Preconstruction review and preliminary determination on the proposed construction, operation, and reclamation of an underground zinc copper lead mine ore processing mill and associated facilities for ...

Wisconsin. Department of Natural Resources
Madison, Wisconsin: Wisconsin Department of Natural Resources, April 26, 1985

PRECONSTRUCTION REVIEW AND PRELIMINARY DETERMINATION ON THE PROPOSED CONSTRUCTION, OPERATION AND RECLAMATION OF AN UNDERGROUND ZINC/COPPER/LEAD MINE, ORE PROCESSING MILL AND ASSOCIATED SURFACE FACILITIES FOR EXXON MINERALS COMPANY TO BE LOCATED FIVE MILES SOUTH OF CRANDON FOREST COUNTY, WISCONSIN

This review was performed by the Wisconsin Department of Natural Resources, Bureau of Air Management in accordance with Sections 144.391 to 144.394, Wisconsin Statutes. This review is for the construction of a minor source located in (or significantly affecting) an area which is attainment/unclassified for all pollutants.

THIS IS ONLY A PRELIMINARY DETERMINATION. CONSTRUCTION AND OPERATION CANNOT COMMENCE UNTIL THE APPLICANT HAS RECEIVED A PERMIT FROM THE DEPARTMENT.

NEW SOURCE REVIEW #85-SJK-003

Wisconsin Department of Natural Resources
Bureau of Air Management
P. O. Box 7921
Madison, Wisconsin 53707

April 26, 1985

INTRODUCTION

Sources which are not exempt from the construction or modification and new operation permit requirements as set forth in Section 144.391(4) or (5), Wis. Stats., and Section NR 154.04, Wis. Adm. Code are required to obtain an air pollution control permit prior to construction or modification and operation. Sources subject to the requirements must submit a permit application to the Department of Natural Resources. The application is then reviewed following the provisions set forth in Sections 144.392 to 144.394, Wis. Stats. The criteria for permit issuance vary depending on whether the source is major or minor and whether the source is locating in or significantly affecting an attainment or nonattainment area. The permit must be received by the applicant prior to start of construction and operation.

Subject sources are to be reviewed for the air pollution control technology proposed to be installed and for their impact upon the air quality. This is to insure compliance with all applicable rules and statutory requirements. The plan review will show why the source(s) should be approved, conditionally approved, or disapproved. It will encompass emission calculations and air quality analysis using U.S. EPA models, if applicable. Emissions from volatile organic compound (VOC) sources and small sources whose emissions are known to be insignificant are normally not modelled. As a precautionary note, the emission estimates are based on U.S. EPA emission factors (AP-42) or theoretical data and can vary from actual stack test data.

TYPE OF PERMIT

Permit to construct, operate and reclaim an underground zinc/copper/lead mine, ore processing mill and associated surface facilities.

Dates of Submittal: December 22, 1982; May 23, 1983; January 24, 1984; March 16, 1984; March 30, 1984; May 2, 1984; February 14, 1985.

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SOURCE DESCRIPTION

Exxon Minerals Company proposes to construct, operate and reclaim an underground zinc, copper and lead mine five miles south of Crandon, Wisconsin in Forest County. This project includes surface facilities for processing tne ore into zinc, copper and lead concentrates and disposal of the waste tailings from ore processing. The project does not include plans for an ore smelter.

The project timetable specifies a four year construction period, approximately 22 years of operation, and a 7 year final site reclamation phase. The ore processing mill has a design capacity of 10,535 short tons per day of ore, producing 519 tons per day of copper concentrate, 79 tons per day of lead concentrate, and 1,130 tons per day of zinc concentrate. The mine will operate 24 hours per day, 5 days per week. The mill will operate 24 hours per day, 7 days per week. A description of the air pollution sources associated with the construction, operation and reclamation phase follows.

Construction Phase

Mine Development:

A significant amount of fugitive dust will be generated during the development of the mine and associated surface facilities. Mine construction will require blasting with dynamite to develop the main access, air intake and mine exhaust shafts. Underground mine development will require blasting with ammonium nitrate and fuel oil. Mine construction will also require the use of diesel vehicles for rock handling and transporting personnel, equipment and material, natural gas-fired air heating equipment, and a temporary 2500 kilowatt diesel generator to provide electricity for the first six months of construction until power lines are installed.

Initial emissions from mine construction will be released at ground level until the east and west exhaust raises begin operation in the third and fourth year of construction. These raises will vent dust and other air pollutants generated within the mine. While the majority of the dust generated within the mine is expected to settle out due to gravitational forces before reaching the surface, all gaseous pollutants from fuel combustion and the detonation of explosives are assumed to be released to the ambient air.

The exhaust gas parameters for <u>each</u> of these raises are as follows:

Diameter = 22 feet (6.71 meters)
Height = 12.1 feet (3.7 meters)
Flow rate = 624,000 actual cubic feet per minute (294 cubic meters per second)

Surface Facilities Development:

Construction of the surface facilities will generate a significant amount of fugitive dust from excavation of the mill site, access roads to Highway 55, the potable water supply, east and west exhaust raises, explosive magazines and preproduction ore storage, the wastewater reclaim ponds (R1 and R2), the haul road to the mine waste disposal facility (MWDF), and the MWDF itself.

The MWDF is composed of four mine waste tailings ponds which will receive a tailings slurry by pipeline from the mill. Tailings pond T1, approximately 82 acres, will be constructed during the initial construction phase; the other three ponds will be excavated and developed as needed during the life of the mine. Construction of a tailings pond will include excavation activities and operation of a soil processing and pond liner batch plants. Water spraying and temporary revegetation will be used to suppress dust from excavation activities as needed. The soil plant will process approximately 139,380 short tons (126,445 mt) of material per year using fabric filters to control dust from handling operations. The liner plant will process approximately 102,820 cubic yards (78,004 m^3) per year of material and also will use fabric filters to control operations dust.

The land cleared for the surface facilities will generate a considerable amount of unmarketable brush and tree limbs (13,908 short tons) and stumps (6,419 short tons). Of this, a maximum of 2,545 short tons may be open burned using air curtain destructors if chipping is not feasible.

A concrete batch plant equipped with a fabric filter baghouse on the loading hopper and filters on the silo vents will operate during the construction phase. This will produce 101.3 short tons (91.9 metric tons) per day, and 26,345 short tons (23,900 metric tons) per year of concrete.

Operation Phase

Mine Operation:

During operation of the underground mine, air pollutant emissions will result from drilling and blasting rock to access the ore (drift development) and allow subsequent ore removal (stope production), ore handling and processing activities, diesel vehicle operation and mine air heating equipment.

Production blasting will use ammonium nitrate and fuel oil (ANFO) explosives. Blasting will occur at the end of each shift.

Maximum blasting rates will be:

179,740 short tons (163,059 mt) of ore and waste rock per day
3,991,900 short tons (3,621,428 mt) of ore and waste rock per year
87.9 short tons (79.7 mt) of ANFO per day
2,329.2 short tons (2,113 mt) of ANFO per year

Drilling is expected to be relatively dust free due to water injection to the drill bit. Most dust from blasting is expected to settle out due to gravitational forces before leaving the mine through the east and west exhaust raises. Gaseous pollutants from blasting are assumed to be exhausted to the ambient air.

After being liberated by blasting, the ore and waste rock will be transported to ore and waste rock passes by diesel vehicles, from here the material is fed to rail cars and transported to the primary crusher feed bin. The primary crusher reduces the ore and waste rock to a six inch or less diameter and

discharges to a picking conveyor belt. This transports the material to the loading belt and into the loading pocket. From the loading pocket, ore and waste rock is fed to hoisting skips and pulled to the surface for processing or disposal. Figure 1.2-8 taken from the project environmental impact report summarizes the ore and waste rock handling procedures within the mine.

Dust will be generated during all handling and crushing operations. Most of this dust will settle out due to gravitational forces before reaching the surface. However, to reduce dust in the mine, the primary crusher, discharge to the picking belt, loading belt and loading pocket will be hooded and ducted through a fabric filter dust collection system. The skip loading station will be equipped with water sprays to suppress dust during loading operations.

The capacity of the primary crusher will be approximately 1,323 short tons (1,200 mt) per hour. The maximum amount of ore and waste rock expected to be transported to the surface headframe of the main shaft is 1,213 short tons (1,100 mt) per hour and 24,000 short tons (21,800 mt) per day.

Diesel vehicles within the mine will be used for ore, waste rock, personnel and equipment transport. Most vehicles will use a catalytic scrubber and water-diesel fuel emulsion for fuel in order to minimize pollutant emissions within the mine. All emissions from diesel fuel usage are expected to eventually be exhausted to the ambient air through the exhaust raises. Maximum diesel fuel usage is expected to be 4,185 gallons (15,841 liters) per day, and 965,387 gallons (3,654,000 liters) per year.

