Appendix A

AERA Forms

AERA-01: Deliverable Checklist
AERA-02: Maps Form
AERA-03: Dispersion Factor Analysis
AERA-04: Emergency Internal Combustion Engine Certification
AERA-05: Emissions
AERA-06: Cumulative Air Emissions Risk Analysis

Permit Forms
(See Mesaba Energy Project Application for a New Source Review Construction Authorization Permit, Mesaba One and Mesaba Two)

GI-01: Facility Information
GI-02: Process Flow Diagram
GI-03: Facility and Stack/Vent Diagram
GI-04: Stack/Vent Information
MI-01: Building and Structure Information
CR-01: Certification

Mercury Guidance and Form
(See Mesaba Energy Project Application for a New Source Review Construction Authorization Permit, Mesaba One and Mesaba Two)
Hg-2003: Assessing the Impacts of Mercury Release to Ambient Air

MINNESOTA POLLUTION CONTROL AGENCY
AIR QUALITY
520 LAFAYETTE ROAD
ST. PAUL, MN 55155-4194

AERA-01 INSTRUCTIONS

AIR EMISSIONS RISK ANALYSIS

1a) AQ Facility ID No.: _____

1b) AQ File No.: _____

2) Facility Name: **Excelsior Energy Inc. Mesaba Energy Project**

3) Facility Location:

Street Address: _____

City: **Taconite** State: **MN** ZIP Code: **55786** County: **Itasca**

To facilitate review, please provide the following documents, forms or information:

Please submit three hard copies of all AERA submittals including forms and supplemental information, and electronic versions of DISPERSE summary reports/figures and the RASS.

AERA Forms

X	Form AERA-01 Deliverable Checklist (this form)
X	Form AERA-02 Maps Form
X	Form AERA-03 Dispersion Factor Analysis
X	Form AERA-04 Emergency Internal Combustion Engine Certification
X	Form AERA-05 Emissions

Permit Forms

X*	Form GI-01: Facility Information
X*	Form GI-02: Process Flow Diagram
X*	Form GI-03: Facility and Stack/Vent Diagram
X*	Form GI-04: Stack/Vent Information
	Form GI-05D: Fugitive Emission Source Information (if applicable)
X*	Form MI-01: Building and Structure Information
X	Form CR-01: Certification of the AERA submittal

X* - forms are included in the Application for a New Source Review Construction Authorization Permit, Mesaba One and Mesaba Two)

Dispersion Submittals (electronic only)

	DISPERSE summary report and summary figures
X	Model input/output if other dispersion modeling used for dispersion factor (e.g. SCREEN3, ISCST3, ISC-PRIME, AERMOD, BPIP, BPIP-PRIME)

Mercury Guidance and Form

X*	Hg 2003 Assessing the Impacts of Mercury Releases to Ambient Air

X* - forms are included in the Application for a New Source Review Construction Authorization Permit, Mesaba One and Mesaba Two)

RASS Submittals

RASS is based on what type of emission rates? (Check one)

	Potential to Emit (PTE)
	Future Projected Actuals
	PTE and Future Projected Actuals (i.e., a separate and complete RASS for each)

Assumed receptor location(s): (Check one)

	Two Separate RASS: (1) Chronic (annual) exposure receptors "at or beyond" the fenceline and (2) Acute (maximum 1 hour exposures) on the property
	One RASS: ~~Chronic~~ Sub-chronic and acute exposure receptors located "at or beyond" the fenceline

RASS excludes chemicals of relatively low risk dropped from analysis (Check one)

	RASS submittal includes all emitted chemicals
	Two submittals: RASS submittal for all emitted chemicals *and* second RASS submittal excluding chemicals previously found to be less than < 10-6 additional cancer risk or < 0.1 hazard quotients

For Modifications (Check one)

	Estimated risks for total facility are greater than risk management thresholds. RASS are provided to characterize the pre-modification (baseline) condition.
	Estimated risks for total facility are below risk management thresholds and no pre-modification (baseline) RASS are needed.

Total Number of RASS submittal(s) _____ **(electronic only)**

Additional information that would facilitate MPCA understanding the assessment or the results.
Please describe any additional attachments in the format below.

Attachment Reference Number (or other identifier)	Title	Purpose
Application dated: June 2006	Application for a New Source Review Construction Authorization Permit, Mesaba One and Mesaba Two)	Process & source description, Construction permit forms
Electronic spreadsheet & AERA report	Q/CHI Evaluation	Sub-chronic and acute risk evaluation
Electronic submittal & AERA report	IRAP Evaluation	Chronic risk evaluation for inhalation and non-inhalation pathways including fish ingestion
Electronic submittal & AERA report	MPCA Mercury Risk Estimation Method for Fish Consumption	Risk evaluation for the fish ingestion pathway – mercury only

Description of missing information and/or substitutes for the above: _____

_____

_____

1) AQ Facility ID No.: _____

2) AQ File No.: _____

3) Facility Name: **Excelsior Energy Inc. Mesaba Energy Project**

See Figure 2, "Facility Plan – Aerial View"

Maps provide a pictorial representation of information and allow for significant abbreviation of text submittals.

1. Provide a "sensitive population receptor" map of the facility and the surrounding area with the following features. The map should cover a circular area around an emissions facility. At a minimum, the radius of the circle should be 1 km from all emission points. This map should be submitted whether or not "sensitive population receptors" are present.
   a. Facility location
   b. Schools
   c. Daycares
   d. Public recreation areas (could include playgrounds, swimming pools, tennis courts, city parks, etc.)
   e. Nursing homes
   f. Hospitals
   g. Other locations where sensitive receptors congregate

2. Facilities emitting PBTs should provide a map showing the following features:

   a. **Fishable water bodies.** A water body may be considered "fishable" if it typically contains water year-round in a year that receives at least 75 percent of the normal annual precipitation for that area. For facilities with stack heights less than 100 meters, provide a map showing lakes, rivers and streams within a 3 km radius (approx. 2 miles). For facilities with stack heights greater than 100 meters, show lakes, rivers and streams for the area within a 10 km radius (6 miles). Also show water bodies outside the specified area that may be fed by rivers and streams lying within the radius of interest. The length of the reach of river or stream (or extent of a lake) outside the radius that must be shown will be determined case-by-case based on local data and conditions. The map should be labeled to identify the fishable waterbodies.

   b. **Farming locations.** If no information is available regarding land use, the default assumption will be that a farmer could be impacted by facility emissions, and the farmer's risks will be used as a basis for decisions. If land use information is provided to the MPCA indicating that the area within a 2-mile radius (6 miles for stack heights greater than 100 meters) is entirely residential (or that it is not and will not be agricultural), only the indirect risks for the resident (which will be lower than

the risks to the farmer) will be considered in any risk-based determinations to be made regarding a facility.

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AERA-03
DISPERSION FACTOR ANALYSIS

AIR EMISSIONS RISK ANALYSIS
Air Quality #9.03 May 2004

1) AQ Facility ID No.: _____

2) AQ File ID No.: _____

1) Facility Name: **Excelsior Energy Inc. Mesaba Energy Project - West Range Site**

Purpose
This worksheet is provided to help describe the assumptions made to determine dispersion factors within the air emissions risk evaluation. This worksheet will act as a completeness checklist. If the requested data or forms are not included, please describe why they are not included, and indicate if substitutes are provided.

