MANISTEE CITY PLANNING COMMISSION

70 Maple Street
Manistee, MI 49660

MEETING MINUTES

February 5, 2004

A meeting of the Manistee City Planning Commission was held on Thursday, February 5, 2004 at 7:00 p.m. in the Cafeteria, Manistee Middle School, 550 Maple Street, Manistee, Michigan.

MEMBERS PRESENT: Bob Davis, Greg Ferguson, Ray Fortier, Cyndy Fuller, Christa Johnson-Ross, David Kelley, Mark Wittlief, and Roger Yoder

MEMBERS ABSENT: Tony Slawinski

OTHERS: Jon Rose (Community Development), Denise Blakeslee (Administrative Assistant), Jay Kilpatric (Williams & Works), Brian Sousa (Wade Trim) and others

Meeting was open at 7:04 p.m. by Chairman Yoder.

Chairman Yoder announced that Planning Commissioner Mark Wittlief will be leaving the meeting at 8:30 p.m. due to a business commitment.

PUBLIC HEARING:

None

APPROVAL OF MINUTES:

Planning Commission Meeting Minutes, January 8, 2004

MOTION by Ray Fortier, seconded by Greg Ferguson that the minutes of the January 8, 2004 Meeting of the Planning Commission be approved.

Motion approved unanimously

NEW BUSINESS:

None

UNFINISHED BUSINESS:

Amend Agenda

MOTION by Ray Fortier, seconded by Cyndy Fuller that the Agenda be amended to discuss Receipt and Review of Conflict of Interest opinion letter before the discussion on Manistee Saltworks Development Corporation Application.

Motion approved unanimously.

Receipt and Review of Conflict of Interest opinion letter

Chairman Yoder read the conclusion of a letter dated February 2, 2004 from John Gretzinger, Nantz, Litowich, Smith & Girard regarding Planning Commission Member Potential Conflict of Interest (copy attached). The letter indicates that there are no conflicts of interest for Planning Commission Members.

Manistee Saltworks Development Corporation - Application

Members of the Planning Commission received an Application from Manistee Saltworks Development Corporation for a Special Use Permit on November 6, 2003. Since that time the members of the Planning Commission with the assistance of the Consultants (Jay Kilpatrick and Brian Sousa) and City Staff have been reviewing the application for completeness.

Mr. Kilpatrick gave an overview of the permit process and discussed the 60 day period to either approve, deny or approve with condition unless extended by mutual agreement by the application and discussed Section 8609 Standards of the Ordinance. The application is complete with regard tot his standard, except for The final Air Quality permit and its emission limits, the NPDES discharge permit and its limits and the Corps of Engineers shoreline alteration permit. In addition, since the proposed facility will be municipally-owned the revenue benefits it will produce are not yet clear.

Mr. Kilpatrick spoke of the requirements for the site plan. The site plan submitted is not complete insofar as it does not provide the level of engineering detail needed for a final plan. However, the applicant has explained that the site plan and all its supporting materials may be adjusted by the final MDEQ and Corps of Engineers permitting requirements. Those requirements may impact the floor elevations of structures, their height, their placement on the site, the overall site dimensions, the location of utilities. The conceptual site plan was prepared to provide as much detail as possible with the understanding that the final permits may affect some of the details of the plan. Mr. Kilpatrick recommended a preliminary site plan review process based on the concept site plan, with the final plan approval to be deferred until the permit approvals are in place the final plan is submitted. If the Planning Commission accepts this approach, the site plan may be considered complete but any approval must be conditioned upon the submission of a final plan that is consistent with the concept site plan and it must meet the engineering requirements of the City's Engineer.

Mr. Kilpatrick recommends the Planning Commission adopt a motion to accept the application as being complete. If the Planning Commission deems the application complete another Public Hearing will be required.

Cyndy Fuller asked for clarification to statements that have been made by the public regarding the application cannot be deemed to complete because the requirements of the Ordinance have not been met. Ms. Fuller and Mr. Kilpatrick spoke of the requirements in the Ordinance under Section 8604. Information Required in Application and that the application meets the requirements of the ordinance.

Motion by Ray Fortier, seconded by Cyndy Fuller that the application from Manistee Saltworks Development Corporation for a Special Use Permit be deemed complete.

Motion approved unanimously.

Schedule Public Hearing

Chairman Yoder scheduled the Public Hearing for the Manistee Saltworks Development Corporation to be held prior to the Worksession February 19, 2004. This Public Hearing will be noticed and posted for public input regarding the application.

OTHER COMMUNICATIONS:

Brian Sousa informed the Planning Commission that the City has authorized securing the services of an independent consultant to review the Air Quality Report submitted by Manistee Saltworks Development Corporation. The Planning Commission should have the results within 60 days.

Jon Rose spoke of the release of the U.S. 31 Corridor Study results during the February 10, 2004 Council Worksession. These results will involve the development of an overlay district when the new Zoning Ordinance is complete. Members of the Planning Commission were invited to attend.

CITIZEN QUESTIONS AND CONCERNS:

Chairman Yoder called a five minute recess to allow those who wish to speak during the Public Comment portion of the meeting time to sign in.

Ray Alqueseva, 277 Sixth Street, Manistee - quoted from Woody Allen.

Bernard Ware, 9094 Alkire Road, Bear Lake - Read a prepared statement (attached) expressing his concerns over the proposed power plant and how he would like to see a Citizen Committee formed.

Fred R. LaPoint, 1606 Main Street, Manistee - Member of the Citizens for Responsible Development spoke in opposition to the plant and requested that information submitted be included in the record (attached).

Alice Mummy, 12332 Smith Street, Bear Lake - Expressed concerns about the Northern Lights Project and her concerns that Tondu has not been truthful.

Tanya Cabala, 700 Washington Avenue, Ste 150 - Member of Lake Michigan Federation, read portion of a prepared statement (attached) which spoke of direct impacts Coal Plants have on the Environment and Communities .

Kay Bond, 12792 Aylsworth Road, Beulah - Spoke of the dirty air in Beulah and expressed concerns over impacts that another coal plant would have on the environment.

Monica Evans, 3840 Blueberry, Honor - Member of the Traverse Group of the Sierra Club and is opposed to the project.

Holly Spaulding, 9283 S. Nowak, Cedar - Expressed concerns over the process and expressed potential health concerns.

Mark DiBenedetts, 13191 Chicago Avenue, Wellston - In favor of the plant, expressed concerns over the decreased number of potential jobs.

Connie Josvais, Fifth Grade Elementary Teacher, John F. Kennedy Elementary School, Project NEED - Ms. Josvai introduced two students who addressed the Planning Commisison.

Alex Tomaszewski - asked how the plant would effect his future?

Carl Jaskiw - asked what other renewable resources could be used?

Lou Blouin, 441 ½ W, Eighth Street, Traverse City - spoke of how important it was to take into account the large impact the plant will have on the community and expressed concerns over the process.

John Kupascski, 11848 River Road, Manistee - Asked why other communities will get a discount on their power while Manistee will not if the plant were constructed.

Bob Powell, 3125 S. Osterville Road, Clarkston - Expressed technical comments and his opinion that the application is incomplete.

Kathleen Hibbard, P.O. Box 112, Honor - Spoke of the Coal Plant in Traverse City which is going to be dismantled and her opposition to the proposed project.

Mark Sanford, 260 E. Piney Road, Manistee - Read a prepared statement (attached) which stated his concerns of the effects that mercury has on the environment.

Jim Coats, 206 Birchwood Avenue, Traverse City - Member of Sweetwater Alliance, Spoke of energy grid trading, and feels that the plant would hurt Manistee's economy.

Ed Levandoski, 1175 Merkey Road, Manistee - Spoke in favor of the proposed plant and potential jobs for the community.

John Keesecker, 441 ½ W. Eighth Street, Traverse City - Member of Sweetwater Alliance, spoke of regional concerns and the negative impacts the plant would have.

Gary Madden, 5422 Lakeshore Road, Manistee - Expressed concerns about gas wells, air quality an alternative power sources.

Gerard Grabowski, 10040 Alkire Road, Bear Lake - Member of Aurora Association, spoke of the Holland Base load report and feels that the project was not submitted in a straightforward manner. He requested that the Planning Commission not approve the permit and expressed concerns about Tondu.

Bill Rastetter, 420 E. Front Street, Traverse City - Attorney for Citizens for Responsible Development, expressed concerns about proposed power plant and the economic benefits vs environmental impact.

Lee Sprague, Ogema, Little River Band of Ottawa Indians, 375 River Street, Manistee - spoke of the impact that mercury will have on the community, renewable resources and jobs,

Bob Davis, Planning Commission member. Mr. Davis wanted to explain how the Planning Commission could consider a Special Use Permit for a project like this. Mr. Davis said that the Planning Commission is obligated to deliberate consider requests that are submitted. Mr. Davis said that the Planning Commission was here tonight to consider the completeness of the application and spoke of the requirements of Article 8604.

MOTION by Bob Davis, seconded by Cyndy Fuller to delay the Public Hearing until the March 18, 2004 Worksession to give the public more time to research the issues.

Staff and members discussed postponing the Public Hearing and the impact that it would have on the time Planning Commission would have to deliberate on the request.

Voting as follows:	yes	-	Davis
	no	-	Ferguson, Fortier, Fuller, Johnson-Ross, Kelley and Yoder

Motion failed - the Public Hearing will be held on February 19, 2004 in the Middle School Cafeteria, 550 Maple Street, Manistee.

ADJOURNMENT:

MOTION by Ray Fortier, seconded by Greg Ferguson that the meeting be adjourned. Motion passed unanimously. Meeting adjourned at 9:35 p.m.

MANISTEE PLANNING COMMISSION

Denise J. Blakeslee

Denise J. Blakeslee, Recording Secretary

February 5, 2004,
Manistee City Planning Commission:

I am grateful for the opportunity to speak tonight. I respect the courage and commitment you have displayed to our community.

Jon, Denise, Roger, Ray, Greg, and Mark, we made the choice last winter to spend eight Wednesday evenings together. We successfully completed the Citizen Planner Land Use Course. Why did we make that choice? I suspect we all share a commitment to serve our communities. Other members of the planning commission, who did not have that opportunity, you undoubtedly share a similar commitment to serve community. Only you know why you choose to serve. I know from my own experience that we are not getting paid the big dollars to attend meetings and participate.

I am the author of the resolution that was unanimously passed in Bear Lake and Pleasanton Township. As I define local government and democracy I choose my words carefully. The Resolution intends no insult to anyone. It asks for <u>independent</u>, Economic Analysis and Environmental Impact Statements. To have information that can be validated is essential to make a proper decision. It is essential that information on which we base our decisions can be analyzed and prioritized. I implore you to seek unbiased information, to ask the probing questions. I request that you analyze your role as citizen planners and community members. In a very real and unique way, everyone in this room wants what they think is best for our community. There is wide diversity of opinion on what is best. Invalidated information has driven wedges into our community so that we are fighting amongst ourselves. We should all be working together to discover what is best for our community. To do this we need information that can be analyzed and validated.

I am proposing that you consider **Section 4.3** in your By Laws, titled, Citizen Committees. I noticed that the city has formed a citizen committee on its upcoming bond issue. This citizen committee could represent interests including corporate, trade unions, citizen groups, Tribal, Township and County government. You have the authority to do this for our community. There is much strength in diversity of opinion. You have a challenge in front of you. The greater the challenge, the greater the potential for community well being.

