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July 9, 2008
NTH Project No. 16-060556

RE: Update to Certain PM10 Emission Limits Contained in Application No. 25-07 Holland Board of Public Works

Dear Mr. Vial:

NTH Consultants, Ltd. (NTH) is submitting certain revised pages to the technical support document supporting the Holland Board of Public Works' (HBPW) application to construct and install and new circulating fluidized bed (CFB) boiler at the James DeYoung Generating Station. The pages included with this letter supersede all previous pages in the application.

The purpose of these revised pages is to reflect the PM_{10} emission limit for the CFB boiler, new transfer/crusher house baghouse, and Unit 10 coal storage silo baghouse. As we discussed, MDEQ has accepted that the PM_{10} limit of 0.025 lb/MMBtu represents BACT for the new CFB. Additionally, as a result of other applications, HBPW accepts that a PM_{10} limit of 0.004 gr/dscf for the two (2) material handling baghouses mentioned previously represents BACT for material handling operations.

Note that we are not updating any of the modeling tables for the material handling baghouses as these sources were modeled at an emission rate equal to 0.005 gr/dscf and the results demonstrate compliance with all applicable air quality standards for PM_{10} at this higher emission rate.

If you have any further questions, please feel free to contact me at (517) 484-6900.

Sincerely,

NTH Consultants, Ltd.

Delbert Rector, P.E.
Project Manager

Jeffrey P. Jaros
Vice President

Enclosures

cc: Mr. David Koster, Holland Board of Public Works

DR/JPJ/sr

3.1.1 Particulate Matter ($PM_{10}/PM_{2.5}$)

The "significant net increase" threshold for $PM_{10}/PM_{2.5}$ emissions is 15 tpy or more. Recent U.S. EPA guidance for $PM_{2.5}$ requires that in the interim period between the date of the $PM_{2.5}$ NAAQS designations and when U.S. EPA promulgates regulations to implement NANSR for the $PM_{2.5}$ NAAQS, states should use PM_{10} as the surrogate for determining whether a facility or modification is considered major for $PM_{2.5}$ under PSD. Therefore, states and facilities should use PM_{10} emissions and net emissions increases (and decreases) as a surrogate for $PM_{2.5}$.

The particulate emissions will primarily consist of flyash. A CFB boiler is specifically designed to reduce the amount of particulate emissions by utilizing a high temperature cyclone to capture the unburned portion of the ash and return it to the primary combustion chamber.

The cyclone and baghouse will be designed such that the $PM_{10}/PM_{2.5}$ emissions will meet the recently promulgated new source performance standard for electrical generating units. The emission limit for PM_{10} has been established at 0.025 lb/MMBtu heat input. The boiler has been designed to produce a maximum gross heat input of approximately 865 MMBtu/hr. The short-term and long-term maximum potential emission rates for PM have been calculated using the following equations.

$$\boldsymbol{PM_{10}\ Emissions} = \frac{0.025\ lb}{MMBtu} \times \frac{865\ MMBtu}{hr} \times = \frac{21.63\ lb}{hr}$$

$$\boldsymbol{PM_{10}\ Emissions} = \frac{21.63\ lb}{hr} \times \frac{8760\ hr}{yr} \times \frac{1\ ton}{2000\ lb} = \frac{94.74\ ton}{yr}$$

3.1.2 Sulfur Dioxide (SO_2)

Sulfur dioxide emissions are proportional to the sulfur content of the coal. In order to minimize the SO_2 emissions, limestone will be co-fired in the boiler bed simultaneously with the coal at a molar ratio of calcium to sulfur of approximately 4:1. Use of limestone injected directly into the CFB burner will be used to comply with the recently promulgated new source performance standard of 1.4 lb/MWh gross electrical output. Based on an electrical output from the boiler of 78 MWh and the SO_2 emission limit of 1.4 lb/MWh, the maximum SO_2 emission rates would be 109.2 lbs/hr and 478.3 tpy.

Table 3-5

Drop Emissions at Underground Hopper			
	Hourly	**Daily**	**Annual**
Coal Transfer Rate (tons)	345	2068	503,262
PM (tons)	0.00002	0.0004	0.09
PM_{10} (tons)	0.00001	0.0002	0.04

Coal will be gravity fed from the underground hopper onto a pair of conveyor belts. The conveyor belts have a width of 30 inches and a maximum transfer rate of 400 feet per minute. In order to minimize the emissions from wind erosion, the conveyor belts will have a 3-sided enclosure that will provide more protection than a typical enclosure. The potential emissions from the conveying process are expected to be negligible as the 3-sided enclosure is expected to act as a nearly complete windbreak. From the previously mentioned 2003 Sierra Research, a 3-sided enclosure with 0.0% porosity, covering a conveyer belt is assumed to have an efficiency considerably larger than 75%.

The conveyor will transfer the coal into the new Transfer/Crusher house where some of the coal will be sent to the hammer mills for Unit 10 and the rest will be sent to Units 4 and 5. A 10,000 ACFM baghouse operating 24 hours per day will control the emissions from the drop activity inside the Transfer/Crusher house as well as the emissions from the hammer mills. These emissions have been estimated using the following equations and are summarized in Table 3-6:

$$PM_{10}\ Emission\ Rate_{Hourly} = \frac{0.004\ gr}{SCF} \times \frac{10{,}000\ SCF}{min} \times \frac{60\ min}{hour} \times \frac{lb}{7000\ gr} = \frac{0.34\ lbs}{hour}$$

$$PM_{10}\ Emission\ Rate_{Daily} = \frac{0.34\ lb}{hr} \times \frac{24\ hr}{day} = \frac{8.16\ lbs}{day}$$

$$PM_{10}\ Emission\ Rate_{Annual} = \frac{8.16\ lb}{day} \times \frac{365\ days}{year} \times \frac{ton}{2000\ lb} = \frac{1.49\ tons}{year}$$