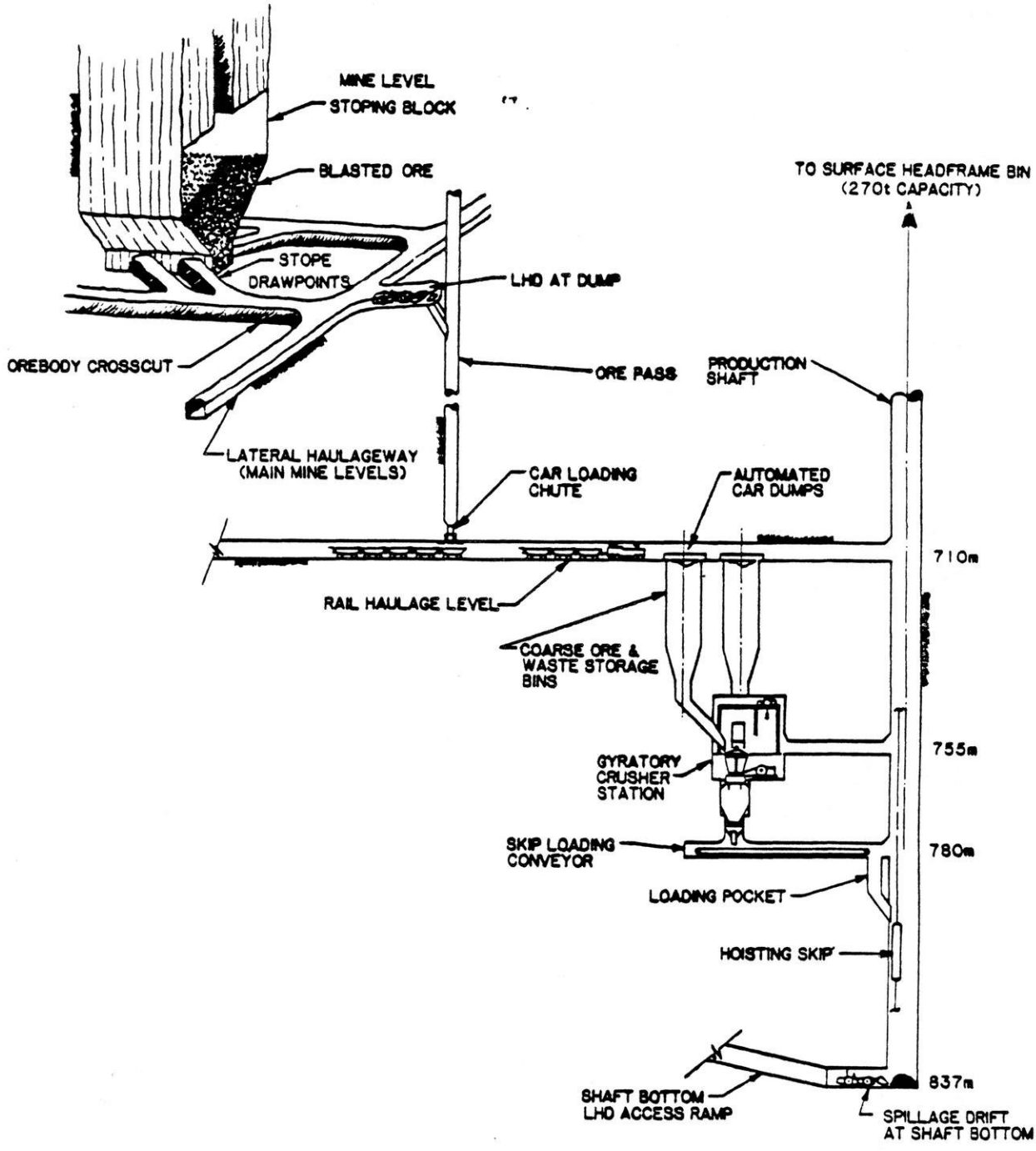
Natural gas-fired air heaters located on the surface will provide heated air when necessary to prevent freezing of water and service pipelines in the intake shafts. Since these directly heat air entering the mine, the combustion gases and pollutants will flow through the mine and are expected to vent through the exhaust raises. The capacity of these heaters is 91,800 cubic feet (2,600 m^3) of natural gas per hour, or 91.8 million BTU per hour @ 1000 BTU per ft^3. Yearly natural gas usage is expected to be 110.6 million cubic feet (3.13 million m^3).

Operation of the underground mine activities will be 24 hours per day, five days per week.

Surface Facilities Operation:

Air pollutant emissions during surface facilities operation will result from ore handling and crushing, fugitive dust and tailpipe emissions from vehicles, fuel transfer and storage, and surface facilities heating. Electrical power to operate the mine and ore processing mill will come from a nearby utility, so an on-site generating facility has not been proposed. Stand-by diesel generators will, however, be used.

Ore from the surface headframe of the main shaft will be transported to the coarse ore storage building by enclosed conveyor. Ore will be stockpiled in the building in massive ore piles (ore containing zinc, copper and lead) and stringer ore piles (ore containing primarily copper and zinc).



EXXON MINERALS COMPANY
CRANDON PROJECT

ORE TRANSPORT SYSTEM

SCALE	STATE	COUNTY
NONE	WISCONSIN	FOREST

DRAWN BY	DATE	CHECKED BY	DATE
APPROVED BY	DATE	APPROVED BY	DATE
APPROVED BY	DATE	EXXON	DATE

DRAWING NO. **FIGURE 1.2-8** SHEET OF REVISION NO.

Typical Representations Refinements May Be Made During Final Engineering

The two piles will feed to a tunnel and conveyor galleries located below, then transported to the fine ore crushing building. Fabric filters will be used when necessary to minimize dust from the ore storage and conveying operations. These filters will vent into the storage building, and not outdoors. The fine crushing building contains secondary and tertiary crushers and screens which reduce the 6 inch diameter ore to 0.75 inches or less. These crushers and screens are hooded and dust is ducted to a wet scrubber which exhausts to the ambient air. The dust/water slurry generated by this scrubber is directed to and recycled in the ore floatation process. The capacity of the fine crushing operation is 683 short tons (620 mt) per hour. The stack parameters for the crushing/screening scrubber is as follows:

Stack height = 85.3 feet (26.0 m)
Diameter = 3.3 feet (1.0 m)
Gas flow rate = 33,617 acfm (15.8 m^3/sec)
Temperature = Ambient

The crushers will feed the ore by conveyor to massive and stringer fine ore bins. Dust generated during the loading and unloading of these bins is also ducted to a wet scrubber before exhausting to the ambient air. The dust/water slurry generated by this scrubber is also recycled in the ore flotation process. The stack parameters for this scrubber are as follows:

Stack height = 124.7 feet (38.0 m)
Diameter = 2.8 feet (0.84 m)
Gas flow rate = 24,042 acfm (11.3 m^3/sec)
Temperature = Ambient

The fine ore bins feed by conveyor to the rest of the ore processing operations which are wet processes and are not expected to produce dust or emissions of concern. These include grinding, flotation, thickening and dewatering, concentrate storage and concentrate loadout. The zinc, copper and lead concentrates (zinc sulfide, copper sulfide and lead sulfide) will contain approximately 8 to 10% moisture when loaded into railroad gondola cars or trucks by telescopic spout. Therefore, no appreciable dust is expected. The gondola cars or trucks will be covered with a plastic cover to keep concentrates from becoming airborne during transport.

A concrete batch plant for miscellaneous uses in the mine and mill will operate during the life of the mine. It will provide a maximum of 50 cubic yards (38.3 m^3) or 101.1 short tons (91.9 mt) of concrete per day, and 26,345 short tons (23,900 mt) per year. Fabric filters will be used to minimize dust emissions to the air from sand, aggregate and cement handling operations. Stack parameters for this batch plant are expected to be as follows:

Stack height = 26.2 feet (8.0 m)
Diameter = 1.4 feet (0.43 m)
Gas flow rate = 3,043 acfm (1.43 m^3/sec)
Temperature = Ambient

Throughout the surface facility buildings, natural gas-fired heaters will be used for space heating, water heating and water treatment (brine crystallizer). Maximum total natural gas usage is proposed to be 33,900 cubic feet (950 m^3) per hour, or 33.9 million BTU per hour @ 1000 BTU per cubic foot, and 171 million cubic feet (4.8 million m^3) per year.

Fuel storage for the surface facilities will consist of two 15,000 gallon fixed roof diesel fuel storage tanks, and a vehicle filling station with a 3,000 gallon diesel tank and 1,000 gallon gasoline tank. Diesel throughput will be a maximum of 6,000 (22,710 liters) gallons per day, and gasoline throughput is 500 gallons (1892.5 liters) per day.

Three emergency generators will be kept on hand, two 2,500 kilowatt and one 1,000 kilowatt units. To verify reliability each unit will be tested weekly and operated for one hour. Emergency operation is estimated to be 2.5 days per year. Maximum yearly diesel fuel usage is estimated to be 163,365 gallons (618,390 liters).

