FINAL

2000 AIR EMISSIONS INVENTORY

WIND CAVE NATIONAL PARK
SOUTH DAKOTA

U.S. NATIONAL PARK SERVICE

FEBRUARY 2003

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WIND CAVE NATIONAL PARK
SOUTH DAKOTA

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1. INTRODUCTION

1.1 BACKGROUND

In August of 1999, the National Park Service (NPS) embarked on the Natural Resource Challenge, a major effort to substantially improve how the NPS manages the natural resources under its care. As part of Natural Resource Challenge, the NPS Air Resources Division (ARD) was tasked with the responsibility of expanding efforts to monitor and understand air quality and related values in the parks. In addition, the NPS Environmental Leadership policy directs the NPS to manage the parks in a manner "that demonstrates sound environmental stewardship by implementing sustainable practices in all aspects of NPS management...." In order to achieve both of these objectives, it is necessary to gain an understanding of air pollution emissions that result from activities within the park. Development of an in-park air emissions inventory for Wind Cave National Park (NP) serves three functions in this regard. First, it provides an understanding of the sources and magnitude of in-park emissions and a basis for contrasting them with emissions from the surrounding area. Second, it identifies existing and potential strategies to mitigate in-park air emissions. Finally, it evaluates and ensures the compliance status of the park relative to state and federal air pollution regulations.

1.2 TYPICAL AIR EMISSION SOURCES

Typical air emission sources within NPS units include stationary, area, and mobile sources. Stationary sources can include fossil fuel-fired space and water heating equipment, generators, fuel storage tanks, and wastewater treatment plants. Area sources may include woodstoves and fireplaces, campfires, and prescribed burning and wild fires. Mobile sources include vehicles operated by visitors and NPS employees and nonroard vehicles and equipment.

1.3 INVENTORY METHODOLOGY

The methodology to accomplish the air emissions inventory was outlined in a protocol that was prepared at the initiation of the project (EA Engineering 2001). Tasks consisted of a site survey in June 2002, interviews with Wind Cave NP personnel [s], review of applicable park records, emission calculations, review of applicable state air quality regulations, an assessment of mitigation measures and potential emission reduction initiatives, and report preparation. The data were used in conjunction with a number of manual and computer software computational tools to calculate emissions. Computational tools included U.S. Environmental Protection

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Agency (USEPA) emission factors such as the Factor Information Retrieval System (FIRE) database, USEPA *TANKS 4.0* model, U.S. Forest Service *First Order Fire Effects Model (FOFEM) 4.0* model, and USEPA *MOBILE6.2* and *PARTS* mobile source emissions model. The year 2000 was selected as the basis for the air emission inventory since data for that year were the most recent available at the park. It should be noted that emissions are expected to vary from year to year due to fluctuations in visitation, prescribed and wildland fires, and other activities. Additional information on emission estimation methodology, including emission factors, are provided in Appendices A and B.

1.4 PARK DESCRIPTION

One of the world's longest and most complex caves and 28,295 acres of mixed-grass prairie, ponderosa pine forest, and associated wildlife are the main features of the park. On January 3, 1903, President Theodore Roosevelt signed the bill creating Wind Cave NP. It was the seventh national park, and the first one created to protect a cave. The cave is well known for its outstanding display of boxwork, an unusual cave formation composed of thin calcite fins resembling honeycombs. The park's mixed grass prairie is one of the few remaining and is home to native wildlife such as bison, elk, pronghorn, mule deer, coyotes, and prairie dogs. A recent proposal would expand the boundary of Wind Cave NP by adding approximately 6,555 acres of land that are located adjacent to and just south and southeast of the park (Engineering-Environmental Management 2002).

Wind Cave NP is located approximately 10 miles north of the community of Hot Springs, SD and is located entirely in Custer County. The park is located on the southern flank of the Black Hills in a transitional zone between the grasslands of the Great Plains and the ponderosa forests of the Black Hills and the eastern Rocky Mountains. Figure 1 depicts the vicinity of the park, and a map of the park is provided in Figure 2. Two paved highways extend through the park on an approximate north-south alignment. State Highway 87. is approximately 12 miles long and extends from the park's south entrance to the boundary between the parks' northern end and Custer State Park. U.S. Highway 365 also enters the south end of the park and leaves its west boundary leading to the town of Custer. The developed areas are concentrated in the southwest area of the park and are illustrated in Figures 3, 4, and 5. Table 1 summarizes these facilities.

TABLE 1: WIND CAVE NATIONAL PARK DEVELOPED AREAS

Figure	Function/Facilities
1	Visitor Center, Park Headquarters, Employee Residences, Storage Building, and Garage
2	Elevator Building, Employee Residences, and Seasonal Bunkhouse
3	Shop Building, Fire Cache, and Refueling Tanks