Table 3-6

New Transfer/Crusher House Baghouse			
	Hourly	**Daily**	**Annual**
Coal Transfer Rate (tons)	345	2068	503,262
PM (tons)	0.0002	0.004	1.49
PM_{10} (tons)	0.0002	0.004	1.49

From the Transfer/Crusher house, the coal will be transported by conveyor to the top of the silos. There are three (3) silos with a total storage capacity of 36 hours (or 2,068 tons of coal). The emissions from the silos will be controlled by a 15,000 ACFM baghouse; these emissions have been estimated using the following equations and are summarized in Table 3-7:

$$PM_{10}\ Emission\ Rate_{Hourly} = \frac{0.004\ gr}{SCF} \times \frac{15{,}000\ SCF}{min} \times \frac{60\ min}{hour} \times \frac{lb}{7000\ gr} = \frac{0.51\ lbs}{hour}$$

$$PM_{10}\ Emission\ Rate_{Daily} = \frac{0.51\ lb}{hr} \times \frac{24\ hr}{day} = \frac{12.24\ lbs}{day}$$

$$PM_{10}\ Emission\ Rate_{Annual} = \frac{12.24\ lb}{day} \times \frac{365\ days}{year} \times \frac{ton}{2000\ lb} = \frac{2.23\ tons}{year}$$

Table 3-7

Unit 10 Storage Silos (3) with Baghouse Control			
	Hourly	**Daily**	**Annual**
Coal Transfer Rate (tons)	345	2068	503,262
PM (tons)	0.0003	0.006	2.23
PM_{10} (tons)	0.0003	0.006	2.23

Emissions may also be generated from wind erosion directly from the pile during high wind speed conditions, i.e., wind speeds that exceed the threshold friction velocity. The pile will be designed to have a maximum capacity of 206,820 tons of coal, roughly a 150-day supply. These emissions are estimated using the industrial wind erosion guidance at AP-42 13.2.5. The calculations are very detailed and are presented in Appendix B. As described in the AP-42, these equations only apply to dry, exposed materials. Therefore, these equations are projected to over predict the emissions as Michigan can expect to receive precipitation on average, 120 days per

Table 3-13. Summary of Fugitive and Point Source Releases Associated with Coal Handling Operations

Operation	Max Hourly PM (lb/hr)	PM (lb/day)	Daily Average Hourly PM (lb/hr) [1]	PM (tpy)	Max Hourly PM_{10} (lb/hr)	PM_{10} (lb/day)	Daily Average Hourly PM_{10} (lb/hr) [1]	PM_{10} (tpy)
Coal Drop from Barge	0.42	1.81	0.075	0.03	0.20	0.85	0.036	0.02
Fugitives from Bulldozer Activity	2.36	28.27	1.178	5.73	0.51	6.16	0.257	1.25
Drop Emissions at Underground Hopper	0.04	0.72	0.030	0.09	0.02	0.34	0.014	0.04
New Transfer/Crusher House Baghouse	0.34	8.16	0.34	1.49	.34	8.16	0.34	1.49
Unit 10 Storage Silos (3) with Baghouse Control	0.51	12.24	0.51	2.23	0.51	12.24	0.51	2.23
Unit 10 Limestone Feed Storage - Bin Filter	0.0014	0.0113	0.0005	0.0001	0.0014	0.0113	0.0005	0.0001
New Fly Ash Bin Filter (Unit 10 Only)	0.0006	0.0142	0.0006	0.0026	0.0006	0.0142	0.0006	0.0026
Existing Fly Ash Bin Filter (Units 4 & 5)	0.0005	0.0124	0.0005	0.0023	0.0005	0.0124	0.0005	0.0023
Wind Erosion From Daily Active Pile	N/A	42.15	1.756	0.113	N/A	21.08	0.878	0.057
Wind Erosion From Pile After Shipment	N/A	14.66	0.611	0.145	N/A	7.33	0.306	0.073
Wind Erosion From Compacted Pile Area	N/A	5.87	0.244	0.058	N/A	2.93	0.122	0.029
Total Emissions	N/A	N/A	N/A	**10.87**	N/A	N/A	N/A	**6.16**

[1] During Normal Operating Conditions

regulated under the CAA. ***Significant*** is defined as any increase in emissions in excess of the levels specified in 52.21. A comparison between the expected potential emission increases and the significant emission rates is presented in Table 4-1.

Table 4-1. Changes in Emissions as a Result of Proposed Modification

Air Pollutant	Maximum Projected Emissions Unit #10 (TPY)	2 –Year Past Actual Emissions Unit #3 (TPY)	Net Change in Emissions (TPY)	PSD Significant Emission Rate (TPY)	PSD Applicability
PM	105.61 *	8.01 *	97.60	25	Yes
$PM_{10}/PM_{2.5}$	101.20 *	6.19 *	95.01	15	Yes
NO_x	341.64	390.52	-48.88	40	No
SO_2	478.30	657.13	-178.83	40	No
CO	1350.40	9.09	559.22	100	Yes
Pb	0.082	0.0085	0.074	0.6	No
VOC	18.94	0.0041	18.9	40	No

* Includes fugitive emissions.

As can be seen from Table 4-1, the proposed modifications at HBPW are subject to PSD review for $PM/PM_{10}/PM_{2.5}$ and CO. PSD review is used to determine whether significant air quality deterioration will result from the new or modified source. As part of the PSD review process, major sources are required to address the following items prior to issuance of a permit:

- Control technology review
- Air quality analysis (monitoring)
- Ambient impact analysis
- Source information
- Additional impact analysis

The control technology review includes a determination of Best Available Control Technology (BACT) for the proposed project and equipment subject to PSD. The air quality analysis (pre-construction monitoring) requires that the source collect ambient air monitoring data in the impact area for at least one year prior to the start of construction. MDEQ has historically waived this requirement since air monitoring stations are currently being operated by the State and sufficient data exists. The ambient impact analysis requires a demonstration of compliance with federal and state air quality standards and allowable PSD Increments using computational

Wet Scrubber

Wet scrubbers remove particles from gas streams principally through inertial impaction of the particle onto a water droplet. Particles are wetted through spray nozzles whereas the gas stream flows counter to the direction of the water spray. In venturi-type scrubbers, the gas stream passes through the scrubber and is constricted in the throat section causing the gas stream to accelerate. As it passes through the throat, it enters a larger cyclone and experiences a pressure drop across the system. The entrained water droplets are then removed by means of a cyclone separator or impingement scrubber section. Typical collection efficiencies for packed-bed and venturi scrubbers are less than 90 percent for particles sizes less than 10 microns.

