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Air Quality

NOTICE OF INTENT
FOR THE HORIZON MINE
CARBON COUNTY, UTAH

LODESTAR ENERGY, INC.
Carbon County, Utah

February 3, 2000

Prepared by

EARTHFAX ENGINEERING, INC.
Engineers/Scientists
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EarthFax

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February 3, 2000

Ursula Kramer, Director
Utah Division of Air Quality
Attn: NSR Section, M. Maung
P.O. Box 144820
Salt Lake City, Utah 84114-4820

Subject: NOI for the Horizon Coal Mine in Carbon County, Utah

Dear Mrs. Trueman

EarthFax Engineering, Inc. is pleased to submit this NOI in behalf of Lodestar Energy, Inc. for the Horizon Coal Mine in Carbon County, Utah. This NOI has been prepared in accordance with the guidance document, "Preparing A Notice of Intent [NOI] The NOI Guide", prepared by the Utah Division of Air Quality. Also, to aid in the review process, the electronic files for the calculations, text, tables and figures have been placed on the disk included in the NOI.

This NOI should be complete. The prompt review of this application would be greatly appreciated. Any questions or concerns may be directed to myself at 561-1555. I will endeavor to respond to any questions promptly.

Sincerely,

Layne D. Jensen

Layne D. Jensen, P.E.
Environmental Engineer

Attachments: Notice of Intent for the Horizon Coal Mine

cc: David Miller
UDOGM
file

File in:
C/007/086 2000 Incoming
Refer to:
❑ Confidential
❑ Shelf
X Expandable
Date 2/03/00 for additional information

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NOTICE OF INTENT FOR THE HORIZON MINE
CARBON COUNTY, UTAH

CHAPTER 1
INTRODUCTION

The Horizon mine began production in January 1997 under Utah Division of Air Quality Approval Order ("AO") number BAQE-336-91 dated May 23, 1991. The facility is an underground coal mine and was initially permitted to produce 220,000 tons/year on a rolling 12-month period. The Standard Industrial Classification Code for this type of facility is 1222. The present owners of the mine, Lodestar Energy, Inc., want to modify the site and increase the production limit to 1.2 million tons/year of coal mined. The general owner and facility information is as follows:

Company name and address:

Lodestar Energy, Inc.
HC35, PO Box 370
Helper, Utah 84526
Phone no.: (435) 472-3994
Fax no.: (435) 448-9456

Company contact for environmental issues:

David B. Miller, Business Manager
HC35, PO Box 370
Helper, Utah 84526
Phone no.: (435) 637-9200
Fax no.: (435) 448-9456

Facility Address:

12530 Consumers Road
Helper, Utah 84526
Phone no.: (435) 472-3994
Fax no.: (435) 472-3980

Owners name and address:

Lodestar Energy, Inc.
333 West Vine Street, suite 1700
Lexington, Kentucky 40507
Phone no.: (606) 255-4006

The Horizon Mine is located in Carbon County which is not classified as a non-attainment area for any pollutant. A site map of the mine surface facilities can be seen in Appendix A. The facility can be reached by turning west off of U.S. Highway 6 between Helper and Price, Utah onto County Road 290, also referred to as Consumers Road. The

facility is located on Beaver Creek Road which is approximately 12 miles from the highway. The mine surface facilities are on the right about 1200 feet from County Road 290. The coordinates of the mine are as follows:

Latitude: 39° 41' 37"	Longitude: 111° 02' 58"	
Township: T13S	Range: R8E	Section: 17
UTM Northing: 4393544	UTM Easting: 495761	

CHAPTER 2
PROCESS DESCRIPTION

The Horizon Mine is an underground bituminous coal mine that utilizes the room and pillar mining method. A flow chart describing the process and identifying the emission points can be found on Figure 1. In the room and pillar method of mining, a continuous miner is used to extract coal from "rooms" while leaving some coal in place, called "pillars", to support the roof. After mining has advanced as far as planned, additional coal will be extracted from the pillars as mining equipment retreats. This is referred to as "pulling pillars".

The extraction of the coal is performed by a continuous miner which has a rotating drum with teeth that pulls down the coal and loads it onto a drag-chain conveyor in one step. The continuous miner's drag-chain conveyor loads a shuttle car which transports the coal to a feeder breaker. The shuttle car unloads to the feeder breaker using a drag-chain conveyor. The feeder breaker breaks large chunks of coal to a more manageable size and loads the coal onto a 48-inch panel conveyor belt. Depending on the location of the mining section, the coal on the conveyor belt may go through up to four transfer points before reaching the surface.

As shown on the surface facilities map in Appendix A, the coal will go through another transfer point and a chute that can either divert the coal into a stockpile or keep it on the conveyor belt. All the coal will go through a screen that sends any coal greater than two inches to a double roll crusher. A screen analysis of run of mine coal, from a similar operation in the same coal seams, shows that less than 20% of the coal is greater than two inches in diameter. Therefore, it is anticipated that less than 20% of the total production will be diverted through the crusher

Following screening and crushing, the coal can be dropped into one of three stockpiles. At least 90% of the coal is discharged to the main stockpile via a stacker tube. The coal not discharged to the main stockpile is diverted from the belt prior to the stacker tube by a plow. The final step in this process is to load the coal from the stockpiles with a front end loader into belly dump trucks with pup trailers for transport to a coal loadout. Note that in the above narrative the only equipment not electric powered is the front end loader which loads the coal into licensed trucks under contract with the mine.

2.1 EQUIPMENT

The current Approval Order lists the following equipment/facilities:

A. Covered conveyors (3)
B. Crusher station
C. Temporary coal pile
D. Under-pile reclaim system
E. Truck loadout with lowering chute
F. Front end loader
G. Haul road

The crusher station, under-pile reclaim system, and truck loadout with lowering chute have not been constructed. Only the crusher station is expected to be constructed in the future. The above list does not include all of the surface equipment necessary to mine 220,000 tons of coal per year. For example a screen, grader, forklift, water truck, and mine ventilation fan is also needed.

The emissions have been estimated assuming two production rates: 220,000 tons/year and 1,200,000 tons/year. The emissions under the current permit were calculated so that the actual increase in emissions could be determined. Essentially the same surface equipment is needed to produce 220,000 tons/ year as to produce

1,200,000 tons/year. Only the amount of time that the equipment will be operating will increase.

The following is a list of surface equipment needed to produce 1.2 million tons of coal per year:

A. Front end loader
B. Crushing and screening station
C. Forklift
D. Grader
E. Generator
F. Water truck
G. Covered conveyors
H. Stacker tube
I. Mine ventilation fan
J. Coal stockpile
K. Haul road

The equipment to be used on the surface has been listed above. The specific underground equipment has not been listed since, according to 40 CFR Section 60.670(a)(2) Subpart OOO Standards of Performance for Nonmetallic Mineral Processing Plants, facilities in underground mines are not subject to this subpart. Although emissions from underground operations are not calculated for individual emission points, fugitive dust from mine ventilation has been estimated. Subsequent sections in this document include reference to underground equipment and operations to assist the reviewer in understanding the operation.

2.2 EMISSION CONTROL EQUIPMENT

Emission-control equipment at the site includes water sprays, sprinklers, and a water truck. Underground operations are regulated by the Mine Safety and Health Administration ("MSHA"). MSHA monitors air quality in the mine closely. Water sprays

have been installed on all stationary underground emission points. Water sprays are also used on the surface to control emissions from the screen and crusher when temperature allows. The water sprays are #3 nozzles with a water pressure of 50 or 75 psi with a flow rate of 0.5 and 0.75 gpm respectively. When temperature allows, sprinklers will be installed to keep piles, unpaved roads, and disturbed areas wet. A water truck will also be used to keep unpaved roads wet.

CHAPTER 3

EMISSION POINTS

The vast majority of emissions resulting from coal mining are fugitive dust emissions. The only equipment to emit pollutants other than fugitive dust, on the surface, are the front end loader, water truck, forklift, and grader. No Hazardous Air Pollutants ("HAPS") will be released from this facility. Both underground and surface emission points are discussed below, although only emissions from surface emissions points have been calculated. The underground emission points are discussed to aid the reviewer in understanding the operation. The emission points associated with the mine are identified and discussed below.

Continuous miner, underground- This is a source of fugitive dust emissions. This single machine has three separate operations that produce fugitive dust: 1) The cutting of the coal from the face by the rotating drum, 2) the loading of the coal onto the drag chain conveyor, and 3) the drag-chain conveyor dropping the coal into the shuttle car. Water sprays have been installed on the continuous miner, to reduce respirable dust, as required by the Mining Safety and Health Administration ("MSHA). The emissions from the coal are also reduced by the fact that the coal is an aquifer and as a result, the coal is wet. Under maximum production, two continuous miners will be operating. The continuous miner is powered by electricity and as such has no emissions from combustion.

Shuttle cars, underground- The shuttle cars produce fugitive dust. The shuttle cars travel between the continuous miner and the panel conveyor belt. A shuttle car is basically a low profile electric-powered truck that can unload itself. The shuttle car produces emissions in two ways. First, the tires produce dust during tramming. Second, dust is produced when the shuttle car uses a drag-chain conveyor to unload into the feeder breaker. Emissions from the shuttle cars wheels are

controlled by the wet floor. Groundwater keeps most of the mine moist all the time. Dust resulting from unloading the shuttle car is controlled by water sprays. Up to four shuttle cars may operate when the mine is at maximum production.

Transfer points, underground- Depending on the location of active mining, there may be up to four transfer points underground when the mine is at full production. The transfer points are a source of fugitive dust. Water sprays have been installed at all underground transfer points as required by MSHA. Additional dust suppression results from the fact that the coal is wet due to groundwater.

Transfer points, surface- There are four possible transfer points on the surface that produce fugitive dust. The first transfer point simply changes the direction of the conveyor belt. The second transfer point is a drop associated with the crushing and screening unit. Following crushing and screening, the coal can either be dropped to a stockpile or back onto the conveyor belt. The third transfer point is an angled piece of metal that can be lowered down to the conveyor belt to plow the coal off of the belt. Only 5 percent or less of the coal produced will be diverted off the belt by the plow. The fourth transfer point is the drop to the main stockpile via a stacker tube. None of these drop points have control equipment. However, when the coal reaches the surface it is always wet from groundwater and the underground water sprays. Although not designed as an emission control device, the stacker tube reduces emissions by keeping dust inside the tube and causing the coarser coal to be on the surface of the coal pile. Doors have been installed on the windows of the stacker tube to keep dust inside the tube to the extent possible. Water sprays have not been installed since emissions are adequately controlled by the fact that the coal is wet and has a high moisture content. The Horizon Mine is at a location that is over 7500 feet above sea level. As a result there are only four to six months out of the year that the temperature does not drop below freezing,

creating problems with ice build up if water sprays were used in the stacker tube. Water sprays could only be used 30 to 50% of the year.

Crusher and Screening station, surface- This is a source of fugitive dust. All coal produced will be put through the screen. Coal greater than 2 inches in diameter is diverted to a double-roll crusher. According to a screen analysis from a similar operation, less than 20% of the mine production will go to the crusher. The emissions from the screen and crusher will be controlled by water sprays when the temperature allows. At times when the water sprays cannot be used, the moisture content of coal (9%) and water on the coal from underground water sprays will control emissions.

Loading coal into trucks, surface- This is another source of fugitive dust. A front-end loader loads the trucks out of the stockpiles. Dust is produced when the front-end loader digs into the coal stockpile and when the coal is dumped into the trucks. Emissions from this activity are controlled by the coal being wet. The coal stockpiles remain wet when coal is being produced and hauled off on a regular basis. If a stockpile remains inactive long enough for it to dry out, the stockpile will be sprayed with water prior to loading trucks.

