Appendix 5.1D
Ambient Air Quality Modeling Analysis

Table of Structures - Power Block					
Facility	Length (ft)	Width (ft)	Height (ft)	Floor Area (sf)	Color/Surface Treatment
Buildings / Structures					
Mirror Wash Parking Shed	300'	50'	20'	15,000	painted
Plant Services Building	122'	38'	15'	8,000	painted
Water Treatment Building	150'	85'	30'	12,750	painted
Deaerator/Feedwater Heater Steel Support Structure	120'	60'	150'	7,200	painted steel structure
Tower and SRSG					
Solar Receiver Tower	96' diameter		573'	7,238	natural concrete finish
Solar Receiver Steam Generator (32 faceted sides supported on Solar Tower)	102' diameter		177'	--	coated w/ absorptive coating
Total Tower Height with SRSG	NA		750'		
Equipment					
Air Cooled Condenser	310'	210'	120'	65,100	painted
Generator Step-up Transformer	40'	58'	25' high concrete wall (one side)	2,320	painted
Unit Auxiliary Transformer	25'	20'	14' high concrete wall (one side)	500	painted
Steam Turbine Generator	110'	43'	45'	4,730	painted enclosure
Fin-Fan Dry Coolers	80'	60'	13' 6"	4,800	painted
WSAC (Wet Surface Air Cooler)	35'	48'	11'	1,680	painted
Emergency Diesel Generator	23'	8'	10'	184	painted
MCC Transformers	12'	8'	8'	96	painted
BCP UPS Transformers	9'	6'	7'	54	painted
Electrical Equipment Modules (5)					
Water Treatment Module	14'	48'	16'	672	painted enclosure
Solar Tower Module	24'	60'	16'	1,440	painted enclosure
Auxiliary Boiler Module	24'	60'	16'	1,440	painted enclosure
Air Cooled Condenser Module	29'	76'	16'	2,204	painted enclosure
Fuel Gas Module	14'	24'	16'	336	painted enclosure
Auxilliary Boilers (3)	80'	90'	25'	7,200	painted
Stack	8' 4" diameter		135'		to be determined
Start-up Boiler	68'	70'	18'	4,760	painted
Stack	5' 6" diameter		135'		to be determined
Night Preservation Boiler	25'	15'	14'	375	painted
Stack	1' 6" diameter		30'		to be determined
Tanks					
Demineralized Water Tank	23' diameter		16'	415	painted tank
Treated Water Storage Tank	33' diameter		32'	855	painted tank
Waste Water Collection Tank	23' diameter		16'	415	painted tank
Service/Fire Water Tank	33' 6" diameter		32'	882	painted tank
Mirror Wash Water Storage Tank	23' diameter		16'	415	painted tank
Potable Water Storage Tank	6' diameter		9'	28	HDPE

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Table 5.1D-1

Table of Structures - Common Area						
Facility		Length (ft)	Width (ft)	Height (ft)	Floor Area (sf)	Color/Surface Treatment
Buildings / Structures						
	Administration/Control Building/Warehouse	304'	85'	14' admin / 22' warehouse	25,840	painted
	Heliostat Assembly Building	480'	120'	30'	57,600	painted
	Pad Bonding Building(s)-2 each	140'	80'	30'	11,200	painted
	Mirror Wash Machine Maintenance Shed	100'	80'	24'	8,000	painted
	Switchyard Control House	55'	36'	12'	1,980	painted
Equipment						
	Emergency Diesel Generator	13'	4'	7'	52	painted
	MCC Transformers	12'	8'	8'	96	painted
Tanks						
	Potable Water Storage Tank	6' diameter		9'	28	HDPE
	Fire Water Storage Tank	33' diameter		24"	855	Painted

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Figure 5.1D-1
Structures and Emission Sources – Power Blocks