The definition of Citizen and Community resides in each of you. Local government must promote and protect the health safety and welfare of its citizens. As a farmer and land keeper I realize we are the breath and prayers of our ancestors, we are the breath and prayers of the future. We can honor the past and the future by honoring the present.

Citizen. Community. Define them in your hearts and mind. I do not question your integrity to make a decision. I trust and respect your commitment to serve.

Thank you,
Bernard Ware

Bernard E Ware, Jr.
9094 Alkire Road
Bear Lake, MI 49614
231 864 3242

The following is information Submitted by Fred R. LaPoint

LAW OFFICES OF
OLSON, BZDOK & HOWARD
A Professional Corporation

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January 29, 2004

Robert M. Powell
Powell & Associates
3125 S. Ortonville Road
Clarkston, MI 48348

UPS OVERNIGHT DELIVERY

Re: Special Use Permit - Manistee Saltworks Development Corporation
Northern Lights Project
Our File N[o]. 5311.00

Dear Mr. Powell:

Enclosed please find a copy of the FOIA received the DEQ Water Division for your review.

Sincerely,

Susan K. Sherman
Legal Assistant

Enclosure
xc: Mark Dougher (via 1st class mail w/encls)
G:\WPFILES\5xxx\C.P.R.\5311.00 01-29-04 ltr to B Powell enc DEQ Water FOIA.wpd

From: Bruce Walker
To: Brian Myers
Date: Wed, Apr 26, 2000 1:33 PM
Subject: ambar chem #2

brian,
never mind my comment about the metals summary, i went throught the daily's included with the application pkg given to me. i have a few more comments/questions, however.

DMRs
- monitoring for Cd, Cu, Zn was maintained at 1-2x/mo following our granting (5/98) of the request to reduce monitoring. in the dmrs (2/99-2/00), there are far fewer detections for these metals than there were btwn 12/96 - 12/97. doesn't make sense that so many samples are all ND now. are they still using the same detection levels (low) that they were using before? in the DMRs i reviewed, Cu, Zn had far fewer detections, as an example, on a percent of samples basis than in the previous dataset reviewed.

- in the 11/99 daily sheet, the units/values for Cu and Li don't make sense. would make more sense if the values are mg/l in stead of ug/l.

- copper again. in the DMRs - only a few detections, relative to the prior dataset reviewed, but they are much larger than before. the 1/00 and 2/00 daily's show some big hits, up to 460 ug/l in 2/00 apparently! are these real? suggests increasing Cu levels. has something changed there or is there still sloppy data mgmt as noted in my 5/18/98 memo?

please advise on these items. thanks, bruce

From: Bruce Walker.....
To: Brian Myers
Date: Wed, Apr 26, 2000 11:27 AM
Subject: Ambar chemical

brian,
i'm looking through the ambar application. dan dell suggested doing review anyway as they often want a permit in hand if they are selling the facility.

question I have is on pg 28 of the app for 001. the TRC data look pretty awful. units error? even if its actually ug/l, #s are pretty high. could you check that out and let me know what is real on this item please? also, did they ever submit a summary of their metals monitoring? i noticed that dmrs are attached. is that the summary they intended or did you include that? i'd prefer a consolidated table to review for PEQ purposes rather that going through all the dmrs if possible.
thanks, bruce

JENNIFER M. GRANHOLM
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

DEQ

STEVEN E. CHESTE
DIRECTOR

January 16, 2004

Mr. William Rastetter
Olson, Bzdok, and Howard
420 East Front Street
Traverse City, MI 49686

Dear Mr. Rastetter:

SUBJECT: Freedom of Information Act (FOIA) requests of December 24, 2003 for documents related to the proposed Manistee Saltworks Development Corporation, Proposed "Northern Lights Project" power plant, General Chemical Industrial Products, Inc., 1501 Main St., Manistee, MI 49660

In response to your FOIA requests regarding the above subject, enclosed is to the best of our knowledge, information, and belief, all of the documents available to fulfill your requests. These documents were inadvertently overlooked when we originally responded on January 14, 2004.

Due to the fact these were overlooked, there is no charge for these copies.

Sincerely,

Thomas J. Hettinger
FOIA Coordinator
Water Division
517-241-1330

Enclosure

BW - For File

RECEIVED
SWQD - GLEAS

PUBLIC NOTICE

NOV 2 8 2000

Date: November 21, 2000
Permit No. MI0054922
General Chem Corp-Manistee

The Michigan Department of Environmental Quality proposes to reissue a discharge permit to: General Chemical Industrial Products, 90 East Halsey Road, Parsippany, New Jersey 07054 for a facility located at 1501 Main Street, Manistee, Michigan 49660. The applicant produces liquid, flake and prill calcium chloride, and blended salts. The applicant discharges noncontact cooling water, water softener regeneration water, miscellaneous condensate water, boiler blowdown, storm water runoff, and intake filter backwash to Manistee Lake, in NW ¼ of the NW ¼, Section 18, T21N, R16W, Manistee County.

The draft permit includes the following modifications to the previously issued permit: new conditions and effluent limits for chlorine and bromine; new effluent limit for total copper; removal of heat addition limitation; removal of metals monitoring requirement; removal of whole effluent toxicity testing requirement; and completed thermal plume study removed.

Comments or objections to the draft permit received by December 21, 2000 will be considered in the final decision to issue the permit. Persons desiring information regarding the draft permit, procedures for commenting, or requesting a hearing, should contact: Barry Burns, Permits Section, Surface Water Quality Division, Department of Environmental Quality, P.O. Box 30273, Lansing, Michigan 48909, telephone: 517-335-3301.

Copies of the public notice, fact sheet, and draft permit may be obtained at the Surface Water Quality Division Cadillac District Office located at 120 W. Chapin Street, Cadillac, Michigan 49601; telephone: 231-775-3960.

BW - ~~[illegible]~~ ~~[illegible]~~? Morton? ~~AKZO?~~ ~~Ambar?~~
└ 6/00 Review as Ambar facility. Just sold, new name. Jason's TDS rec is in here, has any Li, and TRC rec's too.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

June 14, 2000

TO: Daniel Dell, Chief, Lake Michigan Unit
Permits Section
Surface Water Quality Division

FROM: Bruce R. Walker
Great Lakes and Environmental Assessment Section
Surface Water Quality Division

SUBJECT: AMBAR Chemical
Permit Reissuance WQBEL Review
NPDES Permit MI0054992

We have reviewed the data and information contained in the subject facility's NPDES permit renewal application dated March 31, 2000. We also reviewed the 12/96 to 2/00 effluent monitoring data generated as part of the current permit. This facility is the former AKZO plant. The facility produces three calcium chloride products, elemental bromine, and a blended sodium chloride/calcium chloride salt product. Currently, however, there is some uncertainty as to the status of the facility continuing its manufacturing operations as an AMBAR plant.

The applicant is requesting an authorized flow of 14.504 mgd (22.5 cfs) for outfall 001. This flow is the same as in the existing permit. Outfall 001 discharges contact and noncontact cooling waters, process waters, and storm water 24 hr/day and 365 day/yr. Outfall 002 discharges intake back flush water for about 0.5 hr/day and 365 day/yr. The applicant is requesting an authorized flow of 0.01 mgd (0.015cfs) for outfall 002. The current permit does not specify an outfall 002 flow in the authorization statement.

Manistee Lake is the receiving water for these discharges. Manistee Lake is a designated coldwater lake with an average estimated hardness and suspended solids level of 170 and 3.5 mg/l, respectively. A 10x mix factor was carried forward from the last reviews completed for this facility. The facility's mixing and thermal plume study conducted as part of the current permit did not show the 001 discharge to be affecting an unacceptably large area of the lake.

Based on the above information, we have derived the water quality-based permit conditions recommendations listed below.

RECOMMENDATIONS

1. A daily maximum total copper limit of 66 ug/l with a daily loading limit of 7.98 lbs/day for the 001 effluent. Compliance shall be demonstrated via weekly analyses of 24-hour composite samples. Sample analyses shall use EPA methods approved for NPDES applications. This recommendation is based on 001 effluent copper levels which recently have been as high as 460 ug/l. Since this is a new limit, inclusion of a compliance schedule may be appropriate.

Daniel Dell
Page 2
June 14, 2000

2. Include daily maximum total residual chlorine limits (38 ug/l and the intermittent use limits), along with the standard monitoring requirements for outfall 001. This recommendation is based on the application data which show maximum and average concentrations of 340 and 230 mg/l, respectively. Even if the units are incorrect (i.e., ug/l), the levels still indicate that there is a reasonable potential for the Michigan Water Quality Standards to be exceeded.

3. Retain the monthly 001 effluent monitoring for lithium using the same sampling and analytical methods currently used. The PEQ analyses of the data suggest a limit is not needed. However, continued monitoring is warranted as a sample in the database exceeded the theoretical daily maximum limit.

Please contact me if you have any questions regarding this review.

brw:yg
cc: Michael Stifler, SWQD, Cadillac
Gerald Saalfeld/Facility file

Bruce Walker

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te: File missing my initial new facility Permit App review from '96(?)

Ambar Chemical
MI 0054992
Permit Renewal Review

1/

BRW
4/26/00

I Facility

- Was former Akzo, Hardy Salt, Diamond salt plant
- purchased and redone to make diff. products
- instead of solution mining brine/salt formations, now take brine waste stream from Martin Marietta & make $CaCl_2$ products, Br_2 & blended salt products
→ Recent note from District says closing by 6/00; may be sold
- Permit said to process app. as company wants a permit in hand to sell it
- 24-hr/d, 365 d/yr operation

Products	Waste stream
$CaCl_2$ liquid	CCW, NCCW, wash water
$CaCl_2$ Prill	" "
$CaCl_2$ flake (dry)	" "
Br_2 (elemental)	" "
NaCl/$CaCl_2$ salt blend	"

Power house has NCCW, boiler blowdown, softener regen water, wash water
All goes out 001 - settling pond only, total
002 - intake water back flush, ½ hr/day, 365 d/yr

Requesting: 001 24 h/d 365 d/yr 14.504 mgd (225 cfs) (same as existing)
CCW, NCCW, Process, St. Water
002 365 d/yr, 0.5 hr/d ; 0.01 mgd (no flow in current permit)

II Receiving water

Manistee Lake - Designated CW Lake
170 hard, TSS 3.5, pH 7.8 (from last review 5/18/98)
10x mix

Ambar

2/

III Existing Permit Conditions

- Required T°/m² study - completed satisfactorily, '88 ext, 4/90 mus
- plume (Temp & cond) not massive. No Further Rec's.
- Tox Testing Rqmt
  - 4 Qy chronic required
  - 2 acute Tests
  - 6 Permittee tests (QA probe w/ 1 chronic exceedance
  - Result — No Acute tox to either Species
  - Only 1 exceedance of chronic tox - 1.4 TUc well below 10 TUc Theoretical limit
  - No further rec's

IV Metals Monitoring

- Permit Rqd monitoring of 9 metals + CN + 2x/mo for ≥ 1 yr.
- 12/92 requested reduction, granted in 5/96 by EW review (see file) for several metals (down to 1x/yr or 1x/mo for most); Cu & Cl @ 2x/mo
- steel.