Wind erosion of stockpiles, surface- Wind blowing across the stockpiles picks up coal fines and thus becomes a source of fugitive dust. As mentioned above, the stockpiles remain wet during normal operation. However, if the stockpile drys out it will be sprayed with water.

Unpaved roads, underground- The unpaved roads underground are used for personnel transport, maintenance, and to haul supplies. This traffic produces fugitive dust. As mentioned previously this mine is very wet. The roads are far more likely to be mud than to become dry. In the case that roads do dry out, a

chemical dust suppressant, such as magnesium chloride, will be applied every one to four weeks depending on conditions to control dust.

Unpaved roads, surface- The unpaved surface roads are used for the coal haul trucks, front-end loader, personal vehicles, and mine vehicles. The vast majority of fugitive dust is produced by the coal haul trucks and the front-end loader. Emissions will be controlled by using a water truck and sprinklers to keep the road surface moist. The water truck and sprinklers will be used to control dust when temperatures do not make water on the road dangerous. A chemical dust suppressant will be used if water cannot be used safely.

Disturbed ground, surface- Land that has been denuded of vegetation produces more fugitive dust that vegetated undisturbed ground. To the extent possible, all land disturbed by development of the mine has been reclaimed and revegetated. The majority of the operating areas are included in the stockpiles and unpaved roads, which are being controlled by the water truck and sprinklers. The water truck and sprinklers will be used to distribute water on the disturbed area.

Conveyor belts, surface and underground- The conveyor belts do produce some fugitive dust emissions, However, the fugitive dust generated is not significant. What little dust may be generated is controlled by the fact that the coal is wet and the surface conveyors are covered. Since this is an insignificant source of emissions, no calculations have been made.

Roof bolting- After coal has been extracted, the roof of the remaining opening must be supported. This involves drilling a hole into the roof and using a resin and mechanical anchor to anchor a steel rod and plate to the roof. This binds the overlaying rock layers together making them act as a stronger single unit. Drilling the hole in the roof produces fugitive dust. This dust is controlled by the water

pumped through the drill bit to keep it cool. Emissions from the roof bolting are negligible since any dust is turned to mud before exiting the drill hole. The roof bolter is powered by electricity. Therefore, there are no fugitive dust emissions from this piece of equipment.

Internal combustion engines, surface and underground- This is the only emission source that produces pollutants other than fugitive dust. Internal combustion engines produce non-fugitive dust, oxides of nitrogen ("NOx"), oxides of sulfer ("SOx"), carbon monoxide ("CO"), and total organic compounds ("TOC"). The equipment with internal combustion engines include the front-end loader, water truck, mine transports, scoop, forklift, generator, and grader. These all operate on diesel fuel. The emissions are controlled by maintaining the equipment within manufacturer recommendations.

All emissions that occur underground do not impact the ambient air quality until the ventilation air reaches the portals and vent shaft. In addition to the water sprays and other methods of dust suppression in the mine, the fugitive dust emissions from the mine are further reduced by the fact that the ventilation air may travel several miles before being discharged to the atmosphere. This allows more of the coarse dust to settle out before reaching the vent shaft. In addition, the walls, floor, and roof of the openings are wet due to ground water. As the ventilation air travels through the mine, dust particles will adhere to the wet walls, floor, and roof, thereby reducing the fugitive dust released to the atmosphere.

CHAPTER 4
AIR POLLUTION CONTROL EQUIPMENT

The air pollution control equipment ("APCE") for the mine consists of water sprays, sprinklers, a water truck, and chemical dust suppressants if needed. The water sprays are limited in use due to the high elevation of the mine. Due to freezing problems, the water sprays can be used less than half of the year. However, when temperature allow, water sprays will be used to further control emissions from the screen and crusher. The mine stays at a fairly uniform temperature. Therefore, water sprays can be used underground all year. The underground water sprays will be operating whenever the mine is producing coal. More details on the water sprays can be found in Section 2.2.

The water truck and sprinklers will apply water to operational areas, unpaved roads, and stockpiles when needed, unless the application of water will create a dangerous situation due to freezing. Fortunately, during months in which water cannot be applied, due to freezing conditions, natural precipitation keeps the surfaces moist. A chemical dust suppressant also may be used to control emissions from the haul roads if needed.

In the case that the underground unpaved roads dry out, a chemical dust suppressant will be used, such as magnesium chloride, or calcium chloride. When ventilation air is not extremely dry, the mine may wait up to 4 weeks between applications of a chemical dust suppressant. However, when ventilation air is extremely dry, application of chemical dust suppressant may be as frequent as once a week.

The need for APCE at the mine has been reduce by the natural conditions in which the coal is mined. Much of the fugitive dust emissions from the handling of the coal have been reduced because the coal is wet when it is mined. The fact that the walls, floor, and roof of the openings are constantly moist also reduces the fugitive dust released to the atmosphere.

CHAPTER 5
EMISSION CALCULATIONS

The emissions for the surface emission points identified in Section 2.1 have been calculated assuming a production rate of 220,000 tons/year and the proposed production rate of 1,200.000 tons/year. Emissions for both conditions have been made since original calculations for the current AO did not include all of the emission points, such as mobile equipment needed to produce coal.

Modeling requirements are based on the emission increase. Therefore, calculations for the current conditions were made so the current and proposed conditions could be compared.

Emission summary tables for TSP, PM-10, NOx, SOx, and CO can be found on Tables 5-1 through 5-5 respectively. These tables contain the results of calculations for current and proposed conditions, as well as emission rates under controlled and uncontrolled conditions. The actual calculations for current and proposed conditions can be found in Appendix B. Each emission point or group of similar emission points has a calculation sheet. The calculation sheet contains the input data, equations, emission factors, source reference, and comments about assumptions made. Justification for the emission rates can be found on the individual calculation sheets in Appendix B.

Emission rates have been calculated using emission factors and equations from the most recent version of EPA's AP-42, with the exception of the emission rate for mine ventilation. The PM-10 emission rate for mine ventilation is based on 50% of the MSHA respirable dust limit of 2 mg/m^3. The emissions from mine ventilation were assumed to be at 50% of the MSHA limit during the time at which the mine is in production. The MSHA limit is enforced at the source of the emission and not at the portals and vent shaft.

Therefore, the dust concentration is much less after dilution by mine ventilation air. The wet nature of the mine also reduces the dust concentration before the ventilation air reaches the surface.

CHAPTER 6

BEST AVAILABLE CONTROL TECHNOLOGY

A Best Available Control Technology ("BACT") analysis was made for each emission point mentioned in Section 3.0. The emission points underground will be discussed first followed by a discussion of the surface emission points. The inclusion of the underground equipment in the BACT analysis is included for the benefit of the reviewer to demonstrate that underground emissions are being controlled, even though underground equipment is not under the jurisdiction of the Division of Air Quality. MSHA regulates underground air quality. The BACT analysis for the underground emission points is as follows:

Continuous miner- The fugitive emissions from the continuous miner are controlled by water sprays. The use of water sprays to reduce the dust from this operation is mandated by MSHA. The effectiveness of the water sprays in reducing the dust is tested quarterly by placing a calibrated pump and filter on or near the continuous miner for an 8-hour period during operation. The MSHA regulatory limit for respirable dust (PM-5 or smaller) is 2 mg/m^3. In addition to the water sprays, the coal is wet when it is extracted, thereby further reducing emissions. Other APCEs, such as baghouses or scrubbers, are not feasible due the mobile nature of the continuous miner. Therefore, water sprays and wet coal at the time of extraction can be considered BACT.

Shuttle cars- The fugitive dust emissions from the shuttle cars are controlled by the groundwater that keeps the unpaved haul route wet, and by water sprays. Keeping an unpaved road wet by the use of a water truck or sprinklers has been accepted as BACT for other facilities such as sand and gravel pits. The emissions generated by the shuttle car unloading the coal are controlled by water sprays. This operation is similar to drop points on a conveyor belt. Water sprays are accepted as BACT for drop points at facilities such as sand and gravel pits. In addition to the water

sprays, the coal is wet from the continuous miner water sprays and groundwater. The methods used to control fugitive dust from the shuttle cars are consistent with BACT requirements.

Underground transfer points- The fugitive dust emissions from the underground transfer points will be controlled by the use of water sprays. The use of water sprays is mandated by MSHA, as it is with the continuous miner. The compliance with MSHA regulations is monitored with the same sampling procedure as for the continuous miner. The use of water sprays is accepted as BACT for conveyor drop points at sand and gravel operations. Therefore, the use of water sprays to control emissions from underground transfer points is consistent with BACT.

Unpaved roads underground- The fugitive dust generated by traffic on underground unpaved roads is controlled by the damp nature of the mine, which keeps roads moist, or by the use of a chemical dust suppressant, if the roads become dry. Keeping unpaved roads wet to control dust is accepted as BACT in other mining applications such and sand and gravel pits. The use of chemical dust suppressants is also accepted as BACT for unpaved roads in mining applications.

Roof Bolting- Water is pumped through the roof bolter during drilling. The cuttings resulting from the drilling are saturated, resulting in little to no dust being generated. Flushing the drill bit with water is the most effective emission control since it prevents dust from being generated. This can be considered to be consistent with BACT requirements.

In summary the fugitive dust emissions resulting from underground operations are controlled by water sprays and the wet nature of the mine. The wet nature of the mine also reduces air born dust due to the dust particles adhering to the moist walls, floor and roof of the openings. The long path ventilation air must take in the mine before being

discharged to the atmosphere also allows larger dust particles settle out. The installed APCE and the natural conditions of the mine make the underground operation consistent with BACT requirements.

The BACT analysis for the surface operations, of the mine, are as follows:

Surface transfer points- The fugitive dust emissions from the surface transfer points are controlled by the moisture on the coal when it exits the mine. After leaving the mine, the coal will travel a maximum of 800 feet on the conveyor belt before being dropped onto a stockpile. Given the short travel distance on the surface, the coal will remain moist at least until it reaches a stockpile. The water on the coal and high moisture content of the coal will reduce fugitive dust emissions. Water sprays are the generally accepted control technology for transfer points. However, water sprays are not a reasonable alternative for this site due to its location. The Horizon mine is located in a canyon at an elevation of about 7500 feet above sea level. The temperature is above freezing for the entire day for only four to six months of the year. Also, it is not unusual for the temperature to drop below freezing at night in July and August. Under these conditions, water sprays are difficult to maintain and cannot be used for most of the year. Using wet material to control emissions from transfer points has been accepted by the Division of Air Quality as BACT for similar operations. Therefore, using moist material to control emissions is consistent with BACT requirements.

Crusher and Screening station- The fugitive dust emissions from the screen and crusher will be controlled by the wet nature of the coal and water sprays, when possible. The crusher and screen are not enclosed. Therefore, the water sprays can only be used when the temperature will be above freezing. Although the water sprays cannot be used all year, the high moisture content of the coal (9%) and the fact that the surface of the coal is wet due to underground water sprays and

groundwater will adequately control emissions. AP-42 Table 11.19.2-2 identifies material with a moisture content of 2.88 or less as being "controlled". The coal to be crushed and screened has a moisture content of 9%. Wet material and water sprays have been accepted by the Division of Air Quality as BACT for similar crushing and screening operations. Therefore, using water sprays and moist material to control emissions is consistent with BACT requirements.