Information Requested for All Submittals:

1. Does the modeling include any point sources? **Yes**

2. Does the modeling include any fugitive sources? **No**

3. Are all dispersion factors from the DISPERSE Look-Up Table? **No – for Q/CHI and IRAP evaluations.**

4. Enter the maximum terrain variation (meters) (as applicable):

   a. Within 10m of shortest stack: ____**2**_____.
   b. Within 100m of shortest stack: ____**5**___.
   c. Within 1000m of shortest stack: ____**20**__.

   d. Within 10m of lowest fugitive source: __**N/A**_____.
   e. Within 100m of lowest fugitive source: __**N/A**_____.
   f. Within 1000m of lowest fugitive source: __**N/A**_____.

5. Stacks/Vents (if applicable)

   a. Are all stacks considered? **Yes**
   b. Were any stacks merged? **No – for the Q/CHI and IRAP evaluations.**
   c. Were stacks merged per MPCA DISPERSE guidance? **No**
   d. Does the shortest modeled stack height in the RASS equal the shortest height on Form GI-04? **No – RASS not conducted**

6. Fugitive Emission Sources (Not Applicable)

   a. Are there any onsite paved roads? **YES** No
   b. Are there any onsite unpaved roads? **YES** No
   c. Are there any onsite storage/surge piles? **YES** No
   d. Are there any onsite material handling operations? **YES** No
   e. Are there any other types of onsite fugitive sources? **YES** No (Equipment Leaks)

   f. Does the modeling consider all onsite fugitive sources? Yes **NO**
   g. Does the modeling consider most onsite fugitive sources? Yes **NO**

7. Stack Parameters (modeled values should match Form GI-04 values unless merged):

Modeled Stacks and Stack Parameters (see example below):

Model ID & Form GI-04 SV_ID_No.	~~RASS~~ Stack ID number	Stack Height (meters)	Stack Temperature (Kelvin)	Stack Velocity (m/sec)	Stack Diameter (meters)
1 CT1PI	**CT1PI**	**45.72**	**394.3**	**20.08**	**6.1**
2 CT2PI	**CT2PI**	**45.72**	**394.3**	**20.08**	**6.1**
3 TVBPI	**TVIPI**	**64.01**	**579.8**	**8.46 short-term** **1.95 annual**	**1.83**
4 FLRPI	**FLRPI**	**56.39**	**1273.0**	**20.00**	**0.25**
5 CT1PII*	**CT1PII**	**45.72**	**394.3**	**20.08**	**6.1**
6 CT2PII*	**CT2PII**	**45.72**	**394.3**	**20.08**	**6.1**
7 TVBPII	**TVIPII**	**64.01**	**579.8**	**8.46 short-term** **1.95 annual**	**1.83**
8 FLRPII	**FLRPII**	**56.39**	**1273.0**	**20.00**	**0.25**
9					
10					

8. Fugitive Source Release Heights and Area Coverage
   Please indicate in Table 7 if any fugitive/area source was modeled as a point source

Model ID & Form GI-05D FS_ID_No.	RASS Stack ID number	Release Height (meters)	Area Coverage (m^2)	**Brief** Description of Fugitive Source
1 FUGVOC	**-**	**3.05**	**272,381**	**Normal equipment leaks from valve seals, pump and compressor seals, pressure relief valves, flanges, etc.**
2				
3				
4				
5				
6				
7				
8				

EXAMPLE of Merged and Unmerged Stack Parameters

Model ID & Form GI-04 SV_ID_No.	RASS Stack ID number	Stack Height (meters)	Stack Temperature (Kelvin)	Stack Velocity (m/sec)	Stack Diameter (meters)
1 (3 merged stacks from Form GI-04):		10.0 (lowest of 3 values below)	293 (lowest of 3 values below)	2.5 (lowest of 3 values below)	1.0 (lowest of 3 values below)
SV001		10.0	300	3.3	1.1
SV002		11.0	310	2.5	1.1
SV003		12.0	293	2.7	1.0
2 (SV004 only)		20	400	3.3	1.0
3 (SV005 only)		15	350	11.1	3.2
4 (Coal Pile)		1	293	0.001	20

Supplemental Information Requested when using DISPERSE Batch Programs: (Not Applicable)

9. Building Data

   a. Circle the Building Profile Input Program (BPIP) option used:
      i. BPIP option 1: MPCA defined "square" structure
      ii. BPIP option 2: User defined "rectangular" structure
      iii. BPIP option 3: pre-existing BPIP file; Filename: _____.
   b. Is the tallest modeled building height greater than or equal to the tallest height on Form MI-01? Yes No

10. Circle the Land Use Land Cover (LULC) option used:

   a. Cultivated land (a.k.a. row crops or cropland; z_o~0.01m to 0.2m);
   b. 50/50 mix of cultivated land and deciduous forest (z_o ~0.3m to 0.8m);
   c. Deciduous forest (and major urban downtown areas) (z_o ~0.5m to 1.3m);
   d. Unknown

11. Does the modeling use five years of meteorological data? Yes No

12. Are all DISPERSE stack locations at the "building" center? Yes No

Supplemental Information Requested when using other modeling (e.g., ISCST3, ISC-PRIME, or AERMOD):

13. Is a CD-ROM included with all modeling input/output files (BPIP; ISCST3 or ISC-PRIME or AERMOD)? **Yes**

14. Indicate the model (version number), model options (e.g., DFAULT, CONC, FLAT, ELEV, RURAL, URBAN), and POLLUTID, AVERTIME, MULTYEAR, and HnH selections:

Q/CHI Modeling:
AERMOD (04300)
CO MODELOPT DFAULT CONC
CO AVERTIME 1 or MONTH or ANNUAL
CO POLLUTID OTHER

IRAP and Mercury Vapor Phase Modeling:
AERMOD (04300)
CO MODELOPT CONC WDEP WETDPLT TOXICS
CO AVERTIME ANNUAL
CO POLLUTID OTHER
CO GDSEASON 4 4 4 5 5 5 1 1 1 2 3 3
CO GDLANUSE 36*2

IRAP Particle Phase Modeling:
AERMOD (04300)
CO MODELOPT CONC DEPOS DDEP WDEP DRYDPLT WETDPLT TOXICS
CO AVERTIME ANNUAL
CO POLLUTID OTHER
CO GDSEASON 4 4 4 5 5 5 1 1 1 2 3 3
CO GDLANUSE 36*2

15. Is terrain considered? **Yes** If yes, circle DEM data: 1-degree, **7.5 minute**, mix, other.

16. Surface meteorological station: **__14918 (International Falls)**

17. Upper air meteorological station: **_14918 (International** Falls)

18. Years of meteorological data: **1972-1976**

19. Does the modeling calculate high-first-high (H1H) values? **Yes**

20. Does the RASS only use H1H values? **Not Applicable**

21. Other comments to help understand the modeling (e.g., describe receptor grids, BPIP, etc.):

Receptor grid and BPIP are the same as was used for criteria pollutant modeling.

