NMU is proposing a CO emission limit of 0.17 pound per million Btu heat input, and this is within the nation-wide range of accepted CO emissions that represent BACT. This emission limit will be achieved through the use of modern combustion control technology.

5.6 VOLATILE ORGANIC COMPOUNDS (VOC)

Although the proposed CFB boiler is not subject to the requirement of BACT pursuant to the PSD regulations, Michigan's Rule 702(a) requires implementing BACT for VOC emissions from new or modified sources of VOC.

The new CFB boiler will employ state-of-the-art combustion techniques that will limit the potential emission of organic compounds. Organic compounds consist of many forms, and are primarily generated from incomplete combustion.

Installations of add-on control devices such as a thermal oxidizer or catalytic oxidizer are not considered to be acceptable control alternatives based on economic, environmental and energy purposes. Furthermore, these types of control have not been added to control organic and CO emissions from solid fuel fired boilers.

Boilers control potential organic compound emissions by implementing good combustion practices that include proper temperature, adequate mixture of organics with oxygen in the combustion air, and enough residence time to achieve oxidation of the organics inside the furnace. Therefore, the use of state-of-the-art combustion controls represents BACT for VOCs.

The VOC emissions from the proposed CFB boiler are not subject to the BACT requirements of the PSD regulations. The VOC emissions are required to be controlled using BACT pursuant to the requirement in Michigan's Rule 702(a). NMU is proposing a Rule 702(a) BACT limit of 4.0 lb/hr and 17.6 ton/yr.

5.7 TOXIC AIR CONTAMINANTS (TACs)

Rule 224 of Michigan's Rules for Air Pollution Control requires Best Available Control Technology for Toxics (T-BACT) for compounds identified as toxic air contaminants (TACs). TAC's also include hazardous air pollutants (or HAPs) that, for boilers subject to the MACT for industrial, commercial, and institutional boilers, are regulated by the MACT standards of 40 CFR Part 63. The proposed boiler is not subject to these requirements because NMU is a minor source of HAPs.

The majority of the TACs emitted will be in the form of solids (such as metals), and some toxics will likely be emitted as a gas. The gaseous emissions would consist of both organic and acidic compounds with some vapor phase mercury.

Following are discussions regarding T-BACT for the various forms (or groupings) of TACs.

5.7.1 Metals (Except Mercury)

Metals are emitted as a result of their presence in the fuel(s). The metals are contained in the ash from the solid fuel, and are in particulate form. Some of the ash is carried out of the boiler in the form of flyash, and some remains in the bottom of the boiler known as bottom ash. Some of the ash remains at the bottom of the boiler and is removed when the fluidized bed is circulated out of the boiler. The flyash remains in the exhaust gas stream and is removed with a downstream particulate control device. NMU will be installing a baghouse (or fabric filter), which will clean the exhaust gases of the particulate matter. The PSD BACT analysis for PM was addressed in Section 5.1 above.

Baghouses and electrostatic precipitators are considered the best method of removing PM from solid fuel fired boiler exhaust gas streams, and are generally considered to be the best available control technology for removing suspended TACs in the form of PM. See Section 5.1 above for a description regarding PM control devices used by solid fuel fired boilers.

The use of a fabric filter represents BACT for PM emissions, and Rule 224 of Michigan's Rules for Air Pollution Control state that the use of PM BACT represents T-BACT for TACs as PM.

5.7.2 Organic Compounds

The new CFB boiler will employ state-of-the-art combustion techniques that will limit the potential emission of organic compounds. Organic compounds consist of many forms, and are primarily generated from incomplete combustion.

Installations of add-on control devices such as a thermal oxidizer or catalytic oxidizer are not considered to be acceptable control alternatives based on economic, environmental and energy purposes. Furthermore, these types of control have not been added to control organic and CO emissions from solid fuel fired boilers.

