
68 I 2860  2810  2460  2480  2660  2780  2340  2930  3790  3390  3800  3840  3440  2410  1700   810  1530   830   320   920
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
67 I 2670  2370  2360  1910  1810  2090  2610  2600  3160  3070  2950  2420  2020  1390   800   690   480   420   380   780
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
66 I 2310  2260  1910  2070  2500  2330  2070  2020  2010  2570  2770  1860  1360   720   640   490   460  1870  1090   210
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
65 I 2270  2390  2300  2290  3050  3830  2260  1760  1910  2170  1730  1700  2240  3190   890   350   210  2290  1840   240
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
64 I 2130  2140  2130  2250  3920  4660  2700  1730  1900  1920  1900  1600  2980  3830  2080  1350   260  1110  1470  1570
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   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
63 I 2400  2230  2320  3490  3320  4140  3080  2210  2400  1900  2070  1900  2150  3870  2270  1430  1050   430   970  1400
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
62 I 2580  1910  1980  2760  3890  4390  3670  2510  2320  1960  2190  2540  1840  3060  1630   730   600    30    80   990
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
61 I 2810  1540  1960  2500  2850  4350  3620  2860  2510  1850  2140  2320  1520  2760  2810  1430  1120    90     0   280
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
60 I 2800  2210  1930  2080  3420  3200  2140  2560  2390  2040  2070  1510  1850  2610  3570  2560  1290   770     0    30
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
59 I 2980  2230  2180  1910  2310  2970  2300  2130  2010  1830  1580  2050  2050  2460  4340  3050  1640  1050     0    40
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
58 I 3120  2730  2560  3000  2530  2580  2330  2470  3200  2320  1480  2320  2620  2770  4010  3530  1790  1540   930   200
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
57 I 2480  2720  2060  2630  2880  2320  2660  3750  2930  2410  1620  1570  2620  2860  3490  3480  2410  1790  1420   570
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
56 I 2060  2140  1570  2060  2640  2430  2450  2770  2230  2390  2640  1630  1930  2610  2970  3150  2920  2040  1040   830
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
55 I 2120  2080  1540  1670  1710  2470  2360  2370  2430  2580  2810  2230  2350  2210  2750  3140  3260  2530  2380  1740
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
54 I 3580  3110  1910  1300  1560  1640  2230  2170  2130  2660  2750  2210  2520  2140  2600  2630  2590  2340  2230  2480
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
53 I 3250  2790  2360  1320  1220  1360  1870  2120  2090  2480  2740  2380  2760  2350  2340  2290  2260  2390  2120  1630
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
52 I 2290  2750  2620  1430  1200  1310  1570  2140  1990  2360  2100  2380  2750  2110  2160  2230  2160  2340  3080  1780
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
51 I 2130  2510  3110  1980  1270  1200  1380  1410  1360  2010  2390  3510  3030  1980  2430  2100  2210  3900  3130  2430
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
50 I 1830  2400  3030  2370  1560  1250  1210  1280  1330  1800  2200  2480  2520  2460  2130  2040  2570  3980  3180  2370
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
49 I 1900  2110  3400  2540  1720  1310  1200  1410  1490  2040  3130  2610  2410  2110  1960  2430  2290  2970  3740  2900
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
48 I 1920  2190  3090  3120  1910  1430  1290  1540  2520  3130  2970  3360  3250  3370  2940  2290  2580  2490  2920  3120
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
47 I 2090  2810  2870  3050  2550  1660  1770  1960  2230  2740  2920  2940  3190  3610  3140  2520  2150  2100  2210  3150
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
46 I 2180  3750  2930  3170  2670  1980  1970  1850  2300  2890  2910  2960  3150  3750  3450  3390  2260  2100  2100  3060
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
45 I 2160  3290  4110  2750  2890  2420  2050  1840  2500  3130  2960  2820  3300  3810  3720  3990  3460  2140  2470  4170
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
44 I 2240  2770  3460  3110  2830  2860  2020  1930  2320  2790  2740  2810  3380  3640  3530  3960  4090  2960  3690  4320
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
43 I 1920  2200  3590  4790  4040  3720  2560  2390  2190  2670  2870  3230  3690  3610  3630  3710  4190  3790  3380  3100
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
42 I 2030  2080  2350  4250  4660  4240  2870  2150  2250  2700  2720  3130  3570  3640  3610  3260  3670  3670  3090  2980
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
41 I 1860  2000  2420  3540  4580  4570  3200  2150  2390  2700  2760  2990  3380  3670  3640  3670  3620  3520  2900  2850
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
40 I 1960  2270  2410  3000  3850  4140  3130  2210  2500  2700  2750  2970  3350  3660  3710  3690  3910  3770  2880  2650
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
39 I 2130  2270  2210  2520  3070  4470  3640  2960  2800  2870  2870  3070  3620  3670  3700  3720  4170  3760  2860  2280
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
38 I 2020  2170  2100  2340  3080  3930  3730  2870  2540  2750  3010  3490  3610  3680  3720  3750  3990  4120  2950  2140
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
37 I 1860  2240  2010  2210  2640  2670  2590  2370  2580  2980  3330  3630  3690  3730  3970  4030  4390  4640  3440  2280
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
36 I 1820  2060  1640  1750  2060  1880  1790  2230  2850  3390  3870  3710  3710  4220  4350  4110  4340  4630  3370  2210
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
35 I 1720  1730  1220  1300  1350  1260  1830  2500  2860  3570  4980  4380  3760  4610  4380  4420  4280  4570  3540  2130
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
34 I 1510  1290   960  1110  1220  1490  2370  2940  3100  3520  5160  4120  3750  4180  4300  4290  4060  4300  4050  2210
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
33 I  870   850  1360  1050  1790  1760  2760  3350  3820  3740  4650  4680  3620  3760  4260  4250  3990  4000  3920  2530
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
32 I  770  1060  1230   720  1770  1990  3140  3690  4030  3730  4220  4390  3520  3110  3960  4670  4060  3880  4280  2580
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
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31	520	390	350	750	1590	2490	2660	2900	3310	3280	3720	6220	4350	2960	3710	4340	4080	3820	4840	2900
30	160	20	180	690	1100	2630	2250	2760	3010	2960	3530	5220	4940	3210	3370	4040	4310	3960	4720	3580
29	170	0	80	650	1300	1740	2590	2820	2820	4040	3830	4630	4770	3430	4130	5530	4600	3800	4230	3960
28	30	0	80	1150	2280	2330	3090	3070	3430	4600	4420	4550	4630	4010	3730	5960	4630	4250	3840	4880
27	0	10	400	1480	2840	3650	3790	3310	4020	3630	3820	3860	4590	4470	3340	5070	4190	4040	3790	3810
26	10	140	800	1600	2730	3010	3160	3480	3540	3360	4010	4120	4030	3640	3230	3920	4380	4220	4450	3380
25	250	340	450	1280	1800	2290	2480	3200	3980	4000	3970	3950	3830	3400	3360	3630	4000	4230	3950	2850
24	720	740	720	1050	1830	3190	3380	4520	4280	3980	3790	3800	3520	3040	2970	3480	3650	3020	2980	3540
23	690	910	670	1210	2570	3330	3310	3640	3790	3730	3790	3480	3270	3190	2650	3370	3290	2280	2800	4670
22	550	680	500	1680	2430	3030	3010	3280	3420	3390	3530	3020	3250	3400	2400	3390	2890	2210	2430	4210
21	140	340	610	1410	1870	2810	2780	3010	3120	2940	2810	2900	2830	2580	2190	2790	2370	1970	2360	4130
20	290	950	1320	1870	2040	2240	2540	2340	2430	2420	2460	2490	2270	1710	2270	2130	2140	2490	2700	3460
19	500	560	1180	1750	2710	2410	2040	1770	2220	2290	2260	2440	1860	1700	2070	1770	2370	2630	2710	3420
18	770	800	1140	1530	2130	2020	1560	1420	2000	2340	2220	2110	1910	1490	1760	2240	2620	2850	2990	3430
17	600	690	820	1000	1320	710	1010	1740	2130	2200	2020	1970	2150	1300	2070	2510	2820	2720	2710	3060
16	670	810	820	800	600	700	1400	1510	1620	1820	1750	1810	1530	1360	2250	2450	2630	2730	2700	2750
15	180	390	570	580	610	840	1070	1110	1140	1480	1410	1630	1160	1820	2150	2150	2390	2470	2560	2550
14	80	210	240	400	740	800	810	950	1050	1070	920	1390	970	1670	1810	1890	2040	2230	2390	2400
13	10	190	200	350	690	750	780	800	810	820	800	830	1090	1500	1690	1770	1880	1990	2200	2210
12	0	170	200	210	370	630	680	750	820	820	510	840	1190	1220	1510	1590	1770	1880	2140	2200
11	0	100	270	250	180	210	310	540	690	690	330	690	1070	1050	1190	1340	1600	1740	1800	2140
10	0	0	210	260	200	160	200	210	330	450	160	720	840	1030	1110	1350	1610	1600	1620	1740
9	0	0	40	210	220	150	60	100	110	80	180	330	630	890	1100	1300	1700	1690	1780	1970
8	0	0	0	90	220	210	70	0	20	190	390	570	680	960	1100	1250	1640	1710	1680	1760
7	0	0	0	10	170	200	150	0	0	110	500	660	1050	1300	1310	1170	1470	1350	1370	1730
6	0	0	0	0	20	70	70	0	0	280	700	720	1020	820	1010	1090	1250	990	1160	1590
5	0	0	0	0	0	0	0	0	0	410	700	700	700	770	800	810	840	760	820	1270
4	0	0	0	0	0	0	0	0	40	290	700	700	690	700	680	600	540	650	700	660
3	0	0	0	0	0	10	0	10	60	270	640	390	420	140	160	360	570	610	600	590
2	0	0	0	0	0	0	0	80	20	390	530	270	70	200	380	550	780	810	750	610
1	0	0	0	0	0	0	0	20	0	310	350	160	150	360	550	750	800	830	810	790
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40

```
Terrain heights (m)                                                   ELEV

Multiply all values by 10 **  -2

 88 I    50    90     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 87 I   270    80    20     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 86 I   130    80    30     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 85 I   300    90    50     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 84 I   980   240    80     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 83 I   970   350   100     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 82 I   790   330   100     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 81 I   990   390   150     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 80 I   920   580   180    30     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 79 I   600   840   210    50     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 78 I   770  1400   360    50     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 77 I   810  1150   640    60     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 76 I   810   860   830   100     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 75 I   570   910   980   260    20     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 74 I   490   930   990   480     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 73 I   610   830   840   720    80     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 72 I   600   820   890   730   220     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 71 I   400   780   880   940   470     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 70 I   200   760   850   910   680    70     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 69 I   420   590   830   800   660    90     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 68 I   570   530   830   840   710   290    50     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 67 I   500   560   850  1010   790   450    80     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 66 I   360   600   840   870   820   690   170     0     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 65 I    80   480   780   700   710   770   430    40     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 64 I   150   350   690   700   700   710   760   120     0     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 63 I   530   100   600   660   710   690   880   370    20     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 62 I  1190   460   320   470   550   840  1010   640    40     0     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 61 I  1200   780   550   600   660   930   920   700   130    20     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 60 I   920  1140   680   780   890  1110   960   440   500    90     0     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 59 I   960  1160   920  1160  1170  1110  1210   860   580   190    10     0     0     0     0     0     0     0     0     0
    I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 58 I   830  1120   720  1330  1290  1260  1150  1010   640   310    30     0     0     0     0     0     0     0     0     0
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3897		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3898	57	I	220	200	240	2000	1510	1210	1190	1110	860	490	60	0	0	0	0	0	0	0	0	0
3899		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3900	56	I	200	10	140	1880	1730	1240	1200	1160	640	460	40	10	0	0	0	0	0	0	0	0
3901		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3902	55	I	1220	580	230	1700	2040	1420	1200	1120	810	690	370	40	10	0	0	0	0	0	0	0
3903		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3904	54	I	1370	1570	480	1120	1980	1790	1220	1210	990	700	580	150	40	0	0	0	0	0	0	0
3905		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3906	53	I	1440	1670	450	1080	1990	2280	1450	1140	970	680	700	390	20	0	0	0	0	0	0	0
3907		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3908	52	I	1610	1620	460	1330	1890	2380	1310	960	740	660	640	640	160	40	0	0	0	0	0	0
3909		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3910	51	I	1440	1150	440	710	260	890	1250	1060	560	610	610	680	200	10	10	0	0	0	0	0
3911		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3912	50	I	1200	1280	1510	950	330	230	560	440	230	340	620	760	240	80	0	0	0	0	0	0
3913		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3914	49	I	900	890	1510	1980	1450	1240	80	590	260	90	560	680	390	20	30	0	0	0	0	0
3915		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3916	48	I	1600	880	1750	1930	640	100	130	1380	300	140	390	440	570	10	0	0	0	0	0	0
3917		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3918	47	I	3020	2530	2310	2280	1370	1210	1050	890	410	20	290	340	570	120	20	60	0	0	0	0
3919		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3920	46	I	3220	3000	2560	2450	1770	1450	1370	1530	1150	270	100	170	500	300	30	110	120	10	0	0
3921		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3922	45	I	3680	2770	2970	3010	2170	1700	1600	1690	1660	730	110	180	480	480	0	10	40	10	30	0
3923		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3924	44	I	4240	3020	3290	3510	2430	2150	1860	1480	1880	1410	400	230	400	670	30	10	140	30	40	0
3925		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3926	43	I	3820	2780	3020	2970	2450	2280	2110	1630	1930	1550	740	380	390	600	200	40	80	0	130	0
3927		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3928	42	I	3520	2760	2770	2520	2570	2420	2300	1940	2010	1780	890	460	400	560	420	50	50	10	160	10
3929		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3930	41	I	3220	2430	2420	2350	2360	2260	2150	2020	2130	1900	1200	640	410	570	610	110	20	30	10	0
3931		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3932	40	I	2760	2360	2490	2170	2270	2140	2100	2110	2170	2000	1490	750	420	490	600	230	20	10	0	0
3933		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3934	39	I	2220	2250	2200	2090	1810	1850	2090	2100	2170	2030	1190	860	560	420	480	340	20	0	0	0
3935		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3936	38	I	2120	2000	1610	1730	1710	1800	1800	2080	2250	2050	1600	1350	650	440	500	610	50	0	0	0
3937		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3938	37	I	2080	1800	1540	1700	1720	1710	1880	2110	2220	2290	1660	1200	540	470	520	770	320	60	0	0
3939		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3940	36	I	1910	1740	1530	1740	1730	1710	1910	2110	2170	1970	1680	1230	680	490	470	720	620	90	0	0
3941		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3942	35	I	1930	1660	1610	1660	1710	1860	2090	2150	2150	1760	1640	1470	920	600	490	520	710	120	40	0
3943		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3944	34	I	1970	1750	1570	1540	1680	1990	2190	2370	2250	1710	1570	1080	840	600	460	510	750	320	40	0
3945		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3946	33	I	2320	1570	1560	1590	1770	2100	2290	2400	2250	1910	1710	970	690	560	400	520	780	570	60	0
3947		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3948	32	I	2650	1640	1590	1710	1600	1920	2230	2380	2200	1880	1550	1300	1030	600	430	550	770	680	370	10
3949		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3950	31	I	2810	1780	1640	1540	1530	1670	2030	2150	2110	1880	1570	1630	1290	740	560	630	720	710	570	90
3951		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3952	30	I	3330	2260	1620	1630	1500	1570	1740	1890	2010	1970	1900	1770	1260	630	620	690	700	710	620	250
3953		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3954	29	I	3140	2420	1820	1710	1530	1520	1600	1820	1810	1970	2070	1810	1220	670	620	640	630	720	620	490
3955		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3956	28	I	2690	1990	1930	2320	1920	1630	1580	1830	1920	2070	2080	1870	1390	840	620	680	610	660	690	450
3957		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3958	27	I	2860	2120	2220	3050	2210	1660	1550	1790	1980	2030	2050	1940	1510	920	680	670	610	630	780	540
3959		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3960	26	I	2680	2050	2300	3040	2760	1840	1540	1750	1980	1990	1990	1930	1610	1280	720	680	630	640	780	600
3961		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