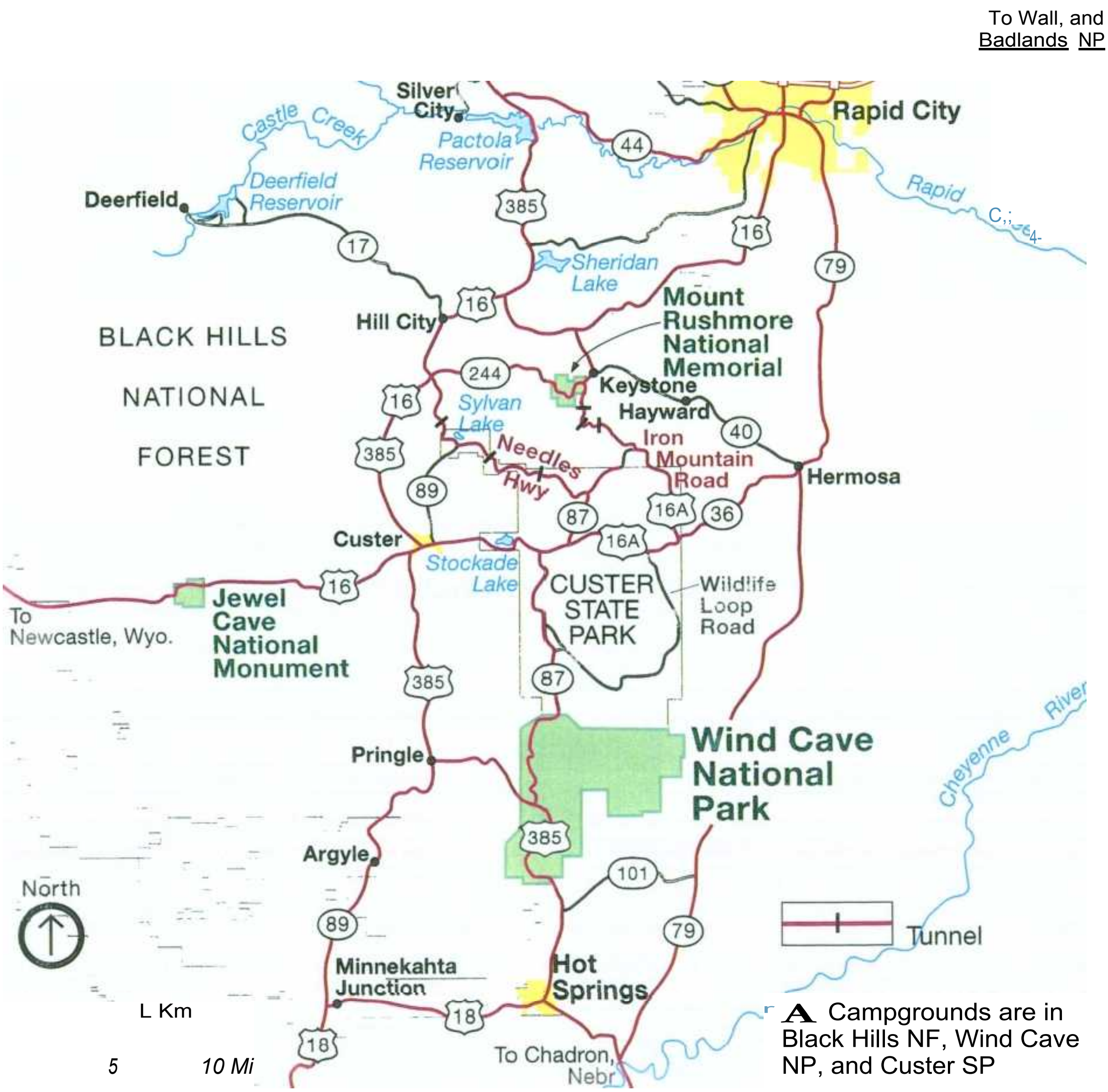


FIGURE 1. WIND CAVE NATIONAL PARK LOCATION

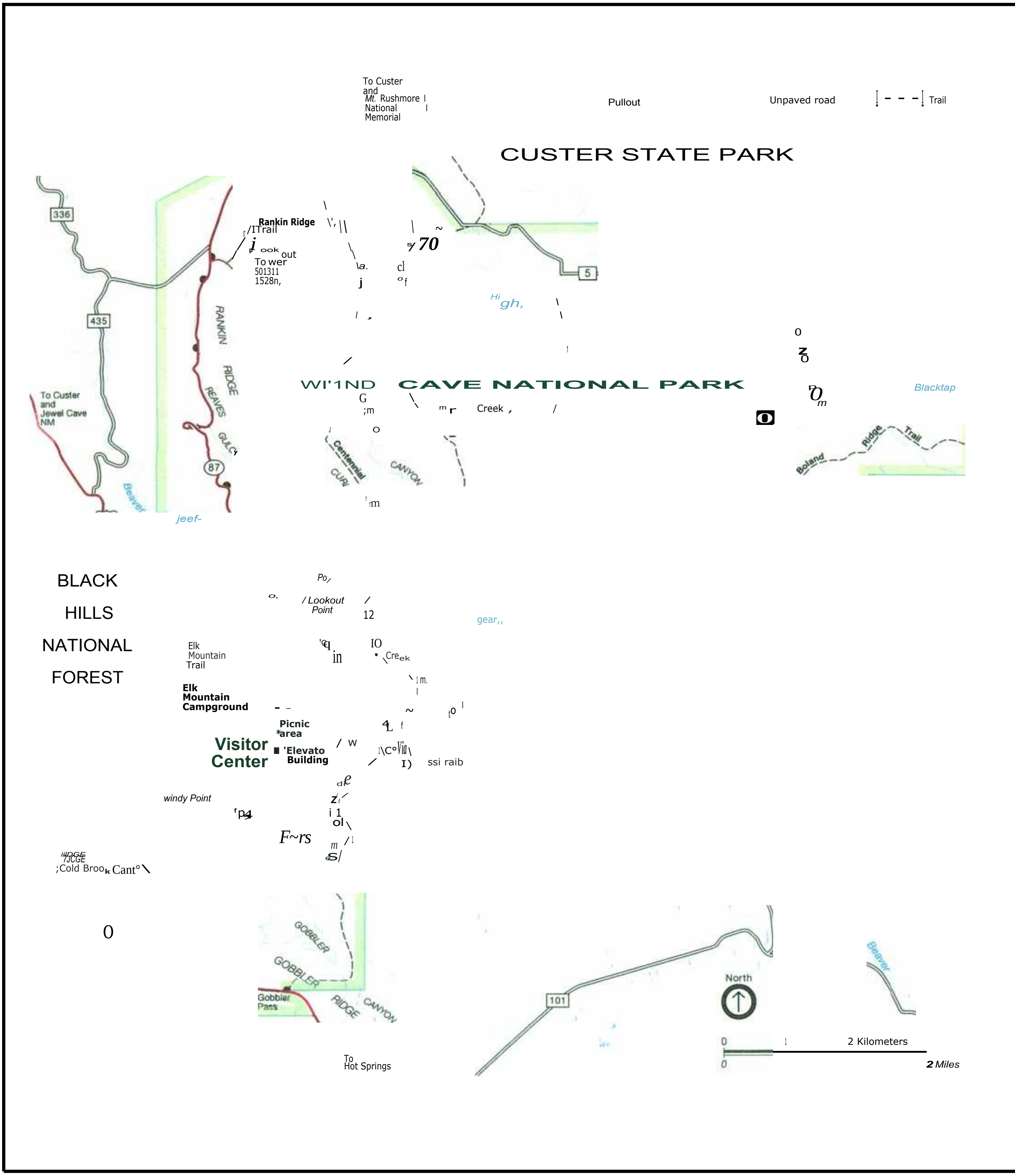
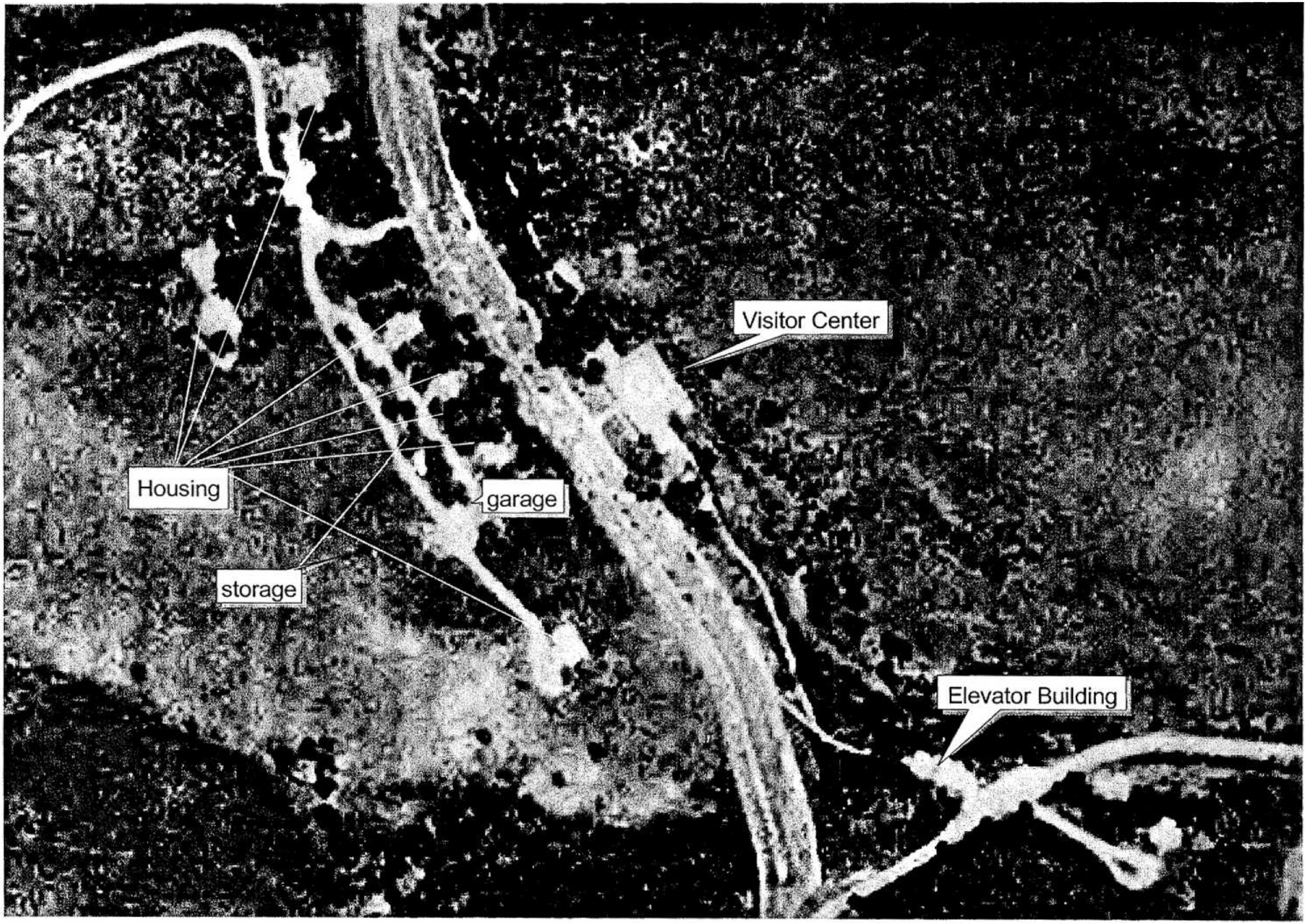


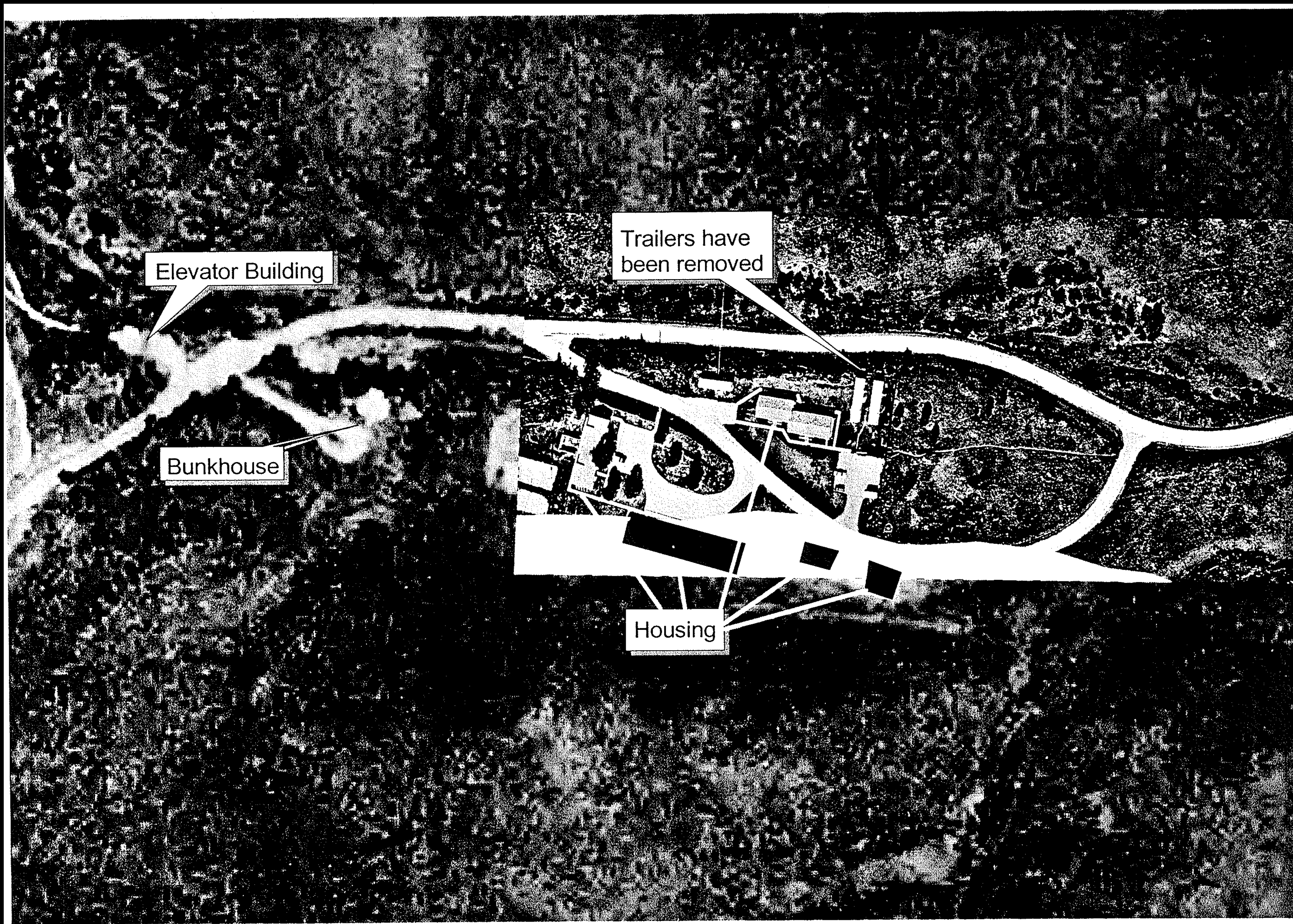
FIGURE 2. WIND CAVE NATIONAL PARK

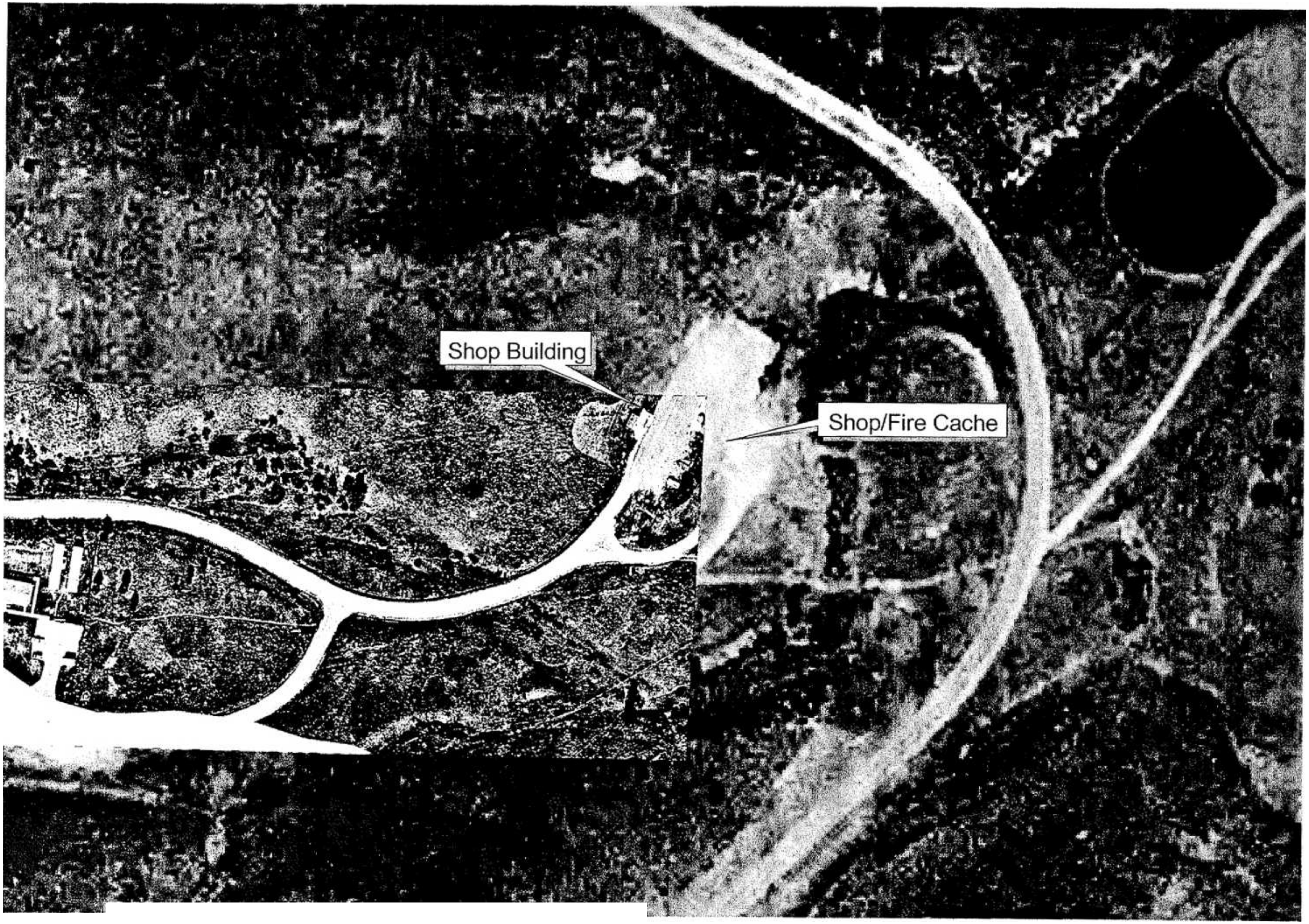


Note: Distortion at edges of overlayed photography is due to size and shape of digital imagery.