Boilers control potential organic compound emissions by implementing good combustion practices that include proper temperature, adequate mixture of organics with oxygen in the combustion air, and enough residence time to achieve oxidation of the organics inside the boiler's furnace box. Therefore, the use of state-of-the-art combustion controls represents T-BACT for organic TACs.

The use of state-of-the-art combustion techniques represents BACT for VOC emissions, and Rule 224 of Michigan's Rules for Air Pollution Control state that the use of VOC BACT represents T-BACT for organic TACs in the form of VOC.

5.7.3 Acid Gas Emissions

Acid gases result from the presence of chlorine, sulfur and fluorine in the fuels combusted. These emissions are primarily hydrogen chloride (HCl), hydrogen fluoride (HF) and sulfuric acid mist (H_2SO_4).

Control of these pollutants will be accomplished through the use of limestone addition to the CFB boiler bed, which is a proven control technique for controlling acid gases from CFB boilers. Sulfuric acid mist, HCl and HF are captured by reacting with the limestone (which is converted to calcium oxide at the temperature of the bed in the CFB boiler), prior to becoming airborne in the exhaust gases.

Therefore, the use of limestone in the CFB boiler bed represents T-BACT for controlling potential acid gas emissions.

5.7.4 Mercury (Hg)

Emissions of Hg from the proposed CFB boiler are subject to the Michigan-specific requirements for T-BACT. MDEQ rules governing T-BACT require a thorough control technology analysis for TACs with respect to energy, environmental, and economic impacts.

Many existing technologies and systems used for control of PM, SO_2, and NO_x have been demonstrated to have significant co-benefits for control of mercury emissions. Specifically, use of flue gas desulfurization (FGD), fabric filters, and selective (and non-selective) catalytic reduction. In addition, certain grades of coal have been shown to inherently reduce emissions of Hg due to the constituents within the coal. Recent information available from EPA reports indicates that bituminous coals tend to have significantly lower mercury emissions in the flue gas due to the presence of chlorine in the coal ash. Studies have shown that the mercury has an affinity to combine with the chlorine in bituminous coal to form mercuric chlorides that are then captured in the downstream particulate collection device. The only demonstrated and commercially available add-on control technology specifically designated for control of Hg from combustion of coal is activated carbon injection (ACI).

NMU will be utilizing a blend of subbituminous and bituminous grade coals and virgin wood with desulfurization occurring inside the furnace through co-firing of limestone while firing coal fuel, and add-on controls consisting of SNCR and fabric filter. EPA has stated in both the preamble to 40 C.F.R. Part 60 Subparts Da and HHHH, and summary to the reconsideration of the clean air mercury rule (CAMR) that the best demonstrated technology for mercury control while firing bituminous coal is a fabric filter, flue gas desulfurization, and, to a lesser extent, selective non-catalytic reduction. Several test studies have shown that removal efficiencies for Hg of at least 80% are readily achieved through such a configuration. In this instance, the proposed limit of 3.0 E-6 lb/MMBtu represents approximately 70% Hg removal when considering a maximum Hg content in coal of 0.1 ppmw on a wet basis.

Nationwide Existing Controls

Some of the gaseous (vapor) mercury present in the exhaust gas stream will adsorb to fly ash and other PM and will be removed by the PM control device. While removal efficiencies range from 0 to 98 percent, data from plants burning only bituminous or a blend of subbituminous and bituminous coals have a much higher removal of mercury. In this project, the PM control device will be a fabric filter.

In addition, divalent mercury (Hg^{2+}) compounds (sometimes referred to as reactive gas mercury or RGM) have been shown to be reduced through the use of FGD devices, including both wet and dry systems, especially for plants firing bituminous coals. The reasons stem from the presence of chlorine in the coal, and the higher concentration of chlorine in bituminous coals. Bituminous coals tend to have higher levels of chlorine and unburned carbon available for removal of Hg. In this scenario, elemental Hg (Hg^{0}) is oxidized to form Hg^{2+} due the presence of HCl, which can then be captured by the baghouse.