5.1.1 Proposed BACT Emission Limit

HBPW will be utilizing a cyclone and new fabric filter to control total particulate emissions from the combustion of solid fuels, including sewage sludge, in the new boiler. The proposed use of both a cyclone and baghouse is considered BACT for this process.

As mentioned previously, EPA has promulgated a NSPS for electric utility steam generating units at 40 C.F.R. Part 60 Subpart Da. This standard was recently revised on February 27, 2006 and sets emission limits for PM, SO_2, and NO_x. The baghouse to be installed as part of the overall project, will be designed to achieve a particulate (PM_{10}) emission limit of 0.025 lb/MMBtu heat input. This level of emissions is considered the BACT limit for this process and meets the limit established in the most recently revised NSPS. This emission limit is equivalent to potential emissions of 21.63 lb/hr and 94.74 ton/year. Therefore, no further analysis for BACT is necessary. A summary of recent BACT determinations is included in Appendix C.

5.2 CARBON MONOXIDE (CO)

Carbon monoxide is emitted from the CFB boiler as a result of incomplete combustion of the fuel(s). Factors affecting the formation of CO include the oxygen to fuel ratio, combustion temperature, residence time, and turbulence (or mixing) of the combustion gases. In addition to the formation of CO, incomplete combustion also leads to increased emissions of particulate matter, including particulate metals, volatile organic compounds, and hazardous air pollutants. Therefore, methods employed in order to reduce or control emissions of CO tend to reduce emissions of other pollutants as well.

Table 6-5. PM_{10} Emission Rates – Net Emissions (PSD Increment Analysis)

Point Sources			Emission Rates (lbs/hr)	Modeled Emission Rates (gram/sec)
New CFB Boiler Unit #10 Baghouse			21.625	2.72
Existing Unit #3 (ESP Control) – Shut down			-1.164	-1.467E-01
Transfer/Crusher House Baghouse			0.429	0.054
Unit 10 Coal Storage Silos Baghouse			0.643	0.081
Unit 10 Limestone Bin Filter			4.71E-04	5.93E-05
Unit 10 Fly Ash Silo Vent			5.92E-04	7.46E-05
Fugitive Area Sources	**Source Area (m^2)**	**Maximum Net Emission Rate (lbs/day)**	**Maximum Net Emission Rates (lbs/hr)**	**Modeled Emission Rates (gram/sec/m^2)**
Active Coal Pile [1]	8,803.0	3.08	0.13	1.837E-06
Compacted Coal Pile [2]	13,274.0	-41.86	-1.74	-1.656E-05
Fugitive Volume Sources			**Net Emission Rate (lbs/hr)**	**Modeled Emission Rate (gram/sec)**
Underground Loading Hopper			0.0092	1.155E-03

[1] The fugitive emission rate for the active coal pile is the sum of the maximum daily emissions for the coal drop from ship unloading, bull dozer activities, wind erosion on the active pile (normal daily activities) and wind erosion during shipments. The net emission rate represents the increase in daily emissions resulting from the increased coal usage proposed in this modification and takes into account the control strategies that will be implemented.

[2] The fugitive emission rate for the compacted coal pile is the maximum daily emission rate resulting from wind erosion on the compacted area of the coal pile (normal daily activities). The net emission rate represents the decrease in daily emissions that will result from post-modification control strategies that will be implemented.

Table 6-6. PM_{10} Emission Rates – Future Potential Emissions (NAAQS Modeling Analysis)

Point Sources			Potential Emission Rates (lbs/hr)	Modeled Emission Rates (gram/sec)
New CFB Boiler Unit #10 Baghouse			21.625	2.72
Existing Unit #4 (ESP Control) - Based on ROP Limit			75.53	9.517E+00
Existing Unit #5 (ESP Control) - Based on ROP Limit			95.74	1.206E+01
Transfer/Crusher House Baghouse			0.429	0.054
Unit #10 Coal Storage Silos Baghouse			0.643	0.081
Unit #10 Limestone Bin Filter			4.71E-04	5.93E-05
Unit #10 Fly Ash Silo Vent			5.92E-04	7.46E-05
Unit #4 and #5 Existing Fly Ash Silo Vent			5.17E-04	6.51E-05
Fugitive Area Sources	**Source Area (m^2)**	**Maximum Net Emission Rate (lbs/day)**	**Potential Emission Rates (lbs/hr)**	**Modeled Emission Rates (gram/sec/m^2)**
Active Coal Pile [1]	8,803.0	35.42	1.476	2.112E-05
Compacted Coal Pile [2]	13,274.0	2.93	0.122	1.159E-06
Fugitive Volume Sources			**Potential Emission Rate (lbs/hr)**	**Modeled Emission Rate (gram/sec)**
Underground Loading Hopper			0.0142	1.785E-03

[1] The fugitive emission rate for the active coal pile is the sum of the maximum daily emissions for the coal drop from ship unloading, bull dozer activities, wind erosion on the active pile (normal daily activities) and wind erosion during shipments. The potential emission rate represents the maximum daily emissions at the increased coal usage rate proposed in this modification and takes into account the control strategies that will be implemented.

[2] The fugitive emission rate for the compacted coal pile is the maximum potential daily emission rate from wind erosion on the compacted area of the coal pile (normal daily activities). The emission rate represents the maximum daily emissions and takes into account post-modification control strategies that will be implemented.

6.7.2 Particulate Matter (PM_{10})

Initial modeling results predicted impacts of PM_{10} greater than the SIL. Consequently, both a PSD Increment and NAAQS modeling analysis were performed.