```
 25 I 2690  2480  1690  2480  3150  1960  1690  1540  1850  1890  1960  2070  2040  1390   760   750   780   780   740   620
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 24 I 3460  2570  1930  1850  2880  2150  1750  1470  1710  1850  2160  2330  2300  2040  1220   840   800   800   800   710
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 23 I 3970  2890  1990  1520  2300  2200  1670  1470  1620  1820  2110  2380  2380  2090  1370   930   890   860   810   790
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 22 I 3440  3150  2060  1930  2060  1730  1420  1560  1650  1850  2140  2300  2350  2050  1460   920   900   900   900   760
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 21 I 3850  3550  2240  1830  1880  1660  1410  1590  1670  1810  2080  2000  2100  2000  1530   960   900   780   780   730
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 20 I 3660  3110  2310  1440  1540  1750  1180  1360  1620  1670  1840  1870  1880  1890  1620  1070   900   730   700   700
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 19 I 3350  2740  2330  1290  1200  1390  1200  1100  1420  1330  1390  1450  1620  1780  1810  1280   920   740   700   700
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 18 I 3490  2470  2420  1560  1200  1180  1230  1220  1070   980  1110  1170  1120  1380  1820  1500   970   760   700   700
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 17 I 3530  2920  2750  2020  1160  1030  1110  1220  1230   930  1030  1050   930   900  1380  1590  1080   750   700   700
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 16 I 3410  3340  2800  2570  1090  1010  1080  1010  1120   890   900   990   980   830  1180  1610  1530   890   710   750
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 15 I 2610  3250  3140  3210  1330   900   900   900   920   870   750   810   770   680   830  1010  1440  1290   870   850
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 14 I 2430  3350  4180  4270  1620   900   900   820   770   820   650   570   540   430   460   640   900  1050   970   900
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 13 I 2240  2630  3890  4440  1650   930   900   870   760   700   610   590   440   400   400   420   660   830   960   910
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 12 I 2170  2080  3230  3650  1350  1020   890   740   710   610   600   480   400   400   400   400   440   680   900  1050
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 11 I 2350  1980  2680  2170  1080   930   900   720   620   600   500   400   400   400   400   400   400   560   780   990
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 10 I 1890  1590  1650  1560   810   810   680   610   560   480   400   400   400   400   400   400   400   500   650   730
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  9 I 1610  1400  1460  1460   840   640   650   520   400   400   400   400   400   400   400   400   400   440   610   700
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  8 I 1730  1700  1630  1200   850   810   780   500   400   400   400   400   400   400   400   400   400   430   530   630
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  7 I 1710  1690  1640  1230   970   900   780   530   400   400   400   400   400   400   400   400   400   450   520   510
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  6 I 1690  1680  1410   880   880   780   660   600   470   420   400   400   400   400   400   400   420   510   530   510
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  5 I 1210  1060   800   630   630   620   600   600   600   540   520   410   400   400   400   400   510   550   550   540
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  4 I  610   600   670   720   730   660   600   600   600   600   600   530   400   400   400   450   520   570   580   550
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  3 I  600   600   660   800   810   800   620   600   600   600   600   560   400   400   400   470   530   510   590   560
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  2 I  670   650   670   780   810   840   690   660   620   600   580   470   400   400   430   500   460   400   530   590
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  1 I  800   830   800   800   800   880   840   820   710   600   490   400   400   400   400   400   400   400   440   600
    I  +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
    ------------------------------------------------------------------------------------------------------------------------
       41    42    43    44    45    46    47    48    49    50    51    52    53    54    55    56    57    58    59    60

Terrain heights (m)                                                      ELEV

Multiply all values by 10 **  -2

 88 I   0     0     0     0     0     0     0     0     0     0     0     0
    I   +     +     +     +     +     +     +     +     +     +     +     +
 87 I   0     0     0     0     0     0     0     0     0     0     0     0
    I   +     +     +     +     +     +     +     +     +     +     +     +
 86 I   0     0     0     0     0     0     0     0     0     0     0     0
    I   +     +     +     +     +     +     +     +     +     +     +     +
 85 I   0     0     0     0     0     0     0     0     0     0     0     0
    I   +     +     +     +     +     +     +     +     +     +     +     +
```

84	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
83	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
82	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
81	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
80	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
79	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
78	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
77	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
76	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
75	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
74	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
73	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
72	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
71	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
70	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
69	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
68	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
67	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
66	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
65	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
64	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
63	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
62	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
61	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
60	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
59	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
58	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
57	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
56	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
55	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
54	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
53	I	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+
52	I	0	0	0	0	0	0	0	0	0	0	0	0

```
     I    +     +     +     +     +     +     +     +     +     +     +     +
  51 I    0     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  50 I    0     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  49 I    0     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  48 I    0     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  47 I    0     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  46 I    0     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  45 I    0     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  44 I    0     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  43 I    0     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  42 I    0     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  41 I    0     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  40 I    0     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  39 I    0     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  38 I    0     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  37 I    0     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  36 I    0     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  35 I    0     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  34 I    0     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  33 I    0     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  32 I    0     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  31 I    0     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  30 I   30     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  29 I   20     0     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  28 I  220    20     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  27 I  500    70     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  26 I  580   250    20     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  25 I  600   480    10     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  24 I  600   560    70     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  23 I  620   600   210    10     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  22 I  630   600   400    10     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  21 I  650   600   580    20     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  20 I  670   600   580   190     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
```

```
  19 I  680   550   380   340     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  18 I  640   570   360   340    60     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  17 I  660   700   430   260   250     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  16 I  730   710   530   210   400    40     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  15 I  840   760   600   210   250   210     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  14 I  900   890   660   430   110   170     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  13 I  900   900   790   550   270   340   100     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  12 I  920   900   860   570   420   390   450    30     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  11 I 1020   910   830   610   550   420   410   290     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  10 I  770   730   670   600   600   470   330   320     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
   9 I  700   700   670   640   600   490   360   150    50     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
   8 I  690   700   700   660   600   600   550   400   150     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
   7 I  540   680   700   610   600   600   600   590   380     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
   6 I  500   560   570   520   560   600   600   600   310    10     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
   5 I  510   500   500   510   500   540   600   600   400     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
   4 I  510   460   480   500   500   500   520   590   470     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
   3 I  430   400   420   520   490   500   500   540   450    10     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
   2 I  520   400   400   400   400   470   500   500   450     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
   1 I  530   400   400   400   400   470   520   510   440     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
     ---------------------------------------------------------------------------
        61    62    63    64    65    66    67    68    69    70    71    72

Leaf area index                                              XLAI

Multiply all values by 10 **  -3

  88 I 2680  3340  3030  2540  2970  2450  3150  3600  2870  2250  2800  2200  2430  3960  3770  4220  4660  4430  3860  3980
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  87 I 2300  3160  3010  1800  2880  2210  2170  3460  4750  3150  3590  3310  3340  4590  3780  3820  2220  4460  4620  4440
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  86 I 2670  2800  2590  3420  3230  2430  3150  3820  3510  3310  3380  3420  3280  3760  4450  3260  3040  4450  4690  4610
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  85 I 3660  2360  3020  4350  3740  2870  3590  4440  3440  3160  2450  2870  3880  3510  3810  3250  4360  4190  3990  4600
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  84 I 4190  3900  4160  4380  4320  3970  4670  4130  3640  2780  1770  1900  2150  2880  3610  3740  4070  3640  4080  4590
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  83 I 4670  4680  4420  4020  4140  4600  4620  3490  2730  1820  3480  1660  1960  2550  3210  2800  3350  3580  4270  4730
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  82 I 4440  4560  4460  4420  4410  4440  3290  2410  2360  2050  2460  2560  3170  3270  3570  3300  2380  3550  4310  4430
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  81 I 4380  4590  4760  4740  3930  3830  2860  2210  2010  2030  2740  3410  3000  4450  3480  2970  2280  3210  2570  3930
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  80 I 2650  4670  4630  3820  3900  2830  2520  2790  3150  1970  2680  2560  3030  3250  2830  2920  2210  2670  2500  3160
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  79 I 2140  3870  4830  4460  4060  2820  1700  3550  3410  2790  2320  3350  3320  1890  3310  3470  3550  2460  1810  3350
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
```

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78 I  3170  3240  4690  4090  4480  4280  3500  2440  2150  2360  3470  3200  2450  3340  2180  2350  2660  2360  2390  2980
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
77 I  2940  3760  4450  4430  4570  4210  4240  4070  4220  3630  2910  3570  1710  2020  3340  3480  3310  2640  1910  2450
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
76 I  3260  3100  4520  4420  4590  4490  3630  3330  3820  4100  3430  2640  2450  2520  1990  3080  3090  4040  3280  1810
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
75 I  4230  3780  3860  4650  4390  4450  2950  3470  3730  3520  3690  3930  3810  1950  2680  3140  2990  3480  3310  3080
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
74 I  4680  4080  4230  3900  4070  3870  4220  3880  3710  3740  4290  3820  3330  3780  2820  4190  3910  2740  2070  3620
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
73 I  4380  3900  3510  3640  4130  3900  4340  4240  4000  3290  3740  4260  3450  3250  3220  4510  3650  2990  2840  2230
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
72 I  3290  4510  4270  3760  4840  4740  4030  3390  3430  3620  3870  3520  3500  2540  3770  4710  4330  3950  1750  1950
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
71 I  1580  3060  4050  4400  4650  4540  4820  4210  4860  4560  4220  3370  3410  2210  3720  4190  4220  3840  2670  1900
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
70 I     0  2130  3400  3720  4230  4780  4260  3670  4840  3440  4640  3460  3020  1650  2580  4130  3600  3500  2180  1790
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
69 I     0     0     0  2040  3610  4720  3640  3560  3790  4060  4720  4800  2410  1700  3080  4340  3720  2860  1810  2060
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
68 I     0     0     0  2910  4440  4550  4320  3790  3350  4190  3760  3490  2230  1500  1910  3060  4470  3470  1950  1730
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
67 I     0     0     0  2890  4930  4960  3860  3760  3230  3410  4600  4370  3760  2450  1780  1700  3100  3440  3160  2850
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
66 I     0     0     0  1220  3360  4720  3850  3280  3040  3500  4140  4110  3320  1920  1820  1900  3010  4550  4040  3920
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
65 I     0     0     0     0  1490  3370  3190  4420  3150  3840  4020  3930  4430  2510  1690  2310  3790  4570  3550  4480
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
64 I     0     0     0     0     0  2670  1880  2720  3340  3990  3900  4400  3020  1790  3700  4930  4300  4890  3020  3980
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
63 I     0     0     0     0     0     0     0  2000  3120  4070  3370  4280  2850  1850  4260  4900  4250  4950  3670  4300
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
62 I     0     0     0     0     0     0     0  1190  2430  3120  3290  3900  2630  3100  4220  4280  4610  4680  4080  3820
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
61 I     0     0     0     0     0     0     0  1180  1860  2370  3570  3520  3570  3560  3700  4090  4700  4660  3920  3920
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
60 I     0     0     0     0     0     0     0     0     0  1730  3430  4130  4160  3310  3020  3160  3780  4390  4160  3890
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
59 I     0     0     0     0     0     0     0     0     0  1620  2940  3370  3020  3040  3310  3160  3730  4160  4070  3670
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
58 I     0     0     0     0     0     0     0     0     0   170  1000  1310  2060  2260  1950  2750  3960  4270  4200  2680
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
57 I     0     0     0     0     0     0     0     0     0   290   220     0     0     0  1740  2700  4700  4840  3710  3880
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
56 I     0     0     0     0     0     0     0     0     0     0     0     0     0     0  1120  1560  4080  4980  4500  4330
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
55 I     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0   690  3240  3450  3710  2040
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
54 I     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0   820  2460  1890  1520  2850
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
53 I     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0  1470  2640  3820  4040
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
52 I     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0   330  1090  2390  3050
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
51 I     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0  1510  1510  2350  2660
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
50 I     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0   900   550  1970  2200  2820
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
49 I     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0   140  1720  2440  2470
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
48 I     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0   350  1290  2290  3340
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
47 I     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0   690  2780  3340
   I     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
46 I     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0  1360  2940  3440
```