Finally, the use of SNCR for control of NO_x has been proven to reduce Hg in the flue gas stream as well, since a portion of the elemental Hg is catalytically oxidized to divalent mercury as it passes through the SNCR unit. The uses of these three technologies in field tests have shown that mercury levels can be reduced by 80% – 90%.

Activated Carbon Injection (ACI)

In ACI systems, powdered activated carbon (PAC) sorbent is injected into the flue gas upstream of the PM control device. Activated carbon is a specially treated carbon that has been exposed to temperatures of 800 – 900 degrees Celsius. It becomes "activated" such that the carbon is very porous and has a high surface area. The pores allow vapor-phase mercury to adsorb to the carbon, which is then collected in the downstream PM control device.

The performance of activated carbon is related to physical properties including surface area, pore size, and particle size distribution. Mercury capture is increased with increased pore size and surface area. A large drawback to the use of ACI is the "poisoning" of the fly ash and reduced ability to sell the ash to other industries. To minimize the impact on the fly ash, one option is to install a TOXECON® system. In this system, PAC is injected downstream of the primary PM collection device, which is used to collect the fly ash, but upstream of a polishing baghouse that vents to the ambient air. The polishing baghouse or Compact Hybrid Particulate Collector (COHPAC) installed downstream of the sorbent injection is specifically designed to capture the mercury contaminated particulate.

Proposed Hg BACT Emission Limit

The facility is proposing a Hg emission limit of 3.0E-06 lb/MMBtu, which, coincidently, is equal to the Boiler MACT limit. To date, the use of ACI has not been proven to significantly increase the Hg removal beyond what NMU is currently proposing.

Instead, the Hg limit of 3.0E-06 lb/MMBtu is consistent with the level of control currently being achieved in some CFBs burning bituminous coals. This level of emissions is considered the T-BACT limit for this process and exceeds many recently issued permits for coal-fired boilers issued in the past several years.

Instead, the Hg limit of 3.0E-06 lb/MMBtu is consistent with the level of control currently being achieved in some CFBs burning bituminous coals. This level of emissions is considered the T-BACT limit for this process and exceeds many recently issued permits for coal-fired boilers issued in the past several years.

6.0 AMBIENT IMPACT ANALYSIS

As discussed in Sections 1 through 5, Northern Michigan University (NMU) is proposing to install a new coal/wood fired boiler at the main campus power facility in Marquette, Michigan. NMU is currently not a major source because its potential to emit of any criteria pollutant is limited to 99.9 tons per year (tpy) by federally enforceable conditions of Permit No. 126-05. The facility, however, will become a major source for PSD purposes upon initial startup of the new CFB boiler, as the CFB boiler has the potential to emit 100 tpy or more of any criteria pollutants and 10 tpy or more of a single HAP. This section presents an air quality modeling analysis, which demonstrates that the emissions from the power facility (including CFB boiler emissions) will comply with the applicable state and federal ambient air quality standards.

The power facility will be subject to the federal PSD regulations because the new CFB boiler is considered a major stationary source under 40 CFR Part 52.21. The potential emissions of SO_2 and CO exceed the PSD major source thresholds, and the potential emissions of PM_{10} and NO_x exceed the significant emission rates defined in the PSD regulations. As required by the PSD regulations and MDEQ-AQD, the emissions of SO_2, PM_{10}, CO and NO_x must be included in a compliance demonstration analysis to show that the emissions of these pollutants will not cause or contribute significantly to the deterioration of the ambient air.

Criteria pollutant modeling was conducted for SO_2, PM_{10}, and NO_x in order to demonstrate compliance with the applicable PSD Class II Increments and National Ambient Air Quality Standards (NAAQS). In addition, modeling has been conducted for SO_2, PM_{10}, and NO_x to demonstrate compliance with 80% of the applicable PSD Class II Increments per MDEQ-AQD policy that no single facility is allowed to consume more than 80% of the applicable Increment standards, in order to allow future industrial growth. Modeling has been conducted for CO in order to demonstrate compliance with the applicable NAAQS. As CO does not have any established PSD Increment standards, Increment modeling is not required for CO emissions.