Supplemental Information Requested (Optional)

22. Do you think this project would significantly benefit from improved dispersion factors? Yes No

23. If 22 is yes, please rank the top 3 items you think would be most helpful:

- Improved stack parameters (height, diameter, temperature, velocity)
- Improved fugitive source information (release height, area coverage)
- Improved general building dimensions
- Improved specific building dimensions
- Improved joint stack/building data (Building Profile Input Program (BPIP) data)

- Fewer merged stacks
- More meteorological options
- More Land Use Land Cover (LCLC) options
- Non-H1H values for short-term criteria pollutants (e.g., H6H 24-hour PM10 values)*

- Terrain options*
- 1.0 degree USGS Digital Elevation Model (DEM) data*
- 7.5 minute USGS Digital Elevation Model (DEM) data*

- Values paired in time*
- Values paired in space*
- Values paired in space & time*

- Facility-specific receptors (e.g., company fence line and/or property line)*
- Source-by-Source impacts (i.e., culpability tables via EVENTFIL option)*

- Other suggestions (list and rank):

_____
_____
_____
_____
_____
_____
_____

* Probably means refined modeling instead of screening modeling.

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AERA-04
CERTIFICATION FOR EMERGENCY INTERNAL COMBUSTION ENGINES

AIR EMISSIONS RISK ANALYSIS
Air Quality #9.04 May 2004

1) AQ Facility ID No.:

2) Facility Name: **Excelsior Energy Inc. Mesaba Energy Project**

This certification must be signed by a responsible official and submitted with any Air Emissions Risk Analysis where emissions from an internal combustion engine are not assessed because the engine is associated with emergency use only. Please review additional background information found in the accompanying instructions.

CERTIFICATION FOR EMERGENCY INTERNAL COMBUSTION ENGINES

I certify under penalty of law that the emission units listed below are for emergency use only, where an emergency internal combustion engine is an engine that is operated when unforeseen conditions result in disruption of electrical power to the stationary source.

"Emergency" or "emergency use only" does NOT include:

a. electrical generators used to supply electricity to a stationary source with an interruptible electrical power supply during times that the supplier has interrupted the supply as provided in the agreement governing the interruptible supply;

b. electrical generators operated at the request of the electric power supplier to assist in meeting peak electrical energy demand.

"Interruptible power supply" means that the owner/operator of a stationary source has agreed with the supplier of electricity which allows the supplier to restrict or discontinue supply of electricity for some specified time period after providing adequate prior notice.

3) Emission unit description

(Column 1)	IC engine #1	IC engine #2	IC engine #3&4	IC engine #5	IC engine #6	IC engine #7&8
Stack/Vent No.	**SV-006**	**SV-007**	**SV-008&9**	**SV-018**	**SV-019**	**SV-020&21**
Type of Use	**Emergency generator**	**Emergency generator**	**Fire pump engines (2)**	**Emergency generator**	**Emergency generator**	**Fire pump engines (2)**
Rated heat input (mmBtu/hr)	*	*	*	*	*	*
Rated mechanical output (HP and RPM)	*	*	*	*	*	*
Fuel type (include % sulfur)	*	*	*	*	*	*
Fuel consumption rate (gal/hr or cf/hr)	*	*	*	*	*	*
Stack height (m)	*	*	*	*	*	*
Engine Location[1] UTM coordinates in NAD 1983	*	*	*	*	*	*
Testing frequency and duration	*	*	*	*	*	*

***See Application for a New Source Review Construction Authorization Permit, Mesaba One and Mesaba Two) .**

4) Additional information (optional)

	IC engine #1	IC engine #2	IC engine #3	IC engine #4	IC engine #5
Stack inside diameter (m)					
Stack velocity or flow Show units (m/s, m^3/s, or ft^3/min)					
Stack temperature (K)					
Urban or rural					
Nearest receptor distance (m)					

[1] Please provide a facility map, clearly labeling IC engines and their locations.

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AIR QUALITY
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AERA-04

CERTIFICATION FOR EMERGENCY INTERNAL COMBUSTION ENGINES

I also certify, in accordance with Minnesota Rules 7007.0500, subp. 2 (K)(2) and subp. 2 (K)(3), that I have reviewed the procedures implemented by my facility to maintain compliance and that those procedures are, to the best of my knowledge and belief, reasonable to maintain compliance with all applicable requirements.

Owner:

Mr./Ms. _____
Title: _____
Signature: _____
Date: _____
Phone: _____

Operator:

Mr./Ms. _____
Title: _____
Signature: _____
Date: _____
Phone: _____

MINNESOTA POLLUTION CONTROL AGENCY
AIR QUALITY
520 LAFAYETTE ROAD
ST. PAUL, MN 55155-4194

AERA-05
EMISSIONS

AIR EMISSIONS RISK ANALYSIS
Air Quality #9.05 May 2004

1) AQ Facility ID No.: _____

2) AQ File ID No.: _____

3) Facility Name: **Excelsior Energy Inc. Mesaba Energy Project**

Purpose

The purpose of this form is to describe and document the process used to generate emission rates. The project proposer may choose to assess emissions at the facility's potential to emit (PTE) as defined by state and federal rules. Alternatively, the project proposer may estimate another future operating scenario, defined in AERA as "future estimated actual emissions."

Submittals

Provide answers below or reference attachments.

4) List emission sources at facility that do not have to be quantified *(AERA guide section 2.3.2)* _____
1. Emission units that only burn natural gas
2. Emergency generators and fire water pumps (diesel internal combustion engines) See Form AERA-04

5) Were insignificant activities included? If included, describe assessment. *(AERA Guide Section 2.3.2)* _____
Insignificant activities are not included.

6) List of data sources used to generate emission factors: *(AERA Guide section 2.3.3)*
   a. Specific citations of emissions data sources used
      i. Reference, table number (etc.), publication date
      ii. Rationale for selecting data sources

Sources of emission factors are described in detail in the appendices of the Prevention of Significant Deterioration Permit to Constuct Application. In summary, emission rates from the emission units are estimated using:

- **Plant performance characteristics**
- **Equipment supplier data**
- **BACT requirements**
- **Test results for similar equipment at other IGCC facilities, especially the existing Wabash River IGCC plant (which also used E-Gas gasification technology)**

- **Engineering calculations, experience, and judgement**
- **Published and accepted average emission factors, such as the U.S. EPA Compilation of Air Pollutant Emission Factors (AP-42)**

Chemical(s)	Reference	Table Number	Date	Rationale

7) Description of treatment of data sources in producing the hourly and annual emission rate estimate *(AERA Guide section 2.3.5)*
See the response to question 6.

8) Description of operating scenario being assessed, and if estimated future actual, documentation of future business case. *(AERA Guide section 2.3.7)*
The operating scenario used in the emission calculations is described in the Application for a New Source Review Construction Authorization Permit, Mesaba One and Mesaba Two. In general, it is annual PTE.

9) Derivation of operating scenario provided: PTE or future estimated actual emissions.
Our emission calculations are based on PTE.

10) If future estimated actual emissions are used, provide business case description to support future case, three years of TRI information for existing facilities, and propose production-based permit limits.

11) Determination of Technical and Economic Feasibility. If risk estimates are above risk criteria, a demonstration of technical and economic feasibility must be prepared. *(AERA Guide Section 3.9)*
A Determination of Technical and Economic Feasibility is not necessary since risks are within acceptable levels.

