

Appendix C-1

Air Quality Worksheets

## Emission Estimates for Southwest Gulf Railroad Medina County, Texas

Emission Summary	Truck (paved road)			Truck (non-paved road)			Rail		
	lb/Ton	lb PM10	Ton PM10	lb/Ton	lb PM10	Ton PM10	lb/Ton	lb PM10	Ton PM10
Loading Emissions at Quarry	0.011	55,322.0	27.7	0.011	55,322.0	27.7	0.011	55,322.0	27.7
Road Emissions (Loaded)	1.01 lb/VMT	1,922,771	961.4	1.89 lb/VMT	3,608,613	1804.3	N/A	N/A	N/A
Road Emissions (Empty)	0.31 lb/VMT	598,823	299.4	1.38 lb/VMT	2,643,864	1321.9	N/A	N/A	N/A
Loading Emissions at Remote Rail Station	0.011	55,322.0	27.7	0.011	55,322.0	27.7	N/A	N/A	N/A
<b>Total</b>		<b>2,632,237</b>	<b>1,316.1</b>		<b>6,363,121</b>	<b>3,181.6</b>		<b>55,322.0</b>	<b>27.7</b>

### Project Data

Mass of Aggregate Loaded/Unloaded =	5,000,000 tons/yr
Days of Operation per Year =	250 days/year
Rail Car Speed =	25 mph
Transport Truck Speed =	30 mph
Rail Car Distance Traveled =	9 miles/trip
Transport Truck Distance Traveled =	9 miles/trip
Number of Rail Car Trips =	4 trips/day
Number of Transport Truck Trips =	1,700 one-way trips/day
Loaded Vehicle Miles Traveled =	1,912,500 miles/year
Empty Vehicle Miles Traveled =	1,912,500 miles/year

### Paved and Unpaved Road Emission Calculation Data

Paved Road Surface Silt Loading =	1.7 g/m2 (average of normal and worst case from EPA Table 13.2.1-2)
	2.4 grains/ft2 (average of normal and worst case)
Particle Size Multiplier (paved road) =	0.016 lb/VMT (EPA Table 13.2-1.1)
Particle Size Multiplier (unpaved road) =	2.6 lb/VMT (EPA Table 13.2.2-2)
Unpaved Road Silt Loading =	9.15 % (average of haul road to/from pit and plant road from EPA Table 13.2.2-1)
Aggregate Weight for Trucking =	23.5 tons
Average Weight of UnLoaded Truck =	20.0 tons (truck weight only--assumed)
Average Weight of Loaded Truck =	43.5 tons (truck weight and aggregate)

### Emission Calculation Data for Loading and Drop Points

Typical Limestone Moisture Content =	0.7 % (Crushed LS from EPA Table 13.2.4-1)
Typical Limestone Silt Content =	1.6 % (Crushed LS from EPA Table 13.2.4-1)
Particle Size Multiplier (10 microns) =	0.35 (EPA page 14.2.4-3)
Mean Wind Speed =	9.4 mph (for San Antonio from "Climate of the States", 3rd Edition)

### Additional Calculation Notes:

Unpaved Road Emission Factors were calculated based on Equation (1) in EPA section 13.2.2 relating to Unpaved Roads

The constants for equation (1) are from Table 13.2.2-2 relating to PM-10 emissions.

Paved Road emission factors were calculated based on Equation (1) in EPA section 13.2.1 relating to Paved Roads

Loading emission factors were calculated based on Equation (1) in EPA section 13.2.4 relating to Aggregate Handling and Storage Piles. The Particle Size Multiplier is based on a 10 micron diameter.

**Emission Estimates for Southwest Gulf Railroad Medina County, Texas**

**Route: Proposed Rail and No-Action Truck**

Emission Summary	Truck		Rail	
	lb/year	Ton/year	lb PM10	Ton PM10
NOx Emissions	6.74E+05	337.0	9.99E+04	50.0
CO Emissions	2.61E+06	1,306	5.71E+04	28.5
PM Emissions	1.69E+04	8.4	5.14E+03	2.6
VOC Emissions	2.19E+05	109.5	1.50E+04	7.5

**Project Data**

Days of Operation per Year =	250	days/year
Rail Car Speed =	25	mph
Transport Truck Speed =	30	mph
Rail Car Distance Traveled =	9	miles/trip (7mile + 2 mile loading loop)
Transport Truck Distance Traveled =	9	miles/trip (7mile + 2 mile loading loop)
Number of Rail Car Trips =	4	trips/day
Number of Transport Truck Trips =	1,700	trips/day
Locomotive Miles Traveled =	9,000	miles/year
Truck Miles Traveled =	3,825,000	miles/year
Locomotive Time Traveled =	360	hours/year
Truck Time Traveled =	127,500	hours/year
Locomotive Horsepower =	9,000	horsepower
Truck Horespower =	600	horsepower (assumed)