Gove

AMBAR CHEMICAL, MANISTEE PLANT
NPDES WATER FLOW DESCRIPTION

Ambar Chemical's Manistee Michigan Plant produces liquid calcium chloride, prill calcium chloride, flake calcium chloride, and bromine. The plant uses water from Manistee Lake for barometric condenser cooling water, boiler feed water make-up, wash water, pump seal flush water, firewater, and non-contact cooling water. Potable water from the City of Manistee is used for safety showers, personal hygiene, and emergency back up for the service water system. The plant discharges water back to Manistee Lake via two outfalls, 001 and 002.

Lake-water (service water) is supplied to the Manistee plant with centrifugal pumps located in the pump house on the west shoreline of the plant. Two pumps are dedicated to the pipeline feeding the barometric condensers in the liquid calcium chloride plant. The other two pumps are dedicated to the general plant header for non-contact cooling, boiler make-up, wash down, and firewater make-up. The water to the general plant header is filtered through screens to remove large debris before it is piped to the plant. The filter screens are back-washed with service water to Manistee Lake as Outfall 002.

Service water is used in the liquid calcium chloride plant in the barometric condensers. The two barometric condensers account for approximately 85% of the plant's service water usage. The barometric condensers pull vacuum on the calcium chloride evaporators by cooling and condensing the vapors from the third and flash effects. The barometric condenser water and condensed condensate is discharged to the outfall settling pond, which discharges to Lake Manistee as Outfall 001.

Service water is used in the dry calcium chloride plant as make-up water to the four dry plant scrubbers. The scrubbers remove calcium chloride dust from the prill dryer exhaust, flake dryer exhaust, and various dust collection headers. The inlet air to the prill and flake scrubbers is hot, resulting in the evaporation of a portion of the service water. The evaporated water vapor is discharged to the atmosphere through the permitted stack vents. The remaining scrubber fluid is contaminated with calcium chloride dust. The scrubber fluid is recycled to the liquid plant where it is concentrated into calcium chloride product in the evaporators.

Service water is used in the bromine plant for non-contact cooling. The primary users are the bromine condensers. Other exchangers include the bromine cooler and the purification tower's overhead condenser. The return header to the outfall settling pond is equipped with a conductivity meter to notify plant personnel of possible exchanger leaks.

Service water is used throughout the Manistee calcium chloride plant as seal and packing flush water on the many centrifugal pumps. Most of the pumps are equipped with once through flushes. The flush water is collected in the plant's trench/wash water system. A few of the pumps have internal flushes, which purge the water into the process fluid inside the pump. Other flushes such as the one on the salt chute under the centrifuge purge water to the brine system.

Service water is used as make-up water to the plant's hot water (wash water) tank. The service water is mixed with condensate returned from the steam system to be used for wash water throughout the calcium chloride plants. Excess water in the hot water tank overflows to the outfall settling pond. The hot water used as wash water is collected in the building's trench system. The trench water is collected in two primary sumps, the dry plant sump and the liquid plant sump. Both sumps are equipped with conductivity meters, flow meters, and pumps. The clean, low conductivity, water is pumped to the outfall settling pond. The dirty, high conductivity, water is pumped to the liquid plant, where it is filtered and recycled to the evaporators.

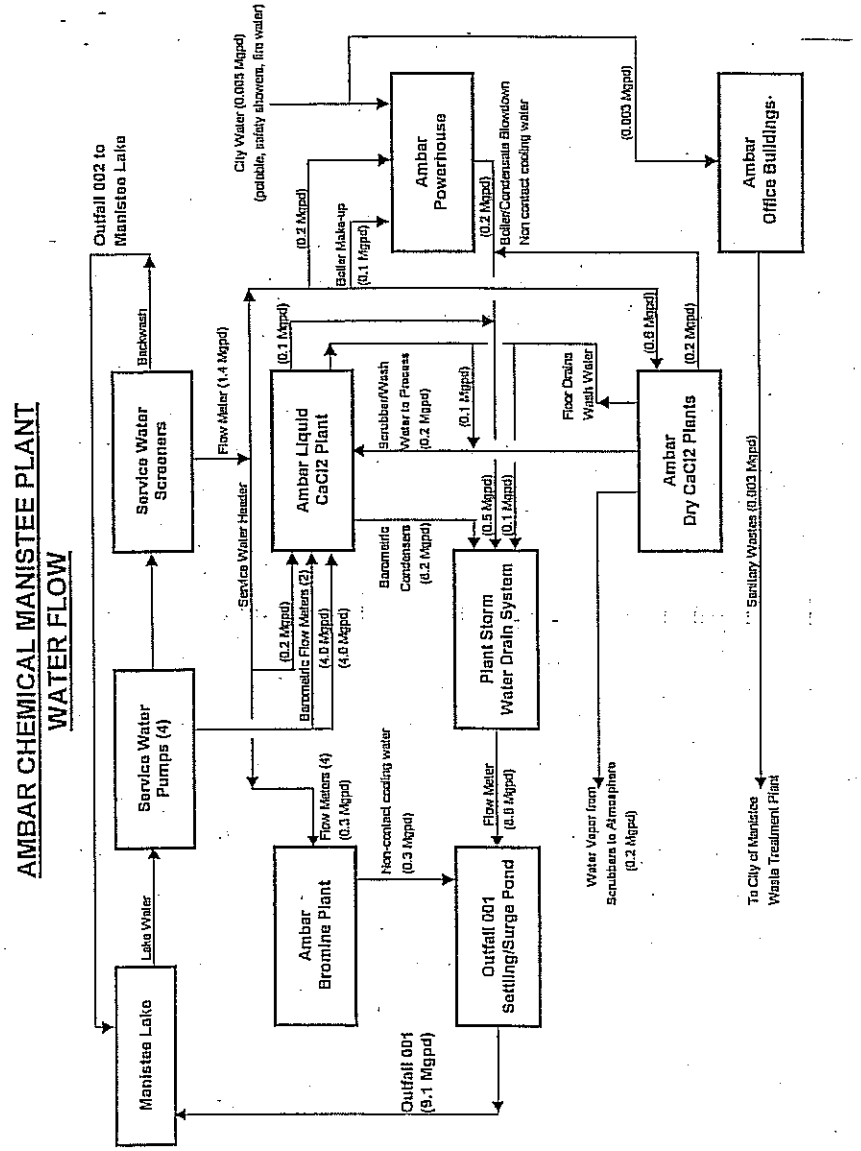
Service water is used as make-up water for the steam system. The service water is processed through water softeners before it is added to the boiler feed water tank. The water softeners are regenerated with salt water. The water softener flush is discharged to the outfall settling pond.

The plant's steam system is equipped with steam traps to collect and blow down condensate from the headers. The steam traps discharge to storm water drains, plant trenches, or the ground.

Service water is used in the powerhouse and the calcium chloride plants for non-contact cooling. Non-contact cooling includes the liquid calcium chloride product cooling, the flaker drum cooling, dry plant air compressor cooling, plant air compressor cooling, packaging area dehumidifier cooling, and numerous other minor users. The water is discharged to the plant trenches or outfall trench.

Service water is used as make-up/dilution water in the solution tanks feeding the prill calcium chloride plant. The solution tanks mix the calcium chloride dust collected in the discharge air cyclones with the incoming feed brine. Service water is added to control the density/strength of the feed solution to the prill dryer. This water is evaporated in the dryer and discharged to the atmosphere through the permitted stack.

The Manistee plant is equipped with a storm water drainage system to collect storm water from the parking lot, the dry product truck-loading bays, the dry product rail-loading bays, and the outside dry product storage areas. The water from the process areas and the storm water drains are combined in a concrete trench that flows to the outfall settling pond. The flow to the settling pond is measured through a weir in the concrete trench. The Manistee plant does not add any continuous treatment chemicals to control the quality of the outfall. The plant spot treated the service water system and outfall to kill zebra mussels in 1999, but special approval was received for this application. The quality of the discharge flow is monitored with instrumentation, grab samples, and composite samples from the settling pond. The settling pond is equipped with oil absorbent booms and weirs to protect Lake Manistee from accidental oil spills. The water in the settling pond gravity flows through a discharge pipe under the liquid level of the pond. The pipe discharges into an earthen trench (Outfall 001), which flows to Manistee Lake. The trench is protected with rocks to minimize erosion.



PART I

Section A. Limitations and Monitoring Requirements

1. Final Effluent Limitations, Outfall 001

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge a maximum of fourteen million five hundred and four thousand (14,504,000) gallons per day of barometric condenser cooling water, noncontact cooling water, water softener regeneration water, equipment and floor wash water, condensate from compressed air and air conditioning systems, yard drainage, boiler blowdown, and an unspecified amount of storm water runoff from outfall 001 to Manistee Lake. Such discharge shall be limited and monitored by the permittee as specified below.

	Quantity of Loading				Quality or Concentration				
Parameter	Monthly Average	Daily Maximum	Units	Daily Minimum	Monthly Average	Daily Maximum	Units	Frequency of Analysis	Sample Type
Flow	(report)	(report)	MGD	—	—	—	—	Daily	Report Total Daily Flow
pH				6.5		9.0	S.U.	Daily	Grab
Outfall Observation	(report)							Daily	Visual
Temperature					(report)	(report)	°F	3x / Day	Reading
Heat Addition						95.6	MBTU/Hr	Daily	Calculation
Total Dissolved Solids (Net), see Part I.A.1.g.	40,340		lbs/day		(report)	(report)	mg/l	Daily	24-Hr Composite
Total Suspended Solids	(report)	(report)	lbs/day		(report)	(report)	mg/l	2x / Month	24-Hr Composite
Dissolved Oxygen				4			mg/l	2x / Month	Grab
Oil and Grease, see Part I.A.1.f.					(report)	(report)	mg/l	2x / Month	Grab
Chlorides, see Part I.A.1.f.					(report)	(report)	mg/l	2x / Month	24-Hr Composite
Total Phosphorus, see Part I.A.1.f.					(report)	(report)	mg/l	2x / Month	24-Hr Composite
Total Cadmium, see Parts I.A.1.e. and f.					(report)	(report)	ug/l	2x / Month	24-Hr Composite
Total Copper, see Parts I.A.1.e. and f.					(report)	(report)	ug/l	2x / Month	24-Hr Composite
Total Nickel, see Parts I.A.1.e. and f.					(report)	(report)	ug/l	2x / Month	24-Hr Composite
Total Lead, see Parts I.A.1.e. and f.					(report)	(report)	ug/l	2x / Month	24-Hr Composite
Total Zinc, see Parts I.A.1.e. and f.					(report)	(report)	ug/l	2x / Month	24-Hr Composite
Total Selenium, see Parts I.A.1.e. and f.					(report)	(report)	ug/l	2x / Month	24-Hr Composite
Total Lithium, see Parts I.A.1.e. and f.					(report)	(report)	ug/l	2x / Month	24-Hr Composite
Total Mercury, see Parts I.A.1.e. and f.					(report)	(report)	ug/l	2x / Month	24-Hr Composite
Total Strontium, see Parts I.A.1.e. and f.					(report)	(report)	ug/l	2x / Month	24-Hr Composite
Amenable Cyanide, see Parts I.A.1.e. and f.					(report)	(report)	ug/l	2x / Month	24-Hr Composite

PART I

Section A. Limitations and Monitoring Requirements

a. Narrative Standard
The receiving water shall contain no unnatural turbidity, color, oil film, floating solids, foams, settleable solids, or deposits as a result of this discharge.

b. Monitoring Location
Samples, measurements, and observations taken in compliance with the monitoring requirements above shall be taken prior to discharge to Manistee Lake.