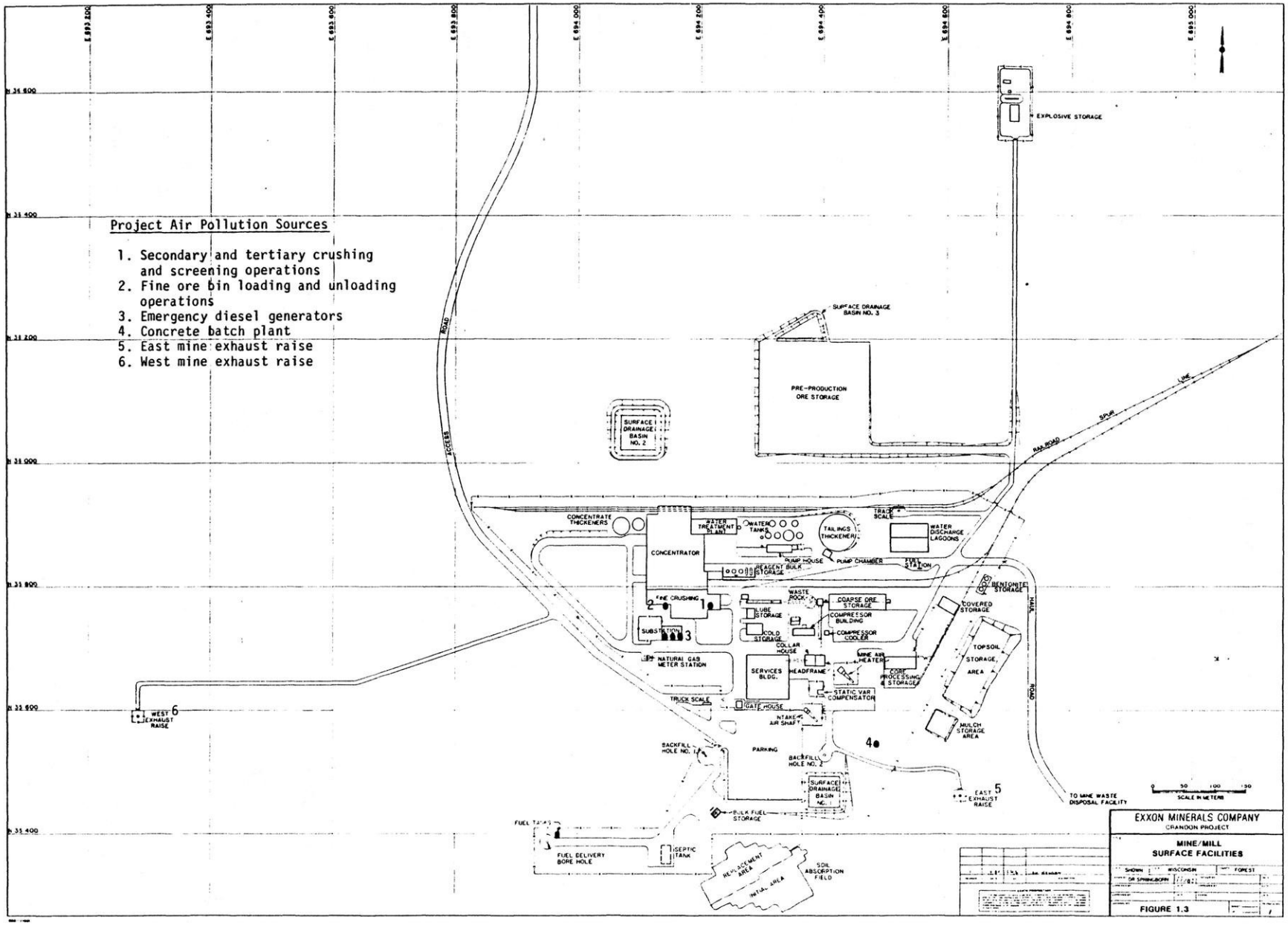
Surface vehicle travel on unpaved roads such as the site access roads and the haul road to the mine waste disposal facility (MWDF) will generate fugitive dust. Water spraying and application of chemical stabilizers such as calcium chloride will be used as necessary to minimize this dust. A truck equipped for this purpose will be kept on-site.

During operation of the surface facilities, tailings ponds T2, T3, and T4 will be constructed as needed. As with T1, fugitive dust will be generated during excavation of these ponds and operation of the soil processing and pond liner batch plants. While in use, the MWDF is not expected to contribute significant dust emissions. The active tailings pond will receive a constant flow of waste tailings slurry by pipeline from the ore processing mill. This will maintain a wet pond surface. Any areas which become dry will be water sprayed as necessary to keep tailings from becoming airborne. Some fugitive dust will be generated by truck activity around the disposal facility ponds. As with other unpaved surface roads, water spraying or longer lasting chemical stabilizers will be used as necessary to suppress vehicle dust.

Ore processing activities at the surface facilities are expected to operate 24 hours per day, 7 days per week. A plot plan of the surface facilities (Figure 1.3) taken from the Revised Mining Permit Application is provided on the following page.

Reclamation Phase

Throughout the life of the mine, reclamation of filled tailings ponds will occur. However, after the useful life of the mine is completed, final site reclamation will begin. Surface facilities will be removed, and the reclaim ponds and remaining tailings ponds will be covered. The mine/mill site will be returned to its original condition as much as it is practical. Air pollution emissions during this phase will primarily be fugitive dust from excavation activities and tailpipe emissions from vehicles. Reclamation phase activities will contribute significantly less emissions than during original site construction or mine/mill operation.


Project Air Pollution Sources
1. Secondary and tertiary crushing and screening operations
2. Fine ore bin loading and unloading operations
3. Emergency diesel generators
4. Concrete batch plant
5. East mine exhaust raise
6. West mine exhaust raise
E 693 200
E 693 400
E 693 600
E 693 800
E 694 000
E 694 200
E 694 400
E 694 600
E 694 800
E 695 000
N 34 600
N 34 400
N 34 200
N 34 000
N 33 800
N 33 600
N 33 400
ACCESS ROAD
EXPLOSIVE STORAGE
SURFACE DRAINAGE BASIN NO. 3
PRE-PRODUCTION ORE STORAGE
SURFACE DRAINAGE BASIN NO. 2
RAILROAD SPUR LINE
CONCENTRATE THICKENERS
WATER TREATMENT PLANT
WATER TANKS
TAILINGS THICKENER
TRUCK SCALE
WATER DISCHARGE LAGOONS
CONCENTRATOR
PUMP HOUSE
PUMP CHAMBER
FUEL STATION
REAGENT BULK STORAGE
BENTONITE STORAGE
FINE CRUSHING
WASTE ROCK
COARSE ORE STORAGE
COVERED STORAGE
SUBSTATION
SLIME STORAGE
COMPRESSOR BUILDING
COLD STORAGE
COMPRESSOR COOLER
COLLAR HOUSE
MINE AIR HEATER
TOPSOIL STORAGE AREA
NATURAL GAS METER STATION
SERVICES BLDG.
HEADFRAME
CORE PROCESSING & STORAGE
TRUCK SCALE
GATE HOUSE
STATIC VAR COMPENSATOR
INTAKE AIR SHAFT
MULCH STORAGE AREA
WEST EXHAUST RAISE
BACKFILL HOLE NO. 1
PARKING
BACKFILL HOLE NO. 2
SURFACE DRAINAGE BASIN NO.
EAST EXHAUST RAISE
TO MINE WASTE DISPOSAL FACILITY
BULK FUEL STORAGE
FUEL TANKS
FUEL DELIVERY BORE HOLE
SEPTIC TANK
REPLACEMENT AREA
INITIAL AREA
SOIL ABSORPTION FIELD
SCALE IN METERS
EXXON MINERALS COMPANY
CRANDON PROJECT
MINE/MILL
SURFACE FACILITIES
WISCONSIN
FOREST
FIGURE 1.3

EXISTING FACILITY EMISSIONS

This is a new facility so there are no existing air pollution emissions.