Unpaved surface roads- The fugitive emissions from the unpaved roads on the surface will be controlled by application of water using a water truck and/or sprinklers. Water will be applied to the road if the surface of the road is dry and creating dust, unless the application of water will create a safety problem. Water will not be sprayed on the road if the temperature is such that traffic cannot prevent ice from forming on the road. Fortunately, in the winter when this situation will likely occur, natural precipitation will usually keep the roads moist. A chemical dust suppressant may also be used, if needed. Watering haul roads has been accepted by the Division of Air Quality as BACT for similar operations. Therefore, application of water to unpaved roads is consistent with BACT.

Loading coal into trucks- The fugitive dust generated by loading trucks with coal is controlled by the moisture on the coal. When the mine is actively being worked the moisture on the coal generally keeps the coal in the stockpile moist. In the case that the stockpile drys out, a water truck or sprinklers will spray down the stockpiles. Loading moist material is accepted as BACT in similar mining applications such as sand and gravels pits. Therefore, using moist material to control emissions is consistent with BACT requirements.

Wind erosion of stockpiles- As mentioned above, the stockpiles will be kept wet to control fugitive dust from the stockpiles and during loading. Keeping a stockpile moist is accepted as BACT in mining applications such as sand and gravel pits.

Disturbed ground- Fugitive dust resulting from disturbed ground has been controlled by revegetating all disturbed areas that will not be redisturbed by mining operations. Fugitive dust from operational areas will be controlled by water application when the application of water will not create a safely problem. Keeping the disturbed surface moist is accepted as BACT in similar mining applications such as sand and gravel pits.

Internal combustion engines- Emissions from internal combustion engines are controlled by proper maintenance and operation of equipment with internal combustion engines. Proper maintenance and operation of equipment with internal combustion engines has been accepted as BACT for similar operations utilizing mobile equipment and generators.

The emission control methods used for the surface facilities are consistent with BACT requirements.

CHAPTER 7

MODELING

The equipment changes and production increase for this mine do not result in emission increases that require modeling. Table IV-1 in Appendix IV of the NOI guide lists the minimum criteria pollutant thresholds requiring modeling. The emissions generated as a result of operation under the current AO were estimates so they could be compared to proposed emission rates. As shown in Table 5-3 through 5-5, the total emissions for NOx, SOx, and CO are less than the emission rate that requires modeling.

The current AO only lists an emission rate for TSP and PM-10. The current AO estimated TSP emissions to be 18.4 tons/yr and PM-10 emissions to be 4.3 tons/yr. Using the same assumptions for the proposed as well as the current emissions calculations the annual emission have been estimated to be only 6.37 tons/yr for TSP and 3.48 tons/yr for PM-10, as shown on Tables 5-1 and 5-2. The proposed PM-10 annual emission rate is 7.70 tons per year. Using the calculated current emission rates instead of the emissions in the AO, the increase of PM-10 emissions is 4.22 tons per year.

Table IV-1 list the threshold for modeling for PM-10 to be an increase of 5 tons per year for fugitive PM-10. The increase in total PM-10 emissions are well below this threshold. Therefore, no modeling is being submitted.

Because a large production increase is proposed, Lodestar has committed to the use of water sprays, sprinklers, a water truck and chemical dust suppressants to minimize the impacts of fugitive dust emissions. The commitment to use these emission controls in conjunction with the wet nature of the mine have resulted in no emission increases that require modeling.

CHAPTER 8

CONCLUSION

Lodestar Energy, Inc. has submitted this NOI for the Horizon Coal Mine in Carbon County, Utah to reflect equipment and configuration modifications and to increase production. Lodestar Energy, Inc. has committed to the use of emission controls as described previously to minimize the impact of the site on air quality. A summary of emissions can be found on Tables 5-1 through 5-5, with the actual calculation sheets found in Appendix B. The emission increases resulting from this modification are well below the amount of increase that requires modeling. Therefore, modeling is not being submitted. Finally, this site will not have any hazardous air pollutant emissions.

TABLES

TABLE 5-1

TSP EMISSIONS SUMMARY

Proposed TSP Emissions						
	Uncontrolled Emissions			Controlled Emissions		
Emission Source	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
Loading haul trucks	31.15	26.99	49.83	6.23	5.40	9.97
Crusher	1.01	0.35	0.60	0.25	0.09	0.15
Screen	31.50	11.03	18.90	1.76	0.62	1.06
Grader	6.71	4.47	0.56	1.34	0.89	0.11
Disturbed area	NA	NA	0.95	NA	NA	0.48
Drop to stockpiles	0.15	0.10	0.18	0.15	0.10	0.18
Stockpiles	4.41	4.41	19.30	0.44	0.44	1.93
Mine Ventilation	1.12	1.12	2.43	1.12	1.12	2.43
Surface drop pt.	2.90	2.03	3.48	0.73	0.51	0.87
Haul trucks	5.53	4.79	11.06	0.28	0.24	0.55
Front end loader	19.03	17.13	38.06	0.95	0.86	1.90
Totals	103.50	72.43	145.36	13.24	10.27	19.62

Existing TSP Emissions						
	Uncontrolled Emissions			Controlled Emissions		
Emission Source	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
Loading haul trucks	16.61	9.14	9.14	3.32	1.83	1.83
Crusher	0.50	0.11	0.11	0.12	0.03	0.03
Screen	15.75	3.47	3.47	0.88	0.19	0.19
Grader	4.47	2.24	0.28	0.89	0.45	0.06
Mine ventilation	1.12	1.12	1.21	1.12	1.12	1.21
Disturbed area	NA	NA	0.95	NA	NA	0.48
Drop to stockpiles	0.15	0.03	0.03	0.15	0.03	0.03
Stockpiles	4.41	4.41	19.30	0.44	0.44	1.93
Surface drop pt.	2.90	0.64	0.64	0.73	0.16	0.16
Haul trucks	3.69	1.62	2.03	0.18	0.08	0.10
Front end loader	12.69	5.58	6.98	0.63	0.28	0.35
Totals	62.29	28.35	44.13	8.48	4.61	6.37
Proposed minus Existing	41.21	44.07	101.22	4.77	5.66	13.25

TABLE 5-2

PM-10 EMISSIONS SUMMARY

Proposed PM-10 Emissions						
	Uncontrolled Emissions			Controlled Emissions		
Emission Source	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
Loading haul trucks	4.63	4.01	7.41	0.93	0.80	1.48
Crusher	0.48	0.17	0.29	0.12	0.04	0.07
Screen	15.00	5.25	9.00	0.84	0.29	0.50
Grader	2.30	1.53	0.19	0.46	0.31	0.04
Disturbed area	NA	NA	0.48	NA	NA	0.24
Drop to stockpiles	0.07	0.05	0.08	0.07	0.05	0.08
Stockpiles	2.20	2.20	9.65	0.22	0.22	0.97
Mine ventilation	0.56	0.56	1.21	0.56	0.56	1.21
Surface drop pt.	1.40	0.98	1.68	0.35	0.25	0.42
Haul trucks	1.10	0.95	2.20	0.06	0.05	0.11
Front end loader	3.87	3.48	7.74	0.19	0.17	0.39
Front end loader engine *	14.30	11.44	1.43	14.30	11.44	1.43
Forklift engine *	2.41	1.21	0.18	2.41	1.21	0.18
Grader engine *	2.29	1.14	0.23	2.29	1.14	0.23
Generator *	0.99	0.50	0.09	0.99	0.50	0.09
Water truck Engine *	5.28	2.64	0.26	5.28	2.64	0.26
Totals			42.13			7.70

Existing PM-10 Emissions						
	Uncontrolled Emissions			Controlled Emissions		
Emission Source	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
Loading haul trucks	2.47	1.36	1.36	0.49	0.27	0.27
Crusher	0.24	0.05	0.05	0.06	0.01	0.01
Screen	7.50	1.65	1.65	0.42	0.09	0.09
Grader	1.53	0.77	0.10	0.31	0.15	0.02
Mine ventilation	0.56	0.56	0.61	0.56	0.56	0.61
Disturbed area	NA	NA	0.48	NA	NA	0.24
Drop to stockpiles	0.07	0.02	0.02	0.07	0.02	0.02
Stockpiles	2.20	2.20	9.65	0.22	0.22	0.97
Surface drop pt.	1.40	0.31	0.31	0.35	0.08	0.08
Haul trucks	0.73	0.32	0.40	0.04	0.02	0.02
Front end loader	2.58	1.14	1.42	0.13	0.06	0.07
Front end loader engine *	7.15	3.58	0.72	7.15	3.58	0.72
Forklift engine *	1.21	0.60	0.09	1.21	0.60	0.09
Grader engine *	1.14	0.57	0.11	1.14	0.57	0.11
Generator *	0.50	0.25	0.04	0.50	0.25	0.04
Water truck Engine *	2.64	1.32	0.13	2.64	1.32	0.13
Totals			17.13			3.48
Proposed minus Existing			25.00			4.22

* The engine emissions are given in lbs/day not lbs/hour.

TABLE 5-3

NOx EMISSIONS SUMMARY

Proposed NOx Emissions						
	Uncontrolled Emissions			Controlled Emissions		
Emission Source	Max (lbs/day)	Ave (lbs/day)	(tons/year)	Max (lbs/day)	Ave (lbs/day)	(tons/year)
Front end loader	201.50	161.20	20.15	201.50	161.20	20.15
Forklift engine	33.98	16.99	2.55	33.98	16.99	2.55
Grader engine	32.24	16.12	3.22	32.24	16.12	3.22
Generator	13.95	6.98	1.22	13.95	6.98	1.22
Water truck Engine	74.40	37.20	3.72	74.40	37.20	3.72
Totals	356.07	238.48	30.86	356.07	238.48	30.86

Existing NOx Emissions						
	Uncontrolled Emissions			Controlled Emissions		
Emission Source	Max (lbs/day)	Ave (lbs/day)	(tons/year)	Max (lbs/day)	Ave (lbs/day)	(tons/year)
Front end loader	100.75	50.38	10.08	100.75	50.38	10.08
Forklift engine	16.99	8.49	1.27	16.99	8.49	1.27
Grader engine	16.12	8.06	1.61	16.12	8.06	1.61
Generator	6.98	3.49	0.61	6.98	3.49	0.61
Water truck Engine	37.20	18.60	1.86	37.20	18.60	1.86
Totals	178.03	89.02	15.43	178.03	89.02	15.43
Proposed minus Existing	178.03	149.47	15.43	178.03	149.47	15.43

TABLE 5-4

CARBON MONOXIDE EMISSIONS SUMMARY

Proposed CO Emissions						
Emission Source	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/day)	Ave (lbs/day)	(tons/year)	Max (lbs/day)	Ave (lbs/day)	(tons/year)
Front end loader	43.42	34.74	4.34	43.42	34.74	4.34
Forklift engine	7.32	3.66	0.55	7.32	3.66	0.55
Grader engine	6.95	3.47	0.69	6.95	3.47	0.69
Generator	3.01	1.50	0.26	3.01	1.50	0.26
Water truck Engine	16.03	8.02	0.80	16.03	8.02	0.80
Totals	76.73	51.39	6.65	76.73	51.39	6.65

Existing CO Emissions						
Emission Source	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/day)	Ave (lbs/day)	(tons/year)	Max (lbs/day)	Ave (lbs/day)	(tons/year)
Front end loader	21.71	10.86	2.17	21.71	10.86	2.17
Forklift engine	3.66	1.83	0.27	3.66	1.83	0.27
Grader engine	3.47	1.74	0.35	3.47	1.74	0.35
Generator	1.50	0.75	0.13	1.50	0.75	0.13
Water truck Engine	8.02	4.01	0.40	8.02	4.01	0.40
Totals	38.36	19.18	3.33	38.36	19.18	3.33
Proposed minus Existing	38.36	32.21	3.33	38.36	32.21	3.33