c. Outfall Observation
Any unusual characteristics of the discharge (i.e., unnatural turbidity, color, oil film, floating solids, foams, settleable solids, or deposits) shall be reported within 24 hours to the Cadillac District Supervisor of the Surface Water Quality Division followed with a written report within five (5) days detailing the findings of the investigation and the steps taken to correct the condition.

d. Water Treatment Additives
In the event the permittee proposes the use or discharge of a water treatment additive that has not previously been approved by the Cadillac District Supervisor of the Surface Water Quality Division, the permittee shall notify the Cadillac District Supervisor. Written approval from the Cadillac District Supervisor to discharge the additive at a specified level shall be obtained prior to discharge by the permittee.

e. Analytical Methods
All monitoring shall be conducted using U.S. EPA approved methods. The following parameters shall be analyzed using the detection levels specified unless higher levels are appropriate because of sample matrix interference. Total cadmium - 0.2 ug/l; total copper - 1 ug/l; total nickel - 1 ug/l; total lead - 1 ug/l; total zinc - 5 ug/l; total selenium - 2 ug/l; total lithium - 10 ug/l; total mercury - 0.2 ug/l; total strontium - 100 ug/l; amenable cyanide - 5 ug/l.

f. Monitoring Frequency Reduction for Chlorides, Total Phosphorus, Metals, and Oil and Grease
After the submittal of twelve months of data, the permittee may request a reduction in monitoring frequency for chlorides, total phosphorus, metals, and oil and grease. This request shall contain an explanation as to why the reduced monitoring is appropriate and shall be submitted to the Cadillac District Supervisor of the Surface Water Quality Division. Upon receipt of written approval and consistent with such approval, the permittee may reduce the monitoring frequency indicated in Part I.A.1 of this permit. The monitoring frequency for chlorides, total phosphorus, metals, and oil and grease shall not be reduced to less than yearly monitoring. The Cadillac District Supervisor may revoke the approval for reduced monitoring at any time upon notification to the permittee.

g. Net Effluent Limitations
The permittee shall limit the net total dissolved solids discharges from outfall 001 as specified above. The net discharge shall be determined by subtracting the total intake load from the total discharge load. The total intake load in lbs/day shall be calculated by summing each intake load which is calculated by using the actual concentration and flow volume at each intake pump. The total discharge load in lbs/day shall be calculated by using the actual concentration and flow volume at outfall 001.

PART I

Section A. Limitations and Monitoring Requirements

2. Intake Monitoring Requirements (Manistee Lake)

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee shall monitor the intakes from Manistee Lake, as specified below.

	Quantity of Loading			Quality or Concentration					
Parameter	Monthly Average	Daily Maximum	Units	Daily Minimum	Monthly Average	Daily Maximum	Units	Frequency of Analysis	Sample Type
Intake Water (Manistee Lake)									
Flow	(report)	(report)	MGD	—	—	—	—	Daily	Report Total Daily Flow
Temperature					(report)	(report)	°F	Daily	Reading
Total Dissolved Solids					(report)	(report)	mg/l	Daily	24-Hr Composite

a. Monitoring Location
Samples and measurements taken in compliance with the monitoring requirements above shall be taken: at the intake pumps.

PART I

Section A. Limitations and Monitoring Requirements

3. Chronic Toxicity Testing, Outfall 001

The permittee shall conduct chronic toxicity tests on each of two (2) test species once every two (2) months for a total of eight (8) tests (four on each species). Testing shall be completed by August 31, 1997. Test species shall include fathead minnow and *Ceriodaphnia dubia*. Testing and reporting procedures shall follow procedures contained in EPA/600/4-91/002, "Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms", for fathead minnow and *Ceriodaphnia*. Acute toxicity and chronic toxicity data shall be included in the reporting of the toxicity test results. Toxicity test data acceptability is contingent upon the validation of the test method by the testing laboratory. Such validation shall be submitted to the Department upon request. The final report on the tests shall be submitted to the Cadillac District Supervisor of the Surface Water Quality Division within 30 days after completion of the final test.

The Surface Water Quality Division will review the toxicity data submitted by the permittee to determine if the toxicity requirements of Rules 57 and 82 (Rules 323.1057 and 323.1082 of the Michigan Administrative Code) are being satisfied.

a. If the toxicity requirements of Rule 57 or Rule 82 are not being met, upon written notification by the Cadillac District Supervisor, the following conditions apply. Within 90 days of the above notification, the permittee shall implement a Toxicity Identification/Reduction Evaluation (TI/RE). The objective of the TI/RE shall be to reduce the toxicity of the final effluent from outfall 001 to acceptable levels (≤ 1.0 TU_A and $\leq$ appropriate TU_C level based on mixing zone study) within three (3) years of notification. The following documents are available as guidance to reduce the toxicity to acceptable levels: Phase I, EPA/600/6-91/003 (acute) and EPA/600/6-91/005F (chronic); Phase II, EPA/600/R-92/080 (acute and chronic); and Phase III, EPA/600/R-92/081 (acute and chronic). The TI/RE shall include quarterly chronic toxicity tests of the discharge from outfall 001 for the duration of the TI/RE. The tests shall be conducted and reported as specified above. Upon approval of the Cadillac District Supervisor, the chronic toxicity tests may be conducted using the more sensitive species identified in the chronic toxicity database. If a more sensitive species cannot be identified, the chronic toxicity tests shall be performed with both species. Annual reports on the quarterly tests shall be submitted to the Cadillac District Supervisor within 30 days of the completion of the last test of each annual cycle.

b. If the toxicity requirements of Rule 57 or Rule 82 are close to being exceeded, upon written notification by the Cadillac District Supervisor, the permittee shall conduct quarterly chronic toxicity tests on the final effluent from outfall 001 for the life of the permit. The tests shall be conducted and reported as specified above. After one (1) year, the monitoring frequency may be reduced upon approval of the Cadillac District Supervisor if the test data indicate that the toxicity requirements of Rule 57 and Rule 82 are consistently being met. Upon approval of the Cadillac District Supervisor, the chronic toxicity tests may be performed using the more sensitive species identified in the chronic toxicity database. If a more sensitive species cannot be identified, the chronic toxicity tests shall be performed with both species. Annual reports on the quarterly tests shall be submitted to the Cadillac District Supervisor within 30 days of the completion of the last test of each annual cycle.

c. This permit may be modified in accordance with applicable laws and rules to include additional whole effluent toxicity control requirements as necessary.

PART I

Section A. Limitations and Monitoring Requirements

4. Mixing Zone Study and Thermal Plume Study

As a condition of this permit, the permittee shall conduct mixing zone studies and thermal plume studies on outfall 001. The mixing zone studies shall determine the mixing characteristics of the discharges from outfall 001 to Manistee Lake. The results of these studies will be used to evaluate the need for water quality based limitations for effluent constituents and toxicity in the effluent.

These studies shall be conducted seasonally, during spring, summer, fall and winter. Each seasonal study shall include a determination of the current velocity and volume which serves to dilute the discharge in Manistee Lake, a determination of the stratification of the effluent, if any in Manistee Lake, predominant wind direction and velocity at the time of the study, and detailed mapping of the plume for each study.

As a part of the mixing zone study, the permittee shall evaluate the benefits and feasibility of alternative discharge locations and types.

On or before January 1, 1997, a plan for conducting the study in accordance with the above requirements shall be submitted to the Cadillac District Supervisor of the Surface Water Quality Division for approval. The study shall be implemented in accordance with the approved plan. A summary report and the study results shall be submitted to the Cadillac District Supervisor by April 1, 1998.

5. Temperature Modification

The Michigan Department of Environmental Quality is considering the necessity of incorporating temperature limitations in this permit to assure that the requirements of Rule 82(1) (Rule 323.1082 of the Michigan Administrative Code) are met. Therefore, when consideration of this issue has been completed, the Department may modify this permit in accordance with applicable laws and rules to add appropriate temperature limitations or requirements.

6. Intake Screen Backwash, Outfall 002

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge intake screen backwash from outfall 002 to Manistee Lake. The permittee shall collect and remove debris accumulated on intake trash bars and dispose of such material on land in an appropriate manner.

From: Brian Myers
To: Bruce Walker
Date: Tue, May 16, 2000 11:10 AM
Subject: Re: Fwd: ambar

My understanding is that they only recently (last 30-45 days)started the clean-up/shutdown routine. I'm clueless as to why copper is high. I can't see that they are doing anything different than Akzo did. The vast majority of the water is from the lake and passes through the condenser.

>>> Bruce Walker 05/15 3:36 PM >>>
brian,
i'm starting to draft the wqbel memo now. i wonder if the high copper may be from the ash line they have and its influencing the effluent somehow, especially if they are doing some sort of closedown/cleanup stuff. bw

From: Bruce Walker
To: Brian Myers
Date: Fri, May 12, 2000 2:59 PM
Subject: ambar

I did the '98 dmr's later yesterday

brian,
ran through the metals PEQ review.

Cu limit is one outcome, no suprise given the large recent hits.

however, also shows Cd limit but that is predicated on the 1 large hit of 24 ug/l in 10/97. if could get a few more of the data points (some '98 monitoring data) w/ just 2 more detections, likely that all Cd rec's would go away. maybe I can figure something out from the '98 monthly dmr's here; I will check that out too. may need you to look at a few daily sheets so don't end up having to give limit and later remove it.

also, I have no CSI reports here. do you have any to forward from this place? that data may be useful in the review and I should have it anyway. thanks, bruce

From: Brian Myers
To: Bruce Walker
Date: Fri, May 5, 2000 10:42 AM
Subject: Re: Ambar chemical

not (per Myers)

Re: Both Ambar notes, I looked through the files and there is no indication of what may have transpired to cause the anomalies you've uncovered. I suggest we take the data at face value. I do think this facility is going to be discharging much longer. Although the discharge is still occurring production is minimal so most of the water is just pass through.