200 0 200 400 600 800 Feet

FIGURE 3


Elevator Building
Trailers have been removed
Bunkhouse
Housing
200 0 200 400 600 800 Feet



Note: Distortion at edges of overlayed photography is due to size and shape of digital imagery.

200 0 200 400 600 800 Feet

FIGURE 5

1.5 AIR QUALITY STATUS

The South Dakota Department of Environment and Natural Resources administers the state's air pollution program. The park is located in Custer County, SD, which is classified as attainment for all state and national ambient air quality standards. Wind Cave NP is designated a Class I airshed under the Clean Air Act, which requires the highest level of air-quality protection. Although passive ozone monitoring has been conducted at Wind Cave NP, air quality monitoring in the park itself is limited. Visibility and continuous ozone monitoring have been conducted at Badlands National Park, which is located approximately 75 miles northeast of Wind Cave NP.

2. STATIONARY AND AREA SOURCE EMISSIONS

This section summarizes emissions from stationary sources at the Park for the year 2000. The discussion is divided into sections covering emissions from combustion sources, fuel storage sources, and area sources. The following emissions were calculated for each source: particulate matter (PM_{10}), sulfur dioxide (SO_2), nitrogen oxides (NO_X), carbon monoxide (CO), carbon dioxide (CO_2), and volatile organic compounds (VOCs).

2.1 STATIONARY SOURCES

2.1.1 Space And Water Heating Equipment

There are five propane, one No. 2 fuel oil, and three wood pellet stove heating units in the Park. Criteria emissions were calculated using the appropriate residential emission factors for the fuel types. For example, PM_{10} emissions from the No. 2 fuel oil boiler in the Visitor Center was calculated as follows:

$$5{,}910\ \textit{gallons/yr}\ x\ \frac{2\ \textit{lb PM}}{1{,}000\ \textit{gallons}} = 12\ \textit{lb PM10/yr}$$

Actual criteria pollutant emissions from the heating equipment are summarized in Table 2. Potential emissions for the propane and No. 2 fuel oil heating equipment also were calculated by assuming that the heating units were operated continuously during the year, and these emissions are noted in Table 3.

TABLE 2. 2000 ACTUAL AND POTENTIAL AIR EMISSIONS FROM WIND CAVE NATIONAL PARK HEATING EQUIPMENT

Location	No.	Fuel	Fuel Consumption	PM_{1a} (lbs/yr)	SO_2 (lbs/yr)	NO_X (Ibs/yr)	CO (Ibs/yr)	CO_2 (Ibs/yr)	VOC (Ibs/yr)
Carpenter Shop	1	Propane	3,000 gal/yr	1	0	43	6	38,130	1
Auto Shop	1	Propane	1,800 gal/yr	1	0	25	3	22,495	1
VIP Building	1	Propane	900 gal/yr	0	0	13	2	11,248	0
Bunkhouse	1	Propane	540 gal/yr	0	0	8	1	6,749	0
4-Unit Apartment	1	Propane	3,644 gal/yr	1	0	51	7	45,553	1
Visitor Center/ Headquarters	1	No. 2 Fuel Oil	5,910 gallyr	2	420	106	30	127,065	4
Residence	1	Wood Pellets	3,600lbs/yr	8	1	25	71	5,314	--
Residence	1		2,400 lbs/yr	5	0	17	47	3,542	--
Office	1		4,800 lbs/yr	10	1	33	95	7,085	--
			Total	29	422	320	261	267,181	7

TABLE 3. *2000* POTENTIAL AIR EMISSIONS FROM WIND CAVE NATIONAL PARK HEATING EQUIPMENT

Location	No.	Fuel	Fuel Consumption	PM,o (lbs/yr)	SO_2 (lbs/yr)	NO_X (lbs/yr)	CO (lbs/yr)	CO_2 (lbs/yr)	VOC (lbs/yr)
Carpenter Shop	1	Propane	32,455 gal/yr	13	1	454	65	405,689	10
Auto Shop	1	Propane	19,148 gallyr	8	0	268	38	239,344	6
VIP Building	1	Propane	9,574 gallyr	4	0	134	19	119,672	3
Bunkhouse	1	Propane	5,744 gallyr	2	1	80	11	71,803	2
4-Unit Apartment	1	Propane	38,774 gal/yr	16	0	543	78	484,672	12
Visitor Center/ Headquarters	1	No. 2 Fuel Oil	105,694 gal/yr	25	4,487	1,138	316	1,358,739	45
Residence	1	Wood Pellets	3,600 lbs/yr	8	1	25	71	71	--
Residence	1		2,400 lbs/yr	5	0	17	47	47	--
Office	1		4,800 lbs/yr	10	1	33	95	95	--
			Total	91	4,491	2,692	740	2,680,132	77

2.1.2 *Generators*

There is one stationary NPS-owned generator at the elevator Building. Emissions were calculated by multiplying the unit rating (kW) of the generator by an estimated annual run time (hr/yr) to get the kW-hr/yr, and the appropriate emission factors were then applied.

$$200\ kW \times \frac{17\ hours}{year} \times \frac{1.34\ hp}{kW} \times \frac{0.00220\ lb\ PM}{hp\text{-}hr} = 10\ lb\ PM/yr$$

Potential emissions also were calculated for the generators. According to EPA guidance on calculating potential emissions from generators, 500 hours is an appropriate default assumption for estimating the number of hours that an emergency generator could be expected to operate.1 Actual and potential generator emissions are summarized in Table 4.

1 *Calculating Potential to Emit (PTE) for Emergency Generators,* Office of Air Quality Planning and Standards (MD-10) U.S. Environmental Protection Agency, September 6, 1995.

TABLE 4. 2000 ACTUAL AND POTENTIAL AIR EMISSIONS FROM WIND CAVE NP GENERATORS

Location	Rating (kW)	Run Time (hrs/yr)	PM_{10} (lbs/yr)	SO_2 (lbs/yr)	NO_x (lbs/yr)	CO (lbs/yr)	CO_2 (lbs/yr)	VOC (lbs/yr)
Actual Emissions								
Elevator Building	200	17	10	9	141	30	5,239	11
Potential Emissions								
Elevator Building	200	500	295	275	4,154	895	154,100	336

Emission Factors from AP-42, Chapter 3.4-1 for generators rated less than 448 kW, S =.05
Formula = Output (kW-hr/yr) * 1.34 (hp/kW) * Emission Factor (lb/hp-hr)

2.1.3 Fuel Storage Tanks

Wind Cave NP has one gasoline and one diesel fuel aboveground storage tanks at the Shop Building that service NPS vehicles and other motorized equipment. There are no public automotive service stations in the park.

There are two basic types of VOC emissions from storage tanks: working losses and standing losses. Working losses are composed of both withdrawal and refilling loss emissions. Withdrawal loss emissions result from the vaporization of liquid fuel residue on the inner surface of tank walls as the liquid levels in the tank are decreased and air is drawn into the tank. Refilling losses refer to fuel vapor releases to the air during the process of refilling the tank as the liquid level in the tank increases and pressurizes the vapor space. Standing losses describe those tank emissions from the vaporization of the liquid fuel in storage due to changes in ambient temperatures. VOC losses are also a direct function of the annual product throughput or turnovers. Emissions from diesel tanks are extremely small since the volatility of diesel fuel is extremely low compared to gasoline. VOC emissions from the NPS fuel storage tanks were calculated using the USEPA *TANKS* software program. *TANKS* is based on the emission estimation procedures from Chapter 7 of EPA's Compilation of Air Pollutant Emission Factors (AP-42) and uses chemical, meteorological, and other data to generate emission estimates for different types of storage tanks. Table 5 summarizes the calculated emissions.

TABLE **5: 2000** WIND CAVE NP FUEL TANK EMISSIONS

Location	Product	Tank Type	Volume (gal)	Throughput (gal/yr)	VOC (lbs/yr)
Shop Building	Gasoline	AST	2,000	8,770	531

2.2 AREA SOURCES

2.2.1 Woodstoves

Two employee housing units and an office are equipped with wood pellet stoves, and these are included in the earlier heating unit emission calculations.

2.2.2 Campfires

There is one campground in the Park at Elk Mountain near the Visitor Center. Almost all firewood that is consumed is purchased from a bin located at the entrance to the campground. Estimates of fuel consumed are based on sales of 10-pound firewood bundles, which were estimated at 727 for 2001, and the emissions are summarized in Table 6.

TABLE **6: 2001 WIND** CAVE NP CAMPFIRE EMISSIONS

Location	Campfires	Fuel (tons/yr)	PM_{10} (lbs/yr)	SO_2 (lbs/yr)	NO_X (lbs/yr)	CO (lbs/yr)	VOC (lbs/yr)
Elk Mountain	727	4	126	1	9	918	832

2.2.3 Wildland Fires and Prescribed Burning

Wildland fires are ignited naturally, usually by lightening and are typically suppressed, while prescribed fires are ignited intentionally in order to achieve fire management objectives. Prescribed burning is a land treatment process to accomplish natural resource management objectives, including reducing the potential for destructive wildfires, eliminating excessive fuel buildup, controlling insects and disease, improving wildlife habitat and forage production, maintaining natural succession of plant communities, and restoring natural processes. Only prescribed burning emissions are considered as anthropogenic emissions; however, to the extent that prescribed burning is conducted to achieve ecological benefit, the emissions could be considered natural.

Park officials estimated that the average acres burned per year were approximately 1,000 and that about 70 percent were grasslands and 30 percent ponderosa pine. The First Order Fire Effects Model (FOFEM) was used to estimate emissions. FOFEM is a computer program developed by the Intermountain Fire Sciences Lab, U.S. Forest Service to predict the effects of prescribed fire and wildfire in forests and rangelands throughout the U.S. In particular, it quantifies emissions of CO, PM_{10}, and $PM_{2.5}$, which are summarized in Table 7.

TABLE 7: WILDFIRE AIR EMISSIONS FROM WIND CAVE NP

Type	Acres	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)	CO (tons/yr)	CO_2 (tons/yr)	VOC' (tons/yr)
Grassland	700	1.05	1.05	0.35	706	2.45
Ponderosa Pine	300	38.10	32.40	19.20	2,662	415.50
Total	1,000	39.15	33.95	19.55	3,368	417.95

As methane

2.2.4 Miscellaneous Area Sources

Miscellaneous area sources include food preparation, degreasers, paints and other surface coatings, lighter fluid consumption, consumer solvents, and propane use by visitors in recreational vehicles. However, there are no data on the consumption of these materials.

2.3 SUMMARY OF STATIONARY AND AREA SOURCE EMISSIONS

Table 8 summarizes the stationary and area source emissions calculated above in a format that allows comparison between the various sources as well as providing totals for each pollutant or pollutant category under consideration.

TABLE 8: SUMMARY OF 2000 STATIONARY AND AREA SOURCE EMISSIONS AT WIND CAVE NP

Activity	Particulates		Sulfur Dioxide		Nitrogen Oxides		Carbon Monoxide		Carbon Dioxide		VOCs	
	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/3[r	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr
Stationary Sources												
Heating Equipment	29	0.02	422	0.21	320	0.16	261	0.13	267,181	133.59	7	<0.01
Generator	10	0.01	9	<0.01	141	0.07	30	0.02	5,239	2.62	11	0.01
Gasoline Storage Tanks											531	0.27
Stationary Sources Subtotal	39	0.02	429	0.21	461	0.23	291	0.15	272,420	136.21	549	0.27
Area Sources												
Campfires	126	0.06	1	<0.01	9	<0.01	918	0.46	-	--	832	0.42
Wildland and Prescribed Fires	78,300	39.15	--	--	--	--	835,900	417.95	6,736,000	3,368	39,100[1]	19.55[1]
	78,426	39.21	1	<0.01	9	<0.01	836,818	418.41	6,736,000	3,368	39,932	19.97
Totals												
	Particulates		Sulfur Dioxide		Nitrogen Oxides		Carbon Monoxide		Carbon Dioxide		VOCs	
	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr
Totals without Prescribed Burning	165	0.08	430	0.21	470	0.24	1,209	0.61	272,420	136.21	1,080	0.54
Totals with Prescribed Burning	78,465	39.23	430	0.21	470	0.24	837,110	418.56	7,008,420	3,504	40,481	20.24

As methane

3. MOBILE SOURCE EMISSIONS

This section summarizes emissions from mobile sources at Wind Cave NP for 2000. Mobile emission sources include highway and nonroad vehicles. The following emissions were calculated for each source: particulate matter (PM_{10}), nitrogen oxides (NO,), carbon monoxide (CO), and volatile organic compounds (VOCs).