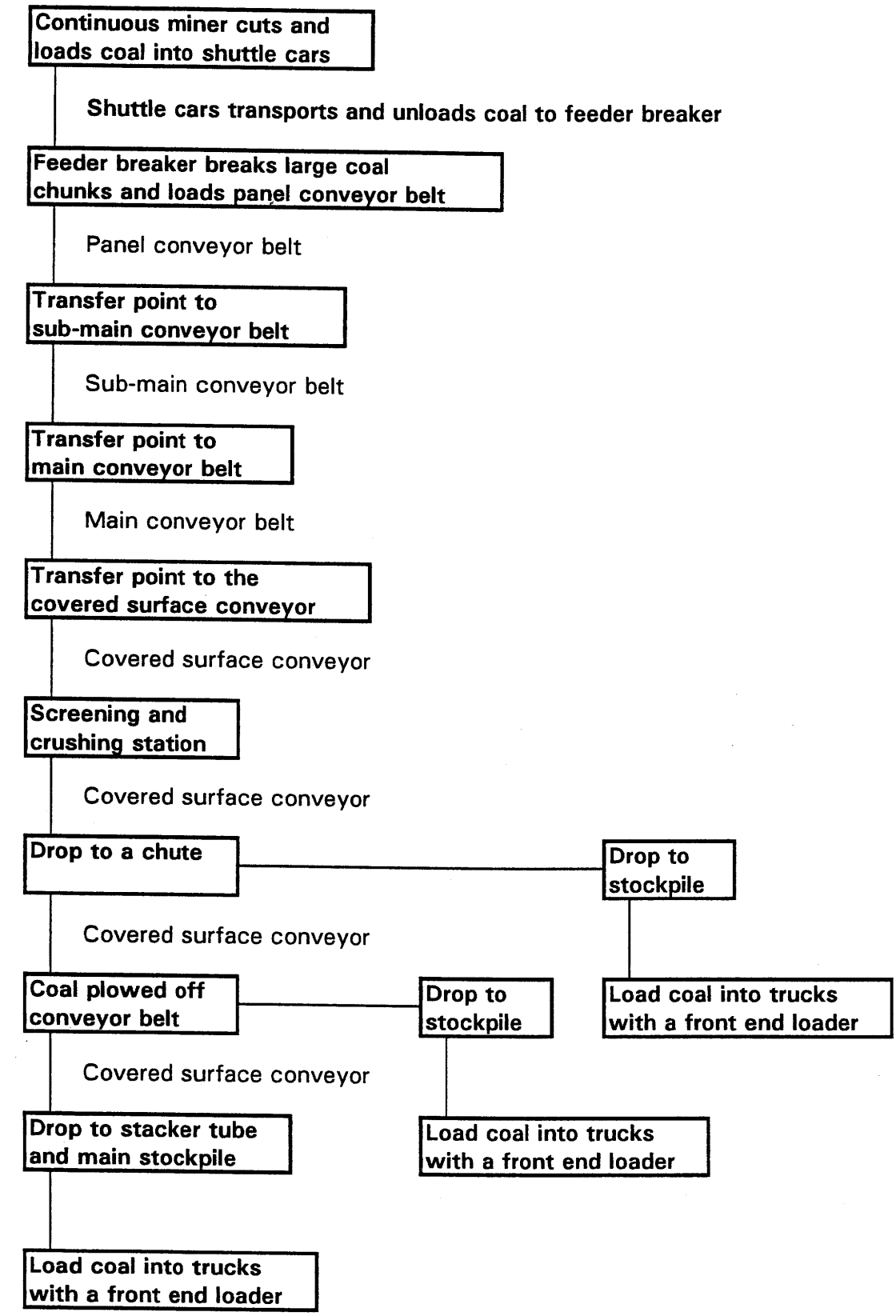
TABLE 5-5

SOx EMISSIONS SUMMARY

Proposed SOx Emissions						
	Uncontrolled Emissions			Controlled Emissions		
Emission Source	Max (lbs/day)	Ave (lbs/day)	(tons/year)	Max (lbs/day)	Ave (lbs/day)	(tons/year)
Front end loader	13.33	10.66	1.33	13.33	10.66	1.33
Forklift engine	2.25	1.12	0.17	2.25	1.12	0.17
Grader engine	2.13	1.07	0.21	2.13	1.07	0.21
Generator	0.92	0.46	0.08	0.92	0.46	0.08
Water truck Engine	4.92	2.46	0.25	4.92	2.46	0.25
Totals	23.55	15.77	2.04	23.55	15.77	2.04

Existing SOx Emissions						
	Uncontrolled Emissions			Controlled Emissions		
Emission Source	Max (lbs/day)	Ave (lbs/day)	(tons/year)	Max (lbs/day)	Ave (lbs/day)	(tons/year)
Front end loader	6.66	3.33	0.67	6.66	3.33	0.67
Forklift engine	1.12	0.56	0.08	1.12	0.56	0.08
Grader engine	1.07	0.53	0.11	1.07	0.53	0.11
Generator	0.46	0.23	0.04	0.46	0.23	0.04
Water truck Engine	2.46	1.23	0.12	2.46	1.23	0.12
Totals	11.77	5.89	1.02	11.77	5.89	1.02
Proposed minus Existing	11.77	9.88	1.02	11.77	9.88	1.02

FIGURES



Note: Text in bold denotes activities that result in significant emissions

FIGURE 1 PROCESS FLOW CHART

APPENDIX A
SITE MAP

APPENDIX B
CALCULATIONS

Proposed Conditions

Coal Haul Truck
Horizon Mine
February, 2000

Truck Loading

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-10	4.63	4.01	7.41	0.93	0.80	1.48
TSP	31.15	26.99	49.83	6.23	5.40	9.97

Input Parameters

Material loaded	375	tons/hour (max)	
	325	tons/hour (ave)	
	1200000	tons/year	
Control efficiency	80	%	
Material moisture content	9	%	Mine coal analysis

Equation

Uncontrolled
PM-10 Emission rate, lb/hr = (0.75*0.119/((moisture,%)^0.9))(throughput, ton/hr)
TSP Emission rate, lb/hr = (1.16/((moisture,%)^1.2))(throughput, ton/hr)

Controlled
PM-10 Emission rate, lb/hr = (0.75*0.119/((moisture,%)^0.9))(throughput, ton/hr)(100-control efficiency/100)
TSP Emission rate, lb/hr = (1.16/((moisture,%)^1.2))(throughput, ton/hr)(100-control efficiency/100)

Reference

AP-42 Section 11.9 Western Surface Coal Mining (Table 11.9-1)

Notes

Emissions are controlled by the wet nature of the coal (internal moisture of 9%) and by keeping the surface of any coal to be loaded wet. Lodestar will make sure the surface of the coal being loaded is wet. Therefore, preventing dust during the loading process. This is also done to control emissions from the stockpile.

Proposed Conditions

Crusher
Horizon Mine
February, 2000

Crusher

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-10	0.48	0.17	0.29	0.12	0.04	0.07
TSP	1.01	0.35	0.60	0.25	0.09	0.15

Input Parameters

Number of crushers	1	
Throughput to crusher	200	tons/hour (max)
	70	tons/hour (ave)
	240000	tons/year

Equation

Emission rate = (Emission factor)(throughput)(number of screens)(100 - control efficiency/100)

Emission Factors

Uncontrolled			
PM-10	0.0024	lb/ton	from Table 11.19.2-2 Crusher
TSP	0.00504	lb/ton	(2.1*0.0024) from Table 11.19.2-2 note c
Controlled			
PM-10	0.00059	lb/ton	from Table 11.19.2-2 Crusher
TSP	0.00124	lb/ton	(2.1*0.00059) from Table 11.19.2-2 note c

Reference

AP-42 Section 11.19.2 Crushed Stone Processing (Table 11.19.2-2)

Notes

Based on a gradation of run of mine coal from the White Oak Mine a maximum of 17.9% of coal was larger than 1.5 inches in diameter. Only oversized (>2") coal will be crushed. To be conservative it was assumed that 20% of the mine production will be put through the crusher.
The White Oak mine uses the same mining method and is in the same coal field as the Horizon Mine.

The natural water content (9%) of the coal and water on the coal from underground water sprays will control emissions year round, while water sprays will be used when possible.

Note b in Table 11.19.2-2 states that facilities using wet suppression systems, such as this mine, could use the controlled emission factors. This note states that the moisture content of the material tested to determine the controlled emission factor was only 0.55 to 2.88 percent. The moisture content of the coal being crushed is 9 percent. Therefore using the controlled emission factor is reasonable and likely conservative.

Screen

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-10	15.00	5.25	9.00	0.84	0.29	0.50
TSP	31.50	11.03	18.90	1.76	0.62	1.06

Input Parameters

Number of screens	1	
Throughput to screen	1000	tons/hour (max)
	350	tons/hour (ave)
	1200000	tons/year

Equation

Emission rate = (Emission factor)(throughput)(number of screens)(100 - control efficiency/100)

Emission Factors

Uncontrolled			
PM-10	0.015	lb/ton	from Table 11.19.2-2 Crusher
TSP	0.0315	lb/ton	(2.1*0.015) from Table 11.19.2-2 note c
Controlled			
PM-10	0.00084	lb/ton	from Table 11.19.2-2 Crusher
TSP	0.00176	lb/ton	(2.1*0.00084) from Table 11.19.2-2 note c

Reference

AP-42 Section 11.19.2 Crushed Stone Processing (Table 11.19.2-2)

Notes

The natural water content (9%) of the coal and water on the coal from underground water sprays will control emissions year round, while water sprays will be used when possible.

Note b in Table 11.19.2-2 states that facilities using wet suppression systems, such as this mine, could use the controlled emission factors. This note states that the moisture content of the material tested to determine the controlled emission factor was only 0.55 to 2.88 percent. The moisture content of the coal being crushed is 9 percent. Therefore using the controlled emission factor is reasonable and likely conservative.

Proposed Conditions

Grading Mine Site
Horizon Mine
February, 2000

Grading

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-10	2.30	1.53	0.19	0.46	0.31	0.04
TSP	6.71	4.47	0.56	1.34	0.89	0.11

Input Parameters

Vehicle miles traveled	3	VMT/hr (max)	
	2	VMT/hr (ave)	
	500	VMT/yr	
Control efficiency	80	%	water truck, sprinklers
Mean vehicle speed	5	mph	

Equation

Uncontrolled
PM-10 Emission rate, lb/hr = (0.60*0.051*(mean vehicle speed, mph)^2.0)*VMT/hr
TSP Emission rate, lb/hr = (0.04*(mean vehicle speed, mph)^2.5)*VMT/hr

Controlled
PM-10 Emission rate, lb/hr = (0.60*0.051*(mean vehicle speed, mph)^2.0)*VMT/hr(100-control efficiency/100)
TSP Emission rate, lb/hr = (0.04*(mean vehicle speed, mph)^2.5)*VMT/hr(100-control efficiency/100)

Reference

AP-42 Section 11.9 Western Surface Coal Mining (Table 11.9-1)

Notes

This grader is shared with another mine site. The grader will spend a maximum of 8 hours per week at this mine. On average the grader will spend 4 hours a week working at the mine. The mine site is small and doesn't allow speeds above 5 mph, with speeds usually much less. Given the limited area the grader can work the estimate of 1 to 3 VMT/hr is conervative.