EMISSIONS FROM NEW EQUIPMENT

Source	Pollutant	Predicted Maximum lbs/hr	Predicted Maximum TPY	Allowable lbs/hr	Allowable TPY
1. Construction phase fugitive dust, open burning, fuel usage and blasting	TSP	-	209.6	Same as maximum	
	SO_2	-	18.8	Same as maximum	
	NO_x	-	79.8	Same as maximum	
	CO	-	186.7	Same as maximum	
	HC	-	74.2	Same as maximum	
	H_2S	-	0.5	Same as maximum	
2. Underground Mine Operations	TSP	93.9	27.4	53.91	27.4
	SO_2	166.8	30.1	Same as maximum	
	NO_x	1344.6	77.6	Same as maximum	
	CO	5669.6	81.3	Same as maximum	
	HC	1.23	1.4	Same as maximum	
	Pb	-	0.11	Same as maximum	
3. Fine ore crushing and screening operations	TSP	3.0	8.8	6.1	26.9
4. Fine ore bin loading and unloading operations	TSP	2.0	5.9	4.4	19.2
5. Concrete batch plant	TSP	0.2	0.2	4.1	17.8
6. Facility heating	TSP	0.3	0.9	Same as maximum	
	SO_2	0.02	0.05	Same as maximum	
	NO_x	4.0	10.3	Same as maximum	
	CO	0.6	1.5	Same as maximum	
	HC	0.1	0.3	Same as maximum	
7. Fuel transfer and storage	HC	NA	1.6	Same as maximum	
8. Emergency diesel generators	TSP	23.0	4.1	10.0	1.8
	SO_2	27.7	4.9	Same as maximum	
	NO_x	230.4	40.8	Same as maximum	
	CO	59.9	10.6	Same as maximum	
	HC	6.5	1.1	Same as maximum	
9. In-plant roads fugitive dust	TSP	-	49.1	Same as maximum	
10. Waste rock handling fugitive dust	TSP	-	9.3	Same as maximum	

Source	Pollutant	Predicted Maximum lbs/hr	TPY	Allowable lbs/hr	TPY
11. Tailings pond construction fugitive dust	TSP	-	112.8	Same as maximum	
12. Access road fugitive dust	TSP	-	3.2	Same as maximum	
13. Reclamation phase fugitive dust	TSP	-	97.0	Same as maximum	

MAJOR APPLICABILITY

Allowable emissions from operation of the air pollution sources at the proposed underground mine/mill are less than 250 tons per year for any pollutant. Therefore, this project is not subject to the requirements for major air pollutant sources under Section 144.393(3), Wisconsin Statutes, or the federal prevention of significant deterioration regulations (40 CFR 52.21).

SITE DESCRIPTION

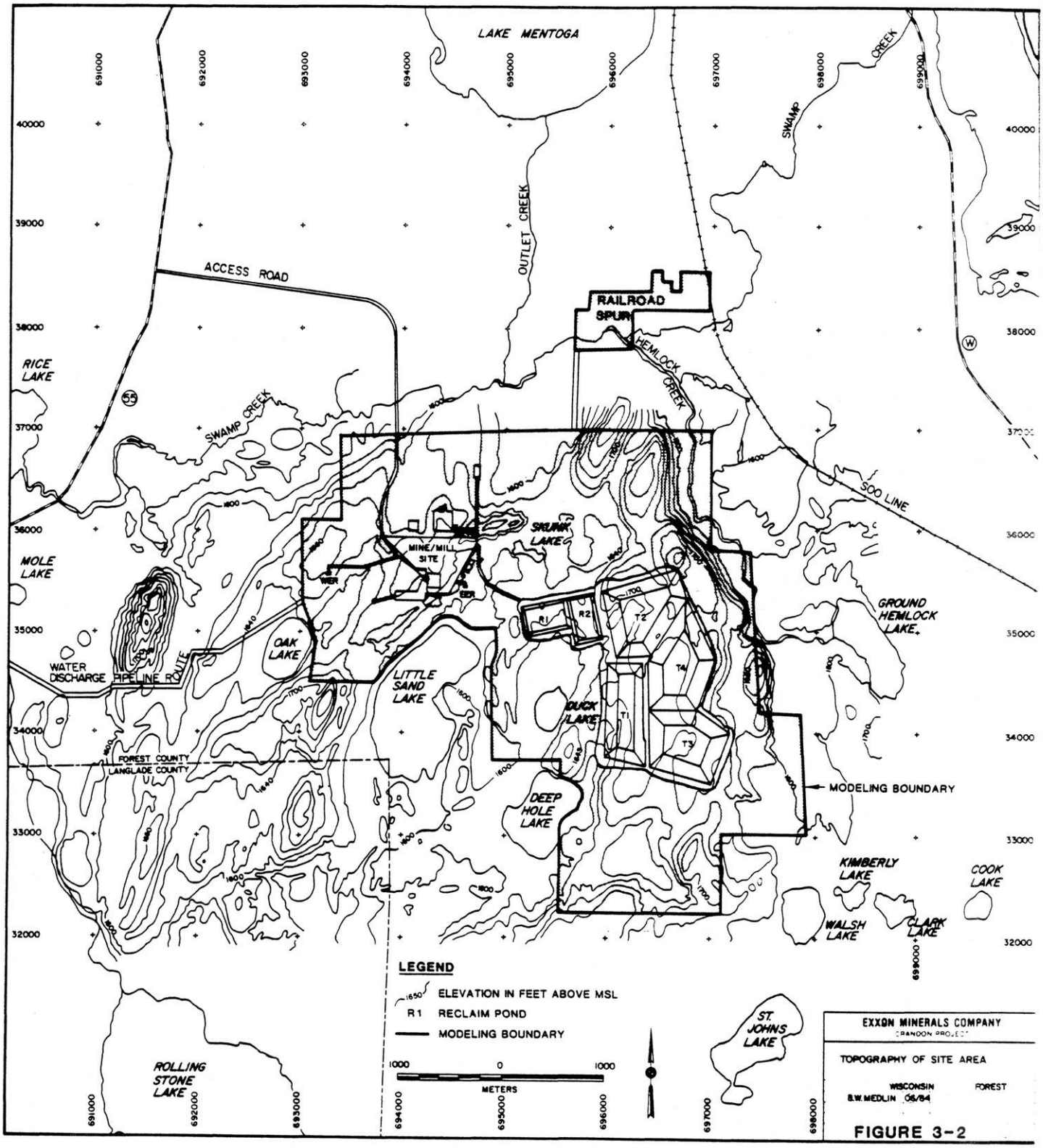
The proposed underground mine and surface facilities will be located five miles (8 km) south of Crandon, Wisconsin in Forest County. See Figure 3-2 which is taken from the revised project air permit application. Forest County is considered attainment/unclassified for all criteria air pollutants. Ambient air quality monitoring by Exxon in 1977 and 1978 confirmed this area to be in attainment status for the particulates and sulfur dioxide air quality standards.

CONTROL TECHNOLOGY REVIEW

Mine Operation:

Dust and gaseous pollutants created within the underground mine will eventually be vented to the ambient air through the east and west exhaust raises. Several steps will be taken to minimize some of these emissions. Diesel vehicles which will transport personnel, ore and equipment within the mine will burn a water/fuel emulsion which reduces nitrogen oxide and particulate tail pipe emissions. A catalytic scrubber will then be used to reduce carbon monoxide and hydrocarbon emissions which increase due to the use of this water/diesel fuel emulsion.

The primary ore crusher and subsequent ore handling operations will be hooded and equipped with fabric filter modules to collect dust. Though not finalized at this time, these modules will be similar to the Dalamatic Insertable Filers manufactured by DCE Vokes, Inc. These are described in the attachment for Comment No. 1 of the Exxon Minerals air permit submittal dated March 16, 1984. The filters chosen will be felted nylon, orlon or dacron type, have an air to cloth ratio not exceeding 10:1 and be frequently cleaned



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WER:West Exhaust Raise
EER:East Exhaust Raise
T1:Tailings Pond T1
R1:Reclaim Pond R1

with a pulse of compressed air. These filters would exhaust back into the mine and return collected dust directly to tne crusher or ore transfer point being controlled. The DCE Vokes, Inc. filters have been used in similar applications and are expected to be successful if they or similar type fabric filters are employed.

The majority of the dust generated by production blasting and rock handling is expected to settle out due to gravitational forces before exiting the mine through the exhaust raises. In this way, the mine acts as a large settling chamber, the simplest of particulate control devices. Emission calculations used an estimated particle size distribution, particle density, flow rate and mine dimensions to estimate the portion of the dust which would settle out. For blasting and non-filtered rock handling operations, 75-95% of the dust was predicted to settle. All dust from handling operations equipped with fabric filters, and fuel combustion, as well as all gaseous pollutants are assumed to exit the mine through the exhaust raises.

In order to verify the emission estimates, it will be recommended as a condition of permit approval that the exhaust raises be stack tested upon startup of the mine for particulates and records be kept of mine ore and waste rock production and explosive usage.

Ore Processing Mill Operations:

The primary sources of emissions during ore processing are fine ore crushing and screening, and fine ore bin loading and unloading operations. Both of these operations will be hooded at the locations where ore is processed and handled. Collected dust will be vented to wet scrubbers which exhaust to the ambient air. Though the actual collectors which will be used have yet to be finalized, Exxon has proposed to use Ducon Type UW-4, Model IV wet scrubbers manufactured by the Ducon Company, Inc. or collectors of similar control effectiveness.

The Ducon Type UW-4 wet scrubber consists of three stages: a precleaner section to remove larger dust particles, a dynamic fan to turbulently mix the finer dust particles with the scrubbing water, and a cyclonic separator to remove the scrubbing liquid and entrained dust from the exiting stack gases. The dynamic fan serves to both pull the exhaust air through the dust collection system and atomize the scrubbing liquid. This type of scrubber is used extensively in the mining industry as well as for other mineral processing operations. Compliance with the federal new source performance standard (NSPS) for metallic mineral processing (0.05 gm/dscm) is expected. Stack tests upon start-up of the fine ore crushing and bin loading/unloading operations will be recommended to verify compliance with NSPS emission limits and determine necessary operating conditions to assure continued compliance.