The ambient impact analysis for criteria pollutants was initially conducted by modeling the potential emission increases from the affected sources under the proposed modification in order to determine the corresponding impacts. These impacts were determined for the pollutants with emissions greater than the PSD significant emission rates (i.e., SO_2, PM_{10}, CO and NO_x), and were compared to the appropriate significance impact levels (SIL) as stipulated by the U.S. EPA.

The results of the initial modeling indicate that the CO, PM_{10}, and NO_x emissions from the NMU power facility will not result in maximum ambient impacts greater than the appropriate SILs, while the SO_2 emissions from the NMU power facility will result in maximum ambient impacts that are greater than the appropriate SILs. Therefore, a more detailed modeling analysis has only been conducted to demonstrate that the SO_2 emissions from the proposed modification will not violate the applicable PSD Class II Increments and NAAQS. This analysis includes all of the NMU power facility sources and off-site sources, as appropriate for each analysis. Because the results of the initial modeling for CO, PM_{10}, and NO_x for the proposed modification indicated that these emissions will not result in maximum ambient impacts that are greater than the appropriate SIL, more detailed modeling is not required for CO, PM_{10}, and NO_x.

The results of the criteria pollutant modeling analyses demonstrate that the SO_2, PM_{10}, and NO_x emissions from the modification and existing facility are in compliance with the PSD Increment and NAAQS and that the CO emissions from the facility are in compliance with the NAAQS.

Based upon AP-42 and other emission factor sources, the new CFB boiler is expected to emit toxic air contaminants (TACs) that consist of various trace metals and organic and inorganic compounds. These TAC emissions have been included in a modeling analysis to demonstrate that the proposed installation of the CFB boiler at the NMU power facility will comply with the ambient impact levels of TACs established pursuant to Michigan's air toxics regulations. These regulations are codified as Michigan Rules 225 through 232 and establish, on a compound-by-compound basis, the maximum ambient concentration that emissions from a proposed modification or facility may produce off the source's secured property.

The predicted ground level concentrations of the TAC emissions have been compared to the appropriate health based screening levels of Michigan Rule 225. The results of this analysis indicate that the emissions TACs will comply with Michigan Rule 225.

Section 6.1 describes the modeling methodology utilized in the criteria pollutant (i.e. CO, SO_2, PM_{10} and NO_x) and TAC ambient impact analyses, and Section 6.2 describes the NMU power facility (both the existing and the newly proposed expansion) and pertinent modeling parameters. Section 6.3 presents the modeled emission rates of CO, SO_2, PM_{10}, NO_x, and TACs, and the results of the air quality impact analysis are presented in Sections 6.5 and 6.6.

6.1 MODELING METHODOLOGY

The primary objective of any air quality analysis is to demonstrate compliance with all applicable state and federal air quality standards. The federal standards include: (1) The National Ambient Air Quality Standards (NAAQS), and (2) Prevention of Significant Deterioration (PSD) Increments – both of which pertain to criteria pollutant emissions. The MDEQ has further incorporated a policy whereas no single source may consume greater than 80% of the PSD Increment standards applicable to any criteria pollutant. Additionally, the MDEQ has rules pertaining to the impacts of toxic air contaminant (TAC) emissions.

Tables 6-1 through 6-3 list the U.S. EPA CO, SO_2, PM_{10}, and NO_x impact standards – Significant Impact Levels, PSD Allowable Increment, and NAAQS, respectively. In addition to the modeling discussed in this section, a visibility analysis was done for Class I areas since the facility is within 200 km from the nearest PSD Class I areas (Seney National Wildlife Refuge). The visibility modeling is discussed in Section 7. The criteria pollutant modeling was conducted in order to demonstrate that the proposed project at the NMU powerhouse would comply with the allowable ambient impact concentrations listed in Tables 6-1 through 6-3.