Proposed Conditions

Disturbed Areas minus stockpiles
Horizon Mine
February, 2000

Disturbed Area

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-10	NA	NA	0.48	NA	NA	0.24
TSP	NA	NA	0.95	NA	NA	0.48

Input Parameters

Disturbed area	2.5 acres	
Control efficiency	50 %	sprinkler, water truck

Equation

Uncontrolled
PM-10 Emission rate, lb/hr = (0.38)(0.50)(area,acres)
TSP Emission rate, lb/hr = 0.38(area,acres)

Controlled
PM-10 Emission rate, lb/hr = 0.38(0.50)(area,acres)(100-control efficiency/100)
TSP Emission rate, lb/hr = 0.38(area,acres)(100-control efficiency/100)

Reference

AP-42 Section 11.9 Western Surface Coal Mining (Table 11.9-4)

Notes

An emission factor for PM-10 has not been determined. However, by using emission factors on the same Table that do have emission rates for TSP and PM-10 the percentage of PM-10 in TSP can be estimated. The percentage of PM-10 in TSP was determined for truck loading, bulldozing coal, and grading. PM-10 made up 15 to 25% of the estimated TSP. To be conservative 50% of the TSP will be assumed to be PM-10.

The disturbed area is the flatter areas that have not been reclaimed or is not in the coal stockpile area. Emissions from the coal stockpile is accounted for on another sheet.

Emissions from the disturbed area are controlled by sprinklers, when temperature allows, and the water truck.

Proposed Conditions

Coal Drop to Stockpiles
Horizon Mine
February, 2000

Drop to Stockpile

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-10	0.07	0.05	0.08	0.07	0.05	0.08
TSP	0.15	0.10	0.18	0.15	0.10	0.18

Input Parameters

Material dropped to a pile	500	tons/hour (max)	
	350	tons/hour (ave)	
	1200000	tons/year	
Control efficiency	0	%	
Material moisture content	9	%	Mine coal analysis
Average wind speed	5.1	mph	AP-42 Table 11.9-5 N.W. Colorado

Equation

Uncontrolled
PM-10 Emission rate, lb/hr = 0.35*0.0032(((wind,mph)/5)^1.3)/(((moisture, %)/2)^1.4)(throughput, ton/hr)
TSP Emission rate, lb/hr = 0.74*0.0032(((wind,mph)/5)^1.3)/(((moisture, %)/2)^1.4)(throughput, ton/hr)

Controlled
PM-10 Emis. rate, lb/hr = 0.35*0.0032(((wind,mph)/5)^1.3)/(((moisture, %)/2)^1.4)(thrpt, ton/hr)(100-control eff./10
TSP Emis. rate, lb/hr = 0.74*0.0032(((wind,mph)/5)^1.3)/(((moisture, %)/2)^1.4)(thrpt, ton/hr)(100-control eff./100)

Reference

AP-42 Section 13.2.4 Aggregate Handling and Storage Piles

Notes

The emissions are controlled by the wet nature of the coal. This is reflected in the moisture content of the coal in the equation. Although the controlled and uncontrolled emission rated are the same, this source should be considered controlled.

The average wind speed was taken from the table mentioned above. The mine site is similar to mines in NW Colorado which are in the same coal field.

The coal may drop to a pile from three places on the conveyor belt. Although the coal may end up in one of three piles, the above production rates account for all coal dropped onto a pile. Coal will not be moved between piles. The coal will only be dropped to a pile once.

Proposed Conditions

Stockpiles
Horizon Mine
February, 2000

Stockpiles

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-10	2.20	2.20	9.65	0.22	0.22	0.97
TSP	4.41	4.41	19.30	0.44	0.44	1.93

Input Parameters

Stockpile Area	1.2	acres	
Control efficiency	90	%	sprinkler, wet material, water truck
Mean wind speed	5.1	mph	AP-42 Table 11.9-5

Equation

Uncontrolled
PM-10 Emission rate, lb/hr = 0.50(0.72)(wind speed, mph)(area,acres)
TSP Emission rate, lb/hr = 0.72(wind speed, mph)(area,acres)

Controlled
PM-10 Emission rate, lb/hr = 0.50(0.72)(wind speed, mph)(area,acres)(100-control efficiency/100)
TSP Emission rate, lb/hr = 0.72(wind speed, mph)(area,acres)(100-control efficiency/100)

Reference

AP-42 Section 11.9 Western Surface Coal Mining (Table 11.9-1)

Notes

An emission factor for PM-10 has not been determined. However, by using emission factors on the same Table that do have emission rates for TSP and PM-10 the percentage of PM-10 in TSP can be estimated. The percentage of PM-10 in TSP was determined for truck loading, bulldozing coal, and grading. PM-10 made up 15 to 25% of the estimated TSP. To be conservative 50% of the TSP will be assumed to be PM-10.

The emissions from the stockpile are controlled by sprinklers, water truck, and the fact that the coal is wet, from sprays in the mine and groundwater, when it reaches the stockpile. Emissions resulting from loading trucks from the stockpile are covered on another sheet.

Proposed Conditions

Mine ventilation
Horizon Mine
February, 2000

Mine Ventilation

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-10	0.56	0.56	1.21	0.56	0.56	1.21
TSP	1.12	1.12	2.43	1.12	1.12	2.43

Input Parameters

Mine flow rate	150000	cfm
Production time per day	16	hours
Operating days per year	270	days
Hours of production per year	4320	hours

Emission Factor

PM-10 Emission factor	1	mg/m3
TSP Emission factor	2	mg/m3

The emission rate is based on the maximum concentration of respirable dust allowed in the mine atmosphere by MSHA. The emission rate for TSP is simply double the PM-10 rate. This is likely too high since dust in the mine has a long period of time to settle out before discharge to the atmosphere. The walls of the mine are also wet.

Equation

Uncontrolled

PM-10 Emission rate, lb/hr = (emission factor, mg/m3)(1 m3 / 35.315 ft3)(2.205xE-6 lb/mg)(flow rate, cfm)(60 min

TSP Emission rate, lb/hr = (emission factor, mg/m3)(1 m3 / 35.315 ft3)(2.205xE-6 lb/mg)(flow rate, cfm)(60 min/h

Controlled

Mine ventilation emissions are controlled at the generation point in the mine. Therefore, the uncontrolled emissio represent the combination of controlled emissions from underground operations.

Reference

MSHA respirable dust regulations

Notes

This calculation sheet assumes an emission rate equal to 50% of the maximum allowed by MSHA. This sheet also assumes that significant fugitive dust is only being generated when the mine is actually producing coal. Therefore, annual emission rates are loosely tied to production.
The MSHA maximum respirable dust concentration is enforced at the sources of the dust. Not all of the ventilation air goes by the dust sources. Therefore, even under worst case conditions at all underground emission points the emission rate from the mine will be much less than at the sources of the dust. The wet nature of the mine also reduces the dust concentration as the air flows through the mine and dust particles stick to the ceiling, walls and floors of the opening.

Proposed Conditions

Surface Conveyor Drop Points
Horizon Mine
February, 2000

Conveyor Drop Points

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-10	1.40	0.98	1.68	0.35	0.25	0.42
TSP	2.90	2.03	3.48	0.73	0.51	0.87

Input Parameters

Number of drop points	2	
Throughput at drop point	500	tons/hour (max)
	350	tons/hour (ave)
	1200000	tons/year
Control Efficiency	75	%

Equation

Emission rate = (Emission factor)(throughput)(number of drop points)(100 - control efficiency/100)

Emission Factors

PM-10	0.0014 lb/ton	from Table 11.19.2-2 Conveyor transfer point
TSP	0.0029 lb/ton	(2.1*0.0014) from Table 11.19.2-2 note c

Reference

AP-42 Section 11.19.2 Crushed Stone Processing (Table 11.19.2-2)

Notes

The first drop point on the surface is a drop from the underground conveyor to the covered surface conveyor. The second drop point is from the crushing and screening unit onto the conveyor belt.

Emissions are controlled by the wet nature of the coal when it leaves the mine. The coal has a 9% moisture content when it is mined and then additional water is added by underground water sprays.

Proposed Conditions

Coal Haul Trucks
Horizon Mine
February, 2000

UNPAVED ROAD

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-2.5	0.16	0.14	0.32	0.01	0.01	0.02
PM-10	1.10	0.95	2.20	0.06	0.05	0.11
TSP	5.53	4.79	11.06	0.28	0.24	0.55

Input Parameters

Surface silt content	8.4	%	AP-42 Table 13.2.2-1
Empty vehicle weight	21.5	tons	
Loaded vehicle weight	64.5	tons	
Surface material moisture content	0.2	% (for dry conditions)	
Average Speed	5	mph	Actual speed likely will be slower
Number of days with precipitation	60	days/year	AP-42 Figure 13.2.2-1
Control Efficiency	95	%	
Roundtrip travel Distance	0.1	miles	
Max hourly production	300	tons/hour	
Average hourly production	260	tons/hour	
Annual production	1200000	tons	
Max hourly VMT	0.7	miles/hour	
Average hourly VMT	0.6	miles/hour	
Annual VMT	2790.7	miles/year	

Equation

Eext = VMT[S/15] [(k(s/12)^a (W/3)^b) / (Mdry/0.2)^c] [(365-p)/365]

Eext	Emission rate extrapolated for natural mitigation (lbs/hour or year)
S	Average speed, used when speeds are less than 15 mph, (mph)
s	surface material silt content (%)
W	Mean vehicle weight (tons) [(loaded wt + empty wt)/2]
Mdry	Surface material moisture content for dry conditions (%)
k	Constant 0.38 for PM-2.5, 2.6 for PM-10, and 10 for TSP
a	Constant 0.8 for PM-2.5, 0.8 for PM-10, and 0.8 for TSP
b	Constant 0.4 for PM-2.5, 0.4 for PM-10, and 0.5 for TSP
c	Constant 0.3 for PM-2.5, 0.3 for PM-10, and 0.4 for TSP
p	Number of days with at least 0.01inches of precipitation

Reference

AP-42 Section 13.2.2 Unpaved Roads

Notes

Emissions are controlled by the use of a water truck and sprinklers, when the temprature allows. A chemical dust suppressant may also be used if necessary to control emissions when water cannot be used safely.

Proposed Conditions

Front End Loader
Horizon Mine
February, 2000

UNPAVED ROAD

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-2.5	0.57	0.51	1.13	0.03	0.03	0.06
PM-10	3.87	3.48	7.74	0.19	0.17	0.39
TSP	19.03	17.13	38.06	0.95	0.86	1.90

Input Parameters

Surface silt content	8.4	%	AP-42 Table 13.2.2-1
Empty vehicle weight	32.6	tons	
Loaded vehicle weight	37.1	tons	
Surface material moisture content	0.2	% (for dry conditions)	
Average Speed	5	mph	Actual speed likely will be slower
Number of days with precipitation	60	days/year	AP-42 Figure 13.2.2-1
Control Efficiency	95	%	
Roundtrip travel Distance	0.04	miles	
Max hourly production	300	tons/hour	
Average hourly production	270	tons/hour	
Annual production	1200000	tons	
Max hourly VMT	2.7	miles/hour	
Average hourly VMT	2.4	miles/hour	
Annual VMT	10666.7	miles/year	

Equation

$$Eext = VMT[S/15] [(k(s/12)^a (W/3)^b) / (Mdry/0.2)^c] [(365-p)/365]$$

Eext	Emission rate extrapolated for natural mitigation (lbs/hour or year)
S	Average speed, used when speeds are less than 15 mph, (mph)
s	surface material silt content (%)
W	Mean vehicle weight (tons) [(loaded wt + empty wt)/2]
Mdry	Surface material moisture content for dry conditions (%)
k	Constant 0.38 for PM-2.5, 2.6 for PM-10, and 10 for TSP
a	Constant 0.8 for PM-2.5, 0.8 for PM-10, and 0.8 for TSP
b	Constant 0.4 for PM-2.5, 0.4 for PM-10, and 0.5 for TSP
c	Constant 0.3 for PM-2.5, 0.3 for PM-10, and 0.4 for TSP
p	Number of days with at least 0.01inches of precipitation

Reference

AP-42 Section 13.2.2 Unpaved Roads

Notes

Emissions are controlled by keeping the haul road and pile moist with sprinklers and a water truck. A chemical dust suppressant may also be used if necessary to control dust when water cannot be used due to freezing problems.