PSD Increment Analysis

The PM_{10} PSD Increment modeling analysis considered all of the HBPW sources that would experience an increase or decrease in PM_{10} emissions as a direct result of the proposed modification (i.e. sources considered "affected sources" for modification purposes). The analysis has a tiered approach for compliance demonstration. The first tier is used to show that the proposed project will not consume more than 80% of the allowed U.S. EPA PSD Increment for each averaging period (i.e., for PM_{10} - annual and 24-hr periods). The second tier is to show that the proposed project and all off-site increment consuming sources, modeled simultaneously, will comply with 100% of the applicable PSD Increment for each averaging period.

Table 6-10 presents the results of the modeling analysis conducted to demonstrate compliance with 80% of the PM_{10} PSD Increments. The HBPW PM_{10} emission sources modeled for the 80% PSD Increment analysis include the all sources for which there will be a net PM_{10} emission increase or decrease as a direct result of the proposed modification, as all other sources not affected by the modification are considered pre-baseline sources (i.e. not installed or modified after January 30, 1980). The HBPW emission sources and PM_{10} emission rates were previously listed in Table 6-5.

Table 6-10. Results of HBPW PM_{10} 80% Increment Modeling (03-07 BIV MET)

Averaging Period	Maximum Impact [1] (μg/m³)	Impact UTM Easting (meters)	Impact UTM Northing (meters)	100% of PSD Class II Increment (μg/m³)	80% of PSD Class II Increment (μg/m³)	Maximum HBPW Impact As % of PSD Class II Increment
Annual	0.0221	576,190.9	4,738,957.5	17	13.6	0.13%
24-hour	6.830	572,358.1	4,738,179.5	30	24	22.77%

[1] Consistent with how the standards are applied, the maximum annual impact is based upon the highest of the 1st high impacts determined using five discrete years of meteorological data (2003 through 2007), while the 24-hour maximum impacts are based upon the highest of the 2nd high impacts from the same five year set of meteorological data.

As shown in Table 6-10, the PSD Increment consuming PM_{10} emission rates for the proposed project do not result in impacts that are greater than 80% of the applicable PM_{10} PSD Increments. The annual impact is predicted to be less than 1% of the PSD Increment, while the 24-hour impact is about 22.8% of the PSD Increment.

To demonstrate compliance with 100% of the PSD Increments, the HBPW sources modeled in relation to the 80% PSD Increment analysis were modeled simultaneously with all appropriate off-site sources of PM_{10} emissions that have been determined to consume the PM_{10} Increment. Table 6-7 presented the off-site PSD sources (i.e., those sources listed with PSD emission rates), including the modeled PM_{10} emission rates and the source parameters. The results of the 100% PSD Increment modeling analysis are presented in Table 6-11.

Table 6-11. Results of the HBPW PM_{10} 100% Increment Modeling (03-07 BIV Met)

Averaging Period	Maximum Impact [1] (µg/m³)	Impact UTM Easting (meters)	Impact UTM Northing (meters)	100% of PSD Class II Increment (µg/m³)	Maximum Impact As % of PSD Class II Increment
Annual	0.453	572,540.9	4,738,907.5	17	2.66%
24-hour	9.057	572,490.9	4,738,957.5	30	30.19%

[1] Consistent with how the standards are applied, the maximum annual impact is based upon the highest of the 1st high impacts determined using five discrete years of meteorological data (2003 through 2007), while the 24-hour maximum impact is based upon the highest of the 2nd high impacts from the same five year set of meteorological data.

The results of the 100% PSD Increment modeling analysis for PM_{10} demonstrate compliance with the PM_{10} PSD Class II Increments. As shown in Table 6-11, the annual PM_{10} impact for all HBPW and off-site increment consuming sources is approximately 2.7% of the annual PSD Increment, the 24-hour PM_{10} impact is about 30% of the associated PSD Increment for PM_{10}.

National Ambient Air Quality Standard (NAAQS) Analysis

After having demonstrated compliance with the PSD Class II Increments, the last step in the PM_{10} modeling analysis is a demonstration of compliance with the annual and 24-hour PM_{10} National Ambient Air Quality Standards (NAAQS).

Table 6-12. Results of the HBPW PM_{10} NAAQS Modeling Analysis (03-07 BIV MET Data)

Averaging Period	Maximum Impact [1] ($\mu g/m^3$)	Impact UTM Easting (meters)	Impact UTM Northing (meters)	Primary NAAQS ($\mu g/m^3$)	Background Concen-tration ($\mu g/m^3$)	Total NAAQS Impact ($\mu g/m^3$)	Total Impact As % Of NAAQS
Annual	19.65	575,240.9	4,733,257.5	50	20	39.65	79.30%
24-Hour	113.67	574,740.9	4,733,257.5	150	45 [2]	158.67 [3]	105.78%

[1] Consistent with how the NAAQS are applied, the maximum annual impact is based upon the highest of the 1st High impacts determined using five discrete years of meteorological data (2003 through 2007), while the 24-hour maximum impacts for PM_{10} are based upon the highest 6th high impact from the same five year set of meteorological data.

[2] This background level comes from a Grand Rapids urban site, approximately 30 miles away from the HBPW facility.

[3] A culpability analysis has been conducted to show that the HBPW will not significantly contribute to any predicted exceedance of the 24-hour PM_{10} NAAQS standard. Additionally, the results of this initial modeling analysis do not necessarily mean that the NAAQS standard will be exceeded. Further refined modeling would be required utilizing more detailed information for off-site sources in order to more accurately predict maximum impacts.