The NSPS requires that any wet scrubbers used for control purposes be continually monitored for pressure drop and scrubbing liquid flow rate. These are two parameters affecting scrubber performance. Exxon has indicated that these parameters will be monitored. These will also be recommended as permit conditions.

The pilot plant used for preproduction ore processing will be hooded at dust generating points on the plant and ducted through a fabric filter baghouse. This baghouse is expected to be a DCE Vokes Model DLM 1/3/10 Type W or equivalent. This DCE model is similar to those used in the mine except for a smaller filter area - 315 ft^2. Fabric filters were found by the U.S. EPA to be able to comply with the NSPS for mineral processing plants. No stack test requirement will be recommended since this pilot plant will operate only for short period (6 to 12 months) and process a small amount of ore (2 short tons per hour).

Several dust sources at the mill will use fabric filters to reduce dust in the work areas. The coarse ore transport conveyor to the headframe, coarse ore storage building, surge bins for the fine ore crushing, fine ore crushing transfer tower, lime storage bin loading, sodium carbonate storage bin loading, cement bin loading operations and backfills sand handling will use fabric filters such as the DCE Vokes type used within the mine. These filters, however, will not vent to the ambient air but back into the buildings which house these operations. Minimal emissions to the ambient air are expected from these operations.

The concrete batch plant used for miscellaneous mine/mill site applications will be equipped with a fabric filter baghouse and miscellaneous filters to control dust from sand, aggregate and cement handling operations. This again would be the DCE Vokes type or similar. Generally fabric filters should be more than adequate to control dust to levels allowed by Sec. NR 154.11(3), Wis. Adm. Code (0.2 pounds per 1000 pounds of exhaust gas).

Fugitive dust may contribute significant particulate during facilities operation. Access road and in-plant road usage, tailings pond construction activities, preproduction ore and waste rock handling operations, and reclamation activities are the primary fugitive dust sources that have been identified. Exxon proposes to use regular water spraying (approximately once a shift) or longer lasting chemical dust suppressants such as calcium chloride during extensive dry periods to control fugitive dust. A truck equipped with spray equipment will be available on-site. Trucks carrying crushed rock or fine sized material will be covered or water sprayed as required if long distance transport is necessary. Areas subject to cut and fill operations will be temporarily revegetated after final grading for soil stabilization and wind blown dust control. Frequently traveled in-plant roads and the access road to Highway 55 will be paved early in the construction phase eliminating probable sources of fugitive dust. It will be recommended that a specific fugitive dust control plan be submitted prior to facility startup.

Using generic emission factors from U.S. EPA publication AP-42, it was shown that diesel generators used for emergency power generation would not comply with the emission limit of 0.15 #TSP for MMBTU in Sec. NR 154.11(4)(a)1., Wis. Adm. Code. (See p. 30 of the Appendix.) Particulate emissions due vary depending on the engine used. It will be recommended as a permit condition that prior to the expiration of the project shakedown period, Exxon verify the specific diesel generators to be used and provide sufficient emissions data to prove compliance.

During the construction phase, significant quantities of waste trees and brush will be generated as the site is cleared. Of this, approximately 20,327 short tons of unmarketable brush, limbs, and stumps will need to be disposed of. (B. Hansen - Exxon correspondence to G. Kulibert - DNR, November 9, 1984.) While most will be chipped and likely sold as fuel or fill, approximately 2,545 short tons have been identified in the air permit application for likely open burning. Air curtain destructors have been proposed to improve waste combustion and reduce emissions. Nevertheless, the air quality analysis has shown significant air quality impacts would result if large amounts of material is burned. Therefore, a constraint on open burning will be recommended as a condition of permit approval. Air curtain destructors must be used to burn waste wood and brush, and no more than 500 pounds per hour of waste may be burned.

The Mine Waste Disposal Facility (MWDF) tailings ponds have been suggested as significant sources of fugitive dust. The MWDF Feasibility Report of December, 1982 (p. 3-14) indicates that better than 85% of the tailings will be 30 um or less. As this is the particle size range where wind blown dust remains airborne for extended distances, the potential for significant fugitive dust exists if the tailings are allowed to dry and be exposed to high winds. However, the MWDF tailings ponds are not expected to be significant dust sources. The tailings will be delivered to the active pond by pipeline in the form of slurry. As the tailings settle in the ponds, a pool of water is expected to form at the end away from the discharge pipes. As the ore processing mill will operate 7 days per week, the tailings flow will be continuous. This will maintain a wet pond surface. Some areas not contacted by the incoming tailings slurry, could potentially become dry enough where strong winds would cause tailings to become airborne. The initial depth of the tailings ponds range from 77 to 101 feet. Therefore, the pond embankments may serve to reduce wind speeds in the ponds and contain airborne tailings. As a precaution against fugitive dust, however, Exxon will water spray tailings which have dried as found necessary. Should an extended mine/mill shutdown occur such that the tailings slurry flow is stopped, Exxon will take additional measures such as chemical stabilizer application to avoid airborne tailings. Specific details of the tailings ponds dust control program will be provided in the MWDF Plan of Operation required under Sec. NR 182.09, Wis. Adm. Code. Development of this plan will also be recommended as a condition of air permit approval.

A malfunction prevention and abatement plan for control equipment and methods as required by Sec. NR 154.06(a), Wis. Adm. Code, was not provided with the air permit application submittals. The submittal of this plan will be recommended as a condition of air permit approval to insure continued maintenance of air pollution control equipment.

APPLICABLE LIMITATION

1. Construction of the mine and surface facilities

Pollutant	Applicable Wis. Adm. Code	Limitation/Requirement
Particulates	Sec. NR 154.11(2)	See Note 1
	Sec. 144.394(6), Wis. Stats.	209.6 tons per year*
Sulfur Dioxide	Sec. 144.394(6), Wis. Stats.	18.8 tons per year*
Nitrogen Oxides	Sec. 144.394(6), Wis. Stats.	79.8 tons per year*
Carbon Monoxide	Sec. 144.394(6), Wis. Stats.	186.7 tons per year*
Hydrocarbons	Sec. 144.394(6), Wis. Stats.	74.2 tons per year*
Hydrogen Sulfide	Sec. 144.394(6), Wis. Stats.	0.5 tons per year*

Note 1: Fugitive Dust: No person shall cause, allow, or permit any materials to be handled, transported, or stored without taking precautions to prevent particulate matter from becoming airborne. Nor shall a person allow a structure, a parking lot, or a road to be used, constructed, altered, repaired, sand blasted or demolished without taking such precautions.

(a) Such precautions shall include, but not be limited to:

1. Use, where possible, of water or chemicals for control of dust in the demolition of existing buildings or structures, or construction operations.

2. Application of asphalt, oil, water, suitable chemicals, or plastic covering on dirt roads, material stockpiles, and other surfaces which can create airborne dust, provided such application does not create a hydrocarbon, odor, or water pollution problem.

3. Installation and use of hoods, fans, and air cleaning devices to enclose and vent the areas where dusty materials are handled.

4. Covering or securing of materials likely to become airborne while being moved on public roads, railroads, or navigable waters.

5. Conduct of agricultural practices such as tilling of land or application of fertilizers in such manner as not to create pollution.

6. The paving or maintenance of roadways or parking lots so as not to create air pollution.

*This emission limitation is set in order to document the allocation of the available air resources. It represents the maximum emissions expected during the project construction phase.

2. Underground mine operations venting through the east and west exhaust raises.

For purposes of determining an applicable emission limitation, the underground mine operations are treated as a process. The applicable limitation for a process is either Sec. NR 154.11(3)(a)1.a. based on the process weight rate, or Sec. NR 154.11(3)(b)1.m., Wis. Adm. Code based on the exhaust gas flow rate, whichever is more restrictive. In this case, the former of the two is more restrictive.

Pollutant	Applicable Wis. Adm. Code	Limitation/Requirement
Particulates	Sec. NR 154.11(3)(a)1.a. Sec. 144.394(6), Wis. Stats.	$E = 17.31\ P^{0.16}$ and 27.4 tons per year*
Sulfur Dioxide	Sec. 144.394(6), Wis. Stats.	8.0 pounds per hour, 17.7 tons per year**
Nitrogen Oxides	Sec. 144.394(6), Wis. Stats.	40.9 pounds per hour, 79.2 tons per year**
Carbon Monoxide	Sec. 144.394(6), Wis. Stats.	59.8 pounds per hour, 81.1 tons per year**

*E represents the allowable emission rate in pounds per hour, and P, represents the total weight of materials introduced to the process, excluding liquid and gaseous fuels and air, in tons per hour. In this case, for a maximum process weight rate of 1,213 short tons per hour, (the weight of material brought to the surface by the hoisting skip), the allowable TSP emission rate is 53.9 pounds per hour. A yearly emission limit of 27.4 tons per year is set in order to document the allocation of available air resources. This is the maximum particulate emissions expected from mine operation.