3.1 HIGHWAY VEHICLES

3.1.1 Visitor Vehicles

Two paved highways extend through the park on an approximate north-south alignment. State Highway 87 is approximately 12 miles long and extends from the park's south entrance to the boundary between the parks' northern end and Custer State Park. U.S. Highway 385 is approximately 6 miles long within the park boundary and also enters the south end of the park and leaves its west boundary leading to the town of Custer. There are traffic counters at each end of Highways 87 and 385 at the park boundary, and these data were used to estimate vehicle miles traveled within the Park by visitors. Total vehicle counts were 289,260 in 2001, which correlates well with total Park visitation of 874,020. These data are summarized in Table 9.

TABLE 9: WIND CAVE NP ANNUAL VISITOR VEHICLE SUMMARY

Entry Point	No. Vehicles	Miles/Vehicle	Vehicle Miles Traveled	
			Summer	Winter
Highway 87 N	41,350	12	466,596	29,600
Highway 87 S	18,970	7	125,683	7,100
Highway 385 N	140,680	6	752,770	91,310
Highway 385 S	88,260	6	443,950	85,610
Total	289,260		1,788,999	213,620

The majonty of mobile source emissions can be categorized as either exhaust or evaporative emissions. Exhaust emissions are related to the combustion of fuel in the engine and include VOC, NOx, CO, and PM_{10}. Exhaust emissions are dependent on a number of factors, including engine load, engine design and age, combustion efficiency, emissions equipment such as catalytic converters, and other factors. Evaporative emissions, which can occur while the vehicle is running or at rest, are related to the volatilization of fuel from vapor expansion, leaks and seepage, and fuel tank vapor displacement. Evaporative emissions are primarily dependent on daily temperature cycles and fuel volatility. In addition to vehicle exhaust, PM_{10} emissions also result from brake and tire wear, as well as the re-entrainment of dust from paved and unpaved roads (referred to as fugitive dust).

Emission factors produced by the USEPA MOBILE6.2 model were used in conjunction with vehicle miles traveled (VMT) data in order to estimate mobile source emissions for VOC (both exhaust and evaporative), NOx, and CO. Similarly, emission factors produced by the PARTS model were used in conjunction with VMT data to estimate PMI0 emissions. MOBILE6.2 produces exhaust and evaporative emission factors for the following classes of vehicles: light duty gasoline vehicles (LDGV), light duty gasoline trucks 1 (LDGT1), light duty gasoline trucks 2 (LDGT2), heavy duty gasoline vehicles (HDGV), light duty diesel vehicles (LDDV), light duty diesel trucks (LDDT), heavy duty diesel vehicles (HDDV), and motorcycles. It also produces a composite emission factor for all vehicles based on the vehicle class mix supplied to the model. Inputs to the model include average vehicle speed, vehicle VMT mix, annual mileage accumulation rates and registration distributions by age, inspection and maintenance (UM) program information, fuel information, ambient temperature data, and others.

Both the MOBILE6.2 and PARTS models are typically used to support planning and modeling efforts in urban or regional areas, and include default inputs suited for these applications. Therefore it is suitable for applications over large, regional transportation networks. Application of the MOBILE6.2 model required the utilization of unique inputs that were representative of mobile source activity within the park. In particular, it was necessary to utilize unique inputs for the visitor vehicle class mix and the vehicle age distribution.

The Center for Environmental Research and Technology within the College of Engineering at the University of California's Riverside Campus (CE-CERT) established park-specific vehicle fleet characterizations in developing air emission inventories for Zion National Park (CE-CERT, 2001). CE-CERT found that the distribution of vehicle ages in the park reflected a larger fraction of newer vehicles than the overall model default vehicle age distribution.

In addition to VMT mix and age distribution, CE-CERT also established park-specific modeling inputs for driving pattern characterization. CE-CERT found that park driving patterns differ significantly from the default driving patterns typically used in mobile modeling, such as the Federal Test Procedure (FTP). In particularly, they found that the FTP reflects both higher speeds and a wider range of speeds than observed in the parks. However, since the MOBILE6.2 model is not designed to readily incorporate unique driving pattern data, the default driving cycle remains the basis for the mobile source emission estimates provided here.

Other important mobile modeling inputs that can significantly affect mobile emission factors are the average speed, fuel characteristics, and I/M program parameters. The average speed input to the mobile models was assumed to be 35 mph. The fuel volatility was assumed to be RVP 913.4 (winter) and 8.3 (summer), and reformulated gasoline was not assumed to be present. Finally, inspection/maintenance (I/M) program inputs were not included since there are no I/M programs in South Dakota.

In order to account for seasonal differences in mobile emissions, separate MOBILE6.2 runs were performed to produce emission factors for winter and summer. A composite emission factor for each season, reflecting a park specific VMT mix adapted from the CE-CERT data, served as the basis for mobile source emission estimates. Additional particulate emissions (or entrained road dust) from vehicles operating on paved roads in Wind Cave NP also were calculated based on VMT. A summary of visitor vehicle emissions is provided in Table 12.

3.1.2 NPS Vehicles

Wind Cave NP operates a fleet of highway vehicles that are owned by the NPS. A summary of NPS vehicles and their estimated annual mileage is provided in Table 10, and emissions are provided in Table 12.

TABLE 10: NPS ROAD VEHICLES AT WIND CAVE NP

Vehicle Type	Number	Annual Usage (mi/yr)
Light-Duty Gasoline Vehicles	16	103,167
Light-Duty Gasoline Vehicles/Trucks	8	33,028
Light-Duty Diesel Trucks	4	30,282
Heavy Duty Diesel Trucks	5	10,412
Total	33	176,889

3.2 NONROAD VEHICLES

The NPS also owns and operates nonroad motorized equipment that is used to maintain roads and grounds and for other purposes. There are records of the Wind Cave NP equipment inventory, and the larger pieces of equipment are noted in Table 11. Park officials provided data on the equipment and its annual usage which were used to calculate annual emissions that are summarized in Table 12.

TABLE 11: NPS NONROAD **VEHICLES AT WIND CAVE NP**

Vehicle Type	Horsepower	Annual Usage (hrs/yr each)
John Deere Tractor	40	120
John Deere Grader	200	60
Case Loader/Backhoe	70	250
Chip Spreader	175	25
Air Compressor	32	400
Road Roller	39	25
Road Broom	23	40
Lawn Sweeper	15	120
Lawn Mower	18	110
Lawn Mower	20	90
John Deere Tractor	65	120
Bobcat Loader	70	80,
John Deere Gator	18	100
Honda ATV	18	100
Daihaitsu	30	100
Trash Compactor	35	20

3.3 SUMMARY OF MOBILE SOURCE EMISSIONS

Table 12 summarizes the mobile source emissions for road and nonroad vehicles and equipment operating in Wind Cave NP in 2000.

TABLE 12: SUMMARY OF 2000 MOBILE SOURCE EMISSIONS AT WIND CAVE NP

Activity	Particulates		Sulfur Dioxide		Nitrogen Oxides		Carbon Monoxide		VOCs	
	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr
Road Vehicles										
Visitor Vehicles	4,117[1]	2.06	--	--	21,432	10.72	71,884	35.94	3,994	2.00
NPS Road Vehicles	351[1]	0.18	--	--	690	0.35	5,334	2.67	296	0.15
Vehicle Emission Subtotal	4,468	2.23	--	--	22,122	11.06	77,218	38.61	4,290	2.15
Nonroad Vehicles										
NPS Nonroad Vehicles	217[1]	0.11	--		336	0.17	325	0.16	1,345	0.67
Totals										
	Particulates[1]		Sulfur Dioxide		Nitrogen Oxides		Carbon Monoxide		VOCs	
	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr
Totals	4,685	2.34			22,458	11.23	77,543	38.77	5,635	2.82

[1] Includes exhaust PM_{10} and road dust

4. WIND CAVE NP AND REGIONAL EMISSIONS

4.1 WIND CAVE NP SUMMARY

A summary of Wind Cave NP emissions is provided in Table 13.

TABLE 13: ESTIMATED ANNUAL EMISSIONS FROM WIND CAVE NP

Source	PM_{10} (tons)	SO_2 (tons)	NO_x (tons)	CO (tons)	VOCs (tons)
Point Sources					
Heating Equipment	0.02	0.21	0.16	0.13	<0.01
Generators	0.01	<0.01	0.07	0.02	0.01
Gasoline Storage Tanks	--	--	--	--	0.27
Subtotal	0.02	0.21	0.23	0.15	0.27
Area Sources					
Campfires	0.06	<0.01	<0.01	0.46	0.42
Prescribed Burning	39.15	--	--	417.95	19.55[1]
Subtotal	39.21	<0.01	<0.01	418.41	19.97
Mobile Sources					
Road Vehicles	2.23	--	11.06	38.61	2.15
Nonroad Vehicles	0.11	--	0.17	0.16	0.67
Subtotal	2.34	--	11.23	38.77	2.82
Totals					
Totals	41.47	0.21	11.46	457.33	23.06

[1] As methane

4.2 REGIONAL AIR EMISSIONS

Emission estimates for Custer County and the state of South Dakota were obtained from the 1999 National Emission Inventory (NEI) maintained by USEPA. It is important to note that differences may exist between the methodologies used to generate the preserve emission inventory and those used to generate the NET. For example, gasoline storage tanks have been included as stationary sources for the Park, while the NEI treats them as area sources. Table 14 provides a comparison of the Park emissions with those from the surrounding county and the State of South Dakota.

TABLE *14:* ESTIMATED ANNUAL EMISSIONS FROM WIND CAVE NP, SURROUNDING COUNTY, AND THE STATE OF SOUTH DAKOTA

Area	PM_{10} (tons/yr)	SO_2 (tons/yr)	NO_X (tons/yr)	CO (tons/yr)	VOC (tons/yr)
Point Sources					
Wind Cave NP	0.02	0.21	0.23	0.15	0.27
Custer County	No Data				
South Dakota	990	27,596	28,770	640	1,481
Area **Sources**					
Wind Cave NP	39	<0.01	<0.01	418	20
Custer County	1,996	85	259	7,698	938
South Dakota	245,528	19,210	7,220	53,727	40,687
Mobile Sources					
Wind Cave NP	2.34	--	11.23	38.77	2.82
Custer County	1,320	33	473	1,829	199
South Dakota	79,393	8,804	81,386	267,604	32,263

5. COMPLIANCE AND RECOMMENDATIONS

5.1 COMPLIANCE

The park is located in Custer County, SD, which is classified as attainment for all state and national ambient air quality standards. The South Dakota Depatlment of Environment and Natural Resources administers the state's air pollution program. Park personnel should coordinate with the agency on permit issues relating to stationary sources, as well as prescribed burning activities. The South Dakota regulations do not address very many specific issues. For example, although they address major stationary sources, they do not set thresholds for triggering the need for a permit. With respect to open burning, the state regulations do not identify what is permissible to open burn.

With respect to wildland and prescribed fires, the state is working with the National Park Service, National Forest Service, Bureau of Land Management, and State Forest Service to develop Smoke Management Plans for the Black Hills region. The plans will follow EPA issued policy on wildland and prescribed fires to minimize air quality impacts.