>>> Bruce Walker 04/26 11:27 AM >>>
brian,
I'm looking through the ambar application. dan dell suggested doing review anyway as they often want a permit in hand if they are selling the facility.

question I have is on pg 28 of the app for 001. the TRC data look pretty awful. units error? even if its actually ug/l, #s are pretty high. could you check that out and let me know what is real on this item please? also, did they ever submit a summary of their metals monitoring? I noticed that dmrs are attached. Is that the summary they intended or did you include that? I'd prefer a consolidated table to review for PEQ purposes rather that going through all the dmrs if possible.
thanks, bruce

From: Bruce Walker
To: Brian Myers
Date: Fri, May 5, 2000 10:52 AM
Subject: Re: Ambar chemical

brian,
your note says "I do think this facility is going to be discharging much longer." is that what you meant or did you leave out a word, such as "not"? got omitted in hurry

I haven't done the PEQ yet but relative to the metals data and TRC info; looks like they will get limits for TRC and Cu and retain monitoring for a couple other metals and TP. any problems with that potential scenario?
bruce No, it's their data

REASONABLE POTENTIAL: CHEMICAL SPECIFIC (p. 1 of 2)

*concentration values in ug/L except as noted

Facility:Ambar	0			Hardness:	170 mg/L CaCO3
Outfall:	001	Drinking Water:	n	pH:	7
Date:	5/12/2000			TSS:	5 mg/L

Parameter	CAS#	Water Quality Values FCV	vd	HNV	vd	HCV	vd	WV	vd	FAV	vd	Diss. Met. Translator	Back-ground Conc.
Cadmium	7440439	3.311805987	1199707	130	1199706	NA	0	NA	0	15.15304229	1199707	2.1	0
Copper	7440508	14.09355739	1199707	64000	1199704	NA	0	NA	0	44.31283984	1199707	1.5	4
Zinc	7440666	185.2049577	1199707	22000	1199706	NA	0	NA	0	367.4045611	1199707	2.1	13
Lithium	7439932	25	2199812	63000	2199705	NA	0	NA	0	310	2199812	1	0
Strontium	7440246	760	2199812	ID*	199808	NA	0	NA	0	14000	2199812	1	0
#N/A	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
#N/A	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

REASONABLE POTENTIAL: CHEMICAL SPECIFIC (p. 2 of 2)

*concentration values in ug/L except as noted; loads in lb/d

Facility:Ambar	0	Disch. Rate:	22.45 cfs	95% Ex. Flow:	808.2 cfs
Outfall:	001			H. Mean Flow:	808.2 cfs
Date:	5/12/2000			90Q10 Flow:	808.2 cfs

Chosen to give 1 Dx mix

Bad (2)

Parameter	Monthly Average PEL FCV	load	HNV	load	HCV	load	WV	load	Daily Max PEL	PEQ Avg	PEQ Max	Decision Avg	Decision Max
Cadmium	69.542315	8.4120721	1299.895132	157.23968	#VALUE!	#VALUE!	#VALUE!	#VALUE!	31.821389	1.6 ~~24~~	3.5 ~~24~~ >10	no rec	
Copper (1)	175.38953	21.215707	639912.3761	77405.951	#VALUE!	#VALUE!	#VALUE!	#VALUE!	66.46926	58 ~~869.2~~	106 ~~869.2~~ >10	[illegible] limit	
Zinc	3772.0009	456.2739	219865.2637	26595.641	#VALUE!	#VALUE!	#VALUE!	#VALUE!	771.54958	0	0	—	
Lithium	249.97983	30.238401	629949.1795	76200.769	#VALUE!	#VALUE!	#VALUE!	#VALUE!	310	98 ~~288~~	203 ~~288~~ >10	monitor	
Strontium	7599.3869	919.24738	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	14000	1027 ~~5700~~	4027 ~~5700~~ >10	no rec	
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0	0		
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0	0		

(1) – 1/00 & 2/00 copper samples w/ major hits
(2) used 12/96 – 2/00 permittee data for PEQ review.

Cu Daily load (0.066 mg/l) × (8.34) × (14.504 mg/l) = 7.98 lb/d

Strontium	
52	
52	
0	
0	
1222.6731	
1809.4415	
1	30
0	0
0.95	0.95
2.4477468	2.4477468
1.6452114	1.6452114
3.1901225	3.1901225
1.1600593	1.1600593
6.5287651	6.5287651
1.1600593	0.0704623
6.5287651	7.0735637
8.3007574	7.5102806
4026.9211	1826.726
Max	Average

PROJECTED EFFLUENT QUALITY ANALYSIS (>=10 Detectable):

PARAMETER:	Cadmium		Copper		Zinc		Lithium	
TOTAL NO. VALUES:	76		73		0		38	
DETECTED:	17		41		0		35	
NON-DETECTED:	59		32		0		3	
d (% data<detect)	0.7763158		0.4383562		#DIV/0!		0.0789474	
m (mean of data >detect)	2.8176471		43.560976		#DIV/0!		75.042857	
std dev	5.6002506		129.64973		#DIV/0!		75.931507	
n	1	30	1	30	1	30	1	30
d^n	0.7763158	0.0005025	0.4383562	1.79E-11	#DIV/0!	#DIV/0!	0.0789474	8.32E-34
p	0.7764706	0.9499749	0.9109756	0.95	#DIV/0!	#DIV/0!	0.9457143	0.95
std normal dist fn (Z)	1.7310184	2.4475415	2.1994749	2.4477468	#DIV/0!	#DIV/0!	2.4139156	2.4477468
Z_p	0.760095	1.6449677	1.3470047	1.6452114	#DIV/0!	#DIV/0!	1.6049905	1.6452114
1+(s/m)^2	4.950406	4.950406	9.8582521	9.8582521	#DIV/0!	#DIV/0!	2.023824	2.023824
(sigma_d)^2	1.5994696	1.5994696	2.2883089	2.2883089	#DIV/0!	#DIV/0!	0.7049888	0.7049888
mu_d	0.2361674	0.2361674	2.6300073	2.6300073	#DIV/0!	#DIV/0!	3.965565	3.965565
(sigma_dn)^2	1.5994696	0.5326954	2.2883089	0.4393833	#DIV/0!	#DIV/0!	0.7049888	0.039134
mu_dn	0.2361674	-0.727463	2.6300073	2.9775827	#DIV/0!	#DIV/0!	3.965565	4.2162543
P_95 exponent	1.1974606	0.4731329	4.6676425	4.0681274	#DIV/0!	#DIV/0!	5.313173	4.5417152
P_95 (PEQ)	3.3116965	1.6050147	106.4465	58.447412	#DIV/0!	#DIV/0!	202.9933	93.851636
	Max	Average	Max	Average	Max	Average	Max	Average

NOTES: For purposes of this summary, ^ represents an exponent or superscript while _ represents a subscript.
Variables are defined in Part 12, Rule 1225 (3) (a).

From For Anton 5/00 Review

Top is covered from 5/98 review

Data from Daily + DMR sheets

Date	TP	Cd	Cu	Zn	Se	Li	Sr	Cl⁻ mg/L	Ta-ND D/W Q (prod) T/max T/max		
											R1016-1
12/96	30/12	<2/<2	2/<4	7/6	<4/<4	<50/10	200/190	71/68			
1/97	17/34	ND/<3	8/14	12/6	ND/ND	16/ND	340/570	65/140			Daily DMR limits set?
2/97	50/180	ND/ND	8/7	ND/10	ND/ND	24/180	1320/2,200	320/830			
3/97	190/180	ND/ND	ND/16	ND/8	ND/ND	100/97	1,970 / 1,770	1,650 max 2,800			
4/97	290/470	ND/ND	9/6	23/26	ND/ND	26/59	1,620 / 1,460	2,400 max 2,500			
5/97	36/220	ND/2	9/9	20/20	ND/ND	9/10	1,220 / 1,030	2,200 max 2,500	69/83	73/10.5	
6/97	21/12	ND/ND	6/22	150/19	ND/5	20/87	500 / 1,060	63/140	83/91	8.7/9.7	
7/97	600/40	ND/ND	5/6	ND/20	ND/ND	97/150	1,400 / 1,600	1,600/130	73/87	6.2/9.8	
8/97	50/70	0.29/0.31	ND/14 / 8	ND/ND	ND/ND	250/40	1,200/1,100 / 810	140/110	70/81	7.5/9.4	Pass DI in Mar Mid Aug Sept
9/97	25/25	ND/ND	ND/ND	ND/ND	ND/ND	34/25	1,274 / 425	240/95	62/67	8/8.3	
10/97	30/19	24/ND	7/1	100/7	ND/ND	27/12	630/400	130/120	56/51	8.2/8.5	
11/97	12/35	ND/ND	5/ND	ND/ND	ND/ND	21/21	310/240	55/35	60/63	7.2/9.0	
12/97	11/22	ND/4.1	6/ND	11/5	ND/ND	100/16	320/520	43/71	41/48	7.4/8.2	
		Max 0.6 mg/l	20 ND	6 ND	5 ND	25 ND	2nd's	–			
	Date	T 0.1 mg/l	6 Lbs	20 Lbs	5 Lbs	1 Lbs	24 Lbs	26 Lbs			
2/99	232	ND/ND	5.0/ND	ND		50	1320/864	125/116			
3/99	43	ND/2	ND/ND	ND		67	1,120 / 1,370	117/158			
4/99	160	ND/ND	ND/ND	ND		54	849/569	102/150			
5/99	23	ND/ND	ND/ND	ND		95	837/1,181	257/173			
6/99	36	ND/1.6	ND/ND	ND		97	1,200/1,300	256/201			
7/99	34	ND/ND	28/28	ND		58	1,050 / 1,316	171/180			ND-ND
8/99	67	ND/ND	ND/ND	ND		170	999/1163	129/146			
9/99	32	ND/ND	ND/ND	ND		370	907/1,006	108/177			
10/99	17	ND/ND	ND/ND	ND		30	780/1150	79/127			
11/99	21	ND/ND		ND			643/785	102/151			
12/99	19	ND/ND	33/ND	ND		ND	3259/1,316	341/119			
1/00	50	ND/ND	49/77	ND		47	5234/574	123/136			ND ND ND ND ND ND
2/00	25	ND/ND	460/100	ND		64	652/587	232/217			

Q Temp for Monthly DMR sheet

Ani - DMR (monthly) review to get '98 data for Cd & Cu for PEQ. 5/12/00 (Fri)

00	X max Cd	X max Cu	
1/98	ND ND	3.0 0, 6.0	Since there are 2 initial
2/98	0.7 0, 1.4 1.4	0.5 0, 1.0 1.0	metals of limits found
3	ND ND	3.5 0, 7.0 7.0	on incomplete dataset.
4	0.5 0, 1.0 0.9	12 8, 16 16	E.g.
5	1.2 0.4, 1.2 2.0	5 5, 15 5	Red - my take on sampling
6	3.5 3, 4 4	3.5 0, 7 7	results. Needed ≥ 2
7	0.2 0, 0.4 0.4	ND ND	detects to get Cd into
8	1.0 0, 2.0 2.0	ND ND	PEQ > 10 mo's
9	ND ND	ND ND	Need more ∑ to calculate
10	ND ND	2.0 1, 3 3.0	other sample results
11	0.5 0, 1.0 1.0	21 8, 34 34	for that month
12	ND ND	8.5 7, 13 13	
	15 ND	10 ND	Needed # ND's & detects to prior PEL Data sum'd already had made on 5/10

Ambar

Metals

Permit had 2x/mo monitoring for:

	Cd	Cu	Ni	Pb	Zn	Se	Li	Hg	Sr	CNA
Single	0.2	1	1	1	5	2	10	0.2	100	5
Th. QPEL Max	32	66			770		490			
From 5/18/98 $\bar{x}$	77	190			4200		440			
Monitoring Δs →	Keep 2x/mo		1x/yr	1x/yr	1x/mo	1x/yr	1x/mo	2x/yr	2x/mo	1x/yr

review of 12/97 request to reduce monitoring

Data summarized through 12/97 for the 5/98 EW memo

Also + TP to 1x/mo

Ni, Pb, Se, Hg, CNA had low max hits.

From: Bruce Walker
To: Michael Stifler
Date: Fri, Apr 21, 2000 2:03 PM
Subject: Ambar Chemical MI0054992-review of revised (9/99) MZ study report

mike,
i have completed my review of the second version of this report. comments on the first report submittal (2/99 rpt) were in my 4/29/99 memo to you. details on the permit conditions and suggestions for report discussion items are in that memo.

while the 9/99 report is an improvement over the first submittal, it still lacks a clear presentation of the conductivity data. I will attempt to explain the problems i see.

conductivity
1. the figures (i.e. drawings) in the report apparently plot isopleths of conductivity relative to the effluent conductivity strength. this is not the appropriate way to plot effluent concentrations. there is a simple calculation to determine effluent strength in a sample based on the diluent and effluent conductivities. it isn't clear to me if that formula was used. the isopleths appear to be plotted as a percentage of the effluent conductivity. plotting a value of 70% of effluent conductivity, which apparently is actually supposed to be where background is achieved in one study period, is not the same as a plotting samples which consist of 70% effluent. additionally, the lowest percentage line plotted for each study does not always appear to define background boundaries; some are just closer (approximately 5-20% effluent) to background than others.