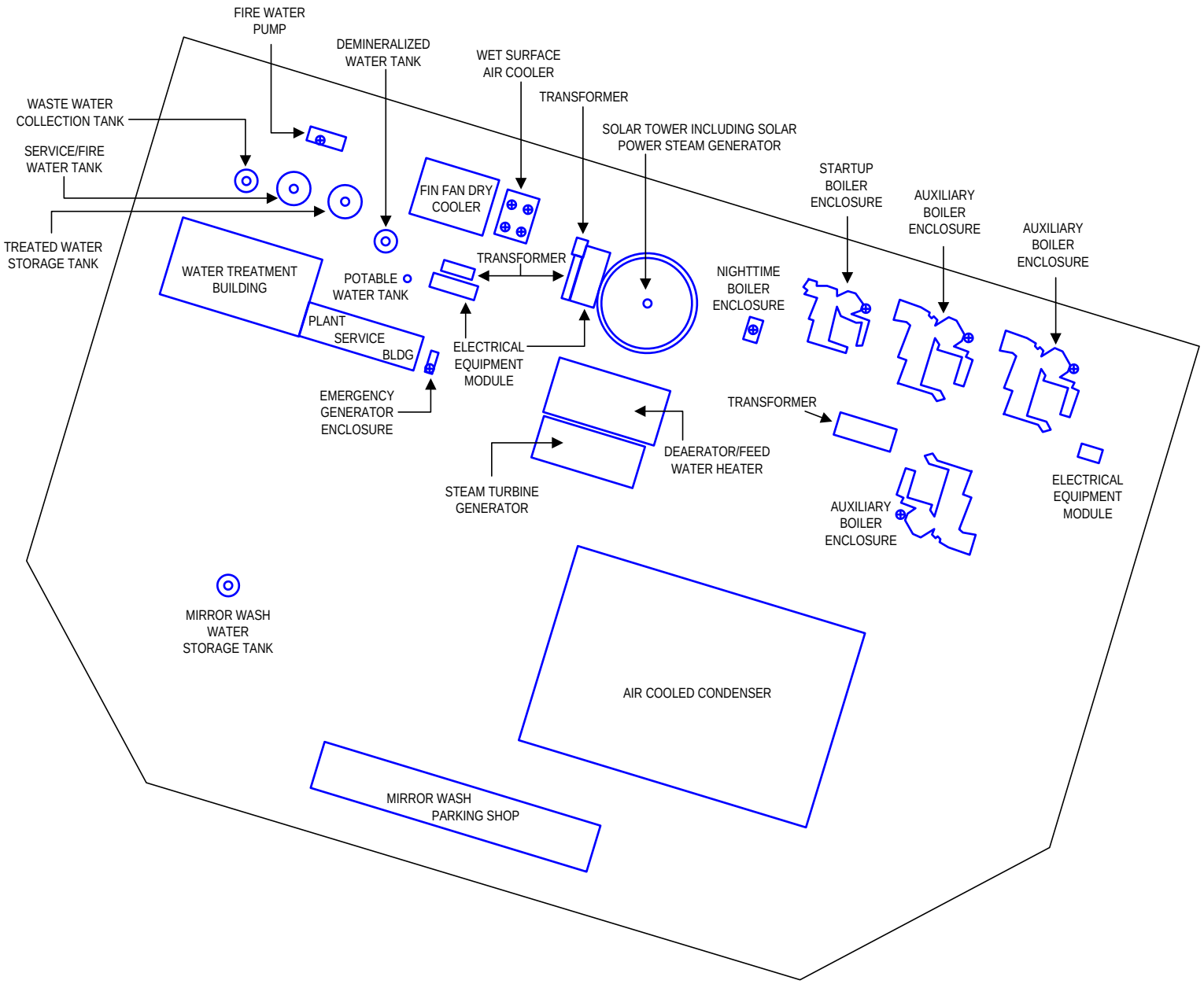

Figure 5.1D-2
Structures and Emission Sources in Common Area

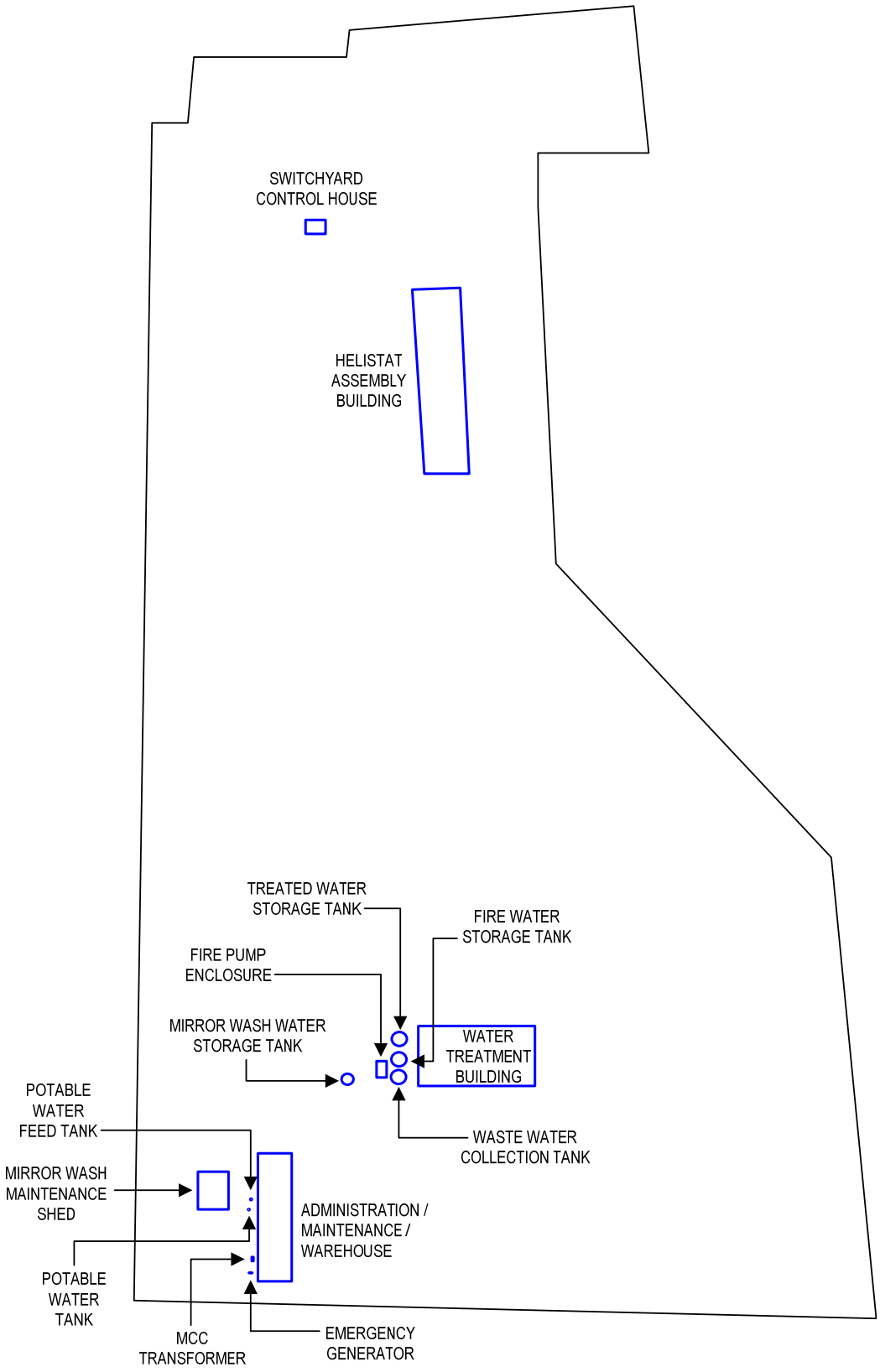

Table 5.1D-2
Rio Mesa Solar Electric Generating Facility
Emission Rates and Stack Parameters for Refined Modeling