Proposed Conditions

Front End Loader
Horizon Mine
February, 2000

Diesel Industrial Engines

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/day)	Ave (lbs/day)	(tons/year)	Max (lbs/day)	Ave (lbs/day)	(tons/year)
NOx	201.50	161.20	20.15	201.50	161.20	20.15
CO	43.42	34.74	4.34	43.42	34.74	4.34
SOx	13.33	10.66	1.33	13.33	10.66	1.33
PM-10	14.30	11.44	1.43	14.30	11.44	1.43
CO2	7475.00	5980.00	747.50	7475.00	5980.00	747.50
Aldehydes	3.01	2.41	0.30	3.01	2.41	0.30
TOC	16.34	13.07	1.63	16.34	13.07	1.63

Input Parameters

Usage
- 20 hours/day (max)
- 16 hours/day (ave)
- 4000 hours/year

Horse power
- 325 hp

Equation

Uncontrolled

Emission (lb/hr) = (Emission factor, lb/hp-hr)(horsepower)

Emission (tons/yr) = (Emission factor, lb/hp-hr)(horsepower)(usage, hrs/yr)/2000

Controlled — No controls on engines

Emission Factors

NOx	0.031 lb/hp-hr
CO	0.00668 lb/hp-hr
SOx	0.00205 lb/hp-hr
PM-10	0.0022 lb/hp-hr
CO2	1.15 lb/hp-hr
Aldehydes	0.000463 lb/hp-hr
TOC	0.0025141 lb/hp-hr

Reference

AP-42 Section 3.3 Gasoline and Diesel Industrial Engines (Table 3.3-1)

Notes

Proposed Conditions

Forklift
Horizon Mine
February, 2000

Diesel Industrial Engines

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/day)	Ave (lbs/day)	(tons/year)	Max (lbs/day)	Ave (lbs/day)	(tons/year)
NOx	33.98	16.99	2.55	33.98	16.99	2.55
CO	7.32	3.66	0.55	7.32	3.66	0.55
SOx	2.25	1.12	0.17	2.25	1.12	0.17
PM-10	2.41	1.21	0.18	2.41	1.21	0.18
CO2	1260.40	630.20	94.53	1260.40	630.20	94.53
Aldehydes	0.51	0.25	0.04	0.51	0.25	0.04
TOC	2.76	1.38	0.21	2.76	1.38	0.21

Input Parameters

Usage	8	hours/day (max)
	4	hours/day (ave)
	1200	hours/year
Horse power	137	hp

Equation

Uncontrolled
Emission (lb/hr) = (Emission factor, lb/hp-hr)(horsepower)
Emission (tons/yr) = (Emission factor, lb/hp-hr)(horsepower)(usage, hrs/yr)/2000

Controlled — No controls on engines

Emission Factors

NOx	0.031	lb/hp-hr
CO	0.00668	lb/hp-hr
SOx	0.00205	lb/hp-hr
PM-10	0.0022	lb/hp-hr
CO2	1.15	lb/hp-hr
Aldehydes	0.000463	lb/hp-hr
TOC	0.0025141	lb/hp-hr

Reference

AP-42 Section 3.3 Gasoline and Diesel Industrial Engines (Table 3.3-1)

Notes

Proposed Conditions

Grader
Horizon Mine
February, 2000

Diesel Industrial Engines

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/day)	Ave (lbs/day)	(tons/year)	Max (lbs/day)	Ave (lbs/day)	(tons/year)
NOx	32.24	16.12	3.22	32.24	16.12	3.22
CO	6.95	3.47	0.69	6.95	3.47	0.69
SOx	2.13	1.07	0.21	2.13	1.07	0.21
PM-10	2.29	1.14	0.23	2.29	1.14	0.23
CO2	1196.00	598.00	119.60	1196.00	598.00	119.60
Aldehydes	0.48	0.24	0.05	0.48	0.24	0.05
TOC	2.61	1.31	0.26	2.61	1.31	0.26

Input Parameters

Usage	4	hours/day (max)
	2	hours/day (ave)
	800	hours/year
Horse power	260	hp

Equation

Uncontrolled

Emission (lb/hr) = (Emission factor, lb/hp-hr)(horsepower)

Emission (tons/yr) = (Emission factor, lb/hp-hr)(horsepower)(usage, hrs/yr)/2000

Controlled — No controls on engines

Emission Factors

NOx	0.031	lb/hp-hr
CO	0.00668	lb/hp-hr
SOx	0.00205	lb/hp-hr
PM-10	0.0022	lb/hp-hr
CO2	1.15	lb/hp-hr
Aldehydes	0.000463	lb/hp-hr
TOC	0.0025141	lb/hp-hr

Reference

AP-42 Section 3.3 Gasoline and Diesel Industrial Engines (Table 3.3-1)

Notes

Proposed Conditions

Generator
Horizon Mine
February, 2000

Diesel Industrial Engines

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/day)	Ave (lbs/day)	(tons/year)	Max (lbs/day)	Ave (lbs/day)	(tons/year)
NOx	13.95	6.98	1.22	13.95	6.98	1.22
CO	3.01	1.50	0.26	3.01	1.50	0.26
SOx	0.92	0.46	0.08	0.92	0.46	0.08
PM-10	0.99	0.50	0.09	0.99	0.50	0.09
CO2	517.50	258.75	45.28	517.50	258.75	45.28
Aldehydes	0.21	0.10	0.02	0.21	0.10	0.02
TOC	1.13	0.57	0.10	1.13	0.57	0.10

Input Parameters

Usage	2	hours/day (max)
	1	hours/day (ave)
	350	hours/year
Horse power	225	hp

Equation

Uncontrolled
Emission (lb/hr) = (Emission factor, lb/hp-hr)(horsepower)
Emission (tons/yr) = (Emission factor, lb/hp-hr)(horsepower)(usage, hrs/yr)/2000

Controlled — No controls on engines

Emission Factors

NOx	0.031	lb/hp-hr
CO	0.00668	lb/hp-hr
SOx	0.00205	lb/hp-hr
PM-10	0.0022	lb/hp-hr
CO2	1.15	lb/hp-hr
Aldehydes	0.000463	lb/hp-hr
TOC	0.0025141	lb/hp-hr

Reference

AP-42 Section 3.3 Gasoline and Diesel Industrial Engines (Table 3.3-1)

Notes

The generator will be used both on the surface and in the mine. These calculations represent emissions on the surface only. Underground emissions are exempt.

Proposed Conditions

Water Truck
Horizon Mine
February, 2000

Diesel Industrial Engines

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/day)	Ave (lbs/day)	(tons/year)	Max (lbs/day)	Ave (lbs/day)	(tons/year)
NOx	74.40	37.20	3.72	74.40	37.20	3.72
CO	16.03	8.02	0.80	16.03	8.02	0.80
SOx	4.92	2.46	0.25	4.92	2.46	0.25
PM-10	5.28	2.64	0.26	5.28	2.64	0.26
CO2	2760.00	1380.00	138.00	2760.00	1380.00	138.00
Aldehydes	1.11	0.56	0.06	1.11	0.56	0.06
TOC	6.03	3.02	0.30	6.03	3.02	0.30

Input Parameters

Usage	8	hours/day (max)
	4	hours/day (ave)
	800	hours/year
Horse power	300	hp

Equation

Uncontrolled
Emission (lb/hr) = (Emission factor, lb/hp-hr)(horsepower)
Emission (tons/yr) = (Emission factor, lb/hp-hr)(horsepower)(usage, hrs/yr)/2000

Controlled — No controls on engines

Emission Factors

NOx	0.031	lb/hp-hr
CO	0.00668	lb/hp-hr
SOx	0.00205	lb/hp-hr
PM-10	0.0022	lb/hp-hr
CO2	1.15	lb/hp-hr
Aldehydes	0.000463	lb/hp-hr
TOC	0.0025141	lb/hp-hr

Reference

AP-42 Section 3.3 Gasoline and Diesel Industrial Engines (Table 3.3-1)

Notes

Current Conditions

Coal Haul Truck
Horizon Mine
February, 2000

Truck Loading

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-10	2.47	1.36	1.36	0.49	0.27	0.27
TSP	16.61	9.14	9.14	3.32	1.83	1.83

Input Parameters

Material loaded	200	tons/hour (max)	
	110	tons/hour (ave)	
	220000	tons/year	
Control efficiency	80	%	
Material moisture content	9	%	Mine coal analysis

Equation

Uncontrolled
PM-10 Emission rate, lb/hr = (0.75*0.119/((moisture,%)^0.9))(throughput, ton/hr)
TSP Emission rate, lb/hr = (1.16/((moisture,%)^1.2))(throughput, ton/hr)

Controlled
PM-10 Emission rate, lb/hr = (0.75*0.119/((moisture,%)^0.9))(throughput, ton/hr)(100-control efficiency/100)
TSP Emission rate, lb/hr = (1.16/((moisture,%)^1.2))(throughput, ton/hr)(100-control efficiency/100)

Reference

AP-42 Section 11.9 Western Surface Coal Mining (Table 11.9-1)

Notes

Emissions are controlled by the wet nature of the coal (internal moisture of 9%) and by keeping the surface of any coal to be loaded wet. Lodestar will make sure the surface of the coal being loaded is wet. Therefore, preventing dust during the loading process. This is also done to control emissions from the stockpile.

Crusher

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-10	0.24	0.05	0.05	0.06	0.01	0.01
TSP	0.50	0.11	0.11	0.12	0.03	0.03

Input Parameters

Number of crushers	1
Throughput to crusher	100 tons/hour (max)
	22 tons/hour (ave)
	44000 tons/year

Equation

Emission rate = (Emission factor)(throughput)(number of screens)(100 - control efficiency/100)

Emission Factors

Uncontrolled			
PM-10	0.0024	lb/ton	from Table 11.19.2-2 Crusher
TSP	0.00504	lb/ton	(2.1*0.0024) from Table 11.19.2-2 note c
Controlled			
PM-10	0.00059	lb/ton	from Table 11.19.2-2 Crusher
TSP	0.00124	lb/ton	(2.1*0.00059) from Table 11.19.2-2 note c

Reference

AP-42 Section 11.19.2 Crushed Stone Processing (Table 11.19.2-2)

Notes

Based on a gradation of run of mine coal from the White Oak Mine a maximum of 17.9% of coal was larger than 1.5 inches in diameter. Only oversized (>2") coal will be crushed. To be conservative it was assumed that 20% of the mine production will be put through the crusher.

The natural water content (9%) of the coal and water on the coal from underground water sprays will control emissions year round, while water sprays will be used when possible.

Note b in Table 11.19.2-2 states that facilities using wet suppression systems, such as this mine, could use the controlled emission factors. This note states that the moisture content of the material tested to determine the controlled emission factor was only 0.55 to 2.88 percent. The moisture content of the coal being crushed is 9 percent. Therefore using the controlled emission factor is reasonable and likely conservative.