4287		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4288	45	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	930	3160	3660
4289		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4290	44	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1330	2950	2890
4291		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4292	43	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1430	2960	3770
4293		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4294	42	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	290	2500	2120	2220
4295		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4296	41	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1830	1860	3360	1340
4297		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4298	40	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	790	1310	1780	1530
4299		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4300	39	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	150	1280	1210	1250	1790
4301		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4302	38	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1390	980	1560	1780	2500
4303		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4304	37	I	0	0	0	0	0	0	0	0	0	0	0	0	0	480	0	1490	980	1600	1740	2000
4305		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4306	36	I	0	0	0	0	0	0	0	0	0	0	0	0	0	400	280	1260	1570	1200	1030	1120
4307		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4308	35	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	960	1150	1450	860	1020
4309		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4310	34	I	0	0	0	0	0	0	0	0	0	0	0	0	0	130	190	1210	1240	1680	1220	860
4311		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4312	33	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	550	890	970	1070	1900	770
4313		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4314	32	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	340	840	1160	200	990	670
4315		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4316	31	I	0	0	0	0	0	0	0	0	0	0	0	0	0	160	250	530	390	0	0	330
4317		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4318	30	I	0	0	0	0	0	0	0	0	0	0	0	0	0	370	870	1220	920	890	40	60
4319		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4320	29	I	0	0	0	0	0	0	0	0	0	0	0	0	0	970	790	880	970	960	910	350
4321		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4322	28	I	0	0	0	0	0	0	0	0	0	0	0	0	0	220	290	590	470	580	620	10
4323		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4324	27	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	240	280	440	380	0	0
4325		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4326	26	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	190	420	630	0	0
4327		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4328	25	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	280	110	0	0	440
4329		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4330	24	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	340	50	0	0	1050
4331		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4332	23	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	150	0	0	660	1390
4333		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4334	22	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	30	440	710	960
4335		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4336	21	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	240	590	940	410	570
4337		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4338	20	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	650	960	750	910
4339		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4340	19	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	120	150	1210
4341		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4342	18	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2080	320	460
4343		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4344	17	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	350	300
4345		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4346	16	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	130	650
4347		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4348	15	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	290
4349		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4350	14	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4351		I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

```
 13 I    0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
 12 I    0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
 11 I    0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
 10 I    0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  9 I    0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  8 I    0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  7 I    0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  6 I    0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  5 I    0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  4 I    0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  3 I    0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  2 I    0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
  1 I    0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
    ---------------------------------------------------------------------------------------------------------------------------------------
         1      2      3      4      5      6      7      8      9     10     11     12     13     14     15     16     17     18     19     20

Leaf area index                                                     XLAI

Multiply all values by 10 **  -3

 88 I 4130   3640   3100   3760   4210   3950   4450   4190   4580   4680   4120   4790   4620   4040   3110   2790   4350   4060   3190   1870
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
 87 I 4420   4510   3100   3530   4480   4280   4460   4530   4470   4840   4550   4700   4850   4670   3930   4280   3170   3120   3340   3360
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
 86 I 4280   3830   3900   4360   4450   4430   3990   4710   4670   4520   4540   4700   4780   4540   3830   3050   2670   2330   2530   3820
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
 85 I 4110   3380   4210   4400   4570   4540   4280   4480   4600   4750   4410   4310   4400   3950   3090   2390    590   1010   1210   1480
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
 84 I 4720   4270   3430   4560   4360   4560   4470   4550   3860   4440   4470   4000   4180   3960   3170   2320    410    390    560   1650
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
 83 I 4590   4360   4550   4560   4510   4190   4530   4000   3360   4560   4200   2770   3240   3570   3070    970    300    230    470   1620
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
 82 I 4180   4180   3810   4540   4340   4100   4160   3260   3550   4740   4450   4190   3880   4030   3170   1190    580    290   1590   2860
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
 81 I 4680   4810   3450   4460   4680   4160   4050   4100   4410   4570   4120   4610   3390   3150   3800   2220   1530    110   2820   3520
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
 80 I 4820   4720   4690   4590   4100   4480   4520   4680   4200   4440   4240   4350   4470   4640   4030   2860    520   1230   3770   3600
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
 79 I 4710   4520   3870   4500   4140   3990   3780   4270   4560   4270   4640   4120   4060   3790   3280   1630   2030    920   3550   4080
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
 78 I 4290   4210   4730   4330   4290   4490   3290   3140   3880   3500   3850   4100   3290   3650   3740   2930   2570   1930   4800   4540
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
 77 I 3500   4600   4330   3480   3470   3800   3270   2640   3360   3360   4150   4140   4100   3980   4000   3690   1470   2870   4700   4560
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
 76 I 2830   3870   3650   3120   4430   3310   4740   3880   3830   4460   3870   4410   4890   4180   3230   4250   2230    840   1800   2950
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
 75 I 2000   2720   3230   3170   2730   4050   4170   2690   3470   3630   2800   3980   4730   4550   4500   4120   2130   3860   1290   3850
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
 74 I 1900   2400   2560   3530   2710   4870   4770   3890   4330   4080   2920   4200   4490   4640   4070   4440   4290   3740   1590   4520
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
 73 I 2090   2570   2840   2150   2130   4090   4120   3270   4120   3570   3970   4790   3770   4700   4670   4440   4380   4320    980   2200
    I    +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +      +
```

```
72 I 1470  1480  2820  2560  3360  4360  4740  3300  3330  3020  2800  2770  4180  3230  4440  4680  4660  3590  3310  2130
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
71 I 1580  2090  2770  4490  4760  4040  4750  4080  2610  1870  1770  3900  3210  2940  4690  3770  3880  3000  3060   930
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
70 I 1880  2850  3810  3910  4220  3420  4390  4580  2960  2630  3390  3520  3300  3150  3510  3120  2830  2270  2090  1220
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
69 I 1640  2610  1860  1920   830  2660  2200  4100  3740  1920  3420  4340  3010  1750  3360  4110  2940  1480  1710  3650
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
68 I 2310  3630  3320  1790  1770  3320  2420  4040  3150  3030  3080  1580  2210  2130  2390  4350  1550  2070  2660  4250
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
67 I 2060  2670  3360  1590  1660  2540  4260  4490  4260  2740  3360  3590  4360  3850  3850  4670  2590  2310  2760  4150
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
66 I 2070  3330  3120  2490  2640  3260  4120  3250  2120  4140  4040  4170  4280  2990  3350  3280  1880  2060  4020  2880
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
65 I 2570  3460  3110  2850  3550  2510  1330  2210  2810  3910  3320  2950  3730  4820  4010  3470  2580  4130  2040  1030
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
64 I 3170  2820  2760  4030  3380  2650  1130  1470  2520  2630  3890  4360  4420  5000  4880  4680  3060  3560  2820  2060
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
63 I 2550  1280  1620  3610  3530  2230  1370  1510  1930  3280  4170  3850  4100  5000  4980  4810  4340  1810  3230  3370
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
62 I 2680  1580  2120  4420  3420  2590  1540  1030  1490  3040  4440  2990  3680  5000  3210  2770  4350  1400  1120  4300
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
61 I 3000  2240  2620  2880  3170  2280  1470  1260  1130  2360  4980  3840  4050  4450  5000  4840  4360   370     0  1940
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
60 I 2680  2370  2050  2830  2940  2020  1260  1350  1430  3910  4720  4260  4040  4610  5000  4980  4620  2780     0  1650
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
59 I 2670  1770  3060  2520  2390  2380  1760  1580  2520  3980  4310  4040  3210  3670  5000  4970  4560  4140   230  1450
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
58 I  520  1390  3700  1350  2030  1640  1890  1040  1260  1480  4150  4170  3320  2880  4930  5000  4370  4200  3900  2920
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
57 I 1900  1800  2690  1320  2420  1640  1460  2080  2380   800  2410  3480  2990  2500  4910  4550  3390  3940  4360  4120
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
56 I 3730  3940  2710  1580  3490  2150  1890  2170  2440   840   760  2290  1840  3160  4810  4940  4800  4810  3950  4430
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
55 I 1880  2350  2180  2420  3750  4470  3600  2830  1700   910  1060   960  1310  3370  4380  4950  4980  4550  4990  4530
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
54 I 4540  3120  3760  3620  2040  1710  3710  2730  1610  1510   820   670  1020  2240  3060  3630  4100  2420  4160  3830
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
53 I 4800  4610  2670  1400  2640  3180  3740  4510  2770  1340  1120  1090   950  1840  1090  1180  1230  1570  2900  2550
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
52 I 3980  3260  1780  1840  2320  2580  2430  2790  1090  1140  1030  1430  1330   660  1270   560  2180  1700  2170  2340
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
51 I 3290  3630  3360  1010  1500  2300  2250  2360  2320  1150  1150  1000  1280   870  1320   760   850  1140  1190  1560
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
50 I 2620  4550  4970  3340  1950  1930  2420  1490  2200  1860  1610  1700   770  1140   690   890   610   830  1030   990
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
49 I 2230  3150  5000  3370  2070  1970  2380  2280  1580  1810  1970  1480  1770   340   200  1390  1070   690  1590  1290
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
48 I 3900  2740  4900  2250  1870  1970  2620  1860  1380  2160  2840   890   820   850   800   860  1620  1180   970  1310
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
47 I 2680  2540  3610  2640  3720  1990  2300  1520  1270  2070  1760  1270   940   710   930  2080  1230   680   850  1130
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
46 I 3580  2580  3380  3080  3550  3030  2210  1500  1170   990  1060  1270  1320   820   950   900  1070     0   110   940
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
45 I 3050  2130  2770  2360  4470  4830  3460  2310  1740  1080  1890  2000  1000  1250  1000   810  1360   170   410  1390
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
44 I 2550  2160  2080  2470  2290  3390  1580  1840  2440  2560  2880  2060  1210  1210   980   640  1170   820  1030   910
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
43 I 4320  2870  3700  2410  1730  1360  1870  2140  2980  3030  3270  2730  1820  1600  1060   830  1090  1060  1210   560
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
42 I 2390  1950  3090  2150  1750  1390  1270  2930  3100  3290  3290  2060  1810  1710  1280  1200   950  1010  1650  1050
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
41 I 1260  1100  2240  1620  1450  1430  1100  2650  2600  2730  2470  1630  1860  1940  2040  2020  1390  1420  1700  1920
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
40 I 1170  1250  1350  1480  1230  1290   750  1450  1860  2330  2400  1340  2010  1740  1860  2050  1540  1580  1890  1650
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     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  39 I 1860  1450  1700  1700   900  1330   890  1000  1950  2270  2170  2770  1340  1760  1760  2080  1940  1920  1600  2090
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  38 I 2110  1110  1990  1600  1000  1140   910   910  2090  2410  1620  1130  1060  1430  1910  1850  1890  1360  1760  2450
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  37 I 1080   760  1760  1130   980  1100   750  1410  1570  1610  1290  1070  1230  1570  1790  2260  2030  1520  1320  2430
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  36 I 1020   890  1480  1330  1000  1170  1680  1130  1250  1520  1550  1350  1620  1120  1870  2080  1850  1370  1400  2370
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  35 I  930   760  1990  1150  1630  2310  2290  1300  1390  1060  1040  1230   580   860  1030  1570  1430  1010  1300  2720
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  34 I  850   670  2080  2070  2330  1330  1030  1270  1150  1230   970   570  1060   900   660   660  1250   770  1040  1540
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  33 I  610   430   570   940   870  1010  1000  1040  1030  1210   690   340  1310  2190  1040   360   980   710  1110  1990
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  32 I  460   420   520  1170   800  1270  1160  1550   860  1310   790   420  1870  2430  1470   640   760  1100  1230  2440
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  31 I  400   340   490   810  1010   930  1140  1400  1200  1440  1240   820  1050   830   970  1390  1220   970   920  2320
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  30 I  340   110  1040  1040  1220  1380  1010  1840  2290  1850  1290   170   360  1390   970  1440  1980  1090   640  1460
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  29 I  320     0   650  1220  2160  2640  2820  2570  2870  1680  1110   340   570   200  1510  1070  1360  1570  1390  1190
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  28 I  370    60   540  1220  1400  1810  1620  1340  2010  1370  1140  1600  1360   130  1730   980  1120  1470   870   820
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  27 I    0   370   970  1900  1660  2120  1080  1430  1590  1630  1280   790  1010   970  1310   890  1340  1860  1410   860
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  26 I  280  1270  1190  1070  1180  1190  1140  1300  2860  1830  1660   730  1540  1260  1820  1500  1310  1320  1400   670
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  25 I 1300  1270  1630  1760  1260  1760  1550  1490  1260  3080  3450   700  2250  3230  2090  1580  1360  1410  1460  1660
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  24 I 1500  1430  1300  1660  1940  1840  1220  1040  1200  1170  2200  1500  2120  2050  1870  1260  1050  1380  1370   810
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  23 I 1500  1430  1820  1390  1150  1510  1350  1110  1210  1210  1520  1980  1950  1490  1850  1130  1110  1790  1140   800
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  22 I 1170  1370  1490  1000  1000  1260  1380  1040  1090  1120  1580  2030  1560  1050  1620  1170  1230  1790  1360  1150
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  21 I 1190  1370  1230  1000  1350  1000  1740  1360  1120  1230  1480  1180  1000  1310  1720  1120  1140  2090  1330  2730
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  20 I 1460  1150  1140  1010  1060  1410  1290  1560  1420  1480  1520  1230  1380  2040  1320  1320  1500  1860  1630  3450
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  19 I 1380  1150  1160  1130  1000  1300  1690  1510  1130  1110  1470  1530  1310  1760  1260  1590  1380  1350  1260  1960
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  18 I 1130  1390  1120  1060  1020  1090  1450  1600  1050  1230  1410  1190  1020  1780  1340  1280  1280  1020  1100  1340
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  17 I 1270  1460  1330  1450  1150  2150  1850  1400  1060  1200  1430  1410  1000  1610  1010  1160  1220  1000  1140  1070
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  16 I 1140  1830  1670  1690  1900  1950  1140  1170  1130  1100  1180  1470  1410  1610  1190  1290  1040  1010   970  1130
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  15 I 1160  1140  1430  1630  1790  1170  1110  1410  1500  1350  1250   980  1370   930  1190  1410  1000   990  1010  1130
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  14 I 1380  1170  2150  1930  1340  1240  1150  1020  1150  1320  1850   980  1520  1240  1130  1050   940  1180  1050  1020
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  13 I  290   770  1130  1160  1740  1700  1220  1090  2230  1230  1500  2020  1230  1010   950  1210  1100  1130  1450  1130
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  12 I  340   460  1000  1180  1510  1540  1180  1700  1930  1620  2070  1090  1070  1020  1070  1090  1090  1180  1210  1230
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  11 I    0  1030  1010  1120   990  1150   350  2070  3220  1620  1860  1040  1120  1130  1160  1000  1000  1170  1200  1210
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  10 I    0  2120  1020  1080  1100   300   300   320   190   980   960   970  1230  2450  1080  1040  1030  1350  1510  1670
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   9 I    0     0   880   930  1060   500  1000  1210   420   660  1020  1210  1330  2360  1450  1640  1100  1170  1730  3770
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   8 I    0     0   450  1090  1050   840  1150   330   500  1340   880  1130  1160  1280  1350  2140  1500  1300  1430  1310
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
```