	Stack Diam, m	Release Height m	Temp, deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	Emission Rates, g/s			
						NOx	SO2	CO	PM10
Averaging Period: One hour, boiler operations									
Aux Boilers	2.540	41.148	480.78	78.815	15.554	0.6930	0.1324	2.306	n/a
Startup Boilers	1.676	41.148	421.89	34.971	15.844	0.3451	6.591E-02	0.5647	n/a
Nighttime Preservation Boilers	0.457	10.668	421.89	2.737	16.673	2.079E-02	3.971E-03	6.917E-02	n/a
Averaging Period: One hour, engine testing									
PB emergency generators (each)	0.457	3.048	769.11	9.250	56.344	2.422	2.316E-03	1.3119	n/a
PB fire pump engines (each)	0.102	3.048	796.89	0.779	96.051	8.333E-02	1.588E-04	7.222E-02	n/a
Common Area em generator	0.203	3.048	730.22	1.062	32.745	1.658E-01	2.646E-04	1.437E-01	n/a
Common Area fire pump engine	0.102	3.048	783.00	0.460	56.757	5.208E-02	1.059E-04	6.424E-02	n/a
Averaging Period: Three hours, boiler operations									
Aux Boilers	2.540	41.148	480.78	78.815	15.554	n/a	1.324E-01	n/a	n/a
Startup Boilers	1.676	41.148	421.89	34.971	15.844	n/a	6.591E-02	n/a	n/a
Nighttime Preservation Boilers	0.457	10.668	421.89	2.737	16.673	n/a	3.971E-03	n/a	n/a
Averaging Period: Three hours, engine testing									
PB emergency generators (each)	0.457	3.048	769.11	9.250	56.344	n/a	7.719E-04	n/a	n/a
PB fire pump engines (each)	0.102	3.048	796.89	0.779	96.051	n/a	5.293E-05	n/a	n/a
Common Area em generator	0.203	3.048	730.22	1.062	32.745	n/a	8.821E-05	n/a	n/a
Common Area fire pump engine	0.102	3.048	783.00	0.460	56.757	n/a	3.529E-05	n/a	n/a
Averaging Period: Eight hours, boiler operations									
Aux Boilers	2.540	41.148	480.78	78.815	15.554	n/a	n/a	1.153	n/a
Startup Boilers	1.676	41.148	421.89	34.971	15.844	n/a	n/a	1.412E-01	n/a
Nighttime Preservation Boilers	0.457	10.668	421.89	2.737	16.673	n/a	n/a	6.917E-02	n/a
Averaging Period: Eight hours, engine testing									
PB emergency generators (each)	0.457	3.048	769.11	9.250	56.344	n/a	n/a	1.640E-01	n/a
PB fire pump engines (each)	0.102	3.048	796.89	0.779	96.051	n/a	n/a	9.028E-03	n/a
Common Area em generator	0.203	3.048	730.22	1.062	32.745	n/a	n/a	1.797E-02	n/a
Common Area fire pump engine	0.102	3.048	783.00	0.460	56.757	n/a	n/a	8.030E-03	n/a

Table 5.1D-2
Rio Mesa Solar Electric Generating Facility
Emission Rates and Stack Parameters for Refined Modeling