Screen

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-10	7.50	1.65	1.65	0.42	0.09	0.09
TSP	15.75	3.47	3.47	0.88	0.19	0.19

Input Parameters

Number of screens	1	
Throughput to screen	500	tons/hour (max)
	110	tons/hour (ave)
	220000	tons/year

Equation

Emission rate = (Emission factor)(throughput)(number of screens)(100 - control efficiency/100)

Emission Factors

Uncontrolled			
PM-10	0.015	lb/ton	from Table 11.19.2-2 Crusher
TSP	0.0315	lb/ton	(2.1*0.015) from Table 11.19.2-2 note c
Controlled			
PM-10	0.00084	lb/ton	from Table 11.19.2-2 Crusher
TSP	0.00176	lb/ton	(2.1*0.00084) from Table 11.19.2-2 note c

Reference

AP-42 Section 11.19.2 Crushed Stone Processing (Table 11.19.2-2)

Notes

The natural water content (9%) of the coal and water on the coal from underground water sprays will control emissions year round, while water sprays will be used when possible.

Note b in Table 11.19.2-2 states that facilities using wet suppression systems, such as this mine, could use the controlled emission factors. This note states that the moisture content of the material tested to determine the controlled emission factor was only 0.55 to 2.88 percent. The moisture content of the coal being crushed is 9 percent. Therefore using the controlled emission factor is reasonable and likely conservative.

Current Conditions

Grading Mine Site
Horizon Mine
February, 2000

Grading

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-10	1.53	0.77	0.10	0.31	0.15	0.02
TSP	4.47	2.24	0.28	0.89	0.45	0.06

Input Parameters

Vehicle miles traveled	2	VMT/hr (max)	
	1	VMT/hr (ave)	
	250	VMT/yr	
Control efficiency	80	%	water truck, sprinklers
Mean vehicle speed	5	mph	

Equation

Uncontrolled
PM-10 Emission rate, lb/hr = (0.60*0.051*(mean vehicle speed, mph)^2.0)*VMT/hr
TSP Emission rate, lb/hr = (0.04*(mean vehicle speed, mph)^2.5)*VMT/hr

Controlled
PM-10 Emission rate, lb/hr = (0.60*0.051*(mean vehicle speed, mph)^2.0)*VMT/hr(100-control efficiency/100)
TSP Emission rate, lb/hr = (0.04*(mean vehicle speed, mph)^2.5)*VMT/hr(100-control efficiency/100)

Reference

AP-42 Section 11.9 Western Surface Coal Mining (Table 11.9-1)

Notes

This grader is shared with another mine site. The grader will spend a maximum of 8 hours per week at this mine. On average to grader will spend 4 hours a week working at the mine. The mine site is small and doesn't allow speeds above 5 mph, with speeds usually much less. Given the limited area the grader can work the estimate of 1 to 2 VMT/hr is conervative.

Current Conditions

Disturbed Areas minus stockpiles
Horizon Mine
February, 2000

Disturbed Area

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-10	NA	NA	0.48	NA	NA	0.24
TSP	NA	NA	0.95	NA	NA	0.48

Input Parameters

Disturbed area	2.5 acres	
Control efficiency	50 %	sprinkler, water truck

Equation

Uncontrolled
PM-10 Emission rate, lb/hr = (0.38)(0.50)(area,acres)
TSP Emission rate, lb/hr = 0.38(area,acres)

Controlled
PM-10 Emission rate, lb/hr = 0.38(0.50)(area,acres)(100-control efficiency/100)
TSP Emission rate, lb/hr = 0.38(area,acres)(100-control efficiency/100)

Reference

AP-42 Section 11.9 Western Surface Coal Mining (Table 11.9-4)

Notes

An emission factor for PM-10 has not been determined. However, by using emission factors on the same Table that do have emission rates for TSP and PM-10 the percentage of PM-10 in TSP can be estimated. The percentage of PM-10 in TSP was determined for truck loading, bulldozing coal, and grading. PM-10 made up 15 to 25% of the estimated TSP. To be conservative 50% of the TSP will be assumed to be PM-10.

The disturbed area is the flatter areas that have not been reclaimed or is not in the coal stockpile area. Emissions from the coal stockpile is accounted for on another sheet.

Emissions from the disturbed area are controlled by sprinklers, when temperature allows, and the water truck.

Current Conditions

Coal Drop to Stockpiles
Horizon Mine
February, 2000

Drop to Stockpile

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-10	0.07	0.02	0.02	0.07	0.02	0.02
TSP	0.15	0.03	0.03	0.15	0.03	0.03

Input Parameters

Material dropped to a pile	500	tons/hour (max)	
	110	tons/hour (ave)	
	220000	tons/year	
Control efficiency	0	%	
Material moisture content	9	%	Mine coal analysis
Average wind speed	5.1	mph	AP-42 Table 11.9-5 N.W. Colorado

Equation

Uncontrolled

PM-10 Emission rate, lb/hr = 0.35*0.0032(((wind,mph)/5)^1.3)/(((moisture, %)/2)^1.4)(throughput, ton/hr)
TSP Emission rate, lb/hr = 0.74*0.0032(((wind,mph)/5)^1.3)/(((moisture, %)/2)^1.4)(throughput, ton/hr)

Controlled

PM-10 Emis. rate, lb/hr = 0.35*0.0032(((wind,mph)/5)^1.3)/(((moisture, %)/2)^1.4)(thrpt, ton/hr)(100-control eff./10
TSP Emis. rate, lb/hr = 0.74*0.0032(((wind,mph)/5)^1.3)/(((moisture, %)/2)^1.4)(thrpt, ton/hr)(100-control eff./100)

Reference

AP-42 Section 13.2.4 Aggregate Handling and Storage Piles

Notes

The emissions are controlled by the wet nature of the coal. This is reflected in the moisture content of the coal in the equation. Although the controlled and uncontrolled emission rated are the same, this source should be considered controlled.

The average wind speed was taken from the table mentioned above. The mine site is similar to mines in NW Colorado which are in the same coal field.

The coal may drop to a pile from three places on the conveyor belt. Although the coal may end up in one of three piles, the above production rates account for all coal dropped onto a pile. Coal will not be moved between piles. The coal wil only be dropped to a pile once.

Stockpiles

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-10	2.20	2.20	9.65	0.22	0.22	0.97
TSP	4.41	4.41	19.30	0.44	0.44	1.93

Input Parameters

Stockpile Area	1.2	acres	
Control efficiency	90	%	sprinkler, wet material, water truck
Mean wind speed	5.1	mph	AP-42 Table 11.9-5

Equation

Uncontrolled
PM-10 Emission rate, lb/hr = 0.50(0.72)(wind speed, mph)(area,acres)
TSP Emission rate, lb/hr = 0.72(wind speed, mph)(area,acres)

Controlled
PM-10 Emission rate, lb/hr = 0.5(0.72)(wind speed, mph)(area,acres)(100-control efficiency/100)
TSP Emission rate, lb/hr = 0.72(wind speed, mph)(area,acres)(100-control efficiency/100)

Reference

AP-42 Section 11.9 Western Surface Coal Mining (Table 11.9-1)

Notes

An emission factor for PM-10 has not been determined. However, by using emission factors on the same Table that do have emission rates for TSP and PM-10 the percentage of PM-10 in TSP can be estimated. The percentage of PM-10 in TSP was determined for truck loading, bulldozing coal, and grading. PM-10 made up 15 to 25% of the estimated TSP. To be conservative 50% of the TSP will be assumed to be PM-10.

The emissions from the stockpile are controlled by sprinklers, water truck, and the fact that the coal is wet, from sprays in the mine and groundwater, when it reaches the stockpile. Emissions resulting from loading trucks from the stockpile are covered on another sheet.

Current Conditions

Mine ventilation
Horizon Mine
February, 2000

Mine Ventilation

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-10	0.56	0.56	0.61	0.56	0.56	0.61
TSP	1.12	1.12	1.21	1.12	1.12	1.21

Input Parameters

Mine flow rate	150000	cfm
Production time per day	8	hours
Operating days per year	270	days
Hours of production per year	2160	hours

Emission Factor

PM-10 Emission factor	1	mg/m3
TSP Emission factor	2	mg/m3

The emission rate is based on the maximum concentration of respirable dust allowed in the mine atmosphere by MSHA. The emission rate for TSP is simply double the PM-10 rate. This is likely too high since dust in the mine has a long period of time to settle out before discharge to the atmosphere. The walls of the mine are also wet.

Equation

Uncontrolled

PM-10 Emission rate, lb/hr = (emission factor, mg/m3)(1 m3 / 35.315 ft3)(2.205xE-6 lb/mg)(flow rate, cfm)(60 min

TSP Emission rate, lb/hr = (emission factor, mg/m3)(1 m3 / 35.315 ft3)(2.205xE-6 lb/mg)(flow rate, cfm)(60 min/h

Controlled

Mine ventilation emissions are controlled at the generation point in the mine. Therefore, the uncontrolled emissio represent the combination of controlled emissions from underground operations.

Reference

MSHA respirable dust regulations

Notes

This calculation sheet assumes an emission rate equal to 50% of the maximum allowed by MSHA. This sheet also assumes that significant fugitive dust is only being generated when the mine is actually producing coal. Therefore, annual emission rates are loosely tied to production.
The MSHA maximum respirable dust concentration is enforced at the sources of the dust. Not all of the ventilation air goes by the dust sources. Therefore, even under worst case conditions at all underground emission points the emission rate from the mine will be much less than at the source of the dust. The wet nature of the mine also reduces the dust concentration as the air flows through the mine and dust particles stick to the ceiling, walls and floor of the opening.

Current conditions

Surface Conveyor Drop Points
Horizon Mine
February, 2000

Conveyor Drop Points

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-10	1.40	0.31	0.31	0.35	0.08	0.08
TSP	2.90	0.64	0.64	0.73	0.16	0.16

Input Parameters

Number of drop points	2	
Throughput at drop point	500	tons/hour (max)
	110	tons/hour (ave)
	220000	tons/year
Control Efficiency	75	%

Equation

Emission rate = (Emission factor)(throughput)(number of drop points)(100 - control efficiency/100)

Emission Factors

PM-10	0.0014 lb/ton	from Table 11.19.2-2 Conveyor transfer point
TSP	0.0029 lb/ton	(2.1*0.0014) from Table 11.19.2-2 note c

Reference

AP-42 Section 11.19.2 Crushed Stone Processing (Table 11.19.2-2)

Notes

The first drop point on the surface is a drop from the underground conveyor to the covered surface conveyor. The second drop point is from the crushing and screening unit onto the conveyor belt.

Emissions are controlled by the wet nature of the coal when it leaves the mine. The coal has a 9% moisture content when it is mined and then additional water is added by underground water sprays.