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  7 I    0     0     0  1020   800   980  1330    30   380  2160  1100  1280  1260  1270  1210  2020  1860  1080  1230  1360
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  6 I    0     0     0     0   400  1540  1810   310     0  2900  1150  1420  1520  1380  1220  1470  2170  1150  1220  1430
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  5 I    0     0     0     0   690   370   650   200   180  2620  1620  1160  1190  1150  1200  1040  1620  1620  1210  1290
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  4 I    0     0     0     0  1010    80     0     0  1080  3350  1410  1350   940  1080  1670  1290  1410  1470  1130  1420
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  3 I    0     0     0     0    10  1080   780   970  1830  2290   250   740  1030   930  1550  1050  1500  1480   730  1010
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  2 I    0     0     0     0     0   670   270  1320  1330  1100   180   300   310   760  2000   950   770   230   190  1240
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  1 I    0     0     0     0     0   470    20   940  2160  1810    90   430   420  1540  2750  1120   850   500   390  1340
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
    ---------------------------------------------------------------------------------------------------------------------
        21    22    23    24    25    26    27    28    29    30    31    32    33    34    35    36    37    38    39    40

Leaf area index                                                   XLAI

Multiply all values by 10 **  -3

 88 I 1410  1650     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 87 I 3830  2560  2390     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 86 I 3000  2340  2530     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 85 I 1920  1320   410     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 84 I 3720  2970  1590     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 83 I 3930  3420  1220     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 82 I 4620  3840  2400     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 81 I 4760  4150  3450     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 80 I 4470  4460  3620  4090     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 79 I 4280  4340  4030  3490     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 78 I 4360  4330  3810  3190     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 77 I 3970  3860  4210  2630     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 76 I 2200  3210  4200  2680  2220     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 75 I 2660  3690  4120  2670  1910     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 74 I 4410  4070  4070  2250   700     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 73 I 3650  4470  3750  3890  2250     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 72 I 3010  3550  3790  4410  2910   130     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 71 I 2780  2570  4600  4560  3950  1110     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 70 I 2100  2800  4640  4340  4860  2300     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 69 I 1700  2010  4650  4630  4620  3180  5000     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 68 I 2940  1740  4340  4990  4510  3770  3180     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 67 I 4470  4200  4130  4320  4440  3870  3090     0     0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
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66	I	4960	4480	3800	4210	4490	4530	3740	2890	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
65	I	2240	3810	2400	3640	4470	4380	3570	3160	0	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
64	I	480	4040	3070	2650	4340	3770	4200	2670	2180	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
63	I	920	2050	3060	4560	4500	4110	4060	3160	2560	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
62	I	1810	2450	4060	3440	3980	3960	4150	4240	1420	0	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
61	I	2560	2840	3430	2200	4590	4190	3790	3370	1970	400	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
60	I	3850	3860	2690	3470	4230	4090	4290	3960	2750	320	0	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
59	I	2670	3340	4320	3770	4440	4110	4020	4470	3420	340	340	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
58	I	3170	3680	3720	3150	3490	4430	3880	3930	3090	1580	330	0	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
57	I	2320	2950	2400	2960	3050	4090	3610	3440	3760	3640	1200	1200	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
56	I	2800	1880	2330	3080	2280	3380	2860	3220	2250	2950	2970	1500	0	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
55	I	4390	3630	2960	1700	1000	2210	2400	3150	3470	1860	3030	1340	1260	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
54	I	3660	3230	2750	2490	3570	1720	1940	1950	3850	4050	3520	2450	1510	0	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
53	I	3500	2200	3260	2890	3450	2810	2110	3410	2180	3870	4150	2850	1680	1350	0	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
52	I	3050	3450	3520	3700	2350	870	1190	1830	1890	3210	3490	3730	1570	1470	50	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
51	I	2410	3780	3530	1880	480	1900	1380	2470	3470	4300	3980	3760	2400	630	660	0	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
50	I	2890	3380	3410	2150	480	1200	2790	2850	2820	4320	3850	3770	3340	1320	580	1060	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
49	I	3670	3630	2870	1040	1570	1040	2140	3570	2130	2020	3100	3010	1610	510	530	790	0	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
48	I	3320	3080	1810	2190	2280	670	2230	2910	2460	1760	2570	3220	1050	310	90	240	560	0	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
47	I	1430	2000	1350	700	2160	2020	2960	3700	3130	1750	2800	2830	1790	600	1180	1670	630	1020	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
46	I	1130	1010	570	1170	1760	2480	3510	3040	3180	2870	2400	1440	1780	770	1070	1700	1260	820	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
45	I	1270	1200	390	530	1370	2860	2700	2090	1530	3620	2120	1770	1240	1400	130	1060	1120	910	3490	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
44	I	840	1040	380	490	1960	1440	1240	1290	1550	2250	2720	1860	1590	1480	400	1110	1710	830	1560	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
43	I	2120	1430	570	820	1950	1430	1470	1280	1020	1620	3250	2790	1910	990	520	1300	1360	150	180	200
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
42	I	1610	2800	900	760	1380	1600	1470	1300	1230	1400	2650	3230	1710	740	740	1160	870	30	200	200
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
41	I	1580	1250	980	970	1180	1310	1670	1660	1930	1440	1710	2250	1620	400	1280	1010	930	310	200	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
40	I	1660	1440	1140	1410	1190	1190	1340	1650	1770	1830	1410	2280	1780	1150	1850	320	410	170	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
39	I	1440	1100	930	1080	650	1370	1440	1670	2100	1390	1370	1480	1910	1210	1870	700	440	730	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
38	I	1890	980	670	830	190	1440	1150	1800	1610	1410	1070	1240	1450	1670	1870	1300	590	80	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
37	I	1710	1050	310	960	920	1040	1130	1160	1840	1650	1130	1290	1870	1960	2130	1420	1030	220	0	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
36	I	1760	1570	290	740	1070	950	1650	2070	1660	1160	1120	1260	1530	1800	2360	2130	1700	800	760	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
35	I	1270	1340	1100	980	2310	1780	1910	2000	1250	1440	1280	1230	1150	1030	1160	1620	1950	690	1740	0
	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
34	I	2570	1460	2080	880	1200	1770	1280	1090	1200	1620	1570	2020	1720	1160	1590	1470	1880	720	480	0

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      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   33 I 2820  1260  1550  1250  1130  1070  1330  1350  1240  1550  1420  1530  2440  2410  1670   970  2930  2200   480  3460
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   32 I 2980  1690  1340  1180   950  1400  1680  1430  1390  1370  1250  1400  1720  1910  2290   820   880  1010   810  1170
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   31 I 2170  1770  1950   790   640   710  1290  1320  1230  1400  1110  1250  1920  1900  2630  1210   660   630  1670   860
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   30 I  950  1870  1230   790    10   510   960  1130  1170  1610  1310  1270  1470  1790  2800  1710   810   770  1520  1140
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   29 I 1870  1710  1470  1120   530   300  1140  1050   710  1130  1190  1160  1240  2530  2750  2520  1150  1060  1470   980
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   28 I 2440  1190   610  1050  1390  1020  1150  1130  1220  1080  1090  1400  1090  2730  3000  2770  1220  1120  1130  1140
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   27 I 2330  2300  1830  3040  1530  1200  1370  1280  1060  1190  1260  1480  1560  1930  2530  1610  1000  1550  1230  1130
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   26 I 1360  2550  2520  2380   970  1150  1460  1070  1020  1070  1100  1130  1140  1680   850  1680   990  1050  1150   780
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   25 I 2090  2430  1490  1020  1360  1270  1200  1250  1060  1080  1270  1300  1250  1950  1990  2830  1720  1730  1200  1320
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   24 I 1270  1970  2310  1020  1900  1150  1240  1350  1070  1120  1280  1110  1230  1140  1290  2760  2500  1470  1350  1570
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   23 I  720  1340  1500  2380  1980  1990  1210  1440  1160  1130  1190   950  1000  1030  1770  2220  2770  1080  1160  1380
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   22 I  770  1550  2440  1350  1720  1600  1880  1220  1120   990  1190  1120  1690  1350  1720   970  1510  2110  1290  1000
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   21 I 1460   980  1560  1420  1080  1200  1700  1100  1150  1020  1120  1100  1270  1040  1360  1050  1030  1680  1240  1220
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   20 I  880  1330  1050   730   980   990  2040  1330  1680  1400  1020  1210  1020  1020  1180  1790  1010  1080  1240  1000
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   19 I  850   940  1500   620   130  1200  1900  2090  1150  1170  1210  1030  1010  1020  1180  1440  1590  1320  1230  1020
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   18 I 1210  1500  1220   840   390   790  1180  1390  1680  1400  1240  1000  1380  1200  1120  1260  1430  1220  1280  1180
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   17 I 1480   740   980   190   320  1010  1300  1000  1040  1540  1150  1460  1450  1260  1480  1200  1700  1600  1100  1040
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   16 I 1590   840  1020   890  1870  2050  1020  1030  1000  1440  1430  1890  1180  1270  1070  1050  1860  1560  1100   980
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   15 I 1380  1010   490   680  1780  1510  1000  1060  1000  1180  1170   930  1260   760  1040   980  1240  1430  1430  1060
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   14 I 1090  1130  1080   810  1090  1060  1150  1130  1020  1190  1310  1250   960   600   390   930  1220  1370  1310  1050
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   13 I 1200  1550  1100   970  1120  1230  1180  1050  1520  1310  1290  1110   900   210     0   360  1180  1980  1640  1200
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   12 I 1080  1540  1240  1020  1800  1510  1590  1110  1040  1190  1000  1610  1580   780     0     0   820  1670  1280  1120
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   11 I 1000  1550  1070  1050  1380  1890  1600  1420  1390  1110  1540  1480   250     0     0     0    90  1690  1530  1080
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   10 I 1110  1620  1210  1140  1830  3740  1600  1540  1120  1330  1330    70     0     0     0     0     0   790  2120  1480
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
    9 I 1370  1880  1500  1270  1390  2390  1700  1720  1240   310    20     0     0     0     0     0     0   300  3060  3000
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
    8 I 1310  1240  1210  1560  1530  1830  2060  1480  1960  1890   850     0     0     0     0     0     0   310  1450  3070
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
    7 I 1740  1090  1400  2550  1320  1390  1220  1300  2000  2080  1820     0     0     0     0     0     0   510  1000  1270
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
    6 I 1520  1320  1540  2150  1370  1060  1000   970  1320  1810  1970   100     0     0     0     0   240   930   990  1000
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
    5 I 1290  1610  1680  1620  1620   970  1150  1480   990  1000  1310   840    50     0     0   190   920  1000  1000  1000
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
    4 I 1300  1460  1380  1280  1090  1120  1130  1020  1050   980   940   920   710   140    50  1230  1080  1000  1000  1000
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
    3 I 1050  1450  1490  1070  1030  2330  3100  2020  1970  1000  1000   990  1000  1020   820   870   780   980  1000  1000
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
    2 I 1240  1420  1690  1950  2330  3970  4010  1840  1750  1660  1000  1000  1000  1000  1000   960   960   990   980  1000
      I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
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```
  1 I 1320  1270  2570  3440  2750  3650  4090  2350  2110  3170  1000  1000  1000  1000  1000  1000  1000   990  1000  1000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
    ----------------------------------------------------------------------------------------------------------------------
        41    42    43    44    45    46    47    48    49    50    51    52    53    54    55    56    57    58    59    60

Leaf area index                                     XLAI

Multiply all values by 10 **  -3

 88 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 87 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 86 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 85 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 84 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 83 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 82 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 81 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 80 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 79 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 78 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 77 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 76 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 75 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 74 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 73 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 72 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 71 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 70 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 69 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 68 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 67 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 66 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 65 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 64 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 63 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 62 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
 61 I    0     0     0     0     0     0     0     0     0     0     0     0
    I    +     +     +     +     +     +     +     +     +     +     +     +
```

4807	60	I	0	0	0	0	0	0	0	0	0	0	0	0
4808		I	+	+	+	+	+	+	+	+	+	+	+	+
4809	59	I	0	0	0	0	0	0	0	0	0	0	0	0
4810		I	+	+	+	+	+	+	+	+	+	+	+	+
4811	58	I	0	0	0	0	0	0	0	0	0	0	0	0
4812		I	+	+	+	+	+	+	+	+	+	+	+	+
4813	57	I	0	0	0	0	0	0	0	0	0	0	0	0
4814		I	+	+	+	+	+	+	+	+	+	+	+	+
4815	56	I	0	0	0	0	0	0	0	0	0	0	0	0
4816		I	+	+	+	+	+	+	+	+	+	+	+	+
4817	55	I	0	0	0	0	0	0	0	0	0	0	0	0
4818		I	+	+	+	+	+	+	+	+	+	+	+	+
4819	54	I	0	0	0	0	0	0	0	0	0	0	0	0
4820		I	+	+	+	+	+	+	+	+	+	+	+	+
4821	53	I	0	0	0	0	0	0	0	0	0	0	0	0
4822		I	+	+	+	+	+	+	+	+	+	+	+	+
4823	52	I	0	0	0	0	0	0	0	0	0	0	0	0
4824		I	+	+	+	+	+	+	+	+	+	+	+	+
4825	51	I	0	0	0	0	0	0	0	0	0	0	0	0
4826		I	+	+	+	+	+	+	+	+	+	+	+	+
4827	50	I	0	0	0	0	0	0	0	0	0	0	0	0
4828		I	+	+	+	+	+	+	+	+	+	+	+	+
4829	49	I	0	0	0	0	0	0	0	0	0	0	0	0
4830		I	+	+	+	+	+	+	+	+	+	+	+	+
4831	48	I	0	0	0	0	0	0	0	0	0	0	0	0
4832		I	+	+	+	+	+	+	+	+	+	+	+	+
4833	47	I	0	0	0	0	0	0	0	0	0	0	0	0
4834		I	+	+	+	+	+	+	+	+	+	+	+	+
4835	46	I	0	0	0	0	0	0	0	0	0	0	0	0
4836		I	+	+	+	+	+	+	+	+	+	+	+	+
4837	45	I	0	0	0	0	0	0	0	0	0	0	0	0
4838		I	+	+	+	+	+	+	+	+	+	+	+	+
4839	44	I	0	0	0	0	0	0	0	0	0	0	0	0
4840		I	+	+	+	+	+	+	+	+	+	+	+	+
4841	43	I	0	0	0	0	0	0	0	0	0	0	0	0
4842		I	+	+	+	+	+	+	+	+	+	+	+	+
4843	42	I	0	0	0	0	0	0	0	0	0	0	0	0
4844		I	+	+	+	+	+	+	+	+	+	+	+	+
4845	41	I	0	0	0	0	0	0	0	0	0	0	0	0
4846		I	+	+	+	+	+	+	+	+	+	+	+	+
4847	40	I	0	0	0	0	0	0	0	0	0	0	0	0
4848		I	+	+	+	+	+	+	+	+	+	+	+	+
4849	39	I	0	0	0	0	0	0	0	0	0	0	0	0
4850		I	+	+	+	+	+	+	+	+	+	+	+	+
4851	38	I	0	0	0	0	0	0	0	0	0	0	0	0
4852		I	+	+	+	+	+	+	+	+	+	+	+	+
4853	37	I	0	0	0	0	0	0	0	0	0	0	0	0
4854		I	+	+	+	+	+	+	+	+	+	+	+	+
4855	36	I	0	0	0	0	0	0	0	0	0	0	0	0
4856		I	+	+	+	+	+	+	+	+	+	+	+	+
4857	35	I	0	0	0	0	0	0	0	0	0	0	0	0
4858		I	+	+	+	+	+	+	+	+	+	+	+	+
4859	34	I	0	0	0	0	0	0	0	0	0	0	0	0
4860		I	+	+	+	+	+	+	+	+	+	+	+	+
4861	33	I	0	0	0	0	0	0	0	0	0	0	0	0
4862		I	+	+	+	+	+	+	+	+	+	+	+	+
4863	32	I	0	0	0	0	0	0	0	0	0	0	0	0
4864		I	+	+	+	+	+	+	+	+	+	+	+	+
4865	31	I	5000	0	0	0	0	0	0	0	0	0	0	0
4866		I	+	+	+	+	+	+	+	+	+	+	+	+
4867	30	I	1400	0	0	0	0	0	0	0	0	0	0	0
4868		I	+	+	+	+	+	+	+	+	+	+	+	+
4869	29	I	980	5000	0	0	0	0	0	0	0	0	0	0
4870		I	+	+	+	+	+	+	+	+	+	+	+	+
4871	28	I	670	1970	0	0	0	0	0	0	0	0	0	0