**Heavy Duty Highway Diesel Engine Federal Emission Standards**

NOx =	4.0	g/bhp-hr
CO =	15.5	g/bhp-hr
PM =	0.1	g/bhp-hr
VOC =	1.3	g/bhp-hr

**Locomotive Federal Emission Standards**

NOx =	14.0	g/bhp-hr
CO =	8.0	g/bhp-hr
PM =	0.7	g/bhp-hr
VOC =	2.1	g/bhp-hr

**Additional Calculation Notes:**

Heavy Duty Highway Diesel Engine Factors are from the EPA's September 1997 guidance document entitled "Emission Standards Reference Guide for Heavy-Duty and Nonroad Engines."

The Federal Standard for 1998+ Heavy Duty Highway Engines has been used for the estimates.

Locomotive Emission Factors are from the EPA's December 1997 document entitled "Final Emission Standards for Locomotives."

SO2 emissions will be based on fuel sulfur content which is proposed to be as low as 15ppm.

**Emission Estimates for Southwest Gulf Railroad Medina County, Texas**

**Route: Alternative 1 Rail and No-Action Truck**

Emission Summary	Truck		Rail	
	lb/year	Ton/year	lb PM10	Ton PM10
NOx Emissions	6.74E+05	337.0	1.22E+05	61.1
CO Emissions	2.61E+06	1,305.9	6.98E+04	34.9
PM Emissions	1.69E+04	8.4	6.28E+03	3.1
VOC Emissions	2.19E+05	109.5	1.83E+04	9.2

**Project Data**

Days of Operation per Year =	250	days/year
Rail Car Speed =	25	mph
Transport Truck Speed =	30	mph
Rail Car Distance Traveled =	11	miles/trip (9mile + 2 mile loading loop)
Transport Truck Distance Traveled =	9	miles/trip (7mile + 2 mile loading loop)
Number of Rail Car Trips =	4	trips/day
Number of Transport Truck Trips =	1,700	trips/day
Locomotive Miles Traveled =	11,000	miles/year
Truck Miles Traveled =	3,825,000	miles/year
Locomotive Time Traveled =	440	hours/year
Truck Time Traveled =	127,500	hours/year
Locomotive Horsepower =	9,000	horsepower
Truck Horespower =	600	horsepower (assumed)

**Heavy Duty Highway Diesel Engine Federal Emission Standards**

NOx =	4.0	g/bhp-hr
CO =	15.5	g/bhp-hr
PM =	0.1	g/bhp-hr
VOC =	1.3	g/bhp-hr

**Locomotive Federal Emission Standards**

NOx =	14.0	g/bhp-hr
CO =	8.0	g/bhp-hr
PM =	0.7	g/bhp-hr
VOC =	2.1	g/bhp-hr

**Additional Calculation Notes:**

Heavy Duty Highway Diesel Engine Factors are from the EPA's September 1997 guidance document entitled "Emission Standards Reference Guide for Heavy-Duty and Nonroad Engines."

The Federal Standard for 1998+ Heavy Duty Highway Engines has been used for the estimates.

Locomotive Emission Factors are from the EPA's December 1997 document entitled "Final Emission Standards for Locomotives."

SO2 emissions will be based on fuel sulfur content which is proposed to be as low as 15ppm.

**Emission Estimates for Southwest Gulf Railroad Medina County, Texas**

**Route: Alternative 2 Rail and No-Action Truck**

Emission Summary	Truck		Rail	
	lb/year	Ton/year	lb PM10	Ton PM10
NOx Emissions	6.74E+05	337.0	9.99E+04	50.0
CO Emissions	2.61E+06	1,305.9	5.71E+04	28.5
PM Emissions	1.69E+04	8.4	5.14E+03	2.6
VOC Emissions	2.19E+05	109.5	1.50E+04	7.5

**Project Data**

Days of Operation per Year =	250	days/year
Rail Car Speed =	25	mph
Transport Truck Speed =	30	mph
Rail Car Distance Traveled =	9	miles/trip (7mile + 2 mile loading loop)
Transport Truck Distance Traveled =	9	miles/trip (7mile + 2 mile loading loop)
Number of Rail Car Trips =	4	trips/day
Number of Transport Truck Trips =	1,700	trips/day
Locomotive Miles Traveled =	9,000	miles/year
Truck Miles Traveled =	3,825,000	miles/year
Locomotive Time Traveled =	360	hours/year
Truck Time Traveled =	127,500	hours/year
Locomotive Horsepower =	9,000	horsepower
Truck Horespower =	600	horsepower (assumed)