Minnesota Pollution Control Agency

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AIR QUALITY
520 LAFAYETTE ROAD
ST. PAUL, MN 55155-4194

AERA-06
CUMULATIVE AIR EMISSIONS RISK ANALYSIS

AIR EMISSIONS RISK ANALYSIS
Air Quality #9.0X February 2009

1. **AQ Facility ID No.:**
2. **AQ File No.:**
3. **SIC Code:**
4. **Facility Name:** **Excelsior Energy Inc. Mesaba Energy Project**
5. **Facility Location:**
   Street Address:

   City: **Taconite** **State:** **MN** **ZIP Code:** **55786** **County:** **Itasca**
6. **Date of submittal:** : 7. To whom:

Cumulative air emissions risk analyses are intended to provide information about risks from sources of air toxics that may interact with the project in such a way as to cause cumulative impacts and are not typically included in AERAs.

8. CD including the following elements for off-site sources and on-site sources (if not submitted for an AERA) :
   a. All RASS and/or Q/CHI spreadsheets
   b. Modeling input/output/plot files if applicable (e.g. AERMOD, BPIP)
   c. The following map files: (*.mxd when possible)
      1. Locations and coordinates of receptors within 10 km including closest residences, schools, daycare centers, hospitals, farms, and fishable water bodies.
      2. Locations and coordinates with potential air emission sources within 10 km. Potential maps can be found on the "What's In My Neighborhood" and "Environmental Data Access" Web sites for potential maps.
      3. Locations and coordinates of nearby monitoring stations, if applicable (e.g. proposer is using customized data).
      4. Locations, coordinates, and values for maximum risks.

9. Zip code population density of the most impacted area from the project/modification? What ambient monitoring data were used (circle: low or intermediate population density or customized)? **15 people per square mile (based on estimated 2007 census)**

   If data was customized, why?

Please circle the off-site sources this data set is being used to reflect:
(mobile, area, point and background sources).

Briefly (one page or less) discuss the surrounding vehicular traffic pattern density and how this proposal will change them.

The traffic forecasts indicate that volumes on State Highway 169 and County Highway 7 (north of the plant site) would have modest traffic increases that are not significantly different from the forecasted No-Build scenarios. County Highway 7, between State Highway 169 and the plant site, would see its highest volumes (around 3,720 vehicles per day) during peak construction periods (expected in 2010), then would drop off after construction with an estimated 2,140 vehicles per day in 2028. The local roadway segments show forecasted volumes that could be comfortably handled by the roadway type.

10. What off-site sources were modeled?

For each off-site point source within 10km, briefly (one page or less total) discuss why it was modeled or not? For off-site point sources of potential concern, not modeled and emitting pollutants not reflected in the monitoring data set (see How To Document) please include any available information about distance to the potentially most impacted area, emissions profile, process and fuel type, historical regulatory compliance, public complaints, dispersion characteristics (stack height, prevailing wind direction), etc.

The closest additional facility that would contribute to increased air concentrations is greater than 10 km. Therefore only risk associated with background ambient air data is considered along with the calculated Mesaba Energy Project risk.

11. Summary table for quantitative results:

	Cancer Risk	Chronic Non-Cancer Hazard Index *	Acute Hazard Index *
1. Proposed facility or modification (from AERA)	**3 in 1,000,000**	**0.08**	**0.7**
2. Existing Facility (from AERA)	**N/A**	**N/A**	**N/A**
3. Off-site sources quantitatively assessed:			
a.) ambient monitoring data	**3 in 100,000**	**1**	**0.5**
b.) modeled off-site sources (separated by source)			

*** If hazard indices are above one, separate by health endpoints. See examples below.**

Ambient monitoring data representing the rural Iron Range in Minnesota was provided by MPCA on January 23, 2009. The ambient monitoring data were used to calculate summed risks from measured air

concentrations of volatile organic chemicals (VOCs), carbonyls, and metals. The most recent metals data (2005-2007) as measured at Virginia, Minnesota was used and carbonyls and VOCs adjusted to reflect rural background air concentrations. MPCA Table 1, "Ambient Moniotr-Based Risk Results and Risk Drivers," is attached to this form. Information below was not used in this evaluation.

Separation of hazard indices and risks by health end point, pollutant and risk drivers from ambient monitored data by zip code population density.

Risks by target health endpoints for zip code population densities of less than 500 people per square mile

	Respiratory	Nervous System	Eyes	Reproductive	Developmental	Hematopoietic
Chronic	0.41		0.32			
Acute	0.22		0.1			

Risks by pollutant families for zip code population densities of less than 500 people per square mile

Pollutant Group Name	Cancer risk in 100,000	Chronic non-cancer	Acute non-cancer
Metals	0.05	0.1	
VOCs	1.43	0.06	0.01
Carbonyls	0.66	0.41	0.1
NO_2			0.12
Sum	2.14	0.57	0.24

Risk drivers for zip code population densities of less than 500 people per square mile

Pollutant	Cancer risk in 100,000	Chronic non-cancer	Acute non-cancer
Carbon tetrachloride	0.83		
Ethylene chloride	0.10		
Benzene	0.40		
Formaldehyde	0.48	0.32	0.1
Acetaldehyde	0.18	0.09	
NO_2			0.12
Sum of risk drivers	1.99	0.41	0.22

Average risks by target health endpoints for zip code population densities between 500 and 2999 people per square mile

	Respiratory	Nervous System	Eyes	Reproductive	Developmental	Hematopoietic
Chronic	0.81	0.13	0.70			
Acute	0.57		0.30	0.11	0.11	

Risks by pollutant families for zip code population densities between 500 and 2999 people per square mile

Pollutant Group Name	Cancer risk in 100,000	Chronic non-cancer	Acute non-cancer
Metals	**0.94**	**0.27**	**0.19**
VOCs	**2.13**	**0.15**	**0.04**
Carbonyls	**1.27**	**0.81**	**0.3**
NO_2 (Respiratory)			**0.19**
Sum	**4.34**	**1.24**	**0.72**

Risk drivers for zip code population densities between 500 and 2999 people per square mile

Pollutant	Cancer risk in 100,000	Chronic non-cancer	Acute non-cancer
Arsenic	0.55		0.11
Manganese		0.13	
Beryllium	0.13		
Chromium	0.14		
Carbon Tetrachloride	0.83		
Benzene	0.55		
Butadiene, 1,3-	0.24		
Methyl Chloride	0.19		
Ethylene Chloride	0.13		
Tetrachloroethene	0.10		
Formaldehyde	1.10	0.7	0.3
Acetaldehyde	0.23	0.11	
NO_2			0.19
Sum of risk drivers	**4.19**	**0.94**	**0.60**

12. Briefly (one page or less) discuss uncertainties specific to the cumulative analysis for this project.

Risk calculation for the Mesaba Energy Project is based on an emission inventory that assumes a level of conservatism using the highest measured value of any COPC quantified in a valid stack test.

This approach provides a basis for eliminating uncertainty with respect to the level of conservatism applied to both the acute and chronic risk assessments. However, it does not represent a realistic basis for establishing the IGCC Power Station's long term potential to emit COPCs (e.g., over the period of one year). Actual emissions will likely be lower than those assume for this AERA. Assembling a long term emission inventory of COPCs would better be served through use of average emission rates collected during stack tests, rather than maximum rate

The health risks from the proposed Project are approximately 10% of potential cumulative cancer risks and chronic non-cancer hazard index.