```
     I    +     +     +     +     +     +     +     +     +     +     +     +
  27 I  550  1250     0     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  26 I  980  1310  1760     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  25 I 1320   870  1800     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  24 I 1210   500   740     0     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  23 I 1200   860   850   790     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  22 I 1130   960   700  1760     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  21 I 1140  1110   990  1600     0     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  20 I 1120  1050   780   410  1000     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  19 I 1010  1340  1250   670  1200     0     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  18 I  990  1020  1150  1230   770  3000     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  17 I 1070  1030   560  1680   450  1000     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  16 I 1180   770   160  1480   880   660     0     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  15 I 1000   880   690   950   780   400  1640     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  14 I 1010  1080  1050  1080   610   370   300     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  13 I 1090  1210  1090  1030   920   780  1830     0     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  12 I 1040  1070  1140  1020   970  1070  1440  1790     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  11 I 1000  1020   950  1080   990  1260  1170  1910     0     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
  10 I 1280  1080  1030   970   950  1000  2280  3660  1260     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
   9 I 1690  1170   810  1010  1120  1100  2290  1760  1480     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
   8 I 2720  2300  1210   890   820   340  1240  1450  2510     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
   7 I 3570  4180  2890  3160  1790   940  2130   990  2690     0     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
   6 I 1950  3120  3180  1900  1460   930  1840  1100   920   940     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
   5 I 1100  1200  1070   660   830   690  1830  1160   690   370     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
   4 I 1130  1230  1060   800   890   800  1820  2190   700   260     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
   3 I  990  1040  1340  1200  3370  1170  2110  1440   440   430     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
   2 I  990  1140  2310  1530  2080  1380  2630  1800   610   530     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
   1 I 1000  1800  2010  2110  1810  2250  1280  1840   830   590     0     0
     I    +     +     +     +     +     +     +     +     +     +     +     +
       -----------------------------------------------------------------------
         61    62    63    64    65    66    67    68    69    70    71    72

 Nearest surface station no. to each grid point                NEARS

 Multiply all values by 10 **   -3

  88 I 1000  1000  1000  1000  1000  1000  1000  1000  1000  1000  6000  6000  6000  6000  6000  2000  2000  2000  2000  2000
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  87 I 1000  1000  1000  1000  1000  1000  1000  1000  1000  6000  6000  6000  6000  6000  6000  6000  6000  2000  2000  2000
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    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 86 I 1000  1000  1000  1000  1000  1000  1000  1000  1000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  2000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 85 I 1000  1000  1000  1000  1000  1000  1000  1000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 84 I 1000  1000  1000  1000  1000  1000  1000  1000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 83 I 1000  1000  1000  1000  1000  1000  1000  1000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 82 I 1000  1000  1000  1000  1000  1000  1000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 81 I 1000  1000  1000  1000  1000  1000  1000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 80 I 1000  1000  1000  1000  1000  1000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 79 I 1000  1000  1000  1000  1000  1000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 78 I 1000  1000  1000  1000  1000  1000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 77 I 1000  1000  1000  1000  1000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 76 I 1000  1000  1000  1000  1000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 75 I 1000  1000  1000  1000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 74 I 1000  1000  1000  1000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 73 I 1000  1000  1000  1000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 72 I 1000  1000  1000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 71 I 1000  1000  1000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 70 I 1000  1000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 69 I 1000  1000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 68 I 1000  1000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 67 I 1000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 66 I 1000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 65 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 64 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 63 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 62 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 61 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 60 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 59 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 58 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 57 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 56 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
 55 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
    I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
```

```
54 I 6000 6000 6000 6000 6000 6000 6000 6000 6000 6000 6000 6000 6000 6000 6000 6000 6000 6000 6000 6000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
53 I 4000 4000 4000 4000 4000 6000 6000 6000 6000 6000 6000 6000 6000 6000 6000 6000 6000 6000 6000 6000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
52 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 6000 6000 6000 6000 6000 6000 6000 6000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
51 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 6000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
50 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
49 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
48 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
47 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
46 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
45 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
44 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
43 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
42 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
41 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
40 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
39 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
38 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
37 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
36 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
35 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
34 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
33 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
32 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
31 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
30 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
29 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
28 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
27 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
26 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
25 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
24 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
23 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
   I   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
22 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000
```

```
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  21 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  20 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  19 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  18 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  17 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  16 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  15 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  14 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  13 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  12 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  11 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  9000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  10 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  9000  9000  9000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   9 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  9000  9000  9000  9000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   8 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  9000  9000  9000  9000  9000  9000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   7 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  9000  9000  9000  9000  9000  9000  9000  9000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   6 I 4000  4000  4000  4000  4000  4000  4000  4000  4000  4000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   5 I 4000  4000  4000  4000  4000  4000  4000  4000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   4 I 4000  4000  4000  4000  4000  4000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   3 I 4000  4000  4000  4000  4000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   2 I 4000  4000  4000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   1 I 4000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
     ------------------------------------------------------------------------------------------------------------------------
         1     2     3     4     5     6     7     8     9    10    11    12    13    14    15    16    17    18    19    20

Nearest surface station no. to each grid point                NEARS

Multiply all values by 10 **  -3

  88 I 2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  87 I 2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  86 I 2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  85 I 2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  84 I 6000  6000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  83 I 6000  6000  6000  6000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  82 I 6000  6000  6000  6000  6000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000
     I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
  81 I 6000  6000  6000  6000  6000  6000  6000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000
```

```
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
80 I 6000  6000  6000  6000  6000  6000  6000  6000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
79 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
78 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  2000  2000  2000  2000  2000  2000  2000  2000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
77 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  2000  2000  2000  2000  2000  2000  2000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
76 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  2000  2000  2000  2000  2000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
75 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  2000  2000  2000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
74 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  2000  2000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
73 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
72 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
71 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
70 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
69 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
68 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  3000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
67 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  3000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
66 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  3000  3000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
65 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  3000  3000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
64 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  3000  3000  3000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
63 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  3000  3000  3000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
62 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  3000  3000  3000  3000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
61 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  3000  3000  3000  3000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
60 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  3000  3000  3000  3000  3000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
59 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  3000  3000  3000  3000  3000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
58 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  3000  3000  3000  3000  3000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
57 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  3000  3000  3000  3000  3000  3000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
56 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  3000  3000  3000  3000  3000  3000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
55 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  3000  3000  3000  3000  3000  3000  3000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
54 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  7000  7000  3000  3000  3000  3000  3000  3000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
53 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  6000  7000  7000  7000  7000  7000  7000  3000  3000  3000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
52 I 6000  6000  6000  6000  6000  6000  6000  6000  6000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
51 I 6000  6000  6000  6000  6000  6000  6000  6000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
50 I 4000  4000  4000  4000  4000  6000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
49 I 4000  4000  4000  4000  4000  4000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000
   I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
```

```
48 I 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
47 I 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
46 I 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
45 I 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
44 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
43 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
42 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
41 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
40 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
39 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000 7000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
38 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000 7000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
37 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
36 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
35 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
34 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
33 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
32 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
31 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
30 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
29 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
28 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
27 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
26 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
25 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
24 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
23 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
22 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 7000 7000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
21 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 9000 9000 9000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
20 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 9000 9000 9000 9000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
19 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 9000 9000 9000 9000 9000 9000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
18 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 9000 9000 9000 9000 9000 9000 9000 9000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
17 I 4000 4000 4000 4000 4000 4000 4000 4000 4000 4000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000
   I    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
16 I 4000 4000 4000 4000 4000 4000 4000 4000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000
```

```
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  15 I 4000 4000 4000 4000 4000 4000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  14 I 4000 4000 4000 4000 4000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  13 I 4000 4000 4000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  12 I 4000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  11 I 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  10 I 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
   9 I 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
   8 I 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
   7 I 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
   6 I 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
   5 I 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
   4 I 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
   3 I 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
   2 I 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
   1 I 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
     ----------------------------------------------------------------------------------------------------
        21   22   23   24   25   26   27   28   29   30   31   32   33   34   35   36   37   38   39   40

Nearest surface station no. to each grid point                 NEARS

Multiply all values by 10 ** -3

  88 I 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  87 I 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  86 I 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  85 I 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  84 I 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  83 I 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  82 I 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  81 I 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  80 I 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  79 I 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 3000 3000 3000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  78 I 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 3000 3000 3000 3000 3000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  77 I 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 3000 3000 3000 3000 3000 3000 3000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  76 I 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 3000 3000 3000 3000 3000 3000 3000 3000 3000 3000
     I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
  75 I 2000 2000 2000 2000 2000 2000 2000 2000 3000 3000 3000 3000 3000 3000 3000 3000 3000 3000 3000 3000
```

```
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
74 I 2000  2000  2000  2000  2000  2000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
73 I 2000  2000  2000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
72 I 6000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
71 I 6000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
70 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
69 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
68 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
67 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
66 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
65 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
64 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
63 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
62 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
61 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
60 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
59 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
58 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
57 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
56 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
55 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
54 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
53 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
52 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
51 I 7000  7000  7000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
50 I 7000  7000  7000  7000  7000  7000  7000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
49 I 7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
48 I 7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  3000  3000  3000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
47 I 7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  3000  3000  3000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
46 I 7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  3000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
45 I 7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
44 I 7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
43 I 7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000  7000
   I   +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
```

```
42 I 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
41 I 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
40 I 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
39 I 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
38 I 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
37 I 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
36 I 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
35 I 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
34 I 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
33 I 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
32 I 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 8000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
31 I 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 8000 8000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
30 I 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
29 I 7000 7000 7000 7000 7000 7000 7000 7000 7000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
28 I 7000 7000 7000 7000 7000 7000 7000 7000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
27 I 7000 7000 7000 7000 7000 7000 7000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
26 I 7000 7000 7000 7000 7000 7000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
25 I 7000 7000 7000 7000 7000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
24 I 7000 7000 7000 7000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
23 I 7000 7000 7000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
22 I 7000 7000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
21 I 9000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
20 I 9000 9000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
19 I 9000 9000 9000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
18 I 9000 9000 9000 9000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
17 I 9000 9000 9000 9000 9000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
16 I 9000 9000 9000 9000 9000 9000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
15 I 9000 9000 9000 9000 9000 9000 9000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
14 I 9000 9000 9000 9000 9000 9000 9000 9000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
13 I 9000 9000 9000 9000 9000 9000 9000 9000 9000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
12 I 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
11 I 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 8000 8000 8000 8000 8000 8000 5000 5000 5000 5000
   I  +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
10 I 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 9000 8000 8000 5000 5000 5000 5000 5000 5000 5000
```

```
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   9 I 9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  5000  5000  5000  5000  5000  5000  5000  5000
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   8 I 9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  5000  5000  5000  5000  5000  5000  5000  5000
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   7 I 9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  5000  5000  5000  5000  5000  5000  5000  5000
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   6 I 9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  5000  5000  5000  5000  5000  5000  5000  5000
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   5 I 9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  5000  5000  5000  5000  5000  5000  5000  5000
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   4 I 9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  5000  5000  5000  5000  5000  5000  5000  5000
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   3 I 9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  5000  5000  5000  5000  5000  5000  5000  5000
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   2 I 9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  5000  5000  5000  5000  5000  5000  5000  5000
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
   1 I 9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  9000  5000  5000  5000  5000  5000  5000  5000  5000
     I    +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +     +
     ----------------------------------------------------------------------------------------------------------------------
         41    42    43    44    45    46    47    48    49    50    51    52    53    54    55    56    57    58    59    60

Nearest surface station no. to each grid point                   NEARS

Multiply all values by 10 **  -3

  88 I 2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  87 I 2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  86 I 2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  85 I 2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  2000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  84 I 2000  2000  2000  2000  2000  2000  2000  2000  2000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  83 I 2000  2000  2000  2000  2000  2000  2000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  82 I 2000  2000  2000  2000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  81 I 2000  2000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  80 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  79 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  78 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  77 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  76 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  75 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  74 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  73 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  72 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  71 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  70 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  69 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
```

```
     I    +     +     +     +     +     +     +     +     +     +     +     +
  68 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  67 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  66 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  65 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  64 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  63 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  62 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  61 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  60 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  59 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  58 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  57 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  56 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  55 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  54 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  53 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  52 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  51 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  50 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  49 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  48 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  47 I 3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  3000  8000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  46 I 3000  3000  3000  3000  3000  3000  3000  3000  8000  8000  8000  8000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  45 I 7000  7000  3000  3000  3000  3000  8000  8000  8000  8000  8000  8000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  44 I 7000  7000  7000  7000  8000  8000  8000  8000  8000  8000  8000  8000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  43 I 7000  7000  7000  8000  8000  8000  8000  8000  8000  8000  8000  8000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  42 I 7000  7000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  41 I 7000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  40 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  39 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  38 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
     I    +     +     +     +     +     +     +     +     +     +     +     +
  37 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
     I    +     +     +     +     +     +     +     +     +     +     +     +
```