5.2 RECOMMENDATIONS

Actions to promote sustainable development in the design, retrofit, and construction of park facilities have associated air quality benefits. These include actions that reduce or replace consumption of conventional fossil fuels and/or reduce the consumption of other resources. Reductions in potable and non-potable water consumption also achieve concurrent reductions in energy consumption and associated air emissions. Acquisition of energy efficient appliances whenever possible also is an incremental energy saving measure that has associated air quality benefits.

Emissions from the Park are minor, both in comparison to state and county totals and to other NPS units. There is a small photovoltaic system that supplies power to a radio repeater on Lookout Tower on Rankin Ridge in the northern area of the Park.

Many western parks have investigated and are implementing alternative fuel programs for their fleets. The most popular alternative fuel investigated by other parks that reduces emissions of PM_{10}, SO_2, CO, and VOC is biodiesel fuel, such as B20, which is a blend of 20 percent biomass-based oil and diesel fuel. Although the vehicle fleet at Wind Cave NP is relatively small, the park could get together with other nearby federal and state fleet operators, such as those at Mount

Rushmore National Memorial, Jewel Cave NM, Black Hills National Forest, and Custer State Park, to consider the feasibility of implementing a regional biodiesel and/or other alternative fuel program.

The principal air emission issues relate to planned energy production facilities in the Powder River Basin in northeast Wyoming. These facilities include three low sulfur coal power plants that are in the planning stages and approximately 40,000 coal seam methane extraction wells. Although each well does not constitute a significant air emission source, collectively, they can impact the Park's air quality resources. Park officials are well aware of these developments and are monitoring their permitting status.

6. REFERENCES

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APPENDIX A

FUEL DATA AND EMISSION FACTORS

FUEL DATA

Fuel	Heating Value	Sulfur Content
No. 2 Distillate Fuel Oil/Diesel	140,000 Btu/gal	0.05% by weight
Natural Gas	1,050 Btu/ft^3	2,000 grains/10^6 ft^3
Propane	91,500 Btu/gal	0.18 grains/100 ft^3

STATIONARY SOURCE EMISSION FACTORS - BOILERS/HEATING UNITS

DISTILLATE OIL (DF-2) - CRITERIA POLLUTANTS					
Combustor Type	Emission Factor (lb/1,000 gal fuel burned)				
	PM[a]	SO_2 [6]	NO_X [c~)]	CO	VOC [d]
Residential Furnace[)]	0.4	142S	18	5	0.713
Boilers < 100 Million Btu/hr (Commercial/Institutional Combust. [*])	2	142S	20	5	0.34
Boilers < 100 Million Btu/hr (Industrial Boilers [s])	2	142S	20	5	0.2
Boilers > 100 Million Btu/hr (Utility Boilers[h])	2	157S	24	5	--
Source: AP-42, 5th Edition, Supplements A, B, C, D, and E, Tables 1.3-1 and 1.3-3.					

NATURAL GAS - CRITERIA POLLUTANTS					
Combustor Type (MMBtu/hr Heat Input)	Emission Factor (lb/10^6 ft^3 fuel burned)				
	PM[0]	SO_2	NO_X [c]	CO	VOC
Residential Furnaces (<0.3)					
-Uncontrolled	7.6	0.6	94	40	5.5
Tangential-Fired Boilers (All Sizes)					
-Uncontrolled	7.6	0.6	170	24	5.5
-Controlled-Flue gas recirculation	7.6	0.6	76	98	5.5
Small Boilers (<100)					
-Uncontrolled	7.6	0.6	100	84	5.5
-Controlled-Low NO_X burners	7.6	0.6	50	84	5.5
-Controlled-Low NO,, burners/Flue gas recirculation	7.6	0.6	32	84	5.5
Large Wall-Fired Boilers (>100)					
-Uncontrolled (Pre-NSPS) [k]	7.6	0.6	280	84	5.5
-Uncontrolled (Post-NSPS)([k])	7.6	0.6	190	84	5.5
-Controlled-Low NO_X burners	7.6	0.6	140	84	5.5
-Controlled-Flue gas recirculation	7.6	0.6	100	84	5.5
Source: AP-42, 5th Edition, Supplements A, B, C, D, and E, Tables 1.4-1 and 1.4-2.					

STATIONARY SOURCE EMISSION FACTORS - BOILERS/HEATING UNITS (Continued)

PROPANE (LPG) - CRITERIA POLLUTANTS					
Combustor Type	Emission Factor (ib/1,000 gal fuel burned)				
	PM[a]	SO_2[b]	NO_X[c]	CO	VOC[d]
Commercial Boilers[f]	0.4	0.10S	14	1.9	0.3
Industrial Boilers[s]	0.6	0.10S	19	3.2	0.3
Source: AP-42, 5th Edition, Supplements A, B, C, D, and E, Table 1.5-1.					

STATIONARY SOURCE EMISSION FACTORS - GENERATORS

For generators rated at less than or equal to 448 kW (600 hp):

Fuel Type	Emission Factor (lb/hp-hr)				
	PM	SO_X	NO,	CO	VOC
DF-2	2.20 E-03	2.05 E-03	0.031	6.68 E-03	2.51 E-03
Gasoline	7.21 E-04	5.91 E-04	0.011	0.439	0.022
Natural Gas/Propane	1.54 E-04	7.52 E-03(S)	3.53 E-03	8.6 E-04	1.92 E-04

Source: AP-42, 5th Edition, Supplements A, B, C, D, and E, Table 3.3-1 and 3.1-1

For generators rated at greater than 448 kW (600 hp):

Fuel Type	Emission Factor (lb/hp-hr)				
	PM	SO_X[b]	NO_X	CO	VOC
DF-2	0.0007	(8.09 E-03)S	0.024	5.5 E-03	6.4 E-04
Source: AP-42, 5th Edition, Supplements A, B, C, D, and E, Table 3.4-1.					

FIREPLACE EMISSION FACTORS

Fuel Type	Emission Factor (lb/ton)				
	PM[f]	SO,	NO_X[e]	CO	VOC
Wood	34.6	0.4	2.6	252.6	229.0
Source: AP-42, 5th Edition, Supplements A, B, C, D, and E, Table 1.9-1.					

WOODSTOVE EMISSION FACTORS

Stove Type	Emission Factor (lb/ton)				
	PM^{0}	SO,,	NO,$^{<o)}$	CO	VOC
Conventional	30.6	0.4	2.8	230.8	53
Noncatalytic	19.6	0.4	--	140.8	12
Catalytic	20.4	0.4	2.0	104.4	15
Source: AP-42, 5th Edition, Supplements A, B, C, D, and E, Table 1.10-1.					

STATIONARY SOURCE EMISSION FACTORS - SURFACE COATING OPERATIONS

Surface Coating Type	VOC Emission Factor (lb/gal)
Paint: Solvent Base	5.6
Paint: Water Base	1.3
Enamel: General	3.5
Lacquer: General	6.1
Primer: General	6.6
Varnish/Shellac: General	3.3
Thinner: General	7.36
Adhesive: General	4.4
Source: *Calculation Methods for Criteria Air Pollutant Emission Inventories*, AL/OE-TR-1994-0049, July 1994. Armstrong Laboratory.	

(a) PM = Filterable Particulate Matter.
(b) These factors must be multiplied by the fuel sulfur content (for example, if the sulfur content is 0.05%, then S equals 0.05).
(c) Expressed as NO_2.
(d) Emission factors given in AP-42 are actually for non-methane total organic compounds (NMTOC) which includes all VOCs and all exempted organic compounds (such as ethane, toxics and HAPs, aldehydes and semivolatile compounds) as measured by EPA reference methods.
(e) Unit Rating <300,000 Btu/hr.
(f) Unit Rating 3300,000 Btu/hr, but <10,000,000 Btu/hr.
(g) Unit Rating 310,000,000 Btu/hr, but <100,000,000 Btu/hr.
(h) Unit Rating 3100,000,000 Btu/hr.
(i) POM = Particulate POM only.
(j) PM = Filterable Particulate Matter + Condensible Particulate Matter.
(k) NSPS = New Source Performance Standard as defined in 40 CFR 60 Subparts D and Db. Post-NSPS units are boilers with greater than 250 MMBtu/hr of heat input that commenced construction, modification, or reconstruction after August 17, 1971, and units with heat input capacities between 100 and 250 MMBtu/hr that commenced construction, modification, or reconstruction after June 19, 1984.
(1) Emission factors are given on a fuel input basis (lb/MMBtu). To convert to a power output basis (lb/hp-hr), use an average brake-specific fuel consumption (BSFC) of 7,000 Btu/hp-hr.

APPENDIX B

EMISSION CALCULATIONS

2000 ACTUAL CRITERIA EMISSIONS FROM GENERATORS AT WIND CAVE NATIONAL PARK

Emission Source	Location	Fuel	Number of Sources	Rating (kW)	Run Time (hrs/yr)	Output (kW-hr/yr)	PKo (lbs/yr)	SO_2 (lbs/yr)	NO, (lbs/yr)	CO (lbs/yr)	CO, (lbs/yr)	VOC (Ibs/yr)
Generator	Elevator Building	Diesel	1	200	17	3,400	10	9	141	30	5,239	11

Emission Factors from AP-42, Chapter 3.4-1 for generators rated less than 448 kW — 2.20E-03 | 0.00205 | 3.10E-02 | 6.68E-03 | 1.15E+00 | 2.51E-03

Formula = Output (kW-hr/yr) * 1.34 (hp/kW) * Emission Factor (lb/hp-hr)

2000 POTENTIAL CRITERIA EMISSIONS FROM GENERATORS AT WIND CAVE NATIONAL PARK

Emission Source	Location	Fuel	Number of Sources	Rating (kW)	Run Time (hrs/yr)	Output (kW-hr/yr)	PM_{10} (Ibs/yr)	SO_2 (lbs/yr)	NO_S (lbs/yr)	CO (lbs/yr)	CO_2 (lbs/yr)	VOC (lbs/yr)
Generator	Elevator Building	Diesel	1	200	500	100,000	295	275	4,154	895	154,100	336

Emission Factors from AP-42, Chapter 3.4-1 for generators rated less than 448 kW — 2.20E-03 | 0.00205 | 3.10E-02 | 6.68E-03 | 1.15E+00 | 2.51E-03

Formula = Output (kW-hr/yr) * 1.34 (hp/kW) * Emission Factor (lb/hp-hr)

2000 ACTUAL CRITERIA EMISSIONS FROM GENERATORS AT WIND CAVE NATIONAL PARK

Emission Source	Location	Fuel	Number of Sources	Rating (kW)	Run Time (hrs/yr)	Output (kW-hr/yr)	PM_{10} (lbs/yr)	SO_2 (lbs/yr)	NO_x (lbs/yr)	CO (lbs/yr)	CO_2 (lbs/yr)	VOC (lbs/yr)
Generator	Elevator Building	Diesel	1	200	17	3,400	10	9	141	30	5,239	11

Emission Factors from AP-42, Chapter 3.4-1 for generators rated less than 448 kW: 2.20E-03, 0.00205, 3.10E-02, 6.68E-03, 1.15E+00, 2.51E-03

Formula = Output (kW-hr/yr) * 1.34 (hp/kW) * Emission Factor (lb/hp-hr)

2000 POTENTIAL CRITERIA EMISSIONS FROM GENERATORS AT WIND CAVE NATIONAL PARK

Emission Source	Location	Fuel	Number of Sources	Rating (kW)	Run Time (hrs/yr)	Output (kW-hr/yr)	PM_{10} (lbs/yr)	SO_2 (lbs/yr)	NO_x (lbs/yr)	CO (lbs/yr)	CO_2 (lbs/yr)	VOC (lbs/yr)
Generator	Elevator Building	Diesel	1	200	500	100,000	295	275	4,154	895	154,100	336

Emission Factors from AP-42, Chapter 3.4-1 for generators rated less than 448 kW: 2.20E-03, 0.00205, 3.10E-02, 6.68E-03, 1.15E+00, 2.51E-03

Formula = Output (kW-hr/yr) * 1.34 (hp/kW) * Emission Factor (lb/hp-hr)