2. in my 4/99 comments, i suggested that isopleths of 50%, 25%, 10% and 5% effluent (not of conductivity) be plotted for the report for each study. the concept was to give us some data to determine if the 10X mix we allocated in the permit review was appropriate and to (hopefully) show that the mixing zone did not extend over an unacceptably large area. the report does not include those isopleths.

3. the report includes, in Appx C, derivation of a TDS to conductivity conversion factor. this conversion factor was based on data collected a year after the study. the revised report also includes the daily DMR sheets for the months in which the studies were conducted. the effluent values used for plotting were apparently "calculated" from the DMR data using the conversion factor rather than using the values actually measured during the study. there is no explanation as to why the study measured outfall values were not used instead of the back calculated values. the outfall conductivity values vary over the course of the day in some studies but they could have been used. the DMR TDS data show some significant day to day variations (vary by about 15-70%) over the 3 day period which brackets each study so i'm not sure as to why those data are any better than the outfall data from when the study was conducted.

Temperature
the temp plots show the plume boundary to within ± 2 degrees F. that is good. however, the discussion mentions a 3 degree boundary idea and includes warmwater temperature values from the standards. manistee lake is designated as a coldwater lake.
the plume areas figured are generally presented based on the conductivity data. however, it appears that the temperature plume in the 8/98 study may be bigger than the conductivity based plume.

SUMMARY
Despite the flaws in the presentation and interpretation of the data, it appears that the study/data can be interpretted to show that the mixing zone boundary area represented by 10% effluent and +2 degrees F are not unacceptably large. the plume was bouyant in 3 of the 4 study periods. consequently, it would appear that large areas of the bottom away from the outfall are not likely to be affected.

as such the study effort allows us to achieve our goals relative to understanding the characteristics and potential effects of this effluent.

please call if you have any questions on my comments. bruce

CC: Brian Myers, Daniel Dell, Gerald Saalfeld

Amber Study - T° & Conductivity
Revised Report

1/1

Prev comments 2/5/97 to my [illegible]
see 4/29/99 [illegible]

- 2nd submittal: 11/6/97 5/29/98 [illegible] Study dates 3/30/98 8/26/98
- apparent additions in studies
  1) Was they did, but was it adequately? ~~did not mention~~ ~~[illegible]~~ each study. Calculated
  See Appx C ~~est~~ eff cond based on TDS/cond relationship determined from 7/98 Samples. Appx D TDS over 3 day window for each study varied alot.

  2) are areas given as affected by eff are based on conductivity measurements or calcd cond?
  appears 8/98 plot shows T° plume > cond plume, however T° plume area may be bigger. What was used, actual eff cond data or the TDS relationship to plot lines?

  3) appears that method used to calc eff concentration from lake cond sample data is wrong. Consequently plots appear off or plots are not correctly identified/represented
  a) E.G. - Drawing 8 (5/29/98 Study) #10. Plot shows 70% line @ #22 sample site. Cond @ #22 (Table 3) is ~314, is background
  70% effluent would be $0.7 = \frac{x - 0.314}{0.414 - 0.314} = 0.405$ mmhos, not the same
  The 70% line appears to define background boundary, which isn't too large
  Didn't present properly here
  → Didn't plot 50, 25, 10, 5% eff lines as requested in 4/29/99 memo

  b) 11/6/97 appears 50% line is to approximate background
  c) 3/30/98 60% " is (based on #8, ~16 eff, ~0% eff = 10 pts) not background, [illegible]
  d) 8/26/99 60% line doesn't pass through any sample. However cond considered as background as #23, 24, 25 are within line and their conductivity is closer to background value given
  → Not clear what the contour lines are, how figured, or what used to figure them
  → Not clear how/if the Appx C conversion (TDS/cond) was used in plotting of data
  → Based on cond data, [illegible] appears that 10% boundary not excessively large [illegible]

Ambar Study

2/2

TEMP

- Plot down to +2°F. Good
- Biggest area in +4 Ac (my set of drawing?)
→ Appears that T effectiveness over unacceptable area

Discussion however talks about +2°F threshold & gives warmwater WQS values. Lake is CW designation, however.

Report flawed but generally can be interpreted to show that areas of +2° & 10% eff aren't too big

TOPS Snap off® CARBONLESS FORM 3801 NO CARBON REQUIRED

RAPID LETTER
NOTE: Send White and Pink copies. Sender retains Canary copy.
TRIPLICATE

99/297

TO Bruce Walker
SWQD - Lansing

SUBJECT Ambar Thermal Plume Study

DATE 9/21/99

MESSAGE
Revised Study per 4/29/99 comments

SIGNED [signature]

REPLY

DATE

SIGNED

TOPS FORM 3801 UPON USA SENDER: RETAIN CANARY COPY RECIPIENT: REPLY ON PINK COPY — RETAIN WHITE COPY

ASI ENVIRONMENTAL TECHNOLOGIES, INC.

ENVIRONMENTAL ENGINEERING AND SCIENTIFIC CONSULTANTS

September 16, 1999

Mr. Brian Myers, Environmental Quality Analyst
Michigan Department of Environmental Quality
Surface Water Quality Division
Cadillac District Office
120 W. Chapin Street
Cadillac, Michigan 49601

RECEIVED
SEP 20 1999
SURFACE WATER QUALITY DIVISION
CADILLAC DISTRICT OFFICE

RE: AMBAR Chemical, Incorporated
1501 Main Street, Manistee, Michigan
Mixing Zone and Thermal Plume Studies
NPDES Permit No. MI0054992

Dear Mr. Myers:

Enclosed please find two (2) bound copies of the Revised Mixing Zone and Thermal Plume Study for National Pollutant Discharge Elimination System (NPDES) Permit # MI0054992 for the above referenced facility.

If you have any questions please contact the undersigned at (231) 845-0371.

Sincerely,

ASI ENVIRONMENTAL TECHNOLOGIES

Matthew C. Bell
Project Manager

Enclosure

CC: Mr. Christopher Hissong, AMBAR Chemical, Inc.

Corporate Office
239 North Jebavy Drive • Ludington, Michigan 49431 • Phone (231) 845-0371 • Facsimile (231) 845-0426
Traverse City Office
806 Hastings Street • Suite B-1 • Traverse City, Michigan 49686 • Phone/Facsimile (231) 929-9479

→ Face File

From: Brian Myers
To: Daniel Dell
Date: Thu, Apr 13, 2000 3:56 PM
Subject: Ambar Chemical-Manistee

I got word today that they are starting shutdown. It probably take til June before they stop discharging and lock the doors.

CC: Jeffrey Jones, Michael Stifler

Bruce Walker
Fac. File

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

November 10, 1999

TO: Mike Stifler, District Supervisor
Cadillac District Office
Surface Water Quality Division

FROM: Diana Butler
Great Lakes and Environmental Assessment Section
Surface Water Quality Division

SUBJECT: AMBAR Chemical-Manistee
NPDES Permit No.MI0054992
Aquatic Toxicity Evaluation

Attached are three copies of our staff report #MI/DEQ/SWQ-99/139 for the *Ceriodaphnia dubia* and fathead minnow chronic toxicity tests conducted from October 7-14, 1999 on a grab sample and two composite samples of the AMBAR Chemical-Manistee outfall 001 effluent.

The effluent was not acutely or chronically toxic to fathead minnows or *Ceriodaphnia dubia*. The results indicate that the effluent was meeting the acute and chronic aquatic toxicity-related requirements of Rule 1219 of the Part 8 Rules.

We have no recommendations for the facility at this time.

Please provide a copy of this report to the designated facility representative, and to the local governmental unit if appropriate.

db:yg
Attachments
cc: Dan Dell, Permits Section
Gerald Saalfeld/AMBAR Chemical-Manistee Facility File

Diana Butler/G

Ambar Chemical

From: Brian Myers
To: Bruce Walker
Date: Wed, Oct 13, 1999 1:54 PM
Subject: Ambar 9/14/99 Mussel Treatment

On 10/13/99 I reviewed the post treatment report and found the procedure was followed and the effluent exhibited no toxicity. A copy of the report will be kept on file here.

To Fac File

From: William Dimond
To: Brian Myers
Date: Mon, Sep 27, 1999 5:51 PM
Subject: Ambar Chemical NPDES #54992: Aquatic Toxicity Data Review

Per your request, I have reviewed the results of the fathead minnow and *Ceriodaphnia dubia* chronic toxicity tests of the subject facility outfall 001 effluent conducted from August 3-10, 1999. The tests were conducted as a makeup for the June 1997 tests, which failed to meet data QA/QC acceptability requirements.

The results of the August 1999 tests met data acceptability requirements.

Tthe results of the tests indicated that the effluent was meeting the aquatic toxicity requirements of Rule 1219 of the Part 8 Rules. The effluent was not toxic to either species.

I have no recommendations at this time.

GLEAS staff: I will forward a copy of this note to Section Files.

CC: Bruce Walker, Gerald Saalfeld

Also see 5/24/99 BD note

To: Fac File

3

From: Bruce Walker
To: "chissong@ambar-inc.com"@SOM.gwia
Date: Thu, Sep 9, 1999 4:06 PM
Subject: Re: RE: Ambar Chemical, MI0054992, Zebra Mussel Treatment Review

chris,
the actual limit is 5 ug/l as a daily max. the 50 ug/l refers the analytical quantification level that the vendor told that they can measure. thus, the statements about limits below quantification and the need to do the mass balance and/or the tox testing to show compliance. you can treat to the necessary level but the final effluent discharge concentration is limited to 5 ug/l or less.

there is an inherent time lag with the reporting of tox test data. the testing company should notify you via phone immediately (before final report is sent to you) if they observe excessive tox in the test. you should then notify district.

i modified this page from some standard permit condition language to try to make it fit this situation. the language usually goes into a permit in cases where treatments will intermittently occur throughout the permit cycle. that is where the tox testing reporting becomes more of and issue.

hope this helps. bruce

From: "Hissong, Chris" <chissong@ambar-inc.com>
To: 'Bruce Walker' <WALKERBR@state.mi.us>
Date: Thu, Sep 9, 1999 3:36 PM
Subject: RE: Ambar Chemical, MI0054992, Zebra Mussel Treatment Review

Bruce:

(2)

I do have a couple of questions/comments regarding the information included in the package you sent.

1. The detoxification period is 4 hours longer than the dosing period, 16 hrs. vs. 12 hrs. The original plan was to run 4 hours after the original 12 to assure all residual CT1300 was removed. However, I like your assumption, and will have Betz run the detox for at least one hour before the CT1300 is added.

2. We discussed the 50 ug/L vs. 6 ppm dosade numbers on the telephone this morning. According to the requirements page, we are authorized for only 50 ug/L concentration of CT1300. Will we be able to treat the incoming water at the 6 ppm concentrations as originally planned?

3. If we demonstrate compliance on the effluent water via acute toxicity testing, the results are not available for some time after the testing is complete. Is this a concern to you?