```
 36 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 35 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 34 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 33 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 32 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 31 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 30 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 29 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 28 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 27 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 26 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 25 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 24 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 23 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 22 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 21 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 20 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 19 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 18 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 17 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 16 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  8000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 15 I 8000  8000  8000  8000  8000  8000  8000  8000  8000  8000  5000  5000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 14 I 8000  8000  8000  8000  8000  8000  5000  5000  5000  5000  5000  5000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 13 I 8000  8000  8000  5000  5000  5000  5000  5000  5000  5000  5000  5000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 12 I 5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 11 I 5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000
    I   +     +     +     +     +     +     +     +     +     +     +     +
 10 I 5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000
    I   +     +     +     +     +     +     +     +     +     +     +     +
  9 I 5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000
    I   +     +     +     +     +     +     +     +     +     +     +     +
  8 I 5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000
    I   +     +     +     +     +     +     +     +     +     +     +     +
  7 I 5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000
    I   +     +     +     +     +     +     +     +     +     +     +     +
  6 I 5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000
    I   +     +     +     +     +     +     +     +     +     +     +     +
  5 I 5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000
    I   +     +     +     +     +     +     +     +     +     +     +     +
  4 I 5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000
```

```
     I    +     +     +     +     +     +     +     +     +     +     +     +
   3 I 5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000
     I    +     +     +     +     +     +     +     +     +     +     +     +
   2 I 5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000
     I    +     +     +     +     +     +     +     +     +     +     +     +
   1 I 5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000  5000
     I    +     +     +     +     +     +     +     +     +     +     +     +
     -----------------------------------------------------------------------
         61    62    63    64    65    66    67    68    69    70    71    72


  LAST DAY/HOUR PROCESSED:
     Year: 1990  Month: 12   Day: 30   Julian day: 364   Hour: 23


  End of run -- Clock time: 14:05:12
                      Date: 07-30-2004

        Elapsed Clock Time:     2890.0 (seconds)

                  CPU Time:     2890.0 (seconds)
```

ATTACHMENT F3

POSTUTIL OUTPUT LIST FILES

```
*****************************************************************************************************
                                          POSTUTIL Version 1.3          Level 030402
*****************************************************************************************************




 Run Title:
    SECI Payne Creek Peaker Project - 1990 Met; HNO3/NO3 Partitioning
    AERMOD Type Dispersion


   2            (none)             * MODDAT =                                                  * *END*


-------------
Note:  provide NMET lines of the form   * UTLMET = name * *END*
       and NFILES lines of the form     * MODDAT = name * *END*
       where the * should be replaced with an exclamation point,
       the special delimiter character.


--------------------------------------------------------------------------------

INPUT GROUP: 1 -- General run control parameters
--------------

     Starting date:    Year  (ISYR) --    No default   ! ISYR  =  1990 !
                       Month (ISMO) --    No default   ! ISMO  = 1    !
                       Day   (ISDY) --    No default   ! ISDY  = 6    !
                       Hour  (ISHR) --    No default   ! ISHR  = 0    !

     Number of periods to process
                            (NPER) -- No default   ! NPER  = 8616    !

     Number of species to process from CALPUFF runs
                        (NSPECINP) -- No default   ! NSPECINP = 6 !

     Number of species to write to output file
                        (NSPECOUT) -- No default   ! NSPECOUT = 6 !

     Number of species to compute from those modeled
     (must be no greater than NSPECOUT)
                        (NSPECCMP) -- No default   ! NSPECCMP = 0 !


 When multiple files are used, a species name may appear in more than
 one file.  Data for this species will be summed (appropriate if the
 CALPUFF runs use different source groups).  If this summing is not
 appropriate, remove duplicate species from the file(s).

     Stop run if duplicate species names
     are found? (MDUPLCT)          Default: 0       ! MDUPLCT   =   0   !
        0 = no  (i.e., duplicate species are summed)
        1 = yes (i.e., run is halted)

 Data for each species in a CALPUFF data file may also be scaled as
 they are read.  This can be done to alter the emission rate of all
 sources that were modeled in a particular CALPUFF application.
 The scaling factor for each species is entered in Subgroup (2d), for
 each file for which scaling is requested.

     Number of CALPUFF data files that will be scaled
     (must be no greater than NFILES)
     (NSCALED)                     Default: 0       ! NSCALED = 0 !
```

```


 Option to recompute the HNO3/NO3 concentration partition prior to
 performing other actions.  This option will NOT alter any deposition
 fluxes contained in the CALPUFF file(s).  Two partition selections
 are provided.  The first (MNITRATE=1) computes the partition for the
 TOTAL (all sources) concentration fields (SO4, NO3, HNO3; NH3), and
 the second (MNITRATE=2) uses this partition (from a previous application
 of POSTUTIL) to compute the partition for individual source groups.

 Required information for MNITRATE=1 includes:
           species NO3, HNO3, and SO4
           NH3 concentration(s)
           met. data file for RH and T

 Required information for MNITRATE=2 includes:
           species NO3 and HNO3 for a source group
           species NO3ALL and HNO3ALL for all source groups, properly
                   partitioned

     Recompute the HNO3/NO3 partition for concentrations?
     (MNITRATE)                    Default: 0       ! MNITRATE  =  1  !
        0 = no
        1 = yes, for all sources combined
        2 = yes, for a source group

     Ammonia concentrations may be available as a modeled species in
     the CALPUFF files.  When NH3 is listed as a processed species in
     Subgroup (2a) (as one of the NSPECINP ASPECI entries), the
     modeled values will be used in the chemical equilibrium calculation.
     If NH3 is not on this list, the default background value listed
     below will be used.
     Default ammonia concentration (ppb) used for HNO3/NO3 partition:
     (BCKNH3) in ppb               Default: 10.     ! BCKNH3 = 1.0 !

!END!

-------------------------------------------------
NOTICE: Starting year in control file sets the
        expected century for the simulation.  All
        YY years are converted to YYYY years in
        the range:  1940 2039
-------------------------------------------------

-------------------------------------------------------------------------------

INPUT GROUP: 2 -- Species Processing Information
--------------

-------------
Subgroup (2a)
-------------

  The following NSPECINP species will be processed:

! ASPECI =          SO2 !          !END!
! ASPECI =          SO4 !          !END!
! ASPECI =          NOX !          !END!
! ASPECI =         HNO3 !          !END!
! ASPECI =          NO3 !          !END!
! ASPECI =         PM10 !          !END!


-------------
Subgroup (2b)
```

```
-------------

  The following NSPECOUT species will be written:

! ASPECO =          SO2 !          !END!
! ASPECO =          SO4 !          !END!
! ASPECO =          NOX !          !END!
! ASPECO =         HNO3 !          !END!
! ASPECO =          NO3 !          !END!
! ASPECO =         PM10 !          !END!

*********************************************************************************************************************************
                                              POSTUTIL Version 1.3          Level 030402
*********************************************************************************************************************************




 POSTUTIL Control File Input Summary -----------------------

                      Run starting date -- year: 1990
                                          month:    1
                                            day:    5
                                     Julian day:    5
                  time beginning  -  hour(0-23):   23
                                  -      second:    0
                           Run length (periods): 8616


Note: the length of a period is controlled by
      the averaging time selected in the model

Partition between HNO3 and NO3 is computed
Default background Ammonia (ppb) =  1.00000000

      Species needed from input file --
                             SO2
                             SO4
                             NOX
                             HNO3
                             NO3
                             PM10

      Species written to output file --
                             SO2
                             SO4
                             NOX
                             HNO3
                             NO3
                             PM10

 Species computed from input species --


PROCESSED MODEL FILE ---------- Number  1

CALPUFF     5.7         030402

SECI Payne Creek - P&W SCCTS; Case 4, Oil-Firing
Chassahowitzka NWR Class I Impacts; AERMOD Type Dispersion
Refined CALMET Data Provided by FDEP, 1990

Averaging time for values reported from model:
      1    HOUR
```

```

Number of averaging periods in file from model:
      8616

Chemical species names for each layer in model:
SO2            1
SO4            1
NOX            1
HNO3           1
NO3            1
PM10           1

 msyr,mjsday       = 1990 5
 mshr,mssec        = 23 0
 nsecdt (period)   = 3600
 mnper,nszout,mavgpd = 8616 6 1
 xorigkm,yorigkm,nstas =  250.000015 2940.00024 9
 ielmet,jelmet = 72 88
 delx,dely,nz = 5.00000000 5.00000000 1
 iastar,iastop,jastar,jastop = 1 72 1 88
 isastr,isastp,jsastr,jsastp = 0 0 0 0
 (computed) ngx,ngy  = 1 1
 meshdn,npts,nareas  = 1 10 0
 nlines,nvols        = 0 0
 ndrec,nctrec,LSGRID = 113 0 F




**********     HNO3/NO3 Partitioning  **********
    SO4 is available
    NO3 is available
    HNO3 is available
    NH3 is NOT available (Default Used)



Chemical species names written to new file:
SO2            1
SO4            1
NOX            1
HNO3           1
NO3            1
PM10           1



------------------------------------------------------------------------------------------------------------------------------------
         INPUT FILES

Default Name     Unit No.     File Name and Path
------------     --------     ------------------
POSTUTIL.INP         5        POSTUTIL90B.INP
 CALPUFF.DAT        10        c:\projects\seci\payne\scct\modeling\calpuff\puff-out\oil90b.con
     MET.DAT         4        d:\chas\1990\chas9001.met
      (none)         4        d:\chas\1990\chas9002.met
      (none)         4        d:\chas\1990\chas9003.met
      (none)         4        d:\chas\1990\chas9004.met
      (none)         4        d:\chas\1990\chas9005.met
      (none)         4        d:\chas\1990\chas9006.met
      (none)         4        d:\chas\1990\chas9007.met
      (none)         4        d:\chas\1990\chas9008.met
      (none)         4        d:\chas\1990\chas9009.met
      (none)         4        d:\chas\1990\chas9010.met
      (none)         4        d:\chas\1990\chas9011.met
```

```
      (none)          4       d:\chas\1990\chas9012.met


-----------------------------------------------------------------------------------------------------------------------------------
         OUTPUT FILES

Default Name     Unit No.     File Name and Path
------------     --------     ------------------
POSTUTIL.LST        7         c:\projects\seci\payne\scct\modeling\calpuff\puff-out\oil90bp.lst
   MODEL.DAT        8         c:\projects\seci\payne\scct\modeling\calpuff\puff-out\oil90bp.con

WARNING  subr. METQA -- Met data end early
     End of simulation:  199036423 0
     End of met data  :  199003123 0


WARNING in subr. METQA -- Met data begin late
     Start of simulation:  199000523 0
     Start of met data  :  199003123 0

WARNING  subr. METQA -- Met data end early
     End of simulation:  199036423 0
     End of met data  :  199005923 0


WARNING in subr. METQA -- Met data begin late
     Start of simulation:  199000523 0
     Start of met data  :  199005923 0

WARNING  subr. METQA -- Met data end early
     End of simulation:  199036423 0
     End of met data  :  199009023 0


WARNING in subr. METQA -- Met data begin late
     Start of simulation:  199000523 0
     Start of met data  :  199009023 0

WARNING  subr. METQA -- Met data end early
     End of simulation:  199036423 0
     End of met data  :  199012023 0


WARNING in subr. METQA -- Met data begin late
     Start of simulation:  199000523 0
     Start of met data  :  199012023 0

WARNING  subr. METQA -- Met data end early
     End of simulation:  199036423 0
     End of met data  :  199015123 0


WARNING in subr. METQA -- Met data begin late
     Start of simulation:  199000523 0
     Start of met data  :  199015123 0

WARNING  subr. METQA -- Met data end early
     End of simulation:  199036423 0
     End of met data  :  199018123 0


WARNING in subr. METQA -- Met data begin late
     Start of simulation:  199000523 0
     Start of met data  :  199018123 0
```

```
WARNING  subr. METQA -- Met data end early
     End of simulation:  199036423 0
     End of met data  :  199021223 0


WARNING in subr. METQA -- Met data begin late
     Start of simulation:  199000523 0
     Start of met data  :  199021223 0

WARNING  subr. METQA -- Met data end early
     End of simulation:  199036423 0
     End of met data  :  199024323 0


WARNING in subr. METQA -- Met data begin late
     Start of simulation:  199000523 0
     Start of met data  :  199024323 0

WARNING  subr. METQA -- Met data end early
     End of simulation:  199036423 0
     End of met data  :  199027323 0


WARNING in subr. METQA -- Met data begin late
     Start of simulation:  199000523 0
     Start of met data  :  199027323 0

WARNING  subr. METQA -- Met data end early
     End of simulation:  199036423 0
     End of met data  :  199030423 0


WARNING in subr. METQA -- Met data begin late
     Start of simulation:  199000523 0
     Start of met data  :  199030423 0

WARNING  subr. METQA -- Met data end early
     End of simulation:  199036423 0
     End of met data  :  199033423 0


WARNING in subr. METQA -- Met data begin late
     Start of simulation:  199000523 0
     Start of met data  :  199033423 0
```

```
SECI Payne Creek - P&W SCCTS; Case 4 Oil-Firing - 1990 Total deposition fluxes (wet & dry)
Nitrogen deposition due to NO, NO2, HNO3, NH4NO3, and (NH4)2SO4
Sulfur deposition due to SO2, (NH4)2SO4
---------------- Run title (3 lines) ------------------------------------------

                    POSTUTIL MODEL CONTROL FILE
                    ---------------------------

------------------------------------------------------------------------------

INPUT GROUP: 0 -- Input and Output File Names
--------------

-------------
Subgroup (0a)
-------------

Output Files
------------

 File             Default File Name
 ----             -----------------
 List File        OSTUTIL.LST        ! UTLLST =C:\PROJECTS\SECI\PAYNE\SCCT\MODELING\CALPUFF\PUFF-OUT\90TFLX.LST   !
 Data File        MODEL.DAT          ! UTLDAT =C:\PROJECTS\SECI\PAYNE\SCCT\MODELING\CALPUFF\PUFF-OUT\90TFLX.CON   !


Input Files
-----------

 Meteorological data files are needed for the HNO3/NO3 partition option.
 The met data file is the 'CALMET.DAT' format file used in the CALPUFF
 simulation.  If multiple CALMET files had been used in sequence, you
 may list all of these files in subgroup 0b.  Specify the total number
 of CALMET files runs you need to use, and provide the filename for each
 in subgroup 0b.

     Number of CALMET data files (NFILES)
                                     Default: 0       ! NMET    = 0   !


 A number of CALPUFF data files may be processed in this application.
 The files may represent individual CALPUFF simulations that were made
 for a specific set of species and/or sources.  Specify the total number
 of CALPUFF runs you wish to combine, and provide the filename for each
 in subgroup 0b.

     Number of CALPUFF data files (NFILES)
                                     Default: 1       ! NFILES  = 2   !