**These emission limits are set in order to document the allocation of available air resources. These represent the maximum emissions expected from mine operation.

3. Fine ore crushing and screening operations

As this is a process, the applicable limitation is either Sec. NR 154.11(3)(a)1.a, or Sec. NR 154.11(3)(b)1.m., Wis. Adm. Code. In this case, Sec. NR 154.11(3)(b)1.m. - 0.2 pounds per 1000 pounds of exhaust gas - would be more restrictive.

Pollutant	Applicable Wis. Adm. Code	Limitation/Requirement
Particulates	Sec. NR 154.11(3)(b)1.m. Sec. 144.394(3), Wis. Stats.	0.05 grams per dry standard cubic meter*
Visible Emissions	Sec. NR 154.11(6)(a)1.	20% opacity

*This process would normally be subject to the emission limit of Sec. NR 154.11(3)(b)1.m., Wis. Adm. Code of 0.2 pounds per 1000 pounds of exhaust gas (0.24 grams per dry standard cubic meter). However, this process is also subject to the federal New Source Performance Standards (NSPS) for metallic mineral processing plants of 40 CFR Part 60 Subpart LL. In anticipation that these standards will be adopted into Chapter 440, Wis. Adm. Code, the more restrictive NSPS of 0.05 grams per dry standard cubic meter is applied.

4. Fine ore bin loading and unloading operations

As this is a process, the applicable limitation is either Sec. NR 154.11(3)(a)1.a., or Sec. NR 154.11(3)(b)1.m., Wis. Adm. Code. In this case, Sec. NR 154.11(3)(b)1.m. - 0.2 pounds per 1000 pounds of exhaust gas - would be more restrictive.

Pollutant	Applicable Wis. Adm. Code	Limitation/Requirement
Particulates	Sec. NR 154.11(3)(b)1.m. Sec. 144.394(3), Wis. Stats.	0.05 grams per dry standard cubic meter*
Visible Emissions	Sec. NR 154.11(6)(a)1.	20% opacity

*This process would normally be subject to the emission limit of Sec. NR 154.11(3)(b)1.m., Wis. Adm. Code of 0.2 pounds per 1000 pounds of exhaust gas (0.24 grams per dry standard cubic meter). However, this process is also subject to the federal New Source Performance Standards (NSPS) for metallic mineral processing plants of 40 CFR Part 60 Subpart LL. In anticipation that these standards will be adopted into Chapter 440, Wis. Adm. Code, the more restrictive NSPS of 0.05 grams per dry standard cubic meter is applied.

5. Concrete batch plant

As this is a process, the applicable limitation is either Sec. NR 154.11(3)(a)1.a., or Sec. NR 154.11(3)(b)1.m., Wis. Adm. Code. In this case, Sec. NR 154.11(3)(b)1.m. - 0.2 pounds per 1,000 pounds of exhaust gas - would be more restrictive.

Pollutant	Applicable Wis. Adm. Code	Limitation/Requirement
Particulates	Sec. NR 154.11(3)(b)1.m.	0.2 pounds per 1,000 pounds of exhaust gas.
Visible Emissions	Sec. NR 154.11(6)(a)1.	20% opacity

6. Facility heating

This includes all fuel usage for surface facility space heating, water heating and water treatment.

Pollutant	Applicable Wis. Adm. Code	Limitation/Requirement
Particulates	Sec. NR 154.11(4)(a)1.	0.01 pounds per million BTU heat input*
	Sec. 144.394(3), Wis. Stats.	
	Sec. 144.394(6), Wis. Stats.	0.9 tons per year**
Sulfur Dioxide	Sec. 144.394(6), Wis. Stats.	0.10 tons per year**
Nitrogen Oxides	Sec. 144.294(6), Wis. Stats.	10.3 tons per year**
Carbon Monoxide	Sec. 144.394(6), Wis. Stats.	1.5 tons per year**
Hydrocarbons	Sec. 144.394(6), Wis. Stats.	0.3 tons per year**

* This alternate limitation represents the maximum emissions expected. Sec. NR 154.11(4)(a)1., Wis. Adm. Code, allows 0.15 pounds per million BTU heat input.

**These emission limitations are set in order to document the allocation of the available air resource. Yearly emissions are based on a maximum total natural gas usage of 171,032,000 standard cubic feet per year.

7. Diesel and Gasoline Storage

This includes diesel and gasoline storage and handling emissions from the two 15,000 gallon diesel fuel oil storage tanks, the 3,000 gallon diesel and gasoline storage tanks at the facility service station, and the mine diesel storage tanks.

Pollutant	Applicable Wis. Adm. Code	Limitation/Requirement
Organic Compounds	Sec. NR 154.13(3)(f)2.	See Note 1
	Sec. 144.394(6), Wis. Stats.	1.6 tons per year*

Note 1: The gasoline storage tank shall be equipped with a permanent submerged fill pipe with a discharge opening which is entirely submerged when the liquid level is 6 inches above the tank bottom.

* This limitation is set in order to document the allocation of the available air resource. Yearly emissions are based on a maximum diesel fuel oil usage of 2.1 million gallons per year, and gasoline usage of 175,000 gallons per year.

8. Emergency diesel generators

Pollutant	Applicable Wis. Adm. Code	Limitation/Requirement
Particulates	Sec. NR 154.11(4)(a)1.	0.15 lbs/MMBTU heat input
	Sec. 144.394(6), Wis. Stats.	1.8 tons per year*
Sulfur Dioxide	Sec. 144.394(6), Wis. Stats.	27.7 pounds per hour,
	Sec. 144.394(6), Wis. Stats.	4.9 tons per year*
Nitrogen Oxides	Sec. 144.394(6), Wis. Stats.	230.4 pounds per hour, 40.84tons per year*
Carbon Monoxide	Sec. 144.394(6), Wis. Stats.	59.9 pounds per hour, 10.6 tons per year*
Hydrocarbons	Sec. 144.394(6), Wis. Stats.	6.5 pounds per hour, 1.1 tons per year*
Visible Emissions	Sec. NR 154.11(6)(a)1.	20% opacity

*These emission limits are set in order to document the allocation of the available air resource. Yearly emissions are based on a maximum diesel fuel usage of 163,365 gallons per year for testing and emergency operation.

9. Surface facilities operation fugitive dust

Pollutant	Applicable Wis. Adm. Code	Limitation/Requirement
Particulates	Sec. NR 154.11(2)	See Note 1
	Sec. 144.394(6), Wis. Stats.	174.4 tons per year*

Note 1: Fugitive Dust. No person shall cause, allow, or permit any materials to be handled, transported, or stored without taking precautions to prevent particulate matter from becoming airborne. Nor shall a person allow a structure, a parking lot, or a road to be used, constructed, altered, repaired, sand blasted or demolished without taking such precautions.

(a) Such precautions shall include, but not be limited to:

1. Use, where possible, of water or chemicals for control of dust in the demolition of existing buildings or structures, or construction operations.

2. Application of asphalt, oil, water, suitable chemicals, or plastic covering on dirt roads, material stockpiles, and other surfaces which can create airborne dust, provided such application does not create a hydrocarbon, odor, or water pollution problem.

3. Installation and use of hoods, fans, and air cleaning devices to enclose and vent the areas where dusty materials are handled.

4. Covering or securing of materials likely to become airborne while being moved on public roads, railroads, or navigable waters.

5. Conduct of agricultural practices such as tilling of land or application of fertilizers in such manner as not to create pollution.

6. The paving or maintenance of roadways or parking lots so as not to create air pollution.

*This emission limitation is set in order to document the allocation of the available air resources. It represents the maximum emissions expected from access road and in-plant road usage, tailings pond construction activities and waste rock handling operations, or reclamation activities.

AIR QUALITY REVIEW

To evaluate the effects of this project on the air quality in the surrounding area, two analyses were done using U.S. EPA approved dispersion models. The first was that completed by Exxon Minerals and submitted with their revised air permit application of February 1985 (Section 4 - Air Quality Assessment). The second was that done by the Air Impact Analysis and Planning Section of the DNR Bureau of Air Management. (See the April 4, 1985 DNR Memorandum from Larry Bruss to Steve Klafka, Exxon Crandon Mine - Air Quality Analysis.)