Site		Cancer	Chronic non-cancer	Acute non-cancer
1300, 7416		2.95	1.03	0.53

Sites Included: Virginia (1999 - 2000) for vocs and carbonyls and Virginia (2002 - 2007) for metals

Site	Name	Cancer	Chronic non-cancer	Acute non-cancer
Virginia	Metals	0.88	0.57	0.29
Virginia	VOCs	1.42	0.04	0.01
Virginia	Carbonyls	0.66	0.41	0.10
Cloquet	NO_2			0.13
Summed Hazard Indicies and Risk:		2.95	1.03	0.53

Sites Included (site where this type of pollutant is monitored)

Metals	Virginia
VOCs	Virginia with rural substitutions
Carbonyls	Virginia with rural substitutions
NO_2	Cloquet Monitoring Site

Risk Drivers	Cancer	% of total Summed Risks	Chronic Non-Cancer	HQ of Risk Driver	% of total Summed HI	Acute	HQ of Risk Driver	% of total Summed HI
Carbon tetrachloride	0.83	28%	Manganese	0.46	44%	Copper	0.17	31%
Arsenic	0.57	19%	Formaldehyde	0.32	31%	Nitrogen Dioxide	0.13	24%
Formaldehyde	0.48	16%	Acetaldehyde	0.09	9%	Arsenic	0.12	23%
Benzene	0.40	14%				Formaldehyde	0.10	19%
Chromium	0.19	7%						
Acetaldehyde	0.18	6%						
Ethylene chloride	0.08	3%						
Nickel	0.05	2%						

Risk Driver Values Separated by Toxic Endpoint for Inhalation Only:

	Chronic Non-Cancer			Acute			
	respiratory	nervous	eyes	respiratory	developmental	reproductive	eye
Acetaldehyde	0.09						
Arsenic					0.12	0.12	
Copper				0.17			
Formaldehyde	0.32		0.32	0.10			0.10
Manganese		0.46					
Nitrogen Dioxide*				0.13			
	0.41	0.46	0.32	0.40	0.12	0.12	0.10

Kristie Ellickson:
olfactory epithelium degenration

Table 1. Ambient Monitor-Based Risk Results and Risk Drivers from Virginia with vocs and carbonyls adjusted to reflect rural background.

**Prepared by MPCA. Obtained by SEH on January 23, 2009.

Appendix B

Electronic Submittals –

Q/CHI Spreadsheet

Q/CHI Modeling Input/Output/Plot Files

IRAP Input/.csv Files

IRAP Backup File

AERMOD Dispersion Modeling Input/Output/Plot Files

Mercury Dispersion Modeling Input/Output

MPCA Local Mercury Hazard Quotients (HQ) Assessment Spreadsheet

"Allfish2008 Itasca County 1997-2007 and Pre-1997"

The electronic files provided herewith are intended solely for the use by the addressee. These electronic files may be subject to manipulation and changes beyond the control of SEH. The addressee must verify the accuracy, suitability for reuse, and completeness of all of the information and detail drawings contained within the electronic files.

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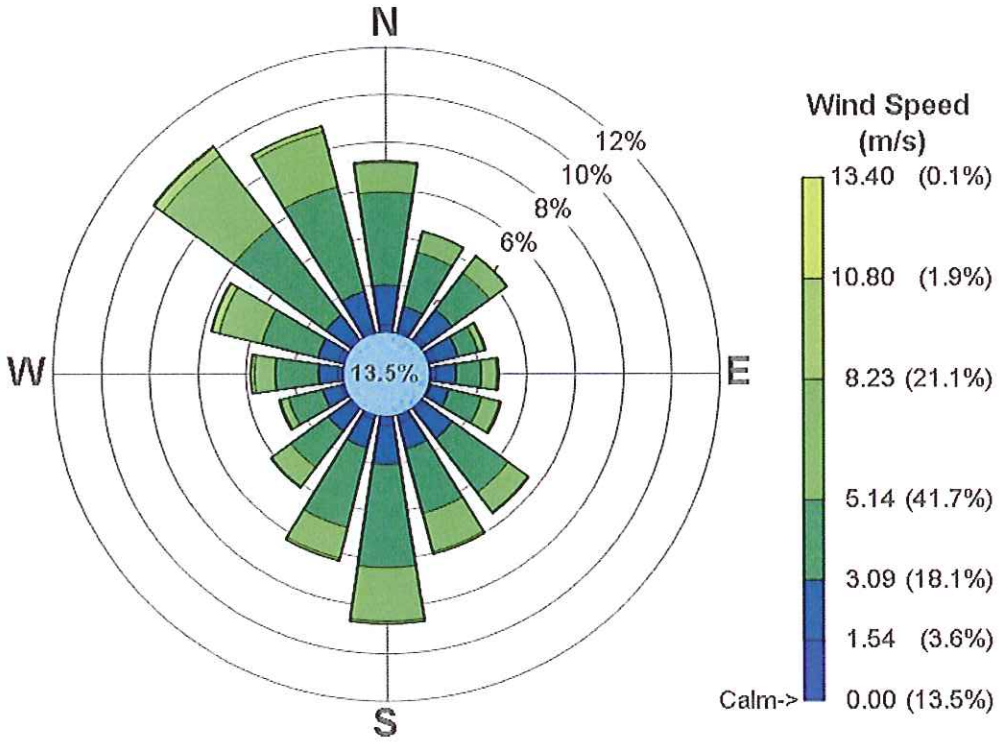
The electronic submittal CD will be available in the Prevention of Significant Deterioration Permit to Construct, submitted to Minnesota Pollution Control Agency.