As shown in Table 6-12, the initial PM_{10} NAAQS modeling analysis predicts an exceedance of the PM_{10} 24-hour NAAQS when the model predicted maximum impact is added to the background concentration. Therefore, in order to determine that the HBPW modification will not significantly contribute to any exceedance (i.e., the modeled exceedances are the result of other off-site facilities), a culpability analysis was conducted. The culpability analysis was conducted by utilizing threshold violation files (or Maxi-Files; *.max) that were generated during the PM_{10} NAAQS modeling runs. The Maxi-Files provide the receptor location and date information for the First High impacts at any receptor and day combination that results in an impact that exceeds a pre-determined threshold. In this case, the threshold was taken as any modeled impact of greater than 105 $\mu g/m^3$ (which is the standard of 150 $\mu g/m^3$ minus the background of 45 $\mu g/m^3$). Thus, the Maxi-Files would provide a determination of which receptors were showing possible NAAQS exceedances and on what days these impacts were predicted to occur.

After reviewing the Maxi-Files for the 5 year data set, it was determined that only 3 receptors (of the 6,032 included in the initial analysis) were showing impacts of 105 $\mu g/m^3$ or greater for various days throughout the 5 year period. These receptors were then included in the culpability analysis. The purpose of the culpability analysis is to show that the HBPW facility's maximum impact at these receptors would be "insignificant" on the day that the violation is predicted to occur, and that the predicted exceedances were not caused by the HBPW sources. In order to achieve this, a separate modeling run was conducted utilizing only the 5 receptors that showed predicted exceedances, in order to determine the maximum HBPW 24-hour impact at the allowable emission rates at each of these 5 receptors. Since all of the predicted excursions were in 2007, only the 2007 MET data set was utilized in the culpability runs, in order to determine the First High impact of HBPW at each of these receptors.

The receptors found to show the predicted NAAQS exceedances are presented in Table 6-13 along with the predicted First High HBPW impact at each receptor, for the entire 5-year MET data set. As shown in Table 6-13, the culpability modeling predicts that the Highest 1st High impact of HBPW for each of these receptors was found to be 2.29 μg/m³. This impact (and all other impacts) is less than the PM_{10} Significant Impact Level (SIL) of 5 μg/m³ for the 24-hour averaging period, therefore, it is concluded that the HBPW facility's impact would not contribute significantly to any predicted exceedance.

Table 6-13. PM_{10} 24-HR NAAQS Culpability Modeling Analysis (01-05 BIV MET)

HBPW Maximum Impact [1] (μg/m³)	Receptor Location UTM Easting (meters)	Receptor Location UTM Northing (meters)	Year of Maximum Impact
2.29	575,240.94	4,733,507.5	**2007**
1.76	574,740.94	4,733,507.5	**2007**
2.01	575,990.94	4,733,507.5	**2007**
2.09	575,240.94	4,733,257.5	**2007**
1.77	574,740.94	4,733,257.5	**2007**

[1] The impacts listed are the model predicted impacts for all HBPW sources represented within the dispersion model. For purposes of this analysis, an exceedance was predicted for each receptor location in the original PM_{10} modeling analysis if the NAAQS Source Group had a predicted impact is greater than 105 μg/m³ (standard - background; 150 - 45 μg/m³). The PM_{10} 24-hr impact listed in Table 6-13 is the highest 1st high impact for HBPW sources at each receptor for the 2007 MET data set, including all days per year.

ambient impact of 0.08 μg/m^3 - approximately 16% of the allowable screening level (SL) of 0.5 μg/m^3 on a 1-hour averaging period basis.

Overall, the results presented in Table D-6 show that all TACs will comply with the applicable screening levels at the maximum predicted emission rates and thus comply with the Michigan AQD air toxics rules.

6.8 DISPERSION MODELING FILES

The complete Lakes Environmental project files are being provided in Appendix G on compact disc for the following modeling analysis conducted in ISC AERMOD PRIME.

Table 6-14. Summary of the HBPW Modeling Files

Modeling File Identification	File Description	Meteorological Data
CO_01_R2 through CO_05_R2	CO SIL Models	2001-2005
HBPMr103 through HBPWr107	PM_{10} PSD Increment Models	2003-2007
NAQ03Pr1 through NAQ07Pr1	PM_{10} NAAQS Models	2003-2007
07PMCULP	PM_{10} NAAQS Culpability Model	2007
HBPW_GPS	TAC modeling Gram/Second Model	2005

Holland BPW - Coal Handling Operations (Fugitive and Point Source) PM Emissions
Revised July 9, 2008

Table B-9. Post Modification Particulate Emissions Summary - Coal Handling Fugitives and Associated Control Releases

Operation	Max Hourly PM (lb/hr)	PM (lb/day)	Daily Average Hourly PM (lb/hr) [1]	PM (tpy)	Max Hourly PM_{10} (lb/hr)	PM_{10} (lb/day)	Daily Average Hourly PM_{10} (lb/hr) [1]	PM_{10} (tpy)
Coal Drop from Barge	0.42	1.81	0.075	0.03	0.20	0.85	0.036	0.02
Fugitives from Bulldozer Activity	2.36	28.27	1.178	5.73	0.51	6.16	0.257	1.25
Drop Emissions at Underground Hopper	0.04	0.72	0.030	0.09	0.02	0.34	0.014	0.04
New Transfer/Crusher House Baghouse	0.34	8.23	0.343	1.50	0.34	8.23	0.343	1.50
Unit 10 Storage Silos (3) with Baghouse Control	0.51	12.34	0.514	2.25	0.51	12.34	0.514	2.25
Unit 10 Limestone Feed Storage - Bin Filter	0.0014	0.0113	0.0005	0.0001	0.0014	0.0113	0.0005	0.0001
New Fly Ash Bin Filter (Unit 10 Only)	0.0006	0.0142	0.0006	0.0026	0.0006	0.0142	0.0006	0.0026
Existing Fly Ash Bin Filter (Units 4 & 5)	0.0005	0.0124	0.0005	0.0023	0.0005	0.0124	0.0005	0.0023
Wind Erosion From Daily Active Pile	N/A	42.15	1.756	0.113	N/A	21.08	0.878	0.057
Wind Erosion From Pile After Shipment	N/A	14.66	0.611	0.145	N/A	7.33	0.306	0.073
Wind Erosion From Compacted Pile Area	N/A	5.87	0.244	0.058	N/A	2.93	0.122	0.029
Total Emissions	N/A	N/A	N/A	**9.93**	N/A	N/A	N/A	**5.23**