**Heavy Duty Highway Diesel Engine Federal Emission Standards**

NOx =	4.0	g/bhp-hr
CO =	15.5	g/bhp-hr
PM =	0.1	g/bhp-hr
VOC =	1.3	g/bhp-hr

**Locomotive Federal Emission Standards**

NOx =	14.0	g/bhp-hr
CO =	8.0	g/bhp-hr
PM =	0.7	g/bhp-hr
VOC =	2.1	g/bhp-hr

**Additional Calculation Notes:**

Heavy Duty Highway Diesel Engine Factors are from the EPA's September 1997 guidance document entitled "Emission Standards Reference Guide for Heavy-Duty and Nonroad Engines."

The Federal Standard for 1998+ Heavy Duty Highway Engines has been used for the estimates.

Locomotive Emission Factors are from the EPA's December 1997 document entitled "Final Emission Standards for Locomotives."

SO2 emissions will be based on fuel sulfur content which is proposed to be as low as 15ppm.

**Emission Estimates for Southwest Gulf Railroad Medina County, Texas**

**Route: Alternative 3 Rail and No-Action Truck**

Emission Summary	Truck		Rail	
	lb/year	Ton/year	lb PM10	Ton PM10
NOx Emissions	6.74E+05	337.0	9.99E+04	50.0
CO Emissions	2.61E+06	1,305.9	5.71E+04	28.5
PM Emissions	1.69E+04	8.4	5.14E+03	2.6
VOC Emissions	2.19E+05	109.5	1.50E+04	7.5

**Project Data**

Days of Operation per Year =	250	days/year
Rail Car Speed =	25	mph
Transport Truck Speed =	30	mph
Rail Car Distance Traveled =	9	miles/trip (7mile + 2 mile loading loop)
Transport Truck Distance Traveled =	9	miles/trip (7mile + 2 mile loading loop)
Number of Rail Car Trips =	4	trips/day
Number of Transport Truck Trips =	1,700	trips/day
Locomotive Miles Traveled =	9,000	miles/year
Truck Miles Traveled =	3,825,000	miles/year
Locomotive Time Traveled =	360	hours/year
Truck Time Traveled =	127,500	hours/year
Locomotive Horsepower =	9,000	horsepower
Truck Horespower =	600	horsepower (assumed)

**Heavy Duty Highway Diesel Engine Federal Emission Standards**

NOx =	4.0	g/bhp-hr
CO =	15.5	g/bhp-hr
PM =	0.1	g/bhp-hr
VOC =	1.3	g/bhp-hr

**Locomotive Federal Emission Standards**

NOx =	14.0	g/bhp-hr
CO =	8.0	g/bhp-hr
PM =	0.7	g/bhp-hr
VOC =	2.1	g/bhp-hr

**Additional Calculation Notes:**

Heavy Duty Highway Diesel Engine Factors are from the EPA's September 1997 guidance document entitled "Emission Standards Reference Guide for Heavy-Duty and Nonroad Engines."

The Federal Standard for 1998+ Heavy Duty Highway Engines has been used for the estimates.

Locomotive Emission Factors are from the EPA's December 1997 document entitled "Final Emission Standards for Locomotives."

SO2 emissions will be based on fuel sulfur content which is proposed to be as low as 15ppm.

## Emission Estimates for Southwest Gulf Railroad Medina County, Texas

### Route: MCEAA Medina Dam Route

Emission Summary	Rail	
	lb PM10	Ton PM10
NOx Emissions	1.32E+05	66.1
CO Emissions	7.55E+04	37.7
PM Emissions	6.79E+03	3.4
VOC Emissions	1.98E+04	9.9

### Project Data

Days of Operation per Year =	250	days/year
Rail Car Speed =	25	mph
Rail Car Distance Traveled =	11.90	miles/trip (route + 2 mile loading loop)
Number of Rail Car Trips =	4	roundtrips/day
Locomotive Miles Traveled =	11,900	miles/year
Locomotive Time Traveled =	476	hours/year
Locomotive Horsepower =	9,000	horsepower

### Locomotive Federal Emission Standards

NOx =	14.0	g/bhp-hr
CO =	8.0	g/bhp-hr
PM =	0.7	g/bhp-hr
VOC =	2.1	g/bhp-hr

### Additional Calculation Notes:

Locomotive Emission Factors are from the EPA's December 1997 document entitled

"Final Emission Standards for Locomotives."

SO2 emissions will be based on fuel sulfur content which is proposed to be as low as 15ppm.