Table 6-1. Significant Impact Levels for Criteria Pollutants

Pollutant	Averaging Period	Concentration ($\mu g/m^3$)
CO	8-Hour	500
	1-Hour	2,000
SO_2	Annual	1
	24-Hour	5
	3-Hour	25
PM_{10}	Annual	1
	24-Hour	5
NO_x	Annual	1

Table 6-2. PSD Allowable Increments ($\mu g/m^3$)

Pollutant	Averaging Period	PSD Increment Standards ($\mu g/m^3$)	
		Class I	Class II
SO_2	Annual [2]	2	20
	24-Hour [1]	5	91
	3-Hour [1]	25	512
PM_{10}	Annual [2]	4	17
	24-Hour [1]	8	30
NO_x	Annual	2.5	25

[1] High 2nd High over a five-year period.
[2] Annual arithmetic mean.

Table 6-3. National Ambient Air Quality Standards (NAAQS)

Pollutant	Averaging Period	National Ambient Standards (µg/m³)	
		Primary	Secondary
CO	8-Hour [1]	10,000	n/a
	1-Hour [1]	40,000	n/a
SO_2	Annual [2]	80	n/a
	24-Hour [1]	365	n/a
	3-Hour [1]	n/a	1,300
PM_{10}	Annual [2]	50	50
	24-Hour [3]	150	150
NO_x	Annual [2]	100	100

[1] High 2nd High.
[2] Annual arithmetic mean.
[3] High 6th High over a five-year period.

6.1.1 Modeling Background

In promulgating the 1977 Clean Air Act Amendments (CAAA), Congress specified that certain increases, or *increments*, in ambient air quality pollutant concentrations above an air quality baseline concentration level for TSP would constitute significant deterioration. The magnitude of the increment that cannot be exceeded depends on the classification of the area in which a new source (or modification to an existing source) will have an ambient air impact. Three classifications were designated based on criteria established in the CAAA. Initially, Congress promulgated areas as Class I (international parks, national wilderness areas, memorial parks larger than 2,024 hectares [ha] [5,000 acres], and national parks larger than 2,428 ha [6,000 acres]) or Class II (all other areas not designated as Class I). No Class III areas, which would be allowed greater deterioration than Class II areas, were designated. However, the states were given the authority to re-designate any Class II area to Class III status provided certain requirements were met. The U.S. EPA then promulgated, as regulations, the requirements for classifications and area designations.

The approach to these analyses generally begins by determining the impacts of the proposed facility or modification alone. If the impacts of the proposed facility or modification are below specified significance levels, no further study of that pollutant-averaging time combination is needed. These "significant impact levels" or SILs were presented in Table 6-1. If the impacts of the proposed facility or modification are found to be significant (i.e. greater than the SILs), further analysis considering all existing facility sources, other nearby facilities, and natural background concentrations is required for the compliance demonstration.

To accomplish these objectives, air quality impact modeling analyses were conducted for the proposed modification. All modeling analyses were conducted in a manner consistent with U.S. EPA guidance and standard practices. Guidance contained in EPA manuals and user's guides was followed. This includes the use of regulatory default options for the selected model.

On November 9, 2005, the U.S. Environmental Protection Agency promulgated the use of the AMS/EPA Regulatory Model Improvement Committee (AERMIC) Model (AERMOD) for all regulatory applications requiring an ambient impact demonstration. As part of the regulation, the U.S. EPA has granted sources a 12-month grace period to facilitate the transition from the use of ISCST3 to AERMOD. As this grace period concluded on November 9, 2006, AERMOD has been used to predict environmental impacts from the emissions of both criteria pollutants and toxic air contaminants (TACs).