	Tons/year			
Coal Usage (Potential) - Post Modification	503,262	Ratio:	0.354	Pre-Mod / Post Mod
Coal Usage (Past Actual) - Pre Modification	178,263			

Table B-10. Pre Modification Particulate Emissions Summary - Coal Handling Fugitives and Associated Control Releases

Operation	Max Hourly PM (lb/hr)	PM (lb/day)	Daily Average Hourly PM (lb/hr) [1]	PM (tpy)	Max Hourly PM_{10} (lb/hr)	PM_{10} (lb/day)	Daily Average Hourly PM_{10} (lb/hr) [1]	PM_{10} (tpy)
Coal Drop from Barge	0.15	0.6	0.027	0.01	0.07	0.30	0.013	0.01
Fugitives from Bulldozer Activity	0.83	10.01	0.417	2.03	0.18	2.18	0.091	0.44
Drop Emissions at Underground Hopper	0.02	0.25	0.011	0.03	0.01	0.12	0.005	0.01
New Transfer/Crusher House Baghouse								
Unit 10 Storage Silos (3) with Baghouse Control								
Unit 10 Limestone Feed Storage - Bin Filter								
New Fly Ash Bin Filter (Unit 10 Only)								
Existing Fly Ash Bin Filter (Units 4 & 5)	0.0002	0.0044	0.0002	0.0008	0.0002	0.0044	0.0002	0.0008
Wind Erosion From Daily Active Pile		14.9	0.622	0.04		7.5	0.311	0.02
Wind Erosion From Pile After Shipment		44.8	1.866	0.12		22.4	0.933	0.06
Wind Erosion From Compacted Pile Area		89.6	3.733	0.24		44.8	1.866	0.12
Total Emissions	N/A	N/A	N/A	**2.48**	N/A	N/A	N/A	**0.66**

Table B-11. Net Particulate Emissions Summary - Coal Handling Fugitives and Associated Control Releases

Operation	Max Hourly PM (lb/hr)	PM (lb/day)	Daily Average Hourly PM (lb/hr) [1]	PM (tpy)	Max Hourly PM_{10} (lb/hr)	PM_{10} (lb/day)	Daily Average Hourly PM_{10} (lb/hr) [1]	PM_{10} (tpy)
Coal Drop from Barge	0.27	1.2	0.049	0.02	0.13	0.55	0.023	0.011
Fugitives from Bulldozer Activity	1.52	18.25	0.761	3.70	0.33	3.98	0.166	0.81
Drop Emissions at Underground Hopper	0.03	0.46	0.019	0.06	0.01	0.22	0.009	0.027
New Transfer/Crusher House Baghouse	0.34	8.23	0.343	1.50	0.34	8.23	0.343	1.50
Unit 10 Storage Silos (3) with Baghouse Control	0.51	12.34	0.514	2.25	0.51	12.34	0.514	2.25
Unit 10 Limestone Feed Storage - Bin Filter	0.0014	0.0113	0.0005	0.0001	0.0014	0.0113	0.0005	0.0001
New Fly Ash Bin Filter (Unit 10 Only)	0.0006	0.0142	0.0006	0.0026	0.0006	0.0142	0.0006	0.0026
Existing Fly Ash Bin Filter (Units 4 & 5)	0.0003	0.0080	0.0003	0.0015	0.0003	0.0080	0.0003	0.0015
Wind Erosion From Daily Active Pile		27.2	1.134	0.07		13.61	0.567	0.037
Wind Erosion From Pile After Shipment		-30.1	-1.255	0.02		-15.06	-0.628	0.012
Wind Erosion From Compacted Pile Area		-83.7	-3.488	-0.18		-41.86	-1.744	-0.091
Total Emissions	N/A	N/A	N/A	**7.45**	N/A	N/A	N/A	**4.56**

Holland Board of Public Works Fugitives
Summary and Working Emissions for
150-day Coal Supply
Revised July 9, 2008

Table B-12. Coal Drop from Barge

Annual Operation (day /yr)	365	
Annual Coal Usage (ton /yr)	503,262	
Barge Capacity (tons/trip)	13,000	From C&B
Average Number of Barge Trips (annually)	39.0	
Barge Unloading Rate (tons /hr)	3000	From C&B 3,000 - 4,000 tph
Barge Unload Time (hr/trip)	4.33	Assuming 3,000 tph
E=k*0.0032*(U/5)^1.3/(M/2)^1.4		
Where, k= Particle size multiplier (AP42 13.2.4-3)		
k, PM	0.74	
k, PM_{10}	0.35	
U= mean wind speed @ BIV (m/s)	4.84	
U= mean wind speed @ BIV (mph)	10.8	
(U/5)^1.3=	2.73	
M = Moisture (%)	6.0	From C&B
(M/2)^1.4=	4.66	
E_{PM}, uncontrolled (lb/ton)	0.00139	
E_{PM10}, uncontrolled (lb/ton)	0.00066	
Control efficiency	90%	Wetting of material while off-loading
E_{PM}, controlled (lb/ton)	0.00014	
E_{PM10}, controlled (lb/ton)	0.00007	
PM Emission Rate, uncontrolled (lb/hr)	4.17	Max lb/hr
PM Emission Rate, uncontrolled (ton/hr)	0.0021	
PM Emission Rate, uncontrolled (ton/day)	0.0090	
PM Emission Rate, uncontrolled (tpy)	0.35	
PM_{10} Emission Rate, uncontrolled (lb/hr)	1.97	Max lb/hr
PM_{10} Emission Rate, uncontrolled (ton/hr)	0.0010	
PM_{10} Emission Rate, uncontrolled (ton/day)	0.0043	
PM_{10} Emission Rate, uncontrolled (tpy)	0.17	
PM Emission Rate, controlled (lb/hr)	0.42	
PM Emission Rate, controlled (ton/hr)	0.0002	
PM Emission Rate, controlled (ton/day)	0.0009	
PM Emission Rate, controlled (tpy)	0.03	
PM_{10} Emission Rate, controlled (lb/hr)	0.20	
PM_{10} Emission Rate, controlled (ton/hr)	0.0001	
PM_{10} Emission Rate, controlled (ton/day)	0.0004	
PM_{10} Emission Rate, controlled (tpy)	0.02	

Max Coal Consumption

	lbs/hr	tons/day
Unit 4	22900	274.8
Unit 5	28000	336
Unit 10	64000	768
Totals	114900	1378.8
Annual Coal Usage (ton /yr)		503,262

2068.2

Table B-13. Fugitives from Bulldozer Activity

Unpaved Roads
AP-42 13.2

E = k (s/12)^a (W/3)^b [(365-P)/365] (AP42 13.2.2-4)
Where W = average vehicle wt.