	Stack Diam, m	Release Height m	Temp, deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	Emission Rates, g/s			
						NOx	SO2	CO	PM10
Averaging Period: 24-hours, boiler operation									
Aux Boilers	2.540	41.148	480.78	78.815	15.554	n/a	2.206E-02	n/a	5.250E-02
Startup Boilers	1.676	41.148	421.89	34.971	15.844	n/a	5.493E-03	n/a	1.307E-02
Nighttime Preservation Boilers	0.457	10.668	421.89	2.737	16.673	n/a	1.324E-03	n/a	3.150E-03
WSACs (per cell, 4 cells per tower)	2.743	3.658	299.67	69.612	11.778	n/a	n/a	n/a	2.362E-04
Averaging Period: 24 hours, engine testing, no aux boiler operation									
Startup Boilers	1.676	41.148	421.89	34.971	15.844	n/a	5.493E-03	n/a	1.307E-02
Nighttime Preservation Boilers	0.457	10.668	421.89	2.737	16.673	n/a	1.985E-03	n/a	4.725E-03
PB emergency generators (each)	0.457	3.048	769.11	9.250	56.344	n/a	9.648E-05	n/a	3.154E-03
PB fire pump engines (each)	0.102	3.048	796.89	0.779	96.051	n/a	6.616E-06	n/a	1.736E-04
Common Area em generator	0.203	3.048	730.22	1.062	32.745	n/a	1.103E-05	n/a	3.455E-04
Common Area fire pump engine	0.102	3.048	783.00	0.460	56.757	n/a	4.411E-06	n/a	1.591E-04
WSACs (per cell, 4 cells per tower)	2.743	3.658	299.67	69.612	11.778	n/a	n/a	n/a	2.362E-04
Averaging Period: Annual									
Aux Boilers	2.540	41.148	480.78	78.815	15.554	1.971E-02	3.112E-03	n/a	7.623E-03
Startup Boilers	1.676	41.148	421.89	34.971	15.844	3.414E-02	6.088E-03	n/a	1.462E-02
Nighttime Preservation Boilers	0.457	10.668	421.89	2.737	16.673	9.675E-03	1.832E-03	n/a	4.365E-03
PB emergency generators (each)	0.457	3.048	769.11	9.250	56.344	2.765E-02	2.643E-05	n/a	8.640E-04
PB fire pump engines (each)	0.102	3.048	796.89	0.779	96.051	9.513E-04	1.813E-06	n/a	4.756E-05
Common Area em generator	0.203	5.486	730.22	1.062	32.745	1.893E-03	3.021E-06	n/a	9.465E-05
Common Area fire pump engine	0.102	3.962	783.00	0.460	56.757	5.946E-04	1.208E-06	n/a	4.360E-05
WSACs (per cell, 4 cells per tower)	2.743	3.658	299.67	69.612	11.778	n/a	n/a	n/a	1.078E-04

Table 5.1D-3
Rio Mesa Solar Electric Generating Facility
Emission Rates and Stack Parameters for Boilers in Startup

	Stack Diam, m	Release Height m	Temp, deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	Emission Rates, g/s			
						NOx	SO2	CO	PM10
Auxiliary Boilers in startup (one unit at each power block)									
Averaging Period: One hour									
Aux Boiler	2.540	41.148	446.89	10.037	1.981	0.7090	1.655E-02	1.727	n/a
Averaging Period: Three hours									
Aux Boiler	2.540	41.148	446.89	10.037	1.981	n/a	1.655E-02	n/a	n/a
Averaging Period: Eight hours									
Aux Boiler	2.540	41.148	446.89	10.037	1.981	n/a	n/a	1.727	n/a
Startup Boilers in startup; Nighttime preservation boilers in operation									
Averaging Period: One hour									
Startup Boiler	1.676	41.148	446.89	4.998	2.265	0.3531	9.281E-03	0.860	n/a
Nighttime Pres. Boiler	0.457	10.668	421.89	2.737	16.673	0.0208	3.971E-03	0.069	n/a
Averaging Period: Three hours									
Startup Boiler	1.676	41.148	446.89	4.998	2.265	n/a	9.281E-03	n/a	n/a
Nighttime Pres. Boiler	0.457	10.668	421.89	2.737	16.673	n/a	3.971E-03	n/a	n/a
Averaging Period: Eight hours									
Startup Boiler	1.676	41.148	446.89	4.998	2.265	n/a	n/a	0.860	n/a
Nighttime Pres. Boiler	0.457	10.668	421.89	2.737	16.673	n/a	n/a	0.069	n/a
Nighttime Preservation Boilers in startup									
Averaging Period: One hour									
Nighttime Pres. Boiler	0.457	10.668	421.89	0.232	1.414	0.0162	4.052E-04	0.039	n/a
Averaging Period: Three hours									
Nighttime Pres. Boiler	0.457	10.668	421.89	0.232	1.414	n/a	4.052E-04	n/a	n/a
Averaging Period: Eight hours									
Nighttime Pres. Boiler	0.457	10.668	421.89	0.232	1.414	n/a	n/a	0.039	n/a