AERMOD is a steady-state Gaussian model capable of handling multiple source inputs and producing both concentration and deposition impacts from point, area, volume, and open-pit sources. AERMOD is also capable of handling numerous source configurations, building inputs, receptor grids and elevated terrain.

6.2 MODEL SELECTION AND MODELING PARAMETERS

As stated, the AERMOD dispersion model (U.S. EPA source code version 04300) was used for all dispersion modeling to obtain refined impact predictions for both short-term and long-term ambient air concentrations. Procedures applicable to the AERMOD dispersion model specified in the U.S. EPA's GAQM were followed in conducting the refined dispersion modeling. The

GAQM is codified in Appendix W of Chapter 40, Code of Federal Regulations (CFR) Part 51 (updated as of November 9, 2005 to include the promulgation of AERMOD).

A description of the various modeling parameters and concerns is presented in the remainder of this section.

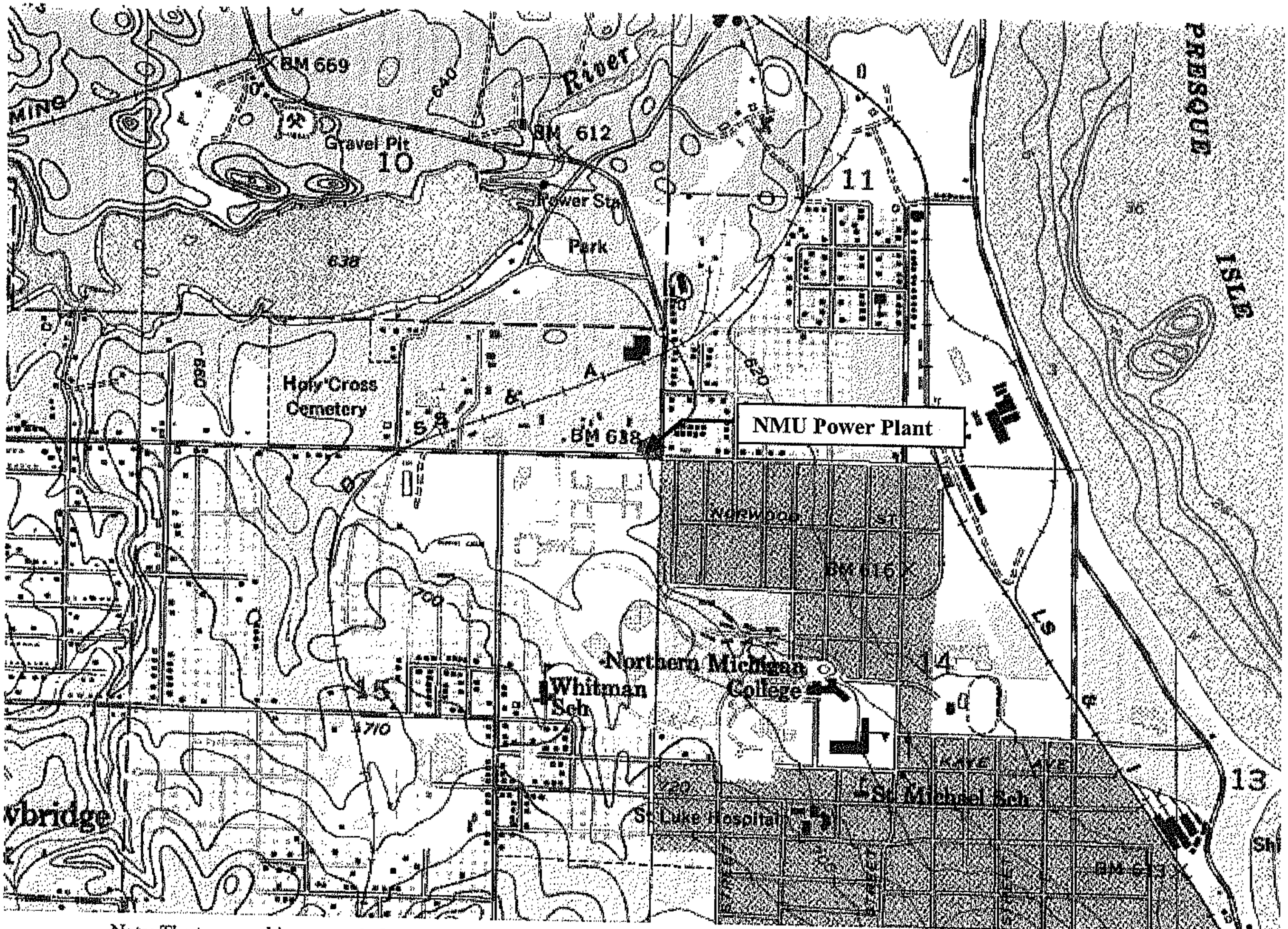
Source Description

The existing powerhouse operations (Ripley Heating Plant) are located toward the northern part of the Northern Michigan University campus, to the northwest of the intersection of Wright Street and Sugar Loaf Avenue, in Marquette, Marquette County, Michigan 49036. The existing facility operates as SRN M3792, under PTI No. 126-05.

The existing facility, as permitted under PTI No. 126-05 is nearing completion of construction to install and operate a total of 3 boilers capable of firing both natural gas and No. 2 fuel oil. The existing powerhouse operations will all be contained within one primary structure, the Ripley Heating Plant building.

The new CFB boiler and steam turbine will be contained within a new building that will be constructed adjacent to the Ripley Heating Plant, directly to the west. The site maps of Appendix A provide an overall view of the NMU campus, and provide detailed drawings of the new equipment and power plant area. The new boiler and turbine building will be rectangular in shape and measure approximately 64 feet east to west, and approximately 155 feet north to south. In addition to the new boiler housing, fuel handling operations and a baghouse structure will also be constructed as a part of the new project.