Bulldozer loads underground hopper 8 hour/day
Bulldozer maintains pile for 24 hours after each Shipment

	Dozer #1 loading hopper		Dozer #2 works the pile		
	PM	PM-10	PM	PM-10	
k (lb/VMT) from Tab. 13.2.2-5, AP-42	4.9	1.5	4.9	1.5	
a dimensionless, from Tab. 13.2.2-5, AP-42	0.7	0.9	0.7	0.9	
b dimensionless, from Tab. 13.2.2-5, AP-42	0.45	0.45	0.45	0.45	
s = silt content	2.2	2.2	2.2	2.2	
W= Average weight of vehicle (tons)	20	20	20	20	
Mdry= Average moisture content of rec'd mat'l	6.0	6.0	6.0	6.0	
p=days of precip>0.01 inches	120	120	120	120	
Eext (lb/VMT)	2.36	0.51	2.36	0.51	
Operating Days (Day/Year)	365	365	365	365	
Average Operating Hours (Hours/Day)	16.0	16.0	10.7	10.7	Assuming Bulldozer #1 operates 16 hr/day, plus Bulldozer #2 operates for 16 hours per day for up to 8 months per year to shape pile.
Distance-Feet Per Day	42240	42240	28160	28160	**Assuming Bulldozer operates at a speed of 0.5 mph**
Distance-Miles Per Day	8.0	8.0	5.3	5.3	
VMT_{hr}=Dist/Operating Hours (miles/hr)	0.5	0.5	0.5	0.5	
VMT_{ann}=Dist*Operating Days (miles/yr)	2920	2920	1947	1947	
Uncontrolled Emiss.= E*VMT_{hr} (lb/hr)	1.18	0.26	1.18	0.26	
Uncontrolled Emiss.= E*VMT_{hr} (ton/hr)	0.0006	0.0001	0.0006	0.0001	
Uncontrolled Emiss.= E*VMT_{hr} (ton/day)	0.0094	0.0021	0.0063	0.0014	annual average
Uncontrolled Emiss.= E*VMT_{ann}/2000 (tpy)	3.44	0.75	2.29	0.50	
Control Factor	0%	0%	0%	0%	
Controlled Hourly Emissions (lb/hr)	1.18	0.26	1.18	0.26	
Controlled Emiss.= E*VMT_{hr} (ton/hr)	0.0006	0.0001	0.0006	0.0001	
Controlled Emiss.= E*VMT_{hr} (ton/day)	0.0094	0.0021	0.0063	0.0014	annual average
Controlled Annual Emissions (tpy)	3.44	0.75	2.29	0.50	

Dozer for deliveries - max daily

	PM	PM10	
	8	8	hour per day - delivery
	8	8	miles/day @ 1 mph
annual average	1.18	0.26	lb/hour
	9.42	2.05	lb/day
	0.551	0.120	tpy

Table B-14. Drop Emissions at Underground Hopper

Operating Time (hr/day)	16	
Annual Operation (day /yr)	365	
Maximum Coal Loading Rate (ton/hr)	344.7	based on a maximum loading of a 36-hr supply in 6 hours
Maximum Coal Loading Rate (ton/day)	2068.2	based on a 36-hour supply
Annual Coal Usage (ton /yr)	503,262	
AP-42 13.2.4-3 Eqn (1)		
E=k*0.0032*(U/5)^1.3/(M/2)^1.4		
Where, k= Particle size multiplier		
k, PM	0.74	
k, PM_{10}	0.35	
U= mean wind speed @ BIV (m/s)	4.84	
U= mean wind speed @ BIV (mph)	10.83	
(U/5)^1.3=	2.73	
M= Moisture	6.0	(Note: M=4.5% in Table 13.2.4-1 of AP-42)
(M/2)^1.4=	4.66	
E_{PM}, uncontrolled (lb/ton)	0.001389	
E_{PM10}, uncontrolled (lb/ton)	0.000657	
Control efficiency [1]	75%	
E_{PM}, controlled (lb/ton)	0.000347	
E_{PM10}, controlled (lb/ton)	0.000164	
PM Emission Rate, uncontrolled (lb/hr)	0.18	
PM Emission Rate, uncontrolled (ton/hr)	0.0001	
PM Emission Rate, uncontrolled (ton/day)	0.0014	
PM Emission Rate, uncontrolled (tpy)	0.35	
PM_{10} Emission Rate, uncontrolled (lb/hr)	0.08	
PM_{10} Emission Rate, uncontrolled (ton/hr)	0.0000	
PM_{10} Emission Rate, uncontrolled (ton/day)	0.0007	
PM_{10} Emission Rate, uncontrolled (tpy)	0.17	
PM Emission Rate, controlled (lb/hr)	0.04	
PM Emission Rate, controlled (ton/hr)	0.00002	
PM Emission Rate, controlled (ton/day)	0.0004	
PM Emission Rate, controlled (tpy)	0.09	
PM_{10} Emission Rate, controlled (lb/hr)	0.02	
PM_{10} Emission Rate, controlled (ton/hr)	0.00001	
PM_{10} Emission Rate, controlled (ton/day)	0.0002	
PM_{10} Emission Rate, controlled (tpy)	0.04	

[1] Sierra Research 2003. Final BACM Technological and Economic Feasibility Analysis. This report demonstrates a control efficiency of 75% for a 3-sided enclosure with 50% porosity. Therefore, an underground hopper (4-sided enclosure with 0.0% porosity) is expected to have at least 75% control efficiency.