The Exxon Minerals analysis evaluated the project impacts during the fourth year of mine/mill operation. This is the year when annual particulate emissions would be greatest. (See emission summary Table 4.1 of the permit application.) The results of this analysis are presented in Table 4.7 which follows are taken from the revised air permit application. This table summarizes the predicted maximum pollutant concentrations, representative background concentrations, and the total pollutant concentrations as they relate to the national ambient air quality standards (NAAQS). The pollutant of greatest consequence (consuming the largest percentage of the applicable standard) is total suspended particulates. The maximum 24 hour average predicted impact or concentration is 36.5 ug/m^3. Combined with a background of 77 ug/m^3, the predicted worst case total is 113.5 ug/m^3. This is below the secondary particulate standard of 150 ug/m^3, and well below the primary (health related) standard of 260 ug/m^3. The predicted annual average impact was 3.8 ug/m^3. Combined with a background of 17.9 ug/m^3, the total is

TABLE 4.7

COMPARISON OF STATE AND FEDERAL AMBIENT AIR QUALITY STANDARDS[a] WITH ISC MODEL PREDICTED CONCENTRATIONS FOR THE PROJECT AT THE MODELLING BOUNDARY
(All Concentrations in ug/m^3)

	PREDICTED CONCENTRATION FROM CRANDON PROJECT	BACKGROUND CONCEN-TRATION	SUMMED CONCEN-TRATION	PRI-MARY NAAQS	SECON-DARY NAAQS
SULFUR DIOXIDE					
Annual	0.1[b](2.1)[c]	25.0	25.1 (27.1)	80	--
24-Hour	1.8 (24.9)	25.0	26.8 (49.9)	365	--
3-Hour	7.1 (186.0)	25.0	32.1 (211.0)	--	1,300
PARTICULATE MATTER (TSP)					
Annual	3.8	17.9	21.7	75	60
24-Hour	36.5	77.0	113.5	260	150
NITROGEN DIOXIDE					
Annual	3.8	19.4	23.2	100	100
CARBON MONOXIDE					
8-Hour	1802.5	N/A[d]	1802.5	10,000	10,000
1-Hour	2025.3	N/A	2025.3	40,000	40,000
HYDROCARBONS (HC)					
3-Hour	31.8	N/A	31.8	160	160
LEAD (Pb)					
3-Month Average	0.04	N/A	0.04	1.5	1.5

a. All short-term limits (24-hour and less) can be exceeded once a year.

b. Stationary sources only (see the December 1982 Air Permit Application, Appendix C - Tables C.10, C.11 and C.12 [Exxon Minerals Company, 1982]).

c. Includes temporary mobile source emissions and are the highest, second-highest predicted concentrations (see the December 1982 Air Permit Application, Appendix C - Table C-9 [Exxon Minerals Company, 1982]).

d. N/A = Not applicable.

21.7 ug/m^3. This, again, is well below the secondary and primary standards of 60 and 75 ug/m^3, respectively. Background particulate concentrations were obtained from an ambient monitoring program conducted by Exxon in 1977 and 1978.

All other criteria pollutants - sulfur dioxide, nitrogen oxides, carbon monoxide and lead - had predicted impacts which when combined with background concentrations were well below their applicable standards. The hydrocarbon standard no longer exists so this part of the Exxon analysis is not addressed.

Emission rates used for the air pollution sources modeled were: state and federal allowable emission limits for short-term particulate impacts, predicted actual emissions for long term particulate impacts, predicted actual emissions for both short and long term SO_2, NO_x, CO and Pb impacts. Thus, short term particulate impacts may be lower than predicted since actual short term emissions may be lower than allowable emission rates. (See April 30, 1984, April 16, 1984 and March 30, 1984 air permit correspondence for the derivation of modeling emission rates.)

An air quality impact analysis was conducted by the Air Impact Analysis and Planning Section of the DNR Bureau of Air Management. This analysis was conducted to both verify and expand the analysis submitted by Exxon Minerals with the revised air permit application. Project impacts were again evaluated for the fourth year of mine/mill operation. This year has the largest particulate emissions due to the excavation of tailings pond T2. Additionally, the first year of the project construction phase was evaluated. This year has significant particulate emissions from excavation activities fugitive dust, and significant gaseous pollutant emissions due to diesel generator operation and open burning of cleared trees and brush. (See emission summary Tables D-1, D-2, D-3 and D-4 of the revised air permit application.)

The results of the analysis are presented in Tables 9 through 14 taken from the aforementioned April 4, 1985 DNR memorandum. Table 9 summarizes the predicted maximum criteria pollutant concentrations, representative background concentrations, and the total pollutant concentrations as they relate to the national ambient air quality standards. As with the Exxon analysis, the pollutant of greatest consequence is particulates. The maximum 24 hour average predicted impact for project operation is 48.9 ug/m^3. Combined with a background of 77 ug/m^3, the predicted worst case total is 125.9 ug/m^3. This, again, is below the particulate standard of 150 ug/m^3, and well below the primary standard of 260 ug/m^3. The predicted annual average impact was 5.7 ug/m^3. Combined with a background of 17.9 ug/m^3, the total is 23.6 ug/m^3. This is well below the secondary and primary air quality standards.

The particulate impacts predicted for the construction phase were lower than the operation phase for the short term, 24 hour averaging period, but higher for the annual averaging period. The 24 hour average was 41.4 ug/m^3, and the annual average was 7.9 ug/m^3. Combined with a background of 17.9 ug/m^3, the total annual concentration is 25.8 ug/m^3. This still is well below the applicable particulate standards. This is summarized in Table 9.

Table 9

Air Quality Summary

Pollutant	Period	NATIONAL AIR QUALITY STANDARD Concentration Primary ug/m3	NATIONAL AIR QUALITY STANDARD Concentration Secondary ug/m3	CONCENTRATION Maximum Concentration Due to Exxon Sources Construction ug/m3	CONCENTRATION Maximum Concentration Due to Exxon Sources Operation ug/m3	CONCENTRATION Background ug/m3	CONCENTRATION Total Construction ug/m3	CONCENTRATION Total Operation ug/m3
TSP	24-hour	260	150	41.4	48.9	77.0	118.4	125.9
	Annual	75	60	7.9	5.7	17.9	25.8	23.6
SO_2	3-hour	No Standard	1300	***	160.9	25.0	***	185.9
	24-hour	365	No Standard	***	52.2	25.0	***	77.2
	Annual	80	No Standard	1.5	0.1	25.0	26.5	25.1
NO_2	Annual	100	100	3.0	0.7	19.4	22.4	20.1
CO	1-hour	40,000	40,000	***	7805	0.0	***	7805
	8-hour	10,000	10,000	***	1654	0.0	***	1654
Lead	Calendar Quarter	1.5	No Standard	***	0.019	0.0	***	0.019

***No air quality modeling done - insignificant emission rates.

As with the Exxon analysis, all other criteria pollutants had predicted impacts which are not expected to cause violations of the applicable ambient air quality standards.

The ore which will be mined contains a vast array of metals besides the copper, zinc and lead which will be recovered. These metals are expected to be found in the particulate emissions resulting from ore processing and waste tailings disposal. Emission rates for any given metal were calculated by assuming it comprised the same percentage of the particulate emissions as its concentration in the ore or tailings handled at the source. The sources of metals included in the analysis were underground mine operations venting through the exhaust raises, fine ore crushing and screening operations, fine ore bin loading and unloading operations and wind blown tailings off of an active tailings pond. Emissions from a tailings pond were estimated to produce a more conservative analysis.All other significant particulate sources do not involve ore handling.

Table 10 summarizes the maximum predicted concentrations for mercury, arsenic, cadmium, chromium, cobolt, copper, manganese and zinc. As no national ambient air quality standards yet exist for these pollutants, concentrations were predicted for averaging periods of currently available guideline levels of acceptability. A 30-day average guideline level of 1 ug/m^3 for mercury is provided in Section NR 154.19, Wisconsin Administrative Code. The maximum predicted calendar quarter average (nearly equal to the 30-day average) was 1.02 pg/m^3 (1.02×10^{-6} ug/m^3). Assuming no background concentrations, this mercury impact is insignificant with regard to the guideline.

The other metals were compared with short-term guideline levels derived from the occupational exposure threshold limit values or TLV's published by the American Conference of Governmental Industrial Hygienists. 2.4% of eight hour TLV's and 1% of ceiling limit TLV's are the guideline levels currently used by the DNR Bureau of Air Management while noncriteria pollutant rules are developed. As shown in Table 11, each metal investigated had predicted short-term concentrations well below the TLV derived quideline values.

Lastly, those metals which the US EPA Carcinogenic Assessment Group (CAG) have identified as potential human carcinogens were evaluated using CAG potency slopes. These potency slopes convert long-term pollutant concentrations into potential risk of developing cancer. As a result, cadmium, chromium and manganese were found to have extremely small predicted risk (i.e. 4.40×10^{-8} or less). This is summarized in Table 12. These are far below the 1×10^{-6} risk level currently used as a guideline of acceptability by most regulatory agencies. Arsenic was found to have a predicted risk of 1.24×10^{-6}. This is greater than the 1×10^{-6} level, but in this case is not considered high enough to merit some regulatory action (e.g. more stringent particulate control requirements). No action is considered necessary because 1) emission estimates are likely to be conservatively high and overpredict the impact, 2) no individual is likely to be exposed to the maximum long-term concentration for his or her lifetime, and 3) not all arsenic inhaled will be absorbed.

Thus, based on current guidelines, airborne concentrations of metals resulting from ore and tailings processing are not expected to pose a significant hazard.