Appendix C

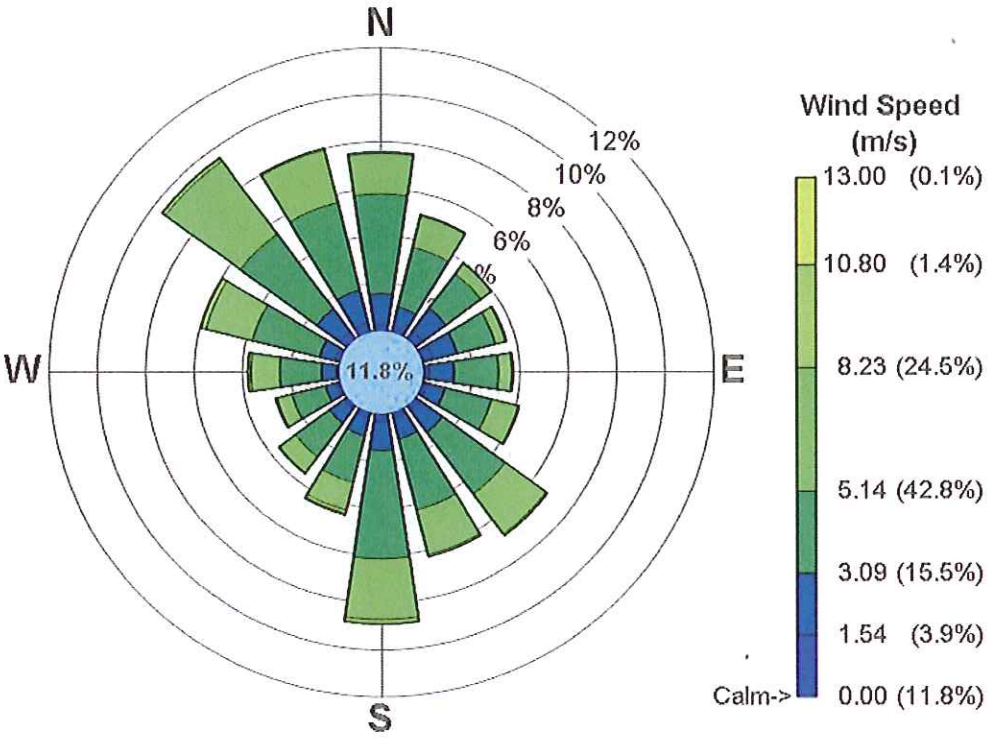
Meteorological Data

1972 Wind Data



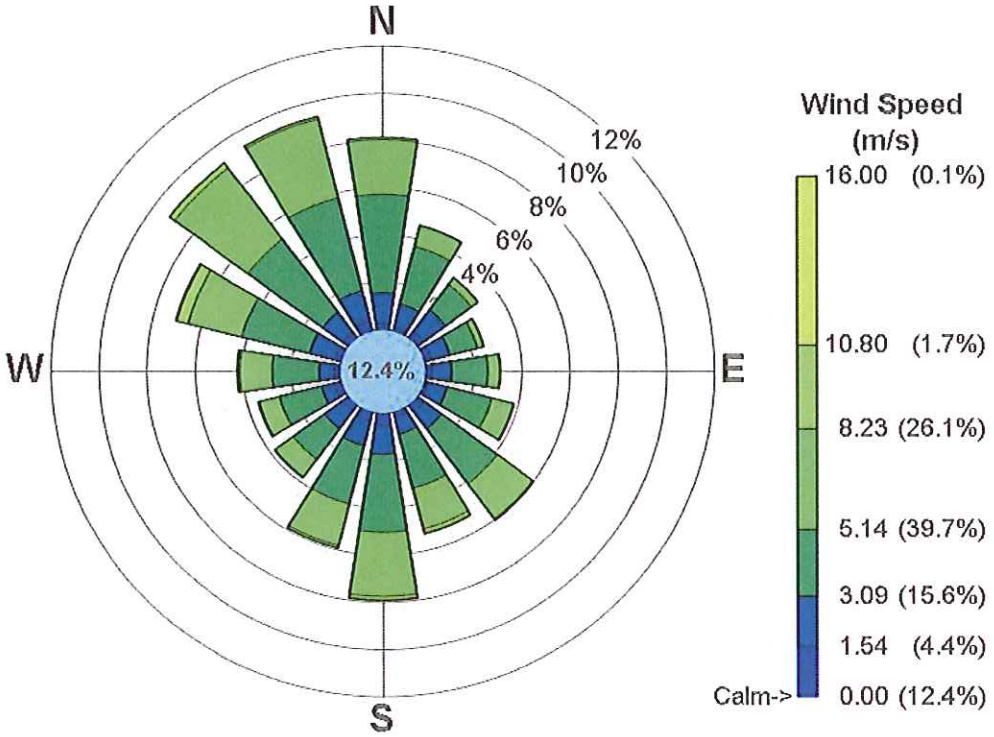
Dir \ Spd	<= 1.54	<= 3.09	<= 5.14	<= 8.23	<= 10.80	> 10.80	Total
0.0	0.27	1.68	3.93	1.26	0.06	0.00	7.21
22.5	0.15	1.00	2.35	0.90	0.01	0.00	4.41
45.0	0.23	1.37	1.91	0.88	0.02	0.00	4.41
67.5	0.30	0.94	0.85	0.27	0.05	0.00	2.41
90.0	0.23	0.84	1.04	0.63	0.09	0.01	2.83
112.5	0.10	0.76	1.37	0.75	0.08	0.00	3.06
135.0	0.20	1.39	2.83	1.02	0.05	0.02	5.52
157.5	0.31	1.15	2.80	1.67	0.09	0.00	6.02
180.0	0.38	1.64	4.35	2.27	0.10	0.00	8.73
202.5	0.18	1.23	3.46	1.33	0.11	0.00	6.32
225.0	0.23	0.98	1.90	1.00	0.06	0.00	4.17
247.5	0.14	0.77	1.45	0.34	0.07	0.00	2.77
270.0	0.20	0.80	1.79	0.87	0.15	0.01	3.81
292.5	0.25	0.85	2.40	1.82	0.33	0.03	5.69
315.0	0.22	1.09	4.71	3.68	0.43	0.07	10.20
337.5	0.20	1.59	4.55	2.40	0.23	0.00	8.98
Total	3.59	18.10	41.69	21.10	1.92	0.15	86.54
Calms							13.46
Missing							0.00
Total							100.00

1973 Wind Data



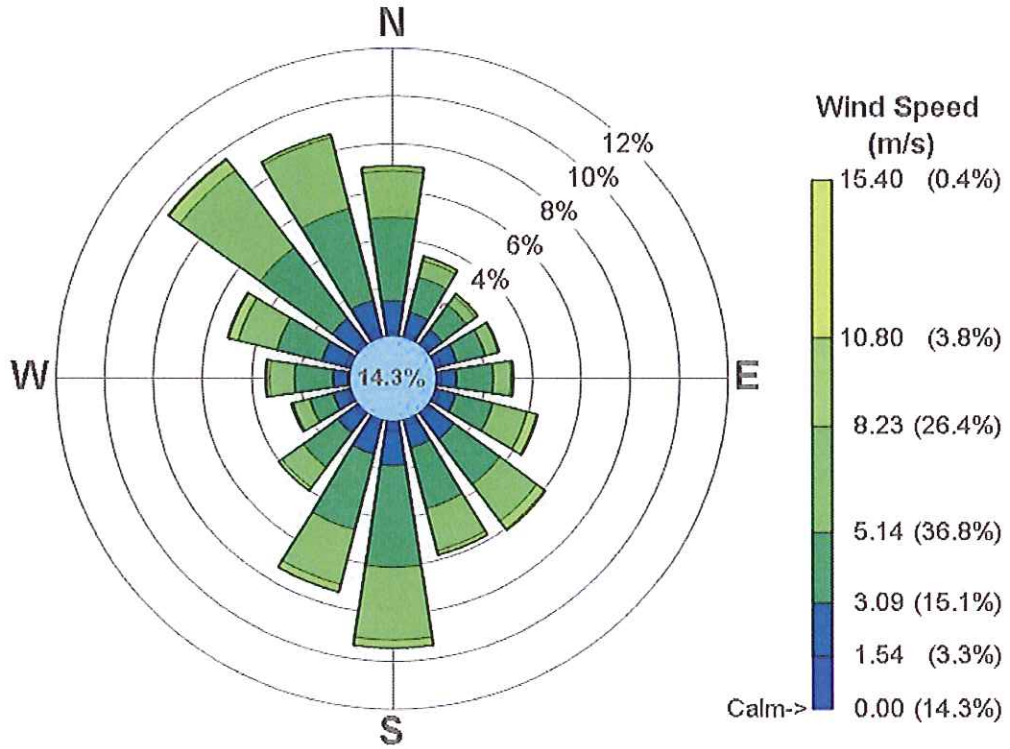
Dir \ Spd	<= 1.54	<= 3.09	<= 5.14	<= 8.23	<= 10.80	> 10.80	Total
0.0	0.21	1.34	4.24	1.74	0.05	0.00	7.56
22.5	0.21	0.86	2.61	1.37	0.03	0.00	5.08
45.0	0.38	1.21	1.82	0.55	0.02	0.00	3.97
67.5	0.43	1.05	1.64	0.43	0.05	0.00	3.61
90.0	0.21	1.05	1.86	0.55	0.06	0.00	3.72
112.5	0.18	0.78	2.00	1.14	0.05	0.00	4.14
135.0	0.26	1.13	3.25	2.11	0.08	0.00	6.84
157.5	0.23	0.91	3.09	1.96	0.08	0.00	6.28
180.0	0.32	1.21	4.60	2.58	0.19	0.00	8.90
202.5	0.19	0.81	2.02	1.22	0.15	0.06	4.45
225.0	0.14	0.78	1.77	0.84	0.03	0.00	3.56
247.5	0.15	0.47	1.45	0.65	0.06	0.01	2.79
270.0	0.09	0.61	1.78	1.18	0.13	0.00	3.78
292.5	0.18	0.67	2.90	2.00	0.21	0.00	5.96
315.0	0.35	1.20	3.97	3.86	0.15	0.02	9.55
337.5	0.38	1.43	3.84	2.31	0.06	0.00	8.00
Total	3.90	15.49	42.84	24.49	1.38	0.09	88.20
Calms							11.80
Missing							0.00
Total							100.00