Table 5.1D-4
Rio Mesa Solar Electric Generating Facility
Emission Rates and Stack Parameters for Aux Boilers on Hot Standby

	Stack Diam, m	Release Height m	Temp, deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	Emission Rates, g/s			
						NOx	SO2	CO	PM10
Averaging Period: One hour, all aux boilers on hot standby									
Aux Boilers	2.540	41.148	454.11	8.315	1.641	0.3781	6.624E-03	0.576	n/a
Averaging Period: Three hours, all aux boilers on hot standby									
Aux Boilers	2.540	41.148	454.11	8.315	1.641	n/a	6.624E-03	n/a	n/a
Averaging Period: Eight hours, all aux boilers on hot standby									
Aux Boilers	2.540	41.148	454.11	8.315	1.641	n/a	n/a	0.576	n/a

Table 5.1D-5
Rio Mesa Solar Electric Generating Facility
Calculation of Inversion Fumigation Impacts

Boiler Emission Rates, g/s

Unit	NOx	SO2	CO	PM10	# of Units
Auxiliary Boilers	0.693	0.132	2.306	5.250E-02	9
Startup Boilers	0.345	6.591E-02	0.565	1.307E-02	3
Nighttime Preservation Boilers	2.079E-02	3.971E-03	6.917E-02	3.150E-03	3

Flat Terrain Modeling Results from SCREEN3

Unit	**Unit Impact, ug/m3 per g/s**	**Distance to Maximum (m)**
Auxiliary Boilers	2.186	1100
Startup Boilers	5.82	779
Nighttime Preservation Boilers	73.83	201

Inversion Breakup Modeling Results from SCREEN3

	Unit Impact, ug/m3 per g/s	**Distance to Maximum (m)**
Auxiliary Boilers	2.58	9379
Startup Boilers	4.88	5843
Nighttime Preservation Boilers	0	n/a

Adjust 1-hour impacts for longer averaging periods to account for 90-minute duration of fumigation

	1-hr unit	**3-hr unit**	**8-hr unit**	**24-hr unit**
Auxiliary Boilers	2.58	2.15	1.58	0.88
Startup Boilers	5.82	5.24	4.08	2.33
Nighttime Preservation Boilers	73.83	66.45	51.68	29.53

Calculation of Fumigation Impacts

Case/Avg Period	**NOx**	**SO2**	**CO**	**PM10**
One-Hour				
Auxiliary Boilers	16.1	3.08	53.62	-
Startup Boilers	6.03	1.04	6.91	-
Nighttime Preservation Boilers[a]	4.60	0.88	7.85	-
Total	26.7	5.0	68.4	-
3 Hours				
Auxiliary Boilers	-	2.56	-	-
Startup Boilers	-	1.04	-	-
Nighttime Preservation Boilers[a]	-	0.79	-	-
Total	-	4.4	-	-
8 Hours				
Auxiliary Boilers	-	-	32.8	-
Startup Boilers	-	-	6.91	-
Nighttime Preservation Boilers[a]	-	-	5.49	-
Total	-	-	45.2	-
24 Hours				
Auxiliary Boilers	-	1.05	-	0.42
Startup Boilers	-	0.46	-	0.09
Nighttime Preservation Boilers[a]	-	0.35	-	0.28
Total	-	1.9	-	0.8

a Although inversion breakup fumigation impacts from the nighttime preservation boilers is zero, flat terrain impacts were included to ensure that the evaluation is conservative.