Table B-15. New Transfer/Crusher House Baghouse

Baghouse (scfm)	10000	
Baghouse (gr /scf)	**0.004**	BACT
Baghouse Emissions (lb /hr)	0.34	
Operating Time (hr /day)	**24**	NTH
Operating Time (day/ year)	**365**	
Baghouse Emissions (lb/day)	8.23	
Baghouse Emissions (tpy)	1.50	

Table B-16. Unit 10 Storage Silos (3) with Baghouse Control

Flow Rate of Baghouse (scfm)	15000	
Baghouse (gr /scf)	**0.004**	BACT
Emissions (lb /hr)	0.51	
Operating Time (hr /day)	**24**	NTH
Operating Time (day/ year)	**365**	
Baghouse Emissions (lb/day)	12.34	
Emissions (tpy)	2.25	

Table B-17. Unit 10 Limestone Feed Storage - Bin Filter

Volume of Silo (ft^3)	**3,962**	dimensions from CAD drawing
Bin Filter (gr /scf)	**0.02**	NTH
Bin Filter Emissions (lb /hr)	0.0014	assumed: total volume displaced
Daily Max Operating Hours	8	assumed: 8 hr/load
Annual Operating Hours	96	assumed: 1 load/month
Bin Filter Emissions (lb/day)	0.0113	
Bin Filter Emissions (tpy)	0.00007	

Table B-18. New Fly Ash Bin Filter (Unit 10 Only)

Size of Silo (ft^3)	**36,816**	25 ft diam with 75 ft height
Density of ash (lb/ft3)	**37**	from MAERS
Bin Filter (gr /scf)	**0.02**	NTH
Bin Filter Emissions (lb /hr)	0.00059	
Operating Time (hr /day)	24	NTH
Operating Time (day/ year)	365	
Bin Vent Filter Emissions (lb /day)	0.0142	
Bin Vent Filter Emissions (tpy)	0.0026	

	15.00%	ash moisture when Bargeped
	0.1199	ton ash/ton coal factor
	681.09	ton ash capacity
	7.39	days capacity
	768	ton coal/day Unit 10
max daily ash	92.11	tons ash based on ton ash/ton coal

Table B-19. Existing Fly Ash Bin Filter (Units 4 & 5)

Size of Silo (ft^3)	**8,482**	20 ft diam by 27 ft tall storage capacity
Density of ash (lb/ft3)	**37**	from MAERS
Bin Filter (gr /scf)	**0.02**	
Bin Filter Emissions (lb /hr)	0.00052	
Operating Hours	24	
Bin Filter Emissions (lb/day)	0.0124	
Bin Filter Emissions (tpy)	0.0023	

	156.92	ton ash capacity
	1.95	days capacity
	336	ton coal/day each boiler
max daily ash for Unit 4 & 5 combined	80.60	tons ash based on ton ash/ton coal

Holland BPW - PM10 Emission Rates for Dispersion Modeling
Revised July 9, 2008

PM10 Emission Rates

Future Potential

	Heat Input (mm Btu/hr)	Emission Factor (lb/mm Btu)	Rate (lb/hour)	rate (tpy)	
New Boiler	865.00	2.500E-02	21.63	94.72	
Boiler 4	0.00		0.000E+00	0.00E+00	same as above
Boiler 5	0.00		0.000E+00	0.00E+00	same as above

Modeled Emission Rates

PSD	lb/hour	gram/sec		NAAQS	lb/hour	gram/sec	
NEW CFB Boiler	21.625	2.725E+00		NEW CF Boiler	21.625	2.725E+00	
Boiler 3	-1.164	-1.467E-01		Boiler 3	N/A	N/A	
Boiler 4	N/A	N/A		Boiler 4	9.68	1.220E+00	0.04 lb/mmbtu basis
Boiler 5	N/A	N/A		Boiler 5	12.76	1.608E+00	0.04 lb/mmbtu basis

Calculation of Potential Emission Rates for Boilers 4 and 5 Based On ROP Limits

Assumptions:

11	mmBtu / MW
7.5	lb air / 10,000 btu (or 1 ft3 air per 100 btu)
11932	btu / pound coal (RY2004 MAERS value)
9.96%	ash content

Calculation: (Btu/hour) x (7.5 lb air / 10,000 btu) x (excess air) + (fuel mass input - ash) = pounds exhaust gas

	MW Output	Heat Input (mmBtu/hr)	Mass of Air (lbs)	Lb Air @ 50% excess	Fuel Mass Input minus Ash (lbs)	Pounds Exhaust Gas (lb gas/hour)	Emission Limit (lb PM / 1000 lb e.g.)	Hourly Emission Rate (lb/hr)	TPY Rate	gram/sec
Boiler 4	22	242.00	181,500.00	272,250.00	18,261.55	290,511.55	0.26	75.53	330.83	9.517E+00
Boiler 5	29	319.00	239,250.00	358,875.00	24,072.04	382,947.04	0.25	95.74	419.33	1.206E+01

Calculation of Potential Emission Rates for Boilers 4 and 5 Based On MAERS

	MW Output	Heat Input (mmBtu/hr)	Coal Use (lbs/hr)	Tons Coal (ton/hr)	PM Emission Factor Based on Testing (lb PM / mmBtu)	Potential Hourly Emission Rate (lb/hr)	Potential Annual Emission Rate (tpy)	
Boiler 4	22	242.00	20,281.60	10.14	0.0386	9.34	40.91	81,829
Boiler 5	29	319.00	26,734.83	13.37	0.0369	11.77	51.56	103,115
		mmbtu/year		ton coal/year	0.0400	9.68	42.40	
		2,119,920.00		88,833.39	0.0400	12.76	55.89	
		2,794,440.00		117,098.56				