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	WIND CAVE
City:	Rapid City
State:	South Dakota
Company:	NPS
Type of Tank:	Horizontal Tank
Description:	2,000 Beige AST

Tank Dimensions

Shell Length (ft):	12.00
Diameter (ft):	5.30
Volume (gallons):	2,000.00
Turnovers:	0.00
Net Throughput (gal/yr):	8,770.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Light
Shell Condition:	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig):	0.03

Meteorological Data used in Emissions Calculations: Rapid City, South Dakota (Avg Atmospheric Pressure = 13.11 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 9)	All	53.53	43.82	63.25	48.77	4.0537	3.3197	4.9134	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 9)	56.71	474.02	530.74

2001 ACTUAL EMISSIONS FROM CAMPFIRES AT WIND CAVE NATIONAL PARK

Location	Camps	Fires/Yr	Tons/Yr	PM (lbs/yr)	SO_2 (lbs/yr)	NO, (lbs/yr)	CO (lbs/yr)	VOC (lbs/yr)
Elk Mountain	727	727	4	126	1	9	918	832

Results of FOFEM model execution on date: 6/13/2002

FUEL CONSUMPTION CALCULATIONS

egion: Interior_West
over Type: SAF/SRM = SRM 611 - Blue Grama - Buffalograss
Fuel Type: Natural
Fuel Reference: FOFEM 271

FUEL CONSUMPTION TABLE

Fuel omponent dame	Preburn Load (t/acre)	Consumed Load (t/acre)	Postburn Load (t/acre)	Percent Reduced (%)	Equation Reference Number	Moisture
.,fitter	0.00	0.00	0.00	0.0	999	
^9ood (0-1/4 inch)	0.00	0.00	0.00	0.0	999	
^9ood (1/4-1 inch)	0.00	0.00	0.00	0.0	999	15.0
^9ood (1-3 inch)	0.00	0.00	0.00	0.0	999	
flood (3+ inch) Sound	0.00	0.00	0.00	0.0	999	15.0
3->6	0.00	0.00	0.00	0.0		
6->9	0.00	0.00	0.00	0.0		
9->20	0.00	0.00	0.00	0.0		
20->	0.00	0.00	0.00	0.0		
lood (3+ inch) Rotten	0.00	0.00	0.00	0.0	999	15.0
3->6	0.00	0.00	0.00	0.0		
6->9	0.00	0.00	0.00	0.0		
9->20	0.00	0.00	0.00	0.0		
20->	0.00	0.00	0.00	0.0		
)uff	0.00	0.00	0.00	0.0	2	75.0
erbaceous	0.63	0.57	0.06	90.0	221	
,hrubs	0.00	0.00	0.00	0.0	23	
rown foliage	0.00	0.00	0.00	0.0	37	
rown branchwood	0.00	0.00	0.00	0.0	38	
otal Fuels	0.63	0.57	0.06	90.0		

IRE EFFECTS ON FOREST FLOOR COMPONENTS

orest Floor omponent	Preburn Condition	Amount Consumed	Postburn Condition	Percent Reduced	Equation Number
uff Depth (in)	0.0	0.0	0.0	0.0 .	6
in Soil Exp (%)	.0	31.0	31.0	31.0	10

	Emissions flaming	-- lbs/acre smoldering	total
YI 10	3	0	3
K 2.5	3	0	3
4	1	0	1
	7	0	7
3 2	2017	0	2017

	Consumption tons/acre	Duration hour:min:sec
Flaming:	0.57	00:01:00
Smoldering:	0.00	00:00:00
Total:	0.57	

TITLE: Results of FOFEM model execution on date: 6/20/2002

FUEL CONSUMPTION CALCULATIONS

Region: Interior_West
Cover Type: SAF/SRM - SAF 237 - Interior Ponderosa Pine
Fuel Type: Natural
Fuel Reference: FOFEM 011

FUEL CONSUMPTION TABLE

Fuel Component Name	Preburn Load (t/acre)	Consumed Load (t/acre)	Postburn Load (t/acre)	Percent Reduced (%)	Equation Reference Number	Moisture
Litter	1.40	1.40	0.00	100.0	999	
Wood (0-1/4 inch)	0.07	0.07	0.00	100.0	999	
Wood (1/4-1 inch)	0.63	0.63	0.00	100.0	999	15.0
Wood (1-3 inch)	0.80	0.56	0.24	70.3	999	
Wood (3+ inch) Sound	4.50	0.58	3.92	12.9	999	15.0
3->6	1.12	0.34	0.79	0.3		
6->9	1.12	0.14	0.99	0.1		
9->20	1.12	0.07	1.05	0.1		
20->	1.12	0.03	1.09	0.0		
Wood (3+ inch) Rotten	0.50	0.13	0.37	25.5	999	15.0
3->6	0.12	0.06	0.06	0.5		
6->9	0.12	0.04	0.09	0.3		
9->20	0.12	0.02	0.10	0.2		
20->	0.12	0.01	0.12	0.1		
Duff	5.00	2.59	2.41	51.8	2	75.0
Herbaceous	0.20	0.20	0.00	100.0	22	
Shrubs	0.40	0.24	0.16	60.0	23	
Crown foliage	6.00	0.00	6.00	0.0	37	
Crown branchwood	0.70	0.00	0.70	0.0	38	
Total Fuels	20.20	6.40	13.80	31.7		

FIRE EFFECTS ON FOREST FLOOR COMPONENTS

Forest Floor Component	Preburn Condition	Amount Consumed	Postburn Condition	Percent Reduced	Equation Number
Duff Depth (in)	0.6	0.4	0.2	70.8	6
Min Soil Exp (%)	.0	31.0	31.0	31.0	10

Tote:
'Duff' (tons/acre) and 'Duff Depth (in)' burned are computed using different equations, sometimes this may cause an inconsistancy in the 'Percent Reduced' shown on this report.
Duff (tons/acre) consumed is best suited for predicting smoke production, while Duff Depth (in) may be better related to fire severity and soil heating

Emissions -- lbs/acre

	flaming	smoldering	total
PM 10	11	243	254
PM 2.5	10	206	216
CH_4	3	125	128
CO	24	2746	2770
CO_2	6572	11175	17747

	Consumption tons/acre	Duration hour:min:sec
Flaming:	1.85	00:01:00
Smoldering:	4.55	00:26:30
Total:	6.40	

2001 WILDFIRE EMISSIONS AT WIND CAVE NATIONAL PARK

Fire Type	Acres	PM_{10} (lbs/yr)	$PM_{2.5}$ (lbs/yr)	CH_4 (lbs/yr)	CO (lbs/yr)	CO_2 (lbs/yr)	PM_{1p} (tons/yr)	$PM_{2.5}$ (tons/yr)	CH_4 (tons/yr)	CO (tons/yr)	CO_2 (tons/yr)
Grassland	700	2,100	2,100	700	4,900	1,411,900	1.05	1.05	0.35	2.45	706
Ponderosa Pine	300	76,200	64,800	38,400	831,000	5,324,100	38.10	32.40	19.20	415.50	2,662
Totals	1,000	78,300	66,900	39,100	835,900	6,736,000	39.15	33.45	19.55	417.95	3,368

Emission Factors (lbs/acre)

Fire Type	PM_{10}	$PM_{2.5}$	CH_4	CO	CO_2
Grassland	3	3	1	7	2,017
Ponderosa Pine	254	216	128	2,770	17,747

```
* #   ############################
* Wind Cave NP Winter Conditions.
* File 1, Run 1, Scenario 3.
* # # # # # # # # # # # # # # # # # # # # # # # # #
  M584 Warning:
            The user supplied area wide average speed of 35.0
            will be used for all hours of the day. 100% of VMT
            has been assigned to a fixed combination of freeways,
            freeway ramps, arterial/collector and local roadways
            for all hours of the day and all vehicle types.

* Reading PM Gas Carbon ZML Levels
* from the external data file PMGZML.CSV

* Reading PM Gas Carbon DR1 Levels
* from the external data file PMGDR1.CSV

* Reading PM Gas Carbon DR2 Levels
* from the external data file PMGDR2.CSV

* Reading PM Diesel Zero Mile Levels
* from the external data file PMDZML.CSV

* Reading the First PM Deterioration Rates
* from the external data file PMDDR1.CSV

* Reading the Second PM Deterioration Rates
* from the external data file PMDDR2.CSV

          User supplied gasoline sulfur content = 300.0 ppm.

  M616 Comment:
               User has supplied post-1999 sulfur levels.
  M 48 Warning:
               there are no sales for vehicle class HDGV8b

                     Calendar Year:   2001
                             Month:   Jan.
                          Altitude:   High
               Minimum Temperature:   10.3 (F)
               Maximum Temperature:   37.0 (F)
                 Absolute Humidity:    75. grains/lb
```

Nominal Fuel RVP:	13.4 psi
Weathered RVP:	13.4 psi
Fuel Sulfur Content:	299. ppm
Exhaust I/M Program:	No
Evap I/M Program:	No
ATP Program:	No
Reformulated Gas:	No

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
VMT Distribution:	0.1339	0.3439	0.1596		0.1033	0.0001	0.0025	0.2567	0.0000	1.0000
Composite Emission Factors (g/mi):										
Composite VOC :	0.833	1.166	1.052	1.130	0.992	0.410	0.466	0.810	0.00	0.992
Composite CO	20.54	27.20	24.29	26.28	29.32	1.278	1.006	4.431	0.00	20.147
Composite NOX :	0.887	1.296	1.509	1.364	3.993	1.254	1.231	14.858	0.00	5.036

Veh. Type:	LDGT1	LDGT2	LDGT3	LDGT4	LDDT12	LDDT34
VMT Mix:	0.0790	0.2649	0.1094	0.0502	0.0001	0.0024
Composite Emission Factors (g/mi):						
Composite VOC :	1.091	1.188	1.023	1.115	2.424	0.390
Composite CO	26.46	27.42	24.16	24.56	6.522	0.792
Composite NOX :	1.018	1.379	1.361	1.832	2.555	1.179

Veh. Type:	HDGV2B	HDGV3	HDGV4	HDGV5	HDGV6	HDGV7	HDGV8A	HDGV8B
VMT Mix:	0.0871	0.0028	0.0009	0.0032	0.0063	0.0026	0.0000	0.0000
Composite Emission Factors (g/mi):								
Composite VOC :	0.966	0.983	1.015	1.148	1.140	1.250	1.365	0.000
Composite CO	28.45	29.36	30.09	34.55	34.30	37.79	40.94	0.00
Composite NOX :	3.933	4.089	3.739	4.299	4.271	4.707	5.102	0.000

Veh. Type:	HDDV2B	HDDV3	HDDV4	HDDVS	HDDV6	HDDV7	HDDV8A	HDDV8B
VMT Mix:	0.0299	0.0092	0.0081	0.0038	0.0187	0.0274	0.0330	0.1190

Composite Emission Factors (g/mi):

Composite VOC :	0.378	0.430	0.502	0.538	0.776	0.963	0.827	0.932
Composite CO	1.941	2.258	2.634	2.859	2.832	3.515	4.997	5.670
Composite NOX :	4.149	4.695	5.517	5.943	9.043	11.209	17.871	20.215

```
* # # # # # # # # # # # # # # # # # # # # #
* Wind Cave NP Summer Conditions.
* File 1, Run 1, Scenario 4.
*    # # # # # # # # # # # # # # # # # # # # # # # #
  M584 Warning:
           The user supplied area wide average speed of 35.0
           will be used for all hours of the day. 100% of VMT
           has been assigned to a fixed combination of freeways,
           freeway ramps, arterial/collector and local roadways
           for all hours of the day and all vehicle types.

* Reading PM Gas Carbon ZML Levels
* from the external data file PMGZML.CSV

* Reading PM Gas Carbon DR1 Levels
* from the external data file PMGDR1.CSV

* Reading PM Gas Carbon DR2 Levels
* from the external data file PMGDR2.CSV

* Reading PM Diesel Zero Mile Levels
* from the external data file PMDZML.CSV

* Reading the First PM Deterioration Rates
* from the external data file PMDDR1.CSV

* Reading the Second PM Deterioration Rates
* from the external data file PMDDR2.CSV

          User supplied gasoline sulfur content = 300.0 ppm.

  M616 Comment:
             User has supplied post-1999 sulfur levels.
  M 48 Warning:
            there are no sales for vehicle class HDGV8b

                 Calendar Year:   2001
```