 All filenames will be converted to lower case if LCFILES = T
 Otherwise, if LCFILES = F, filenames will be converted to UPPER CASE

     Convert filenames to lower case?  Default: T     ! LCFILES = T !
         T = lower case
         F = UPPER CASE

!END!

----------------------------------------------------------
 NOTE: file/path names can be up to 70 characters in length
----------------------------------------------------------

-------------
Subgroup (0b)
```

```
-------------

NMET CALMET Data Files:

Input File      Default File Name
----------      -----------------
   1            MET.DAT              * UTLMET =CALMET.DAT  * *END*


Input File      Default File Name
----------      -----------------
   1            CALPUFF.DAT          ! MODDAT =C:\PROJECTS\SECI\PAYNE\SCCT\MODELING\CALPUFF\PUFF-OUT\OIL90BDF.DAT ! !END!
   2            (none)               ! MODDAT =C:\PROJECTS\SECI\PAYNE\SCCT\MODELING\CALPUFF\PUFF-OUT\OIL90BWF.DAT ! !END!


-------------
Note:  provide NMET lines of the form   * UTLMET = name * *END*
       and NFILES lines of the form     * MODDAT = name * *END*
       where the * should be replaced with an exclamation point,
       the special delimiter character.


--------------------------------------------------------------------------------

INPUT GROUP: 1 -- General run control parameters
--------------

     Starting date:    Year  (ISYR) --    No default    ! ISYR  =  1990 !
                       Month (ISMO) --    No default    ! ISMO  = 1   !
                       Day   (ISDY) --    No default    ! ISDY  = 6   !
                       Hour  (ISHR) --    No default    ! ISHR  = 0   !

     Number of periods to process
                                (NPER) -- No default    ! NPER  = 8616   !

     Number of species to process from CALPUFF runs
                            (NSPECINP) -- No default    ! NSPECINP = 5 !

     Number of species to write to output file
                            (NSPECOUT) -- No default    ! NSPECOUT = 7 !

     Number of species to compute from those modeled
     (must be no greater than NSPECOUT)
                            (NSPECCMP) -- No default    ! NSPECCMP = 2 !


 When multiple files are used, a species name may appear in more than
 one file.  Data for this species will be summed (appropriate if the
 CALPUFF runs use different source groups).  If this summing is not
 appropriate, remove duplicate species from the file(s).

     Stop run if duplicate species names
     are found? (MDUPLCT)           Default: 0       ! MDUPLCT  =  0  !
        0 = no  (i.e., duplicate species are summed)
        1 = yes (i.e., run is halted)

 Data for each species in a CALPUFF data file may also be scaled as
 they are read.  This can be done to alter the emission rate of all
 sources that were modeled in a particular CALPUFF application.
 The scaling factor for each species is entered in Subgroup (2d), for
 each file for which scaling is requested.

     Number of CALPUFF data files that will be scaled
     (must be no greater than NFILES)
     (NSCALED)                      Default: 0       ! NSCALED = 0 !
```

```


Option to recompute the HNO3/NO3 concentration partition prior to
performing other actions.  This option will NOT alter any deposition
fluxes contained in the CALPUFF file(s).  Two partition selections
are provided.  The first (MNITRATE=1) computes the partition for the
TOTAL (all sources) concentration fields (SO4, NO3, HNO3; NH3), and
the second (MNITRATE=2) uses this partition (from a previous application
of POSTUTIL) to compute the partition for individual source groups.

Required information for MNITRATE=1 includes:
          species NO3, HNO3, and SO4
          NH3 concentration(s)
          met. data file for RH and T

Required information for MNITRATE=2 includes:
          species NO3 and HNO3 for a source group
          species NO3ALL and HNO3ALL for all source groups, properly
                  partitioned

    Recompute the HNO3/NO3 partition for concentrations?
    (MNITRATE)                  Default: 0      ! MNITRATE  =  0  !
       0 = no
       1 = yes, for all sources combined
       2 = yes, for a source group

    Ammonia concentrations may be available as a modeled species in
    the CALPUFF files.  When NH3 is listed as a processed species in
    Subgroup (2a) (as one of the NSPECINP ASPECI entries), the
    modeled values will be used in the chemical equilibrium calculation.
    If NH3 is not on this list, the default background value listed
    below will be used.
    Default ammonia concentration (ppb) used for HNO3/NO3 partition:
    (BCKNH3) in ppb             Default: 10.    ! BCKNH3 = 1. !

!END!
--------------------------------------------------------------------------------

INPUT GROUP: 2 -- Species Processing Information
--------------

-------------
Subgroup (2a)
-------------

 The following NSPECINP species will be processed:

! ASPECI =          SO2 !          !END!
! ASPECI =          SO4 !          !END!
! ASPECI =          NOX !          !END!
! ASPECI =         HNO3 !          !END!
! ASPECI =          NO3 !          !END!

-------------
Subgroup (2b)
-------------

 The following NSPECOUT species will be written:

! ASPECO =          SO2 !          !END!
! ASPECO =          SO4 !          !END!
! ASPECO =          NOX !          !END!
! ASPECO =         HNO3 !          !END!
! ASPECO =          NO3 !          !END!
! ASPECO =            N !          !END!
```

```
! ASPECO =           S !         !END!

-------------
Subgroup (2c)
-------------

 The following NSPECCMP species will be computed by scaling and summing
 one or more of the processed input species.  Identify the name(s) of
 the computed species and provide the scaling factors for each of the
 NSPECINP input species (NSPECCMP groups of NSPECINP+1 lines each):

! CSPECCMP =        N !
!      SO2  =     0.0 !
!      SO4  =     0.291667 !
!      NOX  =     0.304348 !
!     HNO3  =     0.222222 !
!      NO3  =     0.451613 !
!END!

! CSPECCMP =        S !
!      SO2  =     0.500000 !
!      SO4  =     0.333333 !
!      NOX  =     0.0 !
!     HNO3  =     0.0 !
!      NO3  =     0.0 !
!END!


-------------
Subgroup (2d)
-------------

 Each species in NSCALED CALPUFF data files may be scaled before being
 processed (e.g., to change the emission rate for all sources modeled
 in the run that produced a data file).  For each file, identify the
 file name and then provide the name(s) of the scaled species and the
 corresponding scaling factors (A,B where x' = Ax+B).

               A(Default=1.0)      B(Default=0.0)
               --------------      --------------

* MODDAT =NOFILES.DAT    *
*      SO2  =      1.0,               0.0    *
*      SO4  =      1.0,               0.0    *
*     HNO3  =      1.0,               0.0    *
*      NO3  =      1.0,               0.0    *
*END*
```

ATTACHMENT F4

CALPOST OUTPUT LIST FILE

```
SECI Payne Creek - P&W SCCTS; Case 4 Oil-Firing
Chassahowitzka NWR Class I Impacts - Regional Haze
Refined FDEP CALMET Data, 1992; AEROD Type Dispersion
---------------- Run title (3 lines) ------------------------------------------

                     CALPOST MODEL CONTROL FILE
                     --------------------------

-------------------------------------------------------------------------------

INPUT GROUP: 0 -- Input and Output File Names
--------------

Input Files
-----------

File                          Default File Name
----                          -----------------
Conc/Dep Flux File            MODEL.DAT          ! MODDAT = C:\PROJECTS\SECI\PAYNE\SCCT\MODELING\CALPUFF\PUFF-OUT\OIL92BP.CON     !
Relative Humidity File        VISB.DAT           ! VISDAT = C:\PROJECTS\SECI\PAYNE\SCCT\MODELING\CALPUFF\PUFF-OUT\OIL92VB.DAT    !
Background Data File          BACK.DAT           *BACKDAT =                                         *
Transmissometer/              VSRN.DAT           *VSRDAT =                                          *
Nephelometer Data File

Output Files
------------

File                          Default File Name
----                          -----------------
List File                     CALPOST.LST        ! PSTLST = C:\PROJECTS\SECI\PAYNE\SCCT\MODELING\CALPUFF\POST-OUT\92BVIS.LST     !

Pathname for Timeseries Files   (blank)          * TSPATH =   *
(activate with exclamation points only if
providing NON-BLANK character string)

Pathname for Plot Files   (blank)                * PLPATH =   *
(activate with exclamation points only if
 providing NON-BLANK character string)

User Character String (U) to augment default filenames
(activate with exclamation points only if
 providing NON-BLANK character string)

Timeseries                    TSttUUUU.DAT       * TSUNAM =   *

Top Nth Rank Plot             RttUUUUU.DAT
                          or  RttiiUUU.GRD       * TUNAM =   *

Exceedance Plot               XttUUUUU.DAT
                          or  XttUUUUU.GRD       * XUNAM =   *

Echo Plot                     jjjtthhU.DAT
(Specific Days)           or  jjjtthhU.GRD       * EUNAM =   *

Visibility Plot               V24UUUUU.DAT       * VUNAM =   *
(Daily Peak Summary)

--------------------------------------------------------------------------------
All file names will be converted to lower case if LCFILES = T
Otherwise, if LCFILES = F, file names will be converted to UPPER CASE
         T = lower case      ! LCFILES = F !
         F = UPPER CASE
NOTE: (1) file/path names can be up to 70 characters in length
NOTE: (2) Filenames for ALL PLOT and TIMESERIES FILES are constructed
          using a template that includes a pathname, user-supplied
```

```
         character(s), and fixed strings (tt,ii,jjj, and hh), where
               tt = Averaging Period (e.g. 03)
               ii = Rank (e.g. 02)
               jjj= Julian Day
               hh = Hour(ending)
         are determined internally based on selections made below.
         If a path or user-supplied character(s) are supplied, each
         must contain at least 1 non-blank character.

!END!
--------------------------------------------------------------------------------

INPUT GROUP: 1 -- General run control parameters
--------------

     Option to run all periods found
     in the met. file(s)  (METRUN)       Default: 0   ! METRUN =   1  !

         METRUN = 0 - Run period explicitly defined below
         METRUN = 1 - Run all periods in CALPUFF data file(s)

     Starting date:    Year  (ISYR) --    No default   ! ISYR  =  1992   !
     (used only if     Month (ISMO) --    No default   ! ISMO  =  0   !
      METRUN = 0)      Day   (ISDY) --    No default   ! ISDY  =  0   !
                       Hour  (ISHR) --    No default   ! ISHR  =  0   !

     Number of hours to process (NHRS) -- No default   ! NHRS  =  0  !

     Process every hour of data?(NREP) -- Default: 1   ! NREP  =  1  !
      (1 = every hour processed,
       2 = every 2nd hour processed,
       5 = every 5th hour processed, etc.)

Species & Concentration/Deposition Information
----------------------------------------------

      Species to process (ASPEC)       -- No default   ! ASPEC = VISIB  !
      (ASPEC = VISIB for visibility processing)

      Layer/deposition code (ILAYER)   -- Default: 1   ! ILAYER =  1  !
        '1'  for CALPUFF concentrations,
        '-1' for dry deposition fluxes,
        '-2' for wet deposition fluxes,
        '-3' for wet+dry deposition fluxes.

      Scaling factors of the form:     -- Defaults:    ! A =  0.0     !
            X(new) = X(old) * A + B         A = 0.0    ! B =  0.0     !
        (NOT applied if A = B = 0.0)        B = 0.0

      Add Hourly Background Concentrations/Fluxes?
                             (LBACK)  -- Default: F   ! LBACK =  F !

Receptor information
--------------------

  Gridded receptors processed?    (LG) -- Default: F   ! LG  = F  !
  Discrete receptors processed?   (LD) -- Default: F   ! LD  = T  !
  CTSG Complex terrain receptors processed?
                                 (LCT) -- Default: F   ! LCT = F  !

--Report results by DISCRETE receptor RING?
  (only used when LD = T)     (LDRING) -- Default: F   ! LDRING = F  !

--Select range of DISCRETE receptors (only used when LD = T):
```

```
  Select ALL DISCRETE receptors by setting NDRECP flag to -1;
                                  OR
  Select SPECIFIC DISCRETE receptors by entering a flag (0,1) for each
     0 = discrete receptor not processed
     1 = discrete receptor processed
  using repeated value notation to select blocks of receptors:
     23*1, 15*0, 12*1
  Flag for all receptors after the last one assigned is set to 0
  (NDRECP) -- Default: -1
                                              ! NDRECP =  -1  !


--Select range of GRIDDED receptors (only used when LG = T):

       X index of LL corner (IBGRID) -- Default: -1     ! IBGRID = -1  !
           (-1 OR 1 <= IBGRID <= NX)

       Y index of LL corner (JBGRID) -- Default: -1     ! JBGRID = -1  !
           (-1 OR 1 <= JBGRID <= NY)

       X index of UR corner (IEGRID) -- Default: -1     ! IEGRID = -1  !
           (-1 OR 1 <= IEGRID <= NX)

       Y index of UR corner (JEGRID) -- Default: -1     ! JEGRID = -1  !
           (-1 OR 1 <= JEGRID <= NY)

  Note: Entire grid is processed if IBGRID=JBGRID=IEGRID=JEGRID=-1


--Specific gridded receptors can also be excluded from CALPOST
  processing by filling a processing grid array with 0s and 1s.  If the
  processing flag for receptor index (i,j) is 1 (ON), that receptor
  will be processed if it lies within the range delineated by IBGRID,
  JBGRID,IEGRID,JEGRID and if LG=T. If it is 0 (OFF), it will not be
  processed in the run.  By default, all array values are set to 1 (ON).

  Number of gridded receptor rows provided in Subgroup (1a) to
  identify specific gridded receptors to process
                          (NGONOFF) -- Default: 0      ! NGONOFF =  0  !

!END!