All existing and new building structures have been incorporated into the modeling analysis. Figure 6-1 presents the power plant and NMU campus location on a topographic map excerpt (Marquette 7.5-Minute Quadrangle). In regards to overall site topography, NMU is located in an area that has some significant changes in elevations, largely due the campus be located near Lake Superior. The general terrain increases to the south and west, with sharp increases in elevations to the southwest within about 1.5 km of the power plant. The terrain gently increases to the north and remains relatively flat to the east, with a gently decreasing slope towards Lake Superior.



Note: The topographic excerpt is from the Marquette 7.5-min. U.S.G.S. quadrangle. The scale of the map is 1.0" = 1,414 ft (431 m).

Figure 6-1. Northern Michigan University Campus Power Plant Site Map

Prevailing elevations are about 640 feet above sea level in the vicinity of the NMU power plant, and fall to about 620 feet to the east of the facility and rise quickly to about 900 feet within about 3.5 km in the southwest direction.

***Terrain Considerations* (AERMAP)**

AERMOD requires the use of an elevated terrain data file for use in establishing elevations for all sources, buildings and receptors. The AERMAP pre-processor is used to process digital elevation maps with location points for all sources, structures, and receptors. 7.5-minute digitized topographic files for the area surrounding the facility were used as input to the AERMAP pre-processor to obtain elevations and hill heights, which were then imported into the AERMOD model. The following North American Datum 1927 (NAD27) based Digital Elevation Models (DEMs) were incorporated into the AERMOD model via the AERMAP pre-processor:

- Marquette
- Marquette OE East

The elevated terrain option was employed for all model runs for the ambient impact analysis. Electronic copies of the DEM files are included in Appendix C for informational purposes.