Table 10

Mercury Concentrations

Standard NR 154.19, Wis. Adm. Code	Predicted Concentrations: Max. Con. Due to Exxon Sources ug/m3	Background ug/m3	Total ug/m3
1 ug/m^3 30 day-average	1.02×10^{-6} (calendar quarter)	0.0	1.02×10^{-6} (calendar quarter)

Table 11

Toxic Metal Concentrations

Pollutant	Threshold Limit Valve ## % of TLV	Threshold Limit Valve ## Concentration	Maximum Predicted Concentration # For The Period (ug/m^3)
Arsenic	2.4% - 24 Hour	4.8 ug/m^3	6.8×10^{-2}
Cadmium	2.4% - 24 Hour	1.2 ug/m^3	7.8×10^{-4}
Chromium	2.4% - 24 Hour	1.2 ug/m^3	1.3×10^{-3}
Cobolt	2.4% - 24 Hour	2.4 ug/m^3	4.8×10^{-7}
Copper	2.4% - 24 Hour	24. ug/m^3	0.67
Manganese	1% - 1 Hour (ceiling)	50. ug/m^3	0.29
Zinc	2.4% - 24 Hour	120. ugm^3	2.83

Calculated from a percentage of TSP impact using allowable TSP emission rates.

Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment and Biological Exposure Indicies with Intended Changes for 1984-1985, American Conference of Governmental Industrial Hygienists, Cincinnati, OH, 1984.

Table 12

Cancer Potential

Pollutant	Unit Risk Factor* m^3/ug	Annual Maximum Concent. ug/m^3	Cancer Risk
Arsenic	4.0×10^{-3}	3.1×10^{-4}	1.24×10^{-6}
Cadmium	1.9×10^{-3}	3.5×10^{-6}	6.65×10^{-9}
Chromium	1.2×10^{-2}	6.2×10^{-6}	7.44×10^{-8}
Manganese	4.0×10^{-4}	1.1×10^{-4}	4.40×10^{-8}

*Source: Standards Applicable to Owners and Operators of Hazardous Waste Treatment, Storage, Disposal Facilities Under RCRA Proposed Additions to Standards for Hazardous Waste Incinerators, U.S. EPA, Research Triangle Park, NC, NTIS PB81-193021, 1981.

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Table 13

Amounts of Metals Emitted (Stacks Only)

Pollutant	Amounts Emitted	
	g/year	pounds/year
Lead	164334.	362.0
Arsenic	38454.	84.7
Cadmium	427.	.9
Chromium	756.	1.7
Cobolt	.26	5.7×10^{-4}
Copper	460135.	1013.5
Manganese	13475.	29.7
Mercury	99.	.2
Zinc	1906274.	4198.8

Table 14

Toxic Metal Deposition

Pollutant	Maximum Deposition, Off-Site	
	Seasonal mg/m2	Annual mg/m2
Arsenic	1.8×10^{-2}	5.3×10^{-2}
Cadmium	2.0×10^{-4}	6.0×10^{-4}
Chromium	3.5×10^{-4}	1.0×10^{-3}
Cobolt	1.2×10^{-4}	3.6×10^{-3}
Copper	2.2×10^{-1}	6.3×10^{-1}
Lead	7.7×10^{-2}	2.3×10^{-1}
Manganese	6.3×10^{-3}	1.9×10^{-2}
Mercury	4.6×10^{-5}	1.4×10^{-4}
Zinc	8.9×10^{-1}	2.6

Table 14 provides a summary of predicted metal deposition rates. No air quality standards or guidelines are currently in use to evaluate deposition of metals. Thus, this data was provided to DNR personnel addressing project impacts on surface waters and terrestrial ecology. Their conclusions will be considered in the final determination on air permit issuance.

To verify pollutant emissions used for the air quality analysis, stack tests will be required as a condition of air permit approval for significant sources. Additionally, an ambient air quality monitoring program has been proposed by Exxon as required under the mining permit requirements of Chapter NR 132, Wisconsin Administrative Code. The preliminary monitoring plan includes the operation of four particulate monitors during the construction phase and three particulate monitors during the operation phase. Asbestiform fiber monitors will be operated during the fourth and fifth year of operation of the tailings pond Tl measure if any asbestiform fibers are present in the waste tailings. This monitoring plan, like the stack tests, will verify if the air quality impact analysis of the project was accurate and necessary particulate control measures are being undertaken.

OFFSET ANALYSIS

The proposed underground mine and surface facilities are not located in a nonattainment area, so offsets are not required.

EMISSION REDUCTION OPTION

This is not applicable.

PRECLUDE OTHER SOURCES

The operation of this facility will not preclude the construction of other air pollution sources in this area. The predicted air quality impact of this facility is well within current air quality standards.

CRITERIA FOR PERMIT APPROVAL

Sec. 144.393, Wisconsin Statutes sets forth the specific language for permit approval criteria. The following conclusions have been made:

1. The source will meet emission limitations.

2. The source will not cause or exacerbate a violation of an air quality standard or ambient air increment.

3. If the source is operating or seeks to operate under an emission reduction option, the required permit application for other sources participating in that emission reduction option are approvable. (Not applicable)

4. The source will not preclude the construction or operation of another source for which an application has been received.

OTHER IMPACTS

This project has been reviewed under the Wisconsin Environmental Policy Act Chapter NR 150, Wis. Adm. Code, to determine the short-term and long-term environmental and economic effects of this project upon the quality of the human environment. It has been determined that an environmental impact statement is required. This is now being prepared by the Department, coordinated by the Bureau of Environmental Analysis and Review. The decision on the permit for this project will be held pending the completion and approval of the statement.

DETERMINATION

The Bureau of Air Management, Wisconsin Department of Natural Resources has reviewed the materials submitted by the Exxon Minerals Company for an air pollution control permit for an underground mine, ore processing mill, and associated facilities and has made a preliminary determination that this project is approvable subject to the following conditions:

a. This permit does authorize an initial operation period of 180 days for equipment shake-down, testing and Department evaluation of operation to assure conformity with the permit conditions. Permanent operation of the source(s) covered by this permit after the initial operation period is prohibited until a release has been issued by the Department.

b. Source performance tests shall be conducted within 90 days after the start of initial operation to prove compliance with the particulate limitations for the underground mine operations, fine ore crushing and screening operations, and fine ore bin loading and unloading operations while operating at 80% or greater capacity and using U.S EPA tests methods identified in 40 CFR 60 Subpart LL. The Department shall be informed at least 10 working days prior to the tests so a Department representative can witness the testing. At the time of notification, a stack test plan following the provisions set forth in Section NR 154.06(5), Wisconsin Administrative Code, shall also be submitted for approval.

   Two copies of the report on the tests shall be submitted to the Department for evaluation within 30 days after the tests or at least 15 working days prior to the expiration of the initial operation period. Release for permanent operation will be issued only upon proof of compliance.

c. The wet scrubbers used to control particulate emissions from the fine ore crushing and screening operations, and the fine ore bin loading and unloading operations shall be equipped with monitoring devices for pressure drop across the scrubber and scrubbing liquid flow rate as required under the new source performance standards for metallic mineral processing plants (40 CFR 60 Subpart LL). The pressure drop monitoring device must be certified by the manufacturer to be accurate within ± 1 inch water (± 250 pascals) gage pressure and must be calibrated on an annual basis in accordance with manufacturer's instructions. The scrubbing liquid flow rate monitoring device must be certified by the manufacturer to be accurate within ± 5% of design scrubbing liquid flow rate and must be calibrated on at least an annual basis in accordance with manufacturer's instructions.

Quarterly reports shall be submitted to the Department of occurrences when the scrubber pressure drop and scrubbing liquid flow rate differ more than ± 30% from those measurements recorded during the most recent performance test.

d. Records shall be kept indicating daily ore and waste rock production rates, and explosive and diesel fuel oil usage rates for the mine. Production rates should be for those materials removed from the mine.

e. Prior to expiration of the project shakedown period, a malfunction prevention and abatement plan shall be submitted to and approved by the Department. This shall include a specific plan for control of fugitive dust during surface facilities operation.

f. All open burning of cleared trees and brush shall use air curtain destructors. Burning rates shall not exceed 500 pounds per hour.

g. Not later than 180 days after initial start-up, no ore processing related fugitive emissions shall exhibit an opacity greater than 10 percent using U.S. EPA Method 9 as required under the NSPS for metallic mineral processing plants (40 CFR 60 Subpart LL).

h. Diesel fuel oil usage by the mill backup generators shall not exceed 163,365 gallons per year.

i. Prior to expiration of the project shakedown period, emissions data acceptable to the Department shall be submitted which verifies the emergency diesel generators used for this project comply with the applicable particulate emission limitation.

Review Engineer: Steven Klafka SKlafka 26April1985

Checked by: _____

Approved by: _____

cc: M. Debrock - NCD
R. Ramharter - EA/3
R. Herbst - Exxon

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