--------------
Subgroup (1a) -- Specific gridded receptors included/excluded
--------------

    Specific gridded receptors are excluded from CALPOST processing
    by filling a processing grid array with 0s and 1s.  A total of
    NGONOFF lines are read here.  Each line corresponds to one 'row'
    in the sampling grid, starting with the NORTHERNMOST row that
    contains receptors that you wish to exclude, and finishing with
    row 1 to the SOUTH (no intervening rows may be skipped).  Within
    a row, each receptor position is assigned either a 0 or 1,
    starting with the westernmost receptor.
       0 = gridded receptor not processed
       1 = gridded receptor processed

    Repeated value notation may be used to select blocks of receptors:
       23*1, 15*0, 12*1

    Because all values are initially set to 1, any receptors north of
    the first row entered, or east of the last value provided in a row,
    remain ON.
```

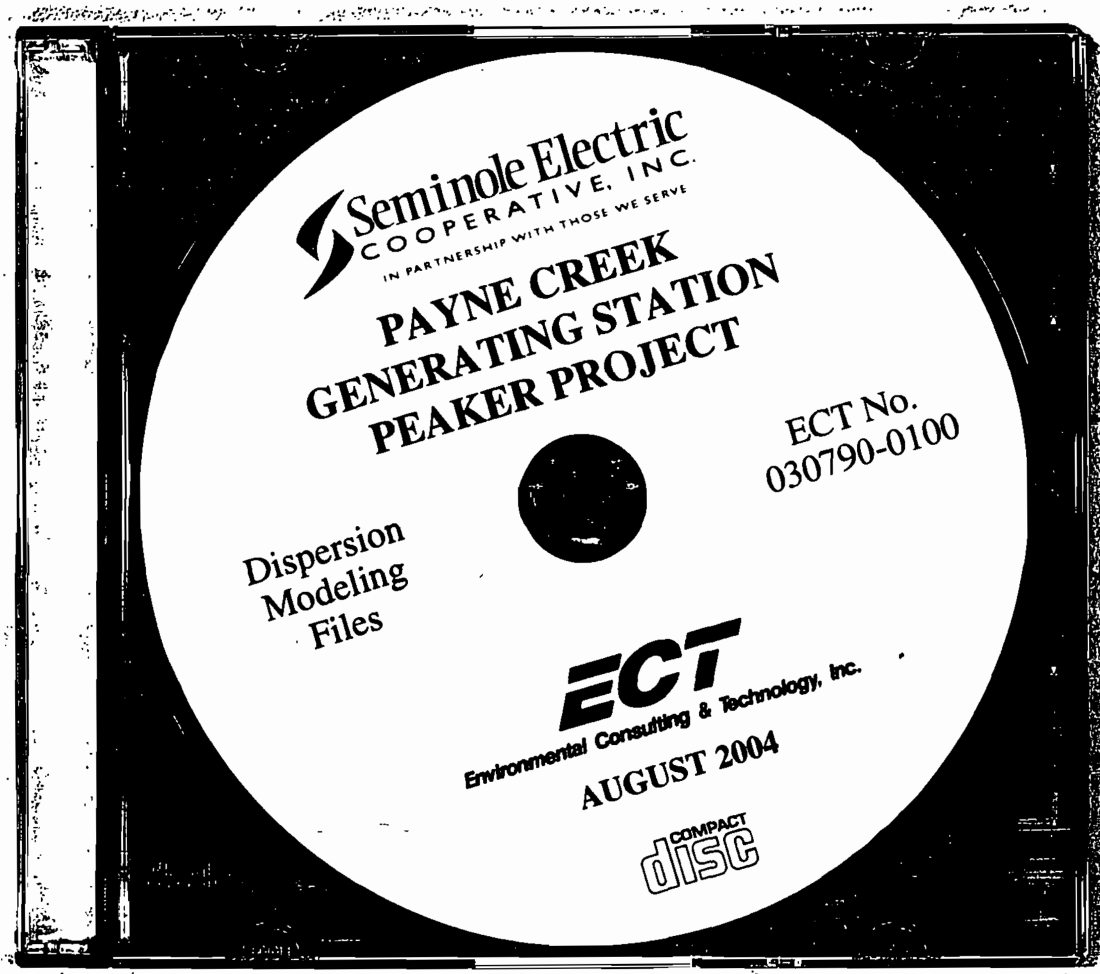
```
    (NGXRECP) -- Default: 1


-------------------------------------------------------------------------------

INPUT GROUP: 2 -- Visibility Parameters (ASPEC = VISIB)
--------------

    Maximum relative humidity (%) used in particle growth curve
                            (RHMAX) -- Default: 98   ! RHMAX  = 95.0 !

    Modeled species to be included in computing the light extinction
     Include SULFATE?           (LVSO4) -- Default: T   ! LVSO4  = T  !
     Include NITRATE?           (LVNO3) -- Default: T   ! LVNO3  = T  !
     Include ORGANIC CARBON?    (LVOC)  -- Default: T   ! LVOC   = F  !
     Include COARSE PARTICLES? (LVPMC) -- Default: T   ! LVPMC  = F  !
     Include FINE PARTICLES?    (LVPMF) -- Default: T   ! LVPMF  = T  !
     Include ELEMENTAL CARBON? (LVEC)  -- Default: T   ! LVEC   = F  !

    And, when ranking for TOP-N, TOP-50, and Exceedance tables,
     Include BACKGROUND?        (LVBK)  -- Default: T   ! LVBK   = T  !

    Species name used for particulates in MODEL.DAT file
                   COARSE    (SPECPMC) -- Default: PMC ! SPECPMC = PM10 !
                   FINE      (SPECPMF) -- Default: PMF ! SPECPMF = PM10 !

Extinction Efficiency (1/Mm per ug/m**3)
----------------------------------------
    MODELED particulate species:
               PM  COARSE       (EEPMC) -- Default: 0.6 ! EEPMC  = 0.6 !
               PM  FINE         (EEPMF) -- Default: 1.0 ! EEPMF  = 4.56 !
    BACKGROUND particulate species:
               PM  COARSE     (EEPMCBK) -- Default: 0.6 ! EEPMCBK = 0.6 !
    Other species:
              AMMONIUM SULFATE (EESO4) -- Default: 3.0 ! EESO4  = 2.5 !
              AMMONIUM NITRATE (EENO3) -- Default: 3.0 ! EENO3  = 2.5 !
              ORGANIC CARBON   (EEOC)  -- Default: 4.0 ! EEOC   = 4.0 !
              SOIL             (EESOIL)-- Default: 1.0 ! EESOIL = 1.0 !
              ELEMENTAL CARBON (EEEC)  -- Default: 10. ! EEEC   = 10.0 !

Background Extinction Computation
---------------------------------

    Method used for background light extinction
                           (MVISBK) -- Default: 2   ! MVISBK =  2  !

         1 =  Supply single light extinction and hygroscopic fraction
              - IWAQM (1993) RH adjustment applied to hygroscopic background
                and modeled sulfate and nitrate
         2 =  Compute extinction from speciated PM measurements (A)
              - Hourly RH adjustment applied to observed and modeled sulfate
                and nitrate
              - RH factor is capped at RHMAX
         3 =  Compute extinction from speciated PM measurements (B)
              - Hourly RH adjustment applied to observed and modeled sulfate
                and nitrate
              - Receptor-hour excluded if RH>RHMAX
              - Receptor-day excluded if fewer than 6 valid receptor-hours
         4 =  Read hourly transmissometer background extinction measurements
              - Hourly RH adjustment applied to modeled sulfate and nitrate
              - Hour excluded if measurement invalid (missing, interference,
                or large RH)
              - Receptor-hour excluded if RH>RHMAX
              - Receptor-day excluded if fewer than 6 valid receptor-hours
         5 =  Read hourly nephelometer background extinction measurements
```

```
                 - Rayleigh extinction value (BEXTRAY) added to measurement
                 - Hourly RH adjustment applied to modeled sulfate and nitrate
                 - Hour excluded if measurement invalid (missing, interference,
                   or large RH)
                 - Receptor-hour excluded if RH>RHMAX
                 - Receptor-day excluded if fewer than 6 valid receptor-hours
             6 = Compute extinction from speciated PM measurements
                 - FLAG RH adjustment factor applied to observed and
                   modeled sulfate and nitrate

     Additional inputs used for MVISBK = 1:
     -------------------------------------
      Background light extinction (1/Mm)
                          (BEXTBK) -- No default   ! BEXTBK = 12.0 !
      Percentage of particles affected by relative humidity
                          (RHFRAC) -- No default   ! RHFRAC = 10.0 !

     Additional inputs used for MVISBK = 6:
     -------------------------------------
      Extinction coefficients for hygroscopic species (modeled and
      background) are computed using a monthly RH adjustment factor
      in place of an hourly RH factor (VISB.DAT file is NOT needed).
      Enter the 12 monthly factors here (RHFAC). Month 1 is January.

      (RHFAC)  -- No default     ! RHFAC = 0.0, 0.0, 0.0, 0.0,
                                           0.0, 0.0, 0.0, 0.0,
                                           0.0, 0.0, 0.0, 0.0 !

     Additional inputs used for MVISBK = 2,3,6:
     ---------------------------------------
      Background extinction coefficients are computed from monthly
      CONCENTRATIONS of ammonium sulfate (BKSO4), ammonium nitrate (BKNO3),
      coarse particulates (BKPMC), organic carbon (BKOC), soil (BKSOIL), and
      elemental carbon (BKEC). Month 1 is January.
      (ug/m**3)

      (BKSO4)  -- No default     ! BKSO4 = 0.3, 0.3, 0.3, 0.3,
                                           0.3, 0.3, 0.3, 0.3,
                                           0.3, 0.3, 0.3, 0.3 !
      (BKNO3)  -- No default     ! BKNO3 = 0.0, 0.0, 0.0, 0.0,
                                           0.0, 0.0, 0.0, 0.0,
                                           0.0, 0.0, 0.0, 0.0 !
      (BKPMC)  -- No default     ! BKPMC = 0.0, 0.0, 0.0, 0.0,
                                           0.0, 0.0, 0.0, 0.0,
                                           0.0, 0.0, 0.0, 0.0 !
      (BKOC)   -- No default     ! BKOC  = 0.0, 0.0, 0.0, 0.0,
                                           0.0, 0.0, 0.0, 0.0,
                                           0.0, 0.0, 0.0, 0.0 !
      (BKSOIL) -- No default     ! BKSOIL= 8.5, 8.5, 8.5, 8.5,
                                           8.5, 8.5, 8.5, 8.5,
                                           8.5, 8.5, 8.5, 8.5 !
      (BKEC)   -- No default     ! BKEC  = 0.0, 0.0, 0.0, 0.0,
                                           0.0, 0.0, 0.0, 0.0,
                                           0.0, 0.0, 0.0, 0.0 !

     Additional inputs used for MVISBK = 2,3,5,6:
     -------------------------------------------
      Extinction due to Rayleigh scattering is added (1/Mm)
                         (BEXTRAY) -- Default: 10.0 ! BEXTRAY = 10.0 !

!END!
-------------------------------------------------------------------------------

INPUT GROUP: 3 -- Output options
--------------
```

```

Output Units
------------
    Units for All Output       (IPRTU) -- Default: 1   ! IPRTU =  3   !
                        for            for
                  Concentration    Deposition
       1 =         g/m**3          g/m**2/s
       2 =        mg/m**3         mg/m**2/s
       3 =        ug/m**3         ug/m**2/s
       4 =        ng/m**3         ng/m**2/s
       5 =      Odour Units

    Visibility: extinction expressed in 1/Mega-meters (IPRTU is ignored)


Averaging time(s) reported
-------------------------

    1-hr averages            (L1HR) -- Default: T   !   L1HR = F  !

    3-hr averages            (L3HR) -- Default: T   !   L3HR = F  !

    24-hr averages          (L24HR) -- Default: T   !  L24HR = T  !

    Run-length averages     (LRUNL) -- Default: T   !  LRUNL = F  !

    User-specified averaging time in hours - results for
    an averaging time of NAVG hours are reported for
    NAVG greater than 0:
                             (NAVG) -- Default: 0   !   NAVG =  0  !


Types of tabulations reported
-----------------------------

   1) Visibility: daily visibility tabulations are always reported
                  for the selected receptors when ASPEC = VISIB.
                  In addition, any of the other tabulations listed
                  below may be chosen to characterize the light
                  extinction coefficients.
                  [List file or Plot/Analysis File]


   2) Top 50 table for each averaging time selected
      [List file only]
                             (LT50) -- Default: T   !   LT50 = F  !

   3) Top 'N' table for each averaging time selected
      [List file or Plot file]
                            (LTOPN) -- Default: F   !  LTOPN = T  !

        -- Number of 'Top-N' values at each receptor
           selected (NTOP must be <= 4)
                             (NTOP) -- Default: 4   ! NTOP =  2   !

        -- Specific ranks of 'Top-N' values reported
           (NTOP values must be entered)
                     (ITOP(4) array) -- Default:     ! ITOP =  1 , 2   !
                                       1,2,3,4


   4) Threshold exceedance counts for each receptor and each averaging
      time selected
      [List file or Plot file]
                            (LEXCD) -- Default: F   !  LEXCD = F  !
```

```

        -- Identify the threshold for each averaging time by assigning a
           non-negative value (output units).

                                   -- Default: -1.0
           Threshold for  1-hr averages   (THRESH1) !  THRESH1 = -1.0  !
           Threshold for  3-hr averages   (THRESH3) !  THRESH3 = -1.0  !
           Threshold for 24-hr averages  (THRESH24) ! THRESH24 = -1.0  !
           Threshold for NAVG-hr averages (THRESHN) !  THRESHN = -1.0  !


        -- Counts for the shortest averaging period selected can be
           tallied daily, and receptors that experience more than NCOUNT
           counts over any NDAY period will be reported.  This type of
           exceedance violation output is triggered only if NDAY > 0.

           Accumulation period(Days)
                            (NDAY) -- Default: 0    !    NDAY =  0  !
           Number of exceedances allowed
                          (NCOUNT) -- Default: 1    !  NCOUNT =  1  !


   5) Selected day table(s)

      Echo Option -- Many records are written each averaging period
      selected and output is grouped by day
      [List file or Plot file]
                           (LECHO) -- Default: F   !  LECHO = F  !

      Timeseries Option -- Averages at all selected receptors for
      each selected averaging period are written to timeseries files.
      Each file contains one averaging period, and all receptors are
      written to a single record each averaging time.
      [TSttUUUU.DAT files]
                           (LTIME) -- Default: F   !  LTIME = F  !

        -- Days selected for output
                      (IECHO(366)) -- Default: 366*0
           ! IECHO  = 366*0  !
           (366 values must be entered)

Plot output options
-------------------

     Plot files can be created for the Top-N, Exceedance, and Echo
     tables selected above.  Two formats for these files are available,
     DATA and GRID.  In the DATA format, results at all receptors are
     listed along with the receptor location [x,y,val1,val2,...].
     In the GRID format, results at only gridded receptors are written,
     using a compact representation.  The gridded values are written in
     rows (x varies), starting with the most southern row of the grid.
     The GRID format is given the .GRD extension, and includes headers
     compatible with the SURFER(R) plotting software.

     A plotting and analysis file can also be created for the daily
     peak visibility summary output, in DATA format only.

     Generate Plot file output in addition to writing tables
     to List file?
                                 (LPLT) -- Default: F   ! LPLT  = F !

     Use GRID format rather than DATA format,
     when available?
                                 (LGRD) -- Default: F   ! LGRD  = F !

```

```

Additional Debug Output
-----------------------

   Output selected information to List file
    for debugging?
                              (LDEBUG) -- Default: F  ! LDEBUG  = F !

!END!
```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IN PARTNERSHIP WITH THOSE WE SERVE
PAYNE CREEK
GENERATING STATION
PEAKER PROJECT
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030790-0100
Dispersion
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Files
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