Land Use Analysis

Another important modeling parameter is the land use classification (rural or urban). A technique was developed by Irwin (1978) to classify a site area as either rural or urban for purpose of using rural or urban dispersion coefficients [refer to Section 8.2.3 of 40 CFR Part 51, Appendix W]. The classification can be based on either average heat flux, land use, or population density within a 3 km radius from a plant site. The rural/urban classification based on land use is as follows:

> Using the land use typing scheme established by Auer, an urban classification of the site area requires more than 50 percent of the following land use types: heavy industrial, light/ moderate industrial, commercial, and compact residential (single and multi-family). Otherwise, the site area is considered rural.

The NMU campus is located in the northern section of the city of Marquette in the mid-eastern portion of Marquette County. While the area within 3 kilometers of NMU does contain some commercial operations and residential areas, the overall surrounding area is predominantly rural in nature and has not historically been considered by the Michigan AQD to be classified as urban. Therefore, the land use has been treated as rural and all modeling has been conducted with rural dispersion coefficients.

Meteorological Data

This modeling analysis has been conducted to demonstrate compliance with the applicable federal ambient standards for CO, SO_2, PM_{10} and NO_x, and the applicable Michigan AQD health based screening levels (Rule 225) for the TACs that may be emitted from the new boiler and existing operations. Actual surface meteorological (MET) data is required for use in the AERMOD modeling system. Raw meteorological data obtained in the SAMSON format can be readily obtained from a number of sources.

Prior to use with the model, the meteorological data must be processed through the AERMET pre-processor with certain site characteristics, including vegetative cover, friction velocity, etc. As part of processing the MET files, the user must specify certain site-specific surface features and characteristics and can, therefore, tailor any MET file to the site-specific conditions at the facility site. The AQD has determined representative surface characteristics and has prepared pre-processed "AERMOD-ready" MET data for use in AERMOD modeling.

The AQD prepared and supplied pre-processed, "AERMOD-ready" MET data (i.e. data processed using AERMET) the Sawyer International Airport (Station # 94836) located in Gwinn, MI. The 5-year data set utilized in this modeling analysis covers the years 2001 through 2005, and the main surface station height is given as 372 meters above Mean Sea Level (MSL). The upper air station processed with this data is Green Bay (Station # 14898) for the years 2001-2005.

The full five-year data set (2001-2005) was utilized for criteria pollutant modeling, while only the most recent year of data (2005) was required for the TAC modeling analysis.

Building Downwash

Prior to performing the dispersion analysis, the new and existing facility baghouse exhaust stack heights were compared to their Good Engineering Practice (GEP) heights. A GEP stack height is the stack height at which building downwash no longer occurs. Dispersion models use different calculation methods depending upon whether a given stack is GEP height or higher. The GEP value is defined as the building height (H_b) plus 1.5 times the lesser (L) of the building height and the maximum projected width (MPW) of the building.

The building layout of the existing Ripley Heating Plant facility and the new power plant consists of multiple structures of varying dimensions. The two predominant structures that influence what is considered GEP for all of the facility stacks are the new boiler building and the existing Ripley Heating Plant. The Ripley Heating Plant is 79 feet tall, and the new boiler building will be approximately 110 feet tall. GEP has been determined through the Lakes Environmental AERMODView software and indicates that all of the facility stacks are lower than their respective GEP stack heights, therefore the effects of building downwash must be addressed within the modeling analysis.

The U.S. EPA's Building Profile Input Program has been used to determine the downwash effects associated with the various buildings. The modeling building layout diagram included with the modeling support information in Appendix C identifies all structures included in the modeling analysis and their associated heights. In addition, it should be noted that the AERMOD model incorporates BPIP PRIME downwash, which provides more accurate downwash parameters than the former BPIP program provided in the ISCST3 model.

Cavity Calculations

Pursuant to current Michigan AQD modeling guidance, all modeling studies must address the cavity region and any associated pollutant concentrations for all of the stacks being modeled. The cavity region occurs immediately downwind from a given structure, and the dimensions are typically three times the lesser of the building height or projected width of a given structure. The Michigan AQD requires that the cavity region be addressed due to the greater turbulence and higher pollutant concentrations that are often encountered in these regions.