> -----Original Message-----
> From: Bruce Walker [SMTP:WALKERBR@state.mi.us]
> Sent: Thursday, September 09, 1999 1:52 PM
> To: chissong@ambar-inc.com
> Cc: Daniel Dell; Brian Myers; Gerald Saalfeld; Michael Stifler
> Subject: Ambar Chemical, MI0054992, Zebra Mussel Treatment Review
>
> To Chris Hissong,

(1)

>
> This note is in response to the August 11, 1999 submittal from
> BetzDearborn regarding a proposed Spectrus CT 1300 treatment for zebra
> mussel control at your facility. We are responding to you via e-mail
> because of your apparent timeline considerations.
>
> My supervisor has authorized me to approve your request to use CT 1300
> subject to the attached conditions which we briefly discussed this
> morning. In summary, the conditions are:
>
> 1) approval for a one time use and 12 hr discharge.
>
> 2) chemical monitoring as noted in the attachment.
>
> 3) demonstrate compliance via mass balance calculations or more likely
> conduct an acute toxicity test to show adequate detoxification.
> Typically, you would collect a grab sample during the middle of the
> discharge period.
>
> 4) submit a summary report to district.
>
> These conditions must be met since this is a first time use of this

> additive at your facility. Some of the conditions could be adjusted for
> potential future uses depending on this event's success. Future uses
> will require additional approvals, however.
>
> I was told that the detox process would be 16 hrs long as opposed to the
> 12 hr dosing period. I assume that this includes starting the detox
> process first and also running it for awhile after the dosing process is
> completed.
>
> Please let me know if you receive this approval and can access the
> attachment and if you have any questions. I will be out of the office
> 9/10-15. I am copying this message to District staff but I suggest that
> you at least telephone them prior to the treatment.
>
> thank you,
> bruce
> << File: Word for Windows 97 >>

For File

From: Bruce Walker
To: l:chissong@ambar-inc.com
Date: Thu, Sep 9, 1999 1:52 PM
Subject: Ambar Chemical, MI0054992, Zebra Mussel Treatment Review

To Chris Hissong,

This note is in response to the August 11, 1999 submittal from BetzDearborn regarding a proposed Spectrus CT 1300 treatment for zebra mussel control at your facility. We are responding to you via e-mail because of your apparent timeline considerations.

My supervisor has authorized me to approve your request to use CT 1300 subject to the attached conditions which we briefly discussed this morning. In summary, the conditions are:

1) approval for a one time use and 12 hr discharge.

2) chemical monitoring as noted in the attachment.

3) demonstrate compliance via mass balance calculations or more likely conduct an acute toxicity test to show adequate detoxification. Typically, you would collect a grab sample during the middle of the discharge period.

4) submit a summary report to district.

These conditions must be met since this is a first time use of this additive at your facility. Some of the conditions could be adjusted for potential future uses depending on this event's success. Future uses will require additional approvals, however.

I was told that the detox process would be 16 hrs long as opposed to the 12 hr dosing period. I assume that this includes starting the detox process first and also running it for awhile after the dosing process is completed.

Please let me know if you receive this approval and can access the attachment and if you have any questions. I will be out of the office 9/10-15. I am copying this message to District staff but I suggest that you at least telephone them prior to the treatment.

thank you,
bruce

CC: Brian Myers, Daniel Dell, Gerald Saalfeld, Mich...

Zebra Mussel Control Requirements – Ambar Chemical 001 Effluent

Parameter	Maximum Limits for Quantity or Loading			Maximum Limits for Quality or Concentration			Frequency of Analysis	Sample Type
	Monthly	Daily	Units	Monthly	Daily	Units		
BetzDearborn Spectrus CT 1300	—	—	—	—	5	ug/l	Every 3 Hrs During Discharge	Grab

The discharge of BetzDearborn Spectrus CT 1300 is restricted to a one time event with a duration of no more than 12 hours. The permittee shall notify the Cadillac District Supervisor of the Surface Water Quality Division prior to the discharge.

The sampling procedures, preservation and handling, and analytical protocol for compliance monitoring shall be in accordance with the Orange II/Methylene Chloride Method. The quantification levels shall not exceed
50 ug/l for BetzDearborn Spectrus CT 1300 unless higher levels are appropriate because of sample matrix interference. Other methods may be used upon approval of the Cadillac District Supervisor. The highest value measured during the discharge event shall be reported. If the concentration in all samples is less than the quantification level, report zero in the summary monitoring report.

The water quality-based effluent limit is less than the quantification levels using the specified analytical method. Detoxification of the treated effluent is required using bentonite clay unless the permittee demonstrates to the Cadillac District Supervisor, through mass-balance calculations, that the final effluent limit of 5 ug/l for BetzDearborn Spectrus CT 1300 will be met. If a successful demonstration is not made, the discharge of BetzDearborn Spectrus CT 1300 from monitoring point 001 requires the permittee to conduct a 48-hour acute toxicity test using a *Daphnia* species to verify adequate detoxification. This test shall be conducted on a discharge sample collected during the treatment. This test shall be conducted using procedures contained in EPA/600/4-90/027F "Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms". The results of the toxicity testing, along with a summary of the dosing and detoxification procedures and discharge concentrations, shall be submitted to the Cadillac District Supervisor within 30 days following the treatment with this product.

Any discharge of BetzDearborn Spectrus CT 1300 at or above the indicated quantification level is a specific violation of this permit. If all the samples for the sampling and reporting period are less than the above quantification levels and, if toxicity testing is required because of the lack of a successful demonstration, the result of the effluent toxicity testing does not exceed 1.0 acute toxic units (TU_A), the Michigan Department of Environmental Quality will consider the permittee to be in compliance with the final effluent limitation for this pollutant for that reporting period.

If the result of the effluent toxicity testing exceeds 1.0 TU_A, the permittee shall immediately notify the Cadillac District Supervisor. The permittee will not be authorized for future discharge of BetzDearborn Spectrus CT 1300 until a demonstration is made to the Cadillac District Supervisor that 1.0 TU_A will be consistently achieved.

TOPS Snap-off® CARBONLESS FORM 3801

NO CARBON REQUIRED

RAPID LETTER
NOTE: Send White and Pink copies. Sender retains Canary copy.
TRIPLICATE

TO Jerry Saalfeld
SWQD
Lansing

99-254
Walker

SUBJECT Ambar Zebra mussel control

MESSAGE DATE 8/17/99
Review and comment/approval

SIGNED Brian Myers

REPLY DATE

SWQD
SIGNED

SENDER: RETAIN CANARY COPY RECIPIENT: REPLY ON PINK COPY — RETAIN WHITE COPY

BetzDearborn

BetzDearborn Inc.
4636 Somerton Road
PO Box 3002
Trevose, PA 19053-6783
215 355-3300

August 11, 1999

Mr. Brian Myers
Michigan Department of Environmental Quality
Cadillac Division
120 West Chapin
Cadillac, MI 49601-2158

AUG 16 1999

Dear Mr. Myers:

Re: **Ambar Chemical**
Manistee, MI
#MI0054992

Enclosed is water treatment additive information for the BetzDearborn product, Spectrus CT1300, proposed for use at Ambar Chemical. Spectrus CT1300 is the same product as ClamTrol CT-2. It is used to control zebra mussels.

5x more concentrated than CT-2

The product will be fed on the suction side of the influent pump. The product will be detoxified with Spectrus DT1400 prior to discharge to the pond on-site. The pond then discharges over a weir to the lake.

If possible, please copy me on the results of your review of this product. If you have any questions, please contact me at 215-942-3654.

Sincerely,
BetzDearborn

Helen R. Cerra
Helen R. Cerra
Product Stewardship Group

Attachment

C: Mr. Chris Hissong and Mr. Peter Landis, Ambar Chemical
Mr. Michael Kline, BetzDearborn

FAV 5
FCV 0.29 ug/l
DL 50 ug/l

Shaping the Future of Water & Process Treatment

BetzDearborn

Shaping the Future of Water & Process Treatment

Ambar Chemical

Manistee, MI

Product Information - Spectrus CT1300 and Spectrus DT1400

1. MSDS are attached.
2. The discharge of Spectrus CT1300 will be zero.
3. The discharge frequency is 24 hours per day, seven days per week. Spectrus CT1300 is fed for 12 hours per day at a concentration of 6 ppm.
4. Outfall 001
5. Spectrus CT1300 will be detoxified with Spectrus DT1400 at a concentration of approximately 200 ppm.
6. Spectrus CT1300 is a molluscicide. It will be used to control zebra muscles.
7. Aquatic toxicity information is listed in Section 12 of the MSDS.
8. See section 12 of the MSDS for Daphnia magna data.

A Division of Hercules Incorporated

From: Brian Myers
To: Bruce Walker
Date: Wed, Sep 8, 1999 1:15 PM
Subject: Re: Fwd: Ambar

It will be one 12hr treatment. No firm plans are made to continue use of these additives.

>>> Bruce Walker 09/07 11:13 AM >>>
brian,
looked at the betz cover letter while waiting for the log letter draft to print. it says will dose for 12 hr/day, 7d/wk. what is to be the duration of the treatment? one week or a longer period? is this a one time thing or will be doing on some regular frequency? may have more questions as i get into this.

i hope we have the necessary product tox data reviewed already so the review can be done more quickly! they didn't really allow much lead time on this one. bw

From: Brian Myers
To: Bruce Walker
Date: Wed, Sep 8, 1999 2:25 PM
Subject: Re: Fwd: Ambar

In addition to the earlier message - I found out they intend to detox for 16 hrs.

>>> Bruce Walker 09/07 11:13 AM >>>
brian,
looked at the betz cover letter while waiting for the log letter draft to print. it says will dose for 12 hr/day, 7d/wk. what is to be the duration of the treatment? one week or a longer period? is this a one time thing or will be doing on some regular frequency? may have more questions as i get into this.

i hope we have the necessary product tox data reviewed already so the review can be done more quickly! they didn't really allow much lead time on this one. bw

Main Ph: 703-5265 Thru Friday 9/12

Fax 703-2862

chissong@betzdearborn.com

STATE OF MICHIGAN

JOHN ENGLER, Governor

DEPARTMENT OF ENVIRONMENTAL QUALITY

"Better Service for a Better Environment"

HOLLISTER BUILDING, PO BOX 30473, LANSING MI 48909-7973

INTERNET: www.deq.state.mi.us

RUSSELL J. HARDING, Director

REPLY TO:

SURFACE WATER QUALITY DIVISION
KNAPPS CENTRE
PO BOX 30473
LANSING MI 48909-7773

May 15, 2000

Mr. Bill Ellison
Ambar Chemical, Inc.
1501 Main Street
Manistee, Michigan 49660

Dear Mr. Ellison:

We have reviewed the water treatment additive (WTA) information contained in the Ambar Chemical, Inc. NPDES permit application package dated March 31, 2000. This application is for permit MI0054992. The information submitted, which included the product MSDS sheets, covered the use and discharge of the Betz Dearborn WTA's Cortrol IS104 and Optisperse CPS501. These WTA's are potentially discharged through outfall 001. For your information, the review and approval or disapproval of WTA use is handled separately from the rest of the permit renewal process although we use the information provided in the permit renewal submittal.

Based on the above information and the stated usage and discharge concentrations, we approve the use of Cortrol IS104 and Optisperse CPS501 under the conditions and concentrations specified in the permit application package.