## Emission Estimates for Southwest Gulf Railroad Medina County, Texas

### Route: Eastern Bypass Route

Emission Summary	Rail	
	lb PM10	Ton PM10
NOx Emissions	1.24E+05	62.2
CO Emissions	7.11E+04	35.5
PM Emissions	6.40E+03	3.2
VOC Emissions	1.87E+04	9.3

### Project Data

Days of Operation per Year =	250	days/year
Rail Car Speed =	25	mph
Rail Car Distance Traveled =	11.20	miles/trip (route + 2 mile loading loop)
Number of Rail Car Trips =	4	roundtrips/day
Locomotive Miles Traveled =	11,204	miles/year
Locomotive Time Traveled =	448	hours/year
Locomotive Horsepower =	9,000	horsepower

### Locomotive Federal Emission Standards

NOx =	14.0	g/bhp-hr
CO =	8.0	g/bhp-hr
PM =	0.7	g/bhp-hr
VOC =	2.1	g/bhp-hr

### Additional Calculation Notes:

Locomotive Emission Factors are from the EPA's December 1997 document entitled

"Final Emission Standards for Locomotives."

SO2 emissions will be based on fuel sulfur content which is proposed to be as low as 15ppm.

## Emission Estimates for Southwest Gulf Railroad Medina County, Texas

### Route: SGR Modified Medina Dam Route

Emission Summary	Rail	
	lb PM10	Ton PM10
NOx Emissions	1.43E+05	71.6
CO Emissions	8.18E+04	40.9
PM Emissions	7.36E+03	3.7
VOC Emissions	2.15E+04	10.7

### Project Data

Days of Operation per Year =	250	days/year
Rail Car Speed =	25	mph
Rail Car Distance Traveled =	12.89	miles/trip (route + 2 mile loading loop)
Number of Rail Car Trips =	4	roundtrips/day
Locomotive Miles Traveled =	12,894	miles/year
Locomotive Time Traveled =	516	hours/year
Locomotive Horsepower =	9,000	horsepower

### Locomotive Federal Emission Standards

NOx =	14.0	g/bhp-hr
CO =	8.0	g/bhp-hr
PM =	0.7	g/bhp-hr
VOC =	2.1	g/bhp-hr

### Additional Calculation Notes:

Locomotive Emission Factors are from the EPA's December 1997 document entitled "Final Emission Standards for Locomotives."

SO2 emissions will be based on fuel sulfur content which is proposed to be as low as 15ppm.

**Mobile Source and Rail Loading Emissions for Proposed Route and Various Alternatives**

	<b>Proposed Route</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>MCEAA Dam Alternative</b>	<b>Eastern Bypass Alternative</b>	<b>Modified Dam Alternative</b>
	<b>Ton/year</b>	<b>Ton/year</b>	<b>Ton/year</b>	<b>Ton/year</b>	<b>Ton/year</b>	<b>Ton/year</b>	<b>Ton/year</b>
<b>Mobile Source</b>							
NOx Emissions	50.0	61.1	50.0	50.0	66.1	62.2	71.6
CO Emissions	28.5	34.9	28.5	28.5	37.7	35.5	40.9
PM Emissions	2.6	3.1	2.6	2.6	3.4	3.2	3.7
HC Emissions	7.5	9.2	7.5	7.5	9.9	9.3	10.7
<b>Rail Loading</b>							
PM Emissions	27.7	27.7	27.7	27.7	27.7	27.7	27.7

**No-Action Alternative--Annual PM<sub>10</sub> Emissions from Transport of Aggregate via Truck**

<b>Emission Summary</b>	<b>Truck (paved road)</b>		<b>Truck (non-paved road)</b>	
	<b>lb PM10</b>	<b>Ton PM10</b>	<b>lb PM10</b>	<b>Ton PM10</b>
Loading Emissions at Quarry	55,322.0	27.7	55,322.0	27.7
Road Emissions (Loaded)	1,922,771	961.4	3,608,613	1,804.3
Road Emissions (Empty)	598,823	299.4	2,643,864	1,321.9
Loading Emissions at Remote Rail Station	55,322.0	27.7	55,322.0	27.7
<b>Total</b>	<b>2,632,237</b>	<b>1,316.1</b>	<b>6,363,121</b>	<b>3,181.6</b>

**Mobile Source Emissions from Truck Transport of Aggregate**

<b>Emission Summary</b>	<b>Truck</b>	
	<b>lb/year</b>	<b>Ton/year</b>
NOx Emissions	6.74E+05	337
CO Emissions	2.61E+06	1,306
PM Emissions	1.69E+04	8.4
VOC Emissions	2.19E+05	109.5