Month:	July
Altitude:	High
Minimum Temperature:	51.7 (F)
Maximum Temperature:	84.3 (F)
Absolute Humidity:	75. grains/lb
Nominal Fuel RVP:	8.3 psi
Weathered RVP:	8.2 psi
Fuel Sulfur Content:	299. ppm
Exhaust I/M Program:	No
Evap I/M Program:	No
ATP Program:	No
Reformulated Gas:	No

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
VMT Distribution:	0.1339	0.3439	0.1596		0.1034	0.0001	0.0025	0.2566	0.0000	1.0000
Composite Emission Factors (g/mi):										
Composite VOC :	0.692	0.865	0.858	0.863	0.825	0.384	0.484	0.806	0.00	0.821
Composite CO	11.85	14.88	14.44	14.74	22.68	1.249	1.012	4.397	0.00	12.485
Composite NOX :	0.738	1.019	1.289	1.105	3.675	1.157	1.255	14.245	0.00	4.693

Veh. Type:	LDGT1	LDGT2	LDGT3	LDGT4	LDDT12	LDDT34
VMT Mix:	0.0790	0.2649	0.1094	0.0502	0.0001	0.0024
Composite Emission Factors (g/mi):						
Composite VOC :	0.824	0.877	0.840	0.899	2.512	0.417
Composite CO	14.48	15.00	14.35	14.63	6.775	0.821
Composite NOX :	0.807	1.082	1.160	1.570	2.574	1.211

Veh. Type:	HDGV2B	HDGV3	HDGV4	HDGV5	HDGV6	HDGV7	HDGV8A	HDGV8E
VMT Mix:	0.0874	0.0028	0.0009	0.0031	0.0062	0.0026	0.0000	0.0000
Composite Emission Factors (g/mi):								
Composite VOC :	0.802	0.807	0.873	0.962	0.955	1.038	1.136	0.000
Composite CO	22.01	22.76	23.19	26.68	26.48	29.19	31.58	0.00
Composite NOX :	3.627	3.774	3.398	3.914	3.888	4.286	4.639	0.000

Veh. Type:	HDDV2B	HDDV3	HDDV4	HDDV5	HDDV6	HDDV7	HDDV8A	HDDV8E
VMT Mix:	0.0296	0.0092	0.0081	0.0039	0.0188	0.0274	0.0330	0.1190
Composite Emission Factors (g/mi):								
Composite VOC :	0.374	0.426	0.498	0.534	0.773	0.959	0.822	0.926
Composite CO	1.956	2.270	2.648	2.871	2.810	3.487	4.951	5.612
Composite NOX :	4.077	4.617	5.427	5.847	8.744	10.841	17.060	19.274

^ #############################
* Wind Cave NP Winter Conditions.
* File 1, Run 1, Scenario 3.
+ #############################

Calendar Year:	2001
Month:	Jan.
Gasoline Fuel Sulfur Content:	299. ppm
Diesel Fuel Sulfur Content:	500. ppm
Particle Size cutoff:	10.00 Microns
Reformulated Gas:	No

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
VMT Distribution:	0.1339	0.3439	0.1596		0.1033	0.0001	0.0025	0.2567	0.0000	1.0000
Compoeite Emission Factors (g/mi):										
Lead:	0.0000	0.0000	0.0000	0.0000	0.0000	----	----	----	0.0000	0.0000
GAS PM:	0.0042	0.0047	0.0044	0.0046	0.0520	----	----	----	0.0205	0.0083
ECARBON:	----	----	----	----	----	0.1198	0.0502	0.I268	----	0.0327
OCARBON:	----	----	----	----	----	0.0I38	0.0722	0.0657	----	0.0170
SO4:	0.0028	0.0049	0.0047	0.0049	0.0I09	0.0049	0.0I05	0.0306	0.0000	0.0118
Total Exhaust PM:	0.0071	0.0096	0.0031	0.0095	0.0629	0,1584	0.1330	0.233I	0.0205	0.0699
Brake:	0.0I25	0.0125	0.0125	0.0I25	0.0125	0.0125	0.0125	0.0125	0.0000	0.0125

Tire:	0.0080	0.0080	0.0080	0.0080	0.0086	0.0080	0.0080	0.0257	0.0000	0.0126
Total PM:	0.0276	0.0302	0.0296	0.0300	0.0841	0.1790	0.1535	0.2614	0.0205	0.0950
SO2:	0.0684	0.0804	0.1134	0.0908	0.1666	0.0934	0.2017	0.4376	0.0000	0.1849
NH3:	0.1016	0.1005	0.1015	0.1008	0.0451	0.0068	0.0068	0.0270	0.0000	0.0760
Idle Emissions (g/hr)										
PM Idle:	------	------	------	------	------	------	------	1.0438	------	0.2680

Veh. Type:	LDGT1	LDGT2	LDGT3	LDGT4	LDDT12	LDDT34
VMT Mix:	0.0790	0.2649	0.1094	0.0502	0.0001	0.0024
Composite Emission Factors (g/mi):						
Lead:	0.0000	0.0000	0.0000	0.0000	------	------
GASPM:	0.0047	0.0047	0.0044	0.0044	------	------
ECARBON:	------	------	------	------	0.1498	0.0463
OCARBON:	------	------	------	------	0.2156	0.0667
SO4:	0.0049	0.0049	0.0047	0.0047	0.0062	0.0107
Total Exhaust PM:	0.0096	0.0096	0.0091	0.0091	0.3717	0.1237
Brake:	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125
Tire:	0.0080	0.0080	0.0080	0.0080	0.0080	0.0080
Total PM:	0.0302	0.0302	0.0296	0.0296	0.3922	0.1443
SO2:	0.0804	0.0804	0.1134	0.1134	0.1196	0.2049
NH3:	0.1005	0.1005	0.1015	0.1015	0.0068	0.0068
Idle Emissions (g/hr)						
PM Idle:	------	------	------	------	------	

Veh. Type:	HDGV2B	HDGV3	HDGV4	HDGV5	HDGV6	HDGV7	HDGV8A	HDGV8B
VMT Mix:	0.0871	0.0028	0.0009	0.0032	0.0063	0.0026	0.0000	0.0000
Composite Emission Factors (g/mi):								
Lead:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
GASPM:	0.0523	0.0523	0.0503	0.0504	0.0503	0.0503	0.0503	0.0000
ECARBON:	------	------	------	------	------	------	------	------
OCARBON:	------	------	------	------	------	------		
SO4:	0.0118	0.0118	0.0049	0.0050	0.0050	0.0049	0.0048	0.0000
Total Exhaust PM:	0.0640	0.0641	0.0553	0.0554	0.0553	0.0553	0.0551	0.0000
Brake:	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0000
Tire:	0.0080	0.0120	0.0120	0.0120	0.0120	0.0120	0.0360	0.0000
Total PM:	0.0846	0.0887	0.0798	0.0799	0.0799	0.0798	0.1036	0.0000
SO2:	0.1603	0.1730	0.1764	0.2054	0.2026	0.2213	0.2339	0.0000
NH3:	0.0451	0.0451	0.0451	0.0451	0.0451	0.0451	0.0451	0.0000

Idle Emissions (g/hr)
PM Idle:

Veh. Type:	HDDV2B	HDDV3	HDDV4	HDDVS	HDDV6	HDDV7	HDDV8A	HDDV8B
VMT Mix:	0.0299	0.0092	0.0081	0.0038	0.0187	0.0274	0.0330	0.1190
Composite Emission Factors (g/mi) :								
Lead:	------	------	------	------	------	------	------	------
GASPM:	------	------	------	------	------	------	------	------
ECARBON:	0.0513	0.0486	0.0476	0.0466	0.1058	0.1043	0.1234	0.1676
OCARBON:	0.0534	0.0506	0.0495	0.0485	0.0831	0.0819	0.0970	0.0529
SO4:	0.0172	0.0190	0.0217	0.0224	0.0254	0.0294	0.0337	0.0353
Total Exhaust PM:	0.1219	0.1182	0.1189	0.1175	0.2143	0.2156	0.2540	0.2558
Brake:	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125
Tire:	0.0080	0.0120	0.0120	0.0120	0.0120	0.0120	0.0360	0.0360
Total PM:	0.1424	0.1427	0.1434	0.1420	0.2389	0.2401	0.3026	0.3043
S02:	0.2452	0.2722	0.3107	0.3208	0.3637	0.4200	0.4813	0.5043
NH3:	0.0270	0.0270	0.0270	0.0270	0.0270	0.0270	0.0270	0.0270
Idle Emissions (g/hr)								
PM Idle:	1.0607	1.0424	1.0459	1.0391	1.0381	1.0402	1.0381	1.0417

* #
* Wind Cave NP Summer Conditions.
* File 1, Run 1, Scenario 4.
* #

Calendar Year: 2001
Month: July
Gasoline Fuel Sulfur Content: 299. ppm
Diesel Fuel Sulfur Content: 500. ppm
Particle Size Cutoff: 10.00 Microns
Reformulated Gas: No

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
VMT Distribution:	0.1339	0.3439	0.1596		0.1034	0.0001	0.0025	0.2566	0.0000	1.0000
Composite Emission. Factors (g/mi):										
Lead:	0.0000	0.0000	0.0000	0.0000	0.0000				0.0000	0.0000

GASPM:	0.0042	0.0046	0.0044	0.0046	0.0520	------	------	------	0.0205	0.0082
ECARBON:	------	------	------	------	------	0.1150	0.0496	0.1241	------	0.0320
OCARBON:	------	------	------	------	------	0.0324	0.0714	0.0641	------	0.0166
S04:	0.0028	0.0049	0.0047	0.0048	0.0113	0.0048	0.0106	0.0306	0.0000	0.0118
Total Exhaust PM:	0.0070	0.0095	0.0091	0.0094	0.0633	0.1522	0.1316	0.2187	0.0205	0.0687
Brake:	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0000	0.0125
Tire:	0.0080	0.0080	0.0080	0.0080	0.0086	0.0080	0.0080	0.0258	0.0000	0.0126
Total PM:	0.0276	0.0300	0.0297	0.0299	0.0845	0.1728	0.1522	0.2570	0.0205	0.0938
S02:	0.0684	0.0804	0.1134	0.0908	0.1663	0.0924	0.2022	0.4374	0.0000	0.1848
NH3:	0.1016	0.1007	0.1015	0.1009	0.0451	0.0068	0.0068	0.0270	0.0000	0.0760
Idle Emissions (g/hr)										
PM Idle:								1.0356		0.2657

Veh. Type:	LDGT1	LDGT2	LDGT3	LDGT4	LDDT12	LDDT34
VMT Mix:	0.0790	0.2649	0.1094	0.0502	0.0001	0.0024

Composite Emission Factors (g/mi):						
Lead:	0.0000	0.0000	0.0000	0.0000		
GASPM:	0.0046	0.0046	0.0044	0.0044		
ECARBON:					0.1498	0.0463
OCARBON:	------	------	------	------	0.2156	0.0667
S04:	0.0049	0.0049	0.0047	0.0047	0.0062	0.0107
Total Exhaust PM:	0.0095	0.0095	0.0091	0.0091	0.3717	0.1237
Brake:	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125
Tire:	0.0080	0.0080	0.0080	0.0080	0.0080	0.0080
Total PM:	0.0300	0.0300	0.0297	0.0297	0.3922	0.1443
S02:	0.0804	0.0804	0.1134	0.1134	0.1196	0.2049
NH3:	0.1007	0.1007	0.1015	0.1015	0.0068	0.0068
Idle Emissions (g/hr)						
PM Idle:						