1974 Wind Data



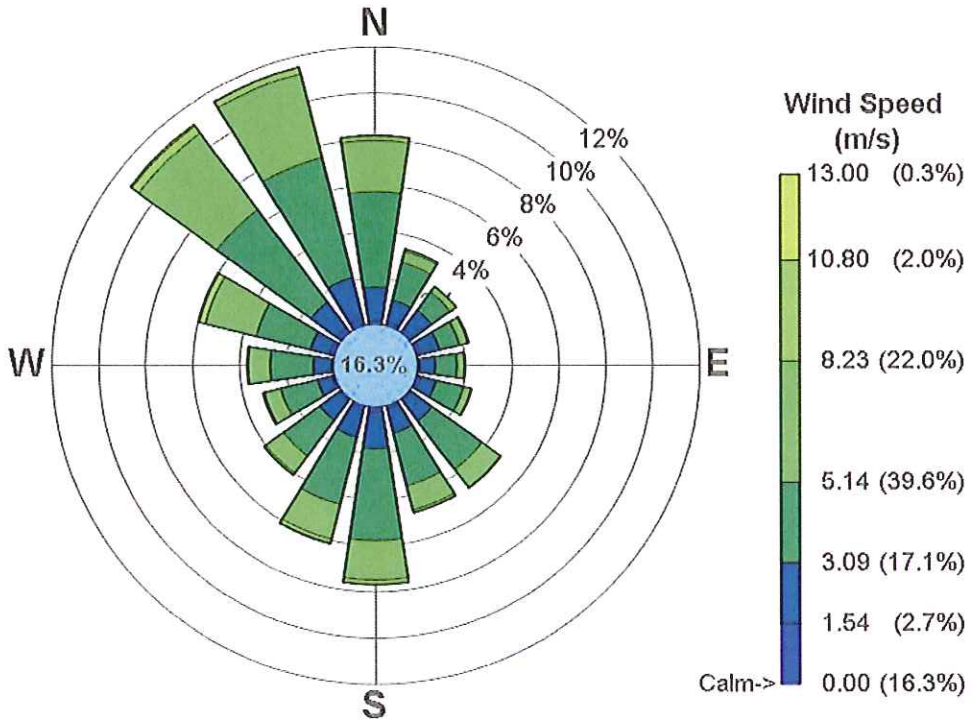
Dir \ Spd	<= 1.54	<= 3.09	<= 5.14	<= 8.23	<= 10.80	> 10.80	Total
0.0	0.24	1.30	4.17	2.34	0.08	0.00	8.13
22.5	0.16	0.99	2.51	0.89	0.01	0.01	4.58
45.0	0.31	1.15	1.34	0.33	0.01	0.00	3.14
67.5	0.26	0.82	1.18	0.26	0.01	0.00	2.53
90.0	0.21	0.86	1.51	0.50	0.00	0.00	3.07
112.5	0.14	0.82	1.91	0.94	0.01	0.01	3.82
135.0	0.31	0.92	2.88	1.85	0.06	0.01	6.03
157.5	0.19	0.75	2.34	1.78	0.19	0.02	5.29
180.0	0.48	1.23	3.30	2.72	0.17	0.02	7.92
202.5	0.38	1.07	2.53	1.83	0.10	0.00	5.91
225.0	0.29	0.95	1.61	0.91	0.05	0.00	3.80
247.5	0.30	0.55	1.77	0.89	0.03	0.01	3.55
270.0	0.22	0.65	1.93	1.32	0.09	0.02	4.24
292.5	0.25	1.10	2.89	2.31	0.48	0.03	7.05
315.0	0.29	1.05	3.85	3.77	0.25	0.00	9.20
337.5	0.40	1.34	4.05	3.45	0.10	0.00	9.34
Total	4.41	15.56	39.75	26.08	1.66	0.15	87.60
Calms							12.40
Missing							0.00
Total							100.00

1975 Wind Data



Dir \ Spd	<= 1.54	<= 3.09	<= 5.14	<= 8.23	<= 10.80	> 10.80	Total
0.0	0.18	1.27	3.47	1.95	0.19	0.01	7.08
22.5	0.15	0.90	1.50	0.72	0.17	0.01	3.45
45.0	0.15	0.61	1.27	0.45	0.13	0.01	2.60
67.5	0.26	0.68	1.19	0.56	0.05	0.00	2.74
90.0	0.19	0.65	1.51	0.73	0.10	0.02	3.21
112.5	0.22	0.68	1.55	1.47	0.42	0.07	4.42
135.0	0.22	1.14	2.34	1.92	0.41	0.07	6.10
157.5	0.24	0.95	2.60	1.82	0.18	0.01	5.80
180.0	0.39	1.44	4.25	3.04	0.33	0.00	9.44
202.5	0.19	1.27	3.24	2.35	0.32	0.01	7.39
225.0	0.16	0.88	1.79	1.04	0.16	0.00	4.03
247.5	0.15	0.59	1.00	0.67	0.08	0.01	2.51
270.0	0.07	0.61	1.58	1.02	0.14	0.05	3.45
292.5	0.23	0.99	1.87	1.63	0.39	0.05	5.16
315.0	0.16	1.16	3.68	4.02	0.55	0.06	9.62
337.5	0.30	1.27	3.95	3.06	0.14	0.00	8.71
Total	3.25	15.09	36.78	26.44	3.76	0.38	85.70
Calms							14.30
Missing							0.00
Total							100.00