Current conditions

Coal Haul Trucks
Horizon Mine
February, 2000

UNPAVED ROAD

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-2.5	0.11	0.05	0.06	0.01	0.00	0.00
PM-10	0.73	0.32	0.40	0.04	0.02	0.02
TSP	3.69	1.62	2.03	0.18	0.08	0.10

Input Parameters

Surface silt content	8.4	%	AP-42 Table 13.2.2-1
Empty vehicle weight	21.5	tons	
Loaded vehicle weight	64.5	tons	
Surface material moisture content	0.2	% (for dry conditions)	
Average Speed	5	mph	
Number of days with precipitation	60	days/year	AP-42 Figure 13.2.2-1
Control Efficiency	95	%	
Roundtrip travel Distance	0.1	miles	
Max hourly production	200	tons/hour	
Average hourly production	88	tons/hour	
Annual production	220000	tons	
Max hourly VMT	0.5	miles/hour	
Average hourly VMT	0.2	miles/hour	
Annual VMT	511.6	miles/year	

Equation

$$Eext = VMT[S/15]\ [(k(s/12)^a\ (W/3)^b) / (Mdry/0.2)^c]\ [(365-p)/365]$$

Eext	Emission rate extrapolated for natural mitigation (lbs/hour or year)
S	Average speed, used when speeds are less than 15 mph, (mph)
s	surface material silt content (%)
W	Mean vehicle weight (tons) [(loaded wt + empty wt)/2]
Mdry	Surface material moisture content for dry conditions (%)
k	Constant 0.38 for PM-2.5, 2.6 for PM-10, and 10 for TSP
a	Constant 0.8 for PM-2.5, 0.8 for PM-10, and 0.8 for TSP
b	Constant 0.4 for PM-2.5, 0.4 for PM-10, and 0.5 for TSP
c	Constant 0.3 for PM-2.5, 0.3 for PM-10, and 0.4 for TSP
p	Number of days with at least 0.01inches of precipitation

Reference

AP-42 Section 13.2.2 Unpaved Roads

Notes

Emissions are controlled by the use of a water truck and sprinklers, when the temprature allows. A chemical dust suppressant may also be used if necessary to control emissions when water cannot be used safely.

Current conditions

Front End Loader
Horizon Mine
February, 2000

UNPAVED ROAD

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)	Max (lbs/hr)	Ave (lbs/hr)	(tons/year)
PM-2.5	0.38	0.17	0.21	0.02	0.01	0.01
PM-10	2.58	1.14	1.42	0.13	0.06	0.07
TSP	12.69	5.58	6.98	0.63	0.28	0.35

Input Parameters

Surface silt content	8.4	%	AP-42 Table 13.2.2-1
Empty vehicle weight	32.6	tons	
Loaded vehicle weight	37.1	tons	
Surface material moisture content	0.2	% (for dry conditions)	
Average Speed	5	mph	
Number of days with precipitation	60	days/year	AP-42 Figure 13.2.2-1
Control Efficiency	95	%	
Roundtrip travel Distance	0.04	miles	
Max hourly production	200	tons/hour	
Average hourly production	88	tons/hour	
Annual production	220000	tons	
Max hourly VMT	1.8	miles/hour	
Average hourly VMT	0.8	miles/hour	
Annual VMT	1955.6	miles/year	

Equation

Eext = VMT[S/15] [(k(s/12)^a (W/3)^b) / (Mdry/0.2)^c] [(365-p)/365]

Eext	Emission rate extrapolated for natural mitigation (lbs/hour or year)
S	Average speed, used when speeds are less than 15 mph, (mph)
s	surface material silt content (%)
W	Mean vehicle weight (tons) [(loaded wt + empty wt)/2]
Mdry	Surface material moisture content for dry conditions (%)
k	Constant 0.38 for PM-2.5, 2.6 for PM-10, and 10 for TSP
a	Constant 0.8 for PM-2.5, 0.8 for PM-10, and 0.8 for TSP
b	Constant 0.4 for PM-2.5, 0.4 for PM-10, and 0.5 for TSP
c	Constant 0.3 for PM-2.5, 0.3 for PM-10, and 0.4 for TSP
p	Number of days with at least 0.01inches of precipitation

Reference

AP-42 Section 13.2.2 Unpaved Roads

Notes

Emissions are controlled by the use of a water truck and sprinklers, when the temprature allows. A chemical dust suppressant may also be used if necessary to control emissions when water cannot be used safely.

Current Conditions

Front End Loader
Horizon Mine
February, 2000

Diesel Industrial Engines

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/day)	Ave (lbs/day)	(tons/year)	Max (lbs/day)	Ave (lbs/day)	(tons/year)
NOx	100.75	50.38	10.08	100.75	50.38	10.08
CO	21.71	10.86	2.17	21.71	10.86	2.17
SOx	6.66	3.33	0.67	6.66	3.33	0.67
PM-10	7.15	3.58	0.72	7.15	3.58	0.72
CO2	3737.50	1868.75	373.75	3737.50	1868.75	373.75
Aldehydes	1.50	0.75	0.15	1.50	0.75	0.15
TOC	8.17	4.09	0.82	8.17	4.09	0.82

Input Parameters

Usage	10	hours/day (max)
	5	hours/day (ave)
	2000	hours/year
Horse power	325	hp

Equation

Uncontrolled
Emission (lb/hr) = (Emission factor, lb/hp-hr)(horsepower)
Emission (tons/yr) = (Emission factor, lb/hp-hr)(horsepower)(usage, hrs/yr)/2000

Controlled — No controls on engines

Emission Factors

NOx	0.031	lb/hp-hr
CO	0.00668	lb/hp-hr
SOx	0.00205	lb/hp-hr
PM-10	0.0022	lb/hp-hr
CO2	1.15	lb/hp-hr
Aldehydes	0.000463	lb/hp-hr
TOC	0.0025141	lb/hp-hr

Reference

AP-42 Section 3.3 Gasoline and Diesel Industrial Engines (Table 3.3-1)

Notes

Current Conditions

Forklift
Horizon Mine
February, 2000

Diesel Industrial Engines

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/day)	Ave (lbs/day)	(tons/year)	Max (lbs/day)	Ave (lbs/day)	(tons/year)
NOx	16.99	8.49	1.27	16.99	8.49	1.27
CO	3.66	1.83	0.27	3.66	1.83	0.27
SOx	1.12	0.56	0.08	1.12	0.56	0.08
PM-10	1.21	0.60	0.09	1.21	0.60	0.09
CO2	630.20	315.10	47.27	630.20	315.10	47.27
Aldehydes	0.25	0.13	0.02	0.25	0.13	0.02
TOC	1.38	0.69	0.10	1.38	0.69	0.10

Input Parameters

Usage
- 4 hours/day (max)
- 2 hours/day (ave)
- 600 hours/year

Horse power
- 137 hp

Equation

Uncontrolled

Emission (lb/hr) = (Emission factor, lb/hp-hr)(horsepower)

Emission (tons/yr) = (Emission factor, lb/hp-hr)(horsepower)(usage, hrs/yr)/2000

Controlled — No controls on engines

Emission Factors

NOx	0.031 lb/hp-hr
CO	0.00668 lb/hp-hr
SOx	0.00205 lb/hp-hr
PM-10	0.0022 lb/hp-hr
CO2	1.15 lb/hp-hr
Aldehydes	0.000463 lb/hp-hr
TOC	0.0025141 lb/hp-hr

Reference

AP-42 Section 3.3 Gasoline and Diesel Industrial Engines (Table 3.3-1)

Notes

Current Conditions

Grader
Horizon Mine
February, 2000

Diesel Industrial Engines

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/day)	Ave (lbs/day)	(tons/year)	Max (lbs/day)	Ave (lbs/day)	(tons/year)
NOx	16.12	8.06	1.61	16.12	8.06	1.61
CO	3.47	1.74	0.35	3.47	1.74	0.35
SOx	1.07	0.53	0.11	1.07	0.53	0.11
PM-10	1.14	0.57	0.11	1.14	0.57	0.11
CO2	598.00	299.00	59.80	598.00	299.00	59.80
Aldehydes	0.24	0.12	0.02	0.24	0.12	0.02
TOC	1.31	0.65	0.13	1.31	0.65	0.13

Input Parameters

Usage	2	hours/day (max)
	1	hours/day (ave)
	400	hours/year
Horse power	260	hp

Equation

Uncontrolled
Emission (lb/hr) = (Emission factor, lb/hp-hr)(horsepower)
Emission (tons/yr) = (Emission factor, lb/hp-hr)(horsepower)(usage, hrs/yr)/2000

Controlled — No controls on engines

Emission Factors

NOx	0.031	lb/hp-hr
CO	0.00668	lb/hp-hr
SOx	0.00205	lb/hp-hr
PM-10	0.0022	lb/hp-hr
CO2	1.15	lb/hp-hr
Aldehydes	0.000463	lb/hp-hr
TOC	0.0025141	lb/hp-hr

Reference

AP-42 Section 3.3 Gasoline and Diesel Industrial Engines (Table 3.3-1)

Notes

Current Conditions

Generator
Horizon Mine
February, 2000

Diesel Industrial Engines

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/day)	Ave (lbs/day)	(tons/year)	Max (lbs/day)	Ave (lbs/day)	(tons/year)
NOx	6.98	3.49	0.61	6.98	3.49	0.61
CO	1.50	0.75	0.13	1.50	0.75	0.13
SOx	0.46	0.23	0.04	0.46	0.23	0.04
PM-10	0.50	0.25	0.04	0.50	0.25	0.04
CO2	258.75	129.38	22.64	258.75	129.38	22.64
Aldehydes	0.10	0.05	0.01	0.10	0.05	0.01
TOC	0.57	0.28	0.05	0.57	0.28	0.05

Input Parameters

Surface usage	1	hours/day (max)
	0.5	hours/day (ave)
	175	hours/year
Horse power	225	hp

Equation

Uncontrolled
Emission (lb/hr) = (Emission factor, lb/hp-hr)(horsepower)
Emission (tons/yr) = (Emission factor, lb/hp-hr)(horsepower)(usage, hrs/yr)/2000

Controlled — No controls on engines

Emission Factors

NOx	0.031	lb/hp-hr
CO	0.00668	lb/hp-hr
SOx	0.00205	lb/hp-hr
PM-10	0.0022	lb/hp-hr
CO2	1.15	lb/hp-hr
Aldehydes	0.000463	lb/hp-hr
TOC	0.0025141	lb/hp-hr

Reference

AP-42 Section 3.3 Gasoline and Diesel Industrial Engines (Table 3.3-1)

Notes

The generator is used both on the surface and underground. Only the time on the surface is reguated
Therefore, only the surface emissions are calculated

Current Conditions

Water Truck
Horizon Mine
February, 2000

Diesel Industrial Engines

Pollutant	Uncontrolled Emissions			Controlled Emissions		
	Max (lbs/day)	Ave (lbs/day)	(tons/year)	Max (lbs/day)	Ave (lbs/day)	(tons/year)
NOx	37.20	18.60	1.86	37.20	18.60	1.86
CO	8.02	4.01	0.40	8.02	4.01	0.40
SOx	2.46	1.23	0.12	2.46	1.23	0.12
PM-10	2.64	1.32	0.13	2.64	1.32	0.13
CO2	1380.00	690.00	69.00	1380.00	690.00	69.00
Aldehydes	0.56	0.28	0.03	0.56	0.28	0.03
TOC	3.02	1.51	0.15	3.02	1.51	0.15

Input Parameters

Usage
4 hours/day (max)
2 hours/day (ave)
400 hours/year

Horse power
300 hp

Equation

Uncontrolled
Emission (lb/hr) = (Emission factor, lb/hp-hr)(horsepower)
Emission (tons/yr) = (Emission factor, lb/hp-hr)(horsepower)(usage, hrs/yr)/2000

Controlled — No controls on engines

Emission Factors

NOx	0.031 lb/hp-hr
CO	0.00668 lb/hp-hr
SOx	0.00205 lb/hp-hr
PM-10	0.0022 lb/hp-hr
CO2	1.15 lb/hp-hr
Aldehydes	0.000463 lb/hp-hr
TOC	0.0025141 lb/hp-hr

Reference

AP-42 Section 3.3 Gasoline and Diesel Industrial Engines (Table 3.3-1)

Notes