Veh. Type:	HDGV2B	HDGV3	HDGV4	HDGV5	HDGV6	HDGV7	HDGV8A	HDGV8B
VMT Mix:	0.0874	0.0028	0.0009	0.0031	0.0062	0.0026	0.0000	0.0000

Composite Emission Factors (g/mi):								
Lead:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
GASPM:	0.0523	0.0523	0.0506	0.0506	0.0506	0.0506	0.0505	0.0000
ECARBON:								
OCARBON:	------	------	------	------	------	------	------	
S04:	0.0120	0.0121	0.0061	0.0062	0.0062	0.0062	0.0060	0.0000

Total Exhaust PM:	0.0643	0.0644	0.0567	0.0568	0.0568	0.0568	0.0565	0.0000
Brake:	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0000
Tire:	0.0080	0.0120	0.0120	0.0120	0.0120	0.0120	0.0360	0.0000
Total PM:	0.0848	0.0889	0.0813	0.0814	0.0814	0.0813	0.1051	0.0000
SO2:	0.1601	0.1728	0.1758	0.2049	0.2021	0.2208	0.2332	0.0000
NH3:	0.0451	0.0451	0.0451	0.0451	0.0451	0.0451	0.0451	0.0000
Idle Emissions (g/hr)								
PM Idle:								

Veh. Type:	HDDV2B	HDDV3	HDDV4	HDDV5	HDDV6	HDDV7	HDDV8A	HDDV8B
VMT Mix:	0.0296	0.0092	0.0081	0.0039	0.0188	0.0274	0.0330	0.1190
Composite Emission Factors (g/mi):								
Lead:								
GASPM:	------	------	------					
ECARBON:	0.0502	0.0478	0.0468	0.0459	0.1020	0.1004	0.1214	0.1647
OCARBON:	0.0523	0.0497	0.0487	0.0477	0.0802	0.0789	0.0954	0.0520
SO4:	0.0171	0.0190	0.0217	0.0224	0.0254	0.0294	0.0337	0.0352
Total Exhaust PM:	0.1196	0.1165	0.1172	0.1161	0.2076	0.2087	0.2504	0.2519
Brake:	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125
Tire:	0.0080	0.0120	0.0120	0.0120	0.0120	0.0120	0.0360	0.0360
Total PM:	0.1402	0.1410	0.1417	0.1406	0.2322	0.2332	0.2990	0.3005
SO2:	0.2449	0.2719	0.3106	0.3207	0.3635	0.4199	0.4810	0.5038
NH3:	0.0270	0.0270	0.0270	0.0270	0.0270	0.0270	0.0270	0.0270
Idle Emissions (g/hr)								
PM Idle:	1 0495	1.0341	1.0377	1.0321	1.0309	1.0326	1.0307	1.0338

WIND CAVE NATIONAL PARK VISITOR VEHICLE EMISSIONS

Paved Road Annual VMT
2,002,618

Emission Factors (g/mi) - All Vehicles

	NOx	CO	VOC	PM_{10} (Paved) Exhaust, Brake, and Tire	PM_{10} (Paved) Fugitive	PM_{10} (Paved) Total
Summer	4.693	12.485	0.821	0.0938	0.84	0.9338
Winter	5.036	20.147	0.992	0.0950	0.84	0.9350
Average	4.865	16.316	0.907			0.934

Emissions (tons/yr) - All Vehicles

NOx	CO	VOC	Paved PM_{10}
10.72	35.94	2.00	2.06

Emissions (lbs/yr) - All Vehicles

NOx	CO	VOC	Paved PM_{10}
21,432	71,884	3,994	4,117

WIND CAVE NATIONAL PARK NPS AND **GSA VEHICLES**

	LDGV	LDGT	LDDT	HDDV	Total
Total Miles	103,167	33,028	30,282	10,412	176,889

Emission Factors (glmi) - LDGV

	NOx	CO	VOC	PM_{10} Exhaust, Brake, and Tire	PM_{10} Fugitive	PM_{10} Total
Summer	0.7380	11.8500	0.6920	0.0276	0.8400	0.8676
Winter	0.8870	20.5400	0.8330	0.0276	0.8400	0.8676
Average	0.8125	16.1950	0.7625			0.8676

Emissions (tonslyr) - **LDGV**

NOx	CO	**VOC**	PM_{10}
0.09	1.84	0.09	0.10

Emission Factors (glmi) - LDGT

	NOx	CO	VOC	PM_{10} Exhaust, **Brake, and** Tire	PM_{10} Fugitive	PM_{10} Total
Summer	1.105	14.740	0.863	0.030	0.840	0.870
Winter	1.364	26.280	1.130	0.030	0.840	0.870
Average	1.235	20.510	0.997			0.870

Emissions (tonslyr) - LDGT

NOx	CO	VOC	PM_{10}
0.04	0.75	0.04	0.03

Emission Factors (glmi) - LDDT

	NOx	CO	VOC	PM_{10} Exhaust, Brake, and Tire	PM_{10} Fugitive	PM_{10} Total
Summer	1.255	1.012	0.484	0.152	0.840	0.992
Winter	1.231	1.006	0.466	0.154	0.840	0.994
Average	1.243	1.009	0.475			0.993

Emissions (tonslyr) - HDGV

NOx	**CO**	**VOC**	PMto
0.04	0.03	0.02	0.03

Emission Factors (glmi) - HDDV

	NOx	CO	VOC	PM_{10} Exhaust, Brake, and Tire	PM_{10} Fugitive	PM_{10} Total
Summer	14.245	4.397	0.806	0.257	0.840	1.097
Winter	14.858	4.431	0.810	0.261	0.840	1.101
Average	14.552	4.414	0.808			1.099

Emissions (tonslyr) - HDDV

NOx	CO	VOC	PM1o
0.17	0.05	0.01	0.01

Emissions (tonslyr) - Total

NOx	CO	VOC	PM_{10}
0.35	2.67	0.15	0.18

Emissions (Ibslyr) - Total

NOx	CO	VOC	PM_{10}
690	5,334	296	351

2000 THEODORE ROOSEVELT NP NONROAD VEHICLE EMISSIONS

		Emission Factors (gm/hp-hr)							Emissions (lbs/yr)			
Vehicle	No.	PM	Nox	CO	VOC	hp	load	hrs/yr	PM	Nox	CO	VOC
Daihaitsu	1	2.04	1.03	2.31	2.19	30	0.55	200	14.8	7.5	16.8	15.9
Honda AN	1	2.04	1.03	2.31	2.19	18	0.55	100	4.4	2.2	5.0	4.8
								100				
Gator	1	2.04	1.03	2.31	2.19	18	0.55	200	8.9	4.5	10.1	9.5
Tractors	1	2.04	1.03	2.31	2.19	40	0.68	120	14.6	7.4	16.6	15.7
Tractors	1	2.04	1.03	2.31	2.19	65	0.68	120	23.8	12.0	27.0	25.6
										0.0	0.0	
Backhoe	1	2.04	1.03	2.31	2.19	70	0.55	250	43.2	21.8	48.9	46.4
Riding Mower	1	1.11	10.3	4.8	1.3	18	0.55	110	2.7	24.7	11.5	3.1
Riding Mower	1	1.11	10.3	4.8	1.3	20	0.55	90	2.4	22.4	10.5	2.8
Brush Mower	0	1.11	10.3	4.8	1.3	15	0.55	40	0.0	0.0	0.0	0.0
Bobcat	1	2.04	1.03	2.31	2.19	70	0.55	80	13.8	7.0	15.7	14.8
Dozer	0	2.04	1.03	2.31	2.19	77	0.55	300	0.0	0.0	0.0	0.0
Grader	1	1.06	9.6	3.8	1.43	200	0.61	60	17.1	154.6	61.2	23.0
Power Pruner	0	3.99	0.9	4.8	1.3	5	0.55	600	0.0	0.0	0.0	0
Stihl Brushcutters	0	3.99	0.9	4.8	1.3	5	0.55	600	0.0	0.0	0.0	0.0
Stihl 14 Quick Cut Saw	0	3.99	0.9	4.8	1.3	5	0.55	100	0.0	0.0	0.0	0.0
Post Hole Digger	0	3.99	0.9	4.8	1.3	5	0.55	400	0.0	0.0	0.0	0.0
Case Plate Tamper	0	3.99	0.9	4.8	1.3	5	0.55	300	0.0	0.0	0.0	0.0
Tamper Rammer	0	3.99	0.9	4.8	1.3	5	0.55	100	0.0	0.0	0.0	0.0
Pionjar	0	3.99	0.9	4.8	1.3	5	0.55	600	0.0	0.0	0.0	0.0
Wacker Trash Pump	0	3.99	0.9	4.8	1.3	5	0.55	100	0.0	0.0	0.0	0.0
Generators	0	3.99	0.9	4.8	1.3	5	0.55	165	0.0	0.0	0.0	0.0
Welder-Arc-Generator	0	3.99	0.9	4.8	1.3	5	0.55	100	0.0	0.0	0.0	0.0
Emglo Air Compressor	1	3.99	0.9	4.8	1.3	32	0.55	400	61.8	13.9	74.3	20.1
Sweeper	1	1.7	14	6.06	1.46	15	0.68	120	4.6	37.7	16.3	3.9
Road Broom	1	1.7	14	6.06	1.46	23	0.68	40	2.3	19.3	8.3	2.0
Leaf Blowers	0	3.99	0.9	4.8	1.3	1.2	0.55	15	0.0	0.0	0.0	0.0
Chainsaws	0	3.6	0.96	4.8	1.3	3	0.55	1600	0.0	0.0	0.0	0.0
Trimmer	0	3.99	0.9	4.8	1.3	1.2	0.55	300	0.0	0.0	0.0	0
Weed Wacker	0	3.99	0.9	4.8	1.3	1.2	0.55	0	0.0	0.0	0.0	0
50 gallon Sprayer	0	1.7	14	6.06	1.46	9	0.55	1000	0.0	0.0	0.0	0
Forklift	0	1.06	9.6	3.8	1.43	172	0.61	175	0.0	0.0	0.0	0.0
Front End Loader	0	1.11	10.3	4.8	1.3	77	0.55	630	0.0	0.0	0.0	76
Roller/Compactor	1	2.04	1.03	2.31	2.19	39	0.55	25	2.4	1.2	2.7	3
Skid Loader	0	1.11	10.3	4.8	1.3	77	0.55	80	0.0	0.0	0.0	0.0
Chipper	0	3.99	0.9	1372	495	30	0.55	60	0.0	0.0	0.0	1078
Crane	0	1.06	9.6	3.8	1.43	172	0.61	175	0.0	0.0	0.0	0.0
Snowplow	0	1	8	5	1.22	210	0.65	130	0.0	0.0	0.0	0.0
							Totals:	(lbs/yr)	217	336	325	1,345
								(tons/yr)	0.11	0.17	0.16	0.67

APPENDIX C

PUBLIC USE DATA

Monthly Public Use Report

Printed on 06/06/2002

WIND CAVE NP			12/2001	1560
	December 2001			
	Recreational	Non-Recreational	Total	Year-To-Date
Visits	14,914	13,517	28,431	874,018
Visitor Hours	24,291	4,461	28,751	2,196,741

Recreation O/N stays	Current Month	Year-To-Date
Concessioner Lodging	0	0
Concessioner Campgrounds	0	0
NPS Campgrounds	0	8,050
NPS Backcountry	0	401
NPS Miscellaneous	0	0
Non Recreation O/N stays	0	0
Total Overnight stays	0	8,451

NPS Campgrounds	
Tents	0
R/V's	0
Total	0

	This Month	Same Month Last Year	Percent Change
Total Rec	14,914	13,425	11.09 %
Total NonRec	13,517	12,130	11.44 %
Total Visits	28,431	25,555	11.25 %
Total YTD	874,018	881,172	-0.81 %

Special Use Data	This Month	Year-To-Date
HIGHWAY 385 SOUTH	6,102	142,195
HIGHWAY 385 NORTH	6,220	140,415
HIGHWAY 87 NORTH	494	41,250