1976 Wind Data



Dir \ Spd	<= 1.54	<= 3.09	<= 5.14	<= 8.23	<= 10.80	> 10.80	Total
0.0	0.14	1.46	4.13	2.22	0.19	0.02	8.16
22.5	0.16	0.97	1.67	0.50	0.08	0.01	3.39
45.0	0.19	1.00	0.97	0.28	0.00	0.00	2.45
67.5	0.16	0.85	0.84	0.35	0.06	0.00	2.27
90.0	0.10	0.66	0.88	0.32	0.02	0.00	1.98
112.5	0.20	0.67	1.15	0.34	0.01	0.00	2.38
135.0	0.11	1.09	2.58	0.98	0.03	0.00	4.80
157.5	0.14	1.08	2.35	1.08	0.11	0.01	4.77
180.0	0.20	1.59	3.97	1.71	0.19	0.01	7.68
202.5	0.23	1.18	2.98	1.55	0.18	0.03	6.16
225.0	0.10	1.05	1.94	0.90	0.09	0.02	4.10
247.5	0.11	0.64	1.61	0.69	0.07	0.01	3.13
270.0	0.09	0.76	1.81	0.97	0.05	0.00	3.68
292.5	0.20	0.84	2.38	2.24	0.28	0.05	6.00
315.0	0.24	1.39	4.97	4.14	0.38	0.08	11.20
337.5	0.30	1.83	5.35	3.75	0.28	0.01	11.52
Total	2.69	17.08	39.58	22.03	2.04	0.26	83.67
Calms							16.33
Missing							0.00
Total							100.00

Appendix D

Risk Associated with Mercury in Fish Ingestion

Calculation of Local Mercury Hazard Quotients (HQ) from Mercury Emissions from a Project
version 1.4 April 13, 2006
Direct any comments to Ed Swain edward.swain@pca.state.mn.us

Inputs are in blue and bold | Calculated Outputs are in yellow | Fixed assumptions are not colored

Facility Name: **Mesaba Energy Project (Excelsior Energy, Inc.)**

Information on the water body for which these calculations are made:

Water body name	County Name	MN DNR lake # (if available) (xx-yyyy)	Existing Ambient Fish Concentration (mg/kg Hg) **(see Note)**	Area of fishable waterbody (acres)	Area of rest of watershed (acres)
Big Diamond	**Itasca**	**31-0223-00**	**0.51**	**122**	**760**

Note: No fish data available from Big Diamond Lake. Ambient fish Hg concentration used is the highest 95% UCL calculated from fish in five lakes near Big Diamond Lake:
Swan 31-0067-00
Ox Hide 31-0106-00
Snowball 31-108-00
Lower Panasa 31-0112-00
Trout 31-0216-00
The highest concentration is from Snowball Lake.
Fish Hg from 1997 - 2007 provided by Bruce Monson (MPCA).

Mercury calculations for the increment due to project:

Hg Species	Modeled Increment to Mean Air Conc. µg/m^3	Percent of each Mercury species (%)	Dep Velocity (cm/sec)	Calculated Deposition Rate (flux) µg/m^2-yr	Area (acres)	Conversion factor (m^2 / acre)	Annual Mass deposited (µg)	Annual Mass deposited (grams)	Fraction Reaching Waterbody	Annual Mass reaching waterbody (grams)
Fishable Waterbody										
Hg(II)	**0.00E+00**	0.0%	1.10	0.00	122	4,046.9	0.0E+00	0.00	1.00	0.00
Hg(0)	**1.30E-05**	100.0%	0.01	0.04	122	4,046.9	2.0E+04	0.02	1.00	0.02
Hg-p	**0.00E+00**	0.0%	0.05	0.00	122	4,046.9	0.0E+00	0.00	1.00	0.00
Total	1.30E-05	100.0%		0.04						
Rest-of-Watershed (excluding waterbody)										
Hg(II)	**0.00E+00**	0.0%	1.10	0.0	760	4,046.9	0.0E+00	0.00	0.10	0.00
Hg(0)	**1.30E-05**	100.0%	0.05	0.2	760	4,046.9	6.3E+05	0.63	0.10	0.06
Hg-p	**0.00E+00**	0.0%	0.10	0.0	760	4,046.9	0.0E+00	0.00	0.10	0.00
Total	1.30E-05	100.0%		0.2						
Total Hg Mass Modeled to the Waterbody from Project Air Concentrations (Direct to Waterbody, plus 10% from Rest-of-Watershed) =										0.08

Mercury calculations for ambient condition (background), assuming no significant local source*:

	Deposition rate (flux) µg/m^2-yr	Area (acres)	Conversion factor (m^2 / acre)	Annual mass deposited (µg)	Annual mass deposited (grams)	Fraction reaching waterbody	Annual mass reaching waterbody (grams)
Total deposition for the fishable waterbody	12.5	122	4,046.9	6.2E+06	6.17	1.00	6.17
Total deposition for the rest of the watershed	33.6	760	4,046.9	1.0E+08	103	0.10	10.3
Total Hg Mass Modeled to the Waterbody from Project Air Concentrations (Direct to Waterbody, plus 10% from Rest-of-Watershed) =							16.5

Mercury Loading Summary

Grams Hg to water body from project	Grams Hg to water body from background
0.08	16.5

Fish Increment

Incremental Hg in fish from project (mg/kg)
0.003

Water Quality Standard Comparison

Ambient fish Hg conc. relative to WQ STD (0.2 mg/kg)	Incremental fish Hg conc. from project relative to WQ STD
2.55	0.01

Subsistence Fisher Methylmercury Intake Calculations

Assumed daily fish consumed (kg)	Incremental daily Hg consumed (mg)	Incremental daily $HgCH_3$ consumed (mg)	Body weight (kg)	Ambient $HgCH_3$ Exposure mg/kg BW-day	Incremental $HgCH_3$ Exposure mg/kg BW-day	RfD (mg $HgCH_3$/kg bw-day)
0.142	0.0004	0.0004	70	1.11E-03	5.61E-06	1.00E-04

Subsistence Fisher Hazard Quotient

Ambient Subsistence Fisher HQ	Incremental Subsistence Fisher HQ
11.12	0.06

Recreational Fisher Methylmercury Intake Calculations

Assumed daily fish consumed (kg)	Incremental daily Hg consumed (mg)	Incremental daily $HgCH_3$ consumed (mg)	Body weight (kg)	Ambient $HgCH_3$ Exposure mg/kg BW-day	Incremental $HgCH_3$ Exposure mg/kg BW-day	RfD (mg $HgCH_3$/kg bw-day)
0.03	0.00008	0.00008	70	2.35E-04	1.19E-06	1.00E-04

Recreational Fisher Hazard Quotient

Ambient Recreational Fisher HQ	Incremental Recreational Fisher HQ
2.35	0.01

*The ambient condition is assumed to result from the following background air concentrations and deposition velocities:

Hg Species	Modeled Increment to Mean Air Conc. µg/m3	Percent of each Mercury species (%)	Dep Velocity (cm/sec)	Calculated Deposition Rate (flux) µg/m2-yr
Fishable Waterbody				
Hg(II)	2.00E-05	1.2%	1.10	6.9
Hg(0)	1.65E-03	97.6%	0.01	5.2
Hg-p	2.00E-05	1.2%	0.05	0.3
Total	1.69E-03	100.0%		12.5
Rest-of-Watershed (excluding waterbody)				
Hg(II)	2.00E-05	1.2%	1.10	6.9
Hg(0)	1.65E-03	97.6%	0.05	26.0
Hg-p	2.00E-05	1.2%	0.10	0.6
Total	1.69E-03	100.0%		33.6