If you have any questions, please contact Mr. Walker of our staff at 517-373-1316, or you may contact me.

Sincerely,

Gerald W. Saalfeld

Gerald Saalfeld, Chief
Water Quality Appraisal Unit North
Great Lakes and Environmental Assessment Section
Surface Water Quality Division
517-335-4201

gs:yg
cc: Mr. Michael Stifler, SWQD, DEQ
Mr. Dan Dell, Permits Section, SWQD, DEQ
Mr. Gerald Saalfeld/Ambar Chemical Facility File, SWQD, DEQ

EQP 0100e
(Rev. 1/98)

Ambar
WTA Review

4/27/00 BPJ

2 listed for 001 only

I – Betz Dearborn Cortrol IS104 (no file onhand)

- O_2 scavenger, in boiler system
- no trtmt per app, continuous use
- Eff TI: Max-20 ug/l, X-15 ug/l

Tox data in MSDS

Fthm 96 hr LC50, SR, 1760 mg/l

Dm 48 hr Cscreen 0% mort @ 1000 ppm, used for calculation 10% @ 2000 ppm

FAV: 77,000 ug/l FCV: 4,300 ug/l

→ Approve Qe discharge concentrations from application

II Betz Dearborn Optisperse CPS501 (no file onhand)

- corrosion inhibitor, in boiler system
- no trtmt per app, continuous use

Eff TI: Max-100 ug/l X-50 ug/l

Tox data in MSDS

Fthm - 48 hr Static Screen 0% mort in 1000 mg/l

Dm 48 hr " Screen " " " 1,000 mg/l

can't figure Tier II

Tier III would be FAV 77,000 ug/l, FCV 4,300 ug/l

20% if not to 25% Qe TI start at 1/20 of FCV

→ BPJ OK of this one since conc below Tier III values

NO TRC + WTA requested for Zebra mussels. Did a 1 time test in 9/99.

To Fax File

From: William Dimond
To: Brian Myers
Date: Mon, May 24, 1999 1:07 pm
Subject: Amber Chemical-Manistee NPDES# 54992: Aquatic Toxicity Data

Per your request, I have reviewed the results of the fathead minnow and *Ceriodaphnia dubia* chronic toxicity tests of the subject facility outfall 001 effluent conducted from June 1997 to July 1998. The tests were conducted as required by the facility's NPDES permit (4 test, 2-species chronic toxicity test requirement).

The results of the tests indicated that the effluent was meeting the aquatic toxicity requirements of Rule 1219 of the Part 8 Rules (≤1.0 TUa and ≤ 10 TUc):

	Fathead minnow		C. dubia	
Date	TUa	TUc	TUa	TUc
6/23/97	0	1.4	0	NA*
11/5/97	0	0	-	-
1/6/98	-	-	0	0
3/23/98	0	0	0	0
7/21/98	0	0	0	0

*Results did not meet QA/QC criteria

An additional *C. dubia* chronic toxicity test is needed to replace the 6/23/97 *C. dubia* test. Therefore, I recommend that you require the facility to conduct an additional *C. dubia* chronic toxicity test. I recommend that you require that the test be conducted before September 1999.

I will make recommendations regarding the entire data set after review of the additional *C. dubia* test results.

Bruce W., please forward a copy of this note to Section files.

cc: Bruce Walker, Gerald Saalfeld

Application Amendment
1) [illegible]
2) File

RECEIVED
MAY - 8 2000
SURFACE WATER QUALITY DIVISION
CADILLAC DISTRICT OFFICE

AMBAR CHEMICAL
1501 Main Street
Manistee, MI 49660
(231) 723-6266
(231) 723-8840 Fax

May 4, 2000

RECEIVED
MAY 12 2000
S.W.Q.D. PERMITS

Mr. Brian Myers
Michigan Department of Environmental Quality
Surface Water Quality Division
Cadillac District Office
120 Chapin St. W.
Cadillac, MI 49601

Re: NPDES Permit MI0054992

Dear Mr. Myers,

Enclosed is an updated page 28/29 for Ambar Chemical's NPDES renewal application. The BOD, COD, TOC, NH3, and Fecal Coliform lab results were added.

If you have any questions about this letter or the data, please give me a call at 231-723-6266 X204.

Sincerely,

Bill Ellison
Manistee Plant Manager

cc: Mike DeCarlo
Tony Caridi

Michigan Department of Environmental Quality- Surface Water Quality Division

WASTEWATER DISCHARGE PERMIT APPLICATION

SECTION III - Industrial and Commercial Wastewater

B. Outfall Information

Complete a separate Section III.B.- Outfall Information (pages 24-30) for each outfall at the facility. Make copies of this blank section of the application if necessary.

PLEASE TYPE OR PRINT

FACILITY NAME	NPDES PERMIT or COC NUMBER	OUTFALL NUMBER
Ambar Chemical Manistee Plant	MI0054992	001

5. WASTEWATER CHARACTERISTICS - CONVENTIONAL POLLUTANTS - Instructions for completing this page are on the facing page.

☐ Check this box if additional information is included as an attachment.

Parameter	Maximum Daily Concentration	Maximum Monthly Concentration	Units	Number of Analyses	Sample Type
Biochemical Oxygen Demand - five day (BOD_5)	2.3	2.3	mg/l	1	☒ Grab ☐ 24 Hr Comp
COD (Chemical oxygen demand)	21	21	mg/l	1	☒ Grab ☐ 24 Hr Comp
TOC (Total organic carbon)	6.5	6.5	mg/l	1	☒ Grab ☐ 24 Hr Comp
Ammonia Nitrogen (as N)	0.70	0.70	mg/l	1	☒ Grab ☐ 24 Hr Comp
Total Suspended Solids	6.0	5.0	mg/l	28	☐ Grab ☒ 24 Hr Comp
Total Dissolved Solids	1520	728	mg/l	425	☐ Grab ☒ 24 Hr Comp
Total Phosphorus (as P)	0.16	0.16	mg/l	14	☐ Grab ☒ 24 Hr Comp
Fecal Coliform Bacteria (report geometric means)	maximum-7day <1	<1	counts/100ml	1	Grab
Total Residual Chlorine	340.9	230.1	~~mg/l~~ ug/l	28	Grab
Dissolved Oxygen	minimum daily 5.40	Do Not Use	mg/l	28	Grab
pH (report maximum and minimum of individual samples)	minimum 6.64	maximum 8.88	Standard Units	425	Grab
Temperature, Summer	82.1	80.1	~~°F~~ °C	92	Grab
Temperature, Winter	53.7	47.0	~~°F~~ °C	90	Grab
Oil & Grease	ND<5.0	ND<5.0	mg/l	24	Grab
Total Dissolved Solids (Inlet)	792	482	mg/l	425	☐ Grab ☒ 24 Hr Comp
Net Dissolved Solids (Outlet vs Inlet)	65538	16525	lb/day	425	☐ Grab Calc ☐ 24 Hr Comp
Temperature, Summer (Inlet)	76.8	73.3	°F	92	☒ Grab ☐ 24 Hr Comp
Temperature, Winter (Inlet)	50.4	44.8	°F	90	☒ Grab ☐ 24 Hr Comp
Net Heat Input (Out vs In)	35.92	26.73	MBtu/hr	425	☐ Grab Calc ☐ 24 Hr Comp
					☐ Grab ☐ 24 Hr Comp
					☐ Grab ☐ 24 Hr Comp
					☐ Grab ☐ 24 Hr Comp
					☐ Grab ☐ 24 Hr Comp

Michigan Department of Environmental Quality- Surface Water Quality Division

WASTEWATER DISCHARGE PERMIT APPLICATION

SECTION III - Industrial and Commercial Wastewater

B. Outfall Information

Complete a separate Section III.B.- Outfall Information (pages 24-30) for each outfall at the facility. Make copies of this blank section of the application if necessary.

PLEASE TYPE OR PRINT

FACILITY NAME	NPDES PERMIT or COC NUMBER	OUTFALL NUMBER
Ambar Chemical Manistee Plant	MI0054992	001

7. PRIMARY INDUSTRY TOXIC POLLUTANT INFORMATION

Complete this item only if the facility is a primary industry as indicated in item 1 of this section. If this is not a primary industry, continue with item 8.

For two or more substantially identical outfalls, permission may be requested from the appropriate district supervisor to sample and analyze only one outfall and submit the results of the analysis for other substantially identical outfall(s). If the request is granted by the district supervisor, attach a narrative describing which outfall was sampled, and describe why the outfalls which were not sampled are substantially similar to the outfall that was sampled.

A. Indicate if the discharge from this outfall contains any process wastewater. If the discharge from this outfall contains process wastewater, check "YES" and continue with B below. If the discharge from this outfall does not contain any process wastewater, check "NO" and continue with item 8. Does this outfall discharge contain any process wastewater?

☒ Yes, Continue with B. ☐ No, Continue with item 8.

B. Primary industries must submit test results for organic toxic pollutants. Table 2 in the appendix contains a list of GC/MS fractions required by each industrial category. Indicate the GC/MS fractions required for the facility industrial category.

☒ Volatile ☒ Base/Neutral ☒ Acid ☐ Pesticide

Provide analytical data for each parameter of the GC/MS fraction checked above. The required parameters in each fraction are specified in Table 3 in the appendix. Provide copies of the analytical results or record the information in Item 9. Additionally, all primary industries which discharge process wastewater shall provide quantitative data for the parameters specified in Table 4 in the appendix. Applicants are not required to analyze 2,3,7,8-TCDD (Dioxin) unless they believe it is present in the discharge.

ADDITIONAL TOXIC POLLUTANT INFORMATION

A. If an applicant, regardless of the type of discharge, knows or has reason to believe that any pollutant listed in Tables 3, 4, 5, 7 and 8 (in the appendix) is discharged from any outfall, then quantitative data shall be provided for those pollutants.

☐ Not Applicable/Believed Absent ☒ Present, Data is attached or recorded in Item 9.

B. If an applicant (primary or secondary industry), regardless of the type of discharge, knows or has reason to believe any pollutants listed in Table 6 (in the appendix) are discharged from any outfall, the applicant shall describe reasons for the pollutant being present and provide any available quantitative data.

☒ Not Applicable/Believed Absent ☐ Present, Data is attached or recorded in Item 9.

C. All applicants (primary and secondary industries) who use or manufacture 2,4,5-Trichlorophenoxy acetic acid (2,4,5-T); 2-(2,4,5-Trichlorophenoxy) propanoic acid (Silvex); 2-(2,4,5-Trichlorophenoxy) ethyl 2,2-Dichloropropionate (Erbon); 0,0-Dimethyl 0-(2,4,5-trichlorophenyl) phosphorothioate (Ronnel); 2,4,5-Trichlorophenol (TCP); or Hexachlorophene (HCP) must report data using standard analytical calibration procedures. All surface water discharge applicants (primary and secondary industries) who know or have reason to believe that 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) is or may be present in their discharge must report qualitative data generated using a screening procedure not calibrated with analytical standards for TCDD.

☒ Not Applicable/Believed Absent ☐ Present, Data is attached or recorded in Item 9.

D. If the applicant knows or has reason to believe that biological tests (including WET tests) were made in the last three (3) years on any of the applicant's discharges or on a receiving water in relation to the discharge(s), provide this information as an attachment to this application.

☒ Not Applicable ☒ Applicable, Data is attached.

E. If a contract laboratory or consulting firm performed any of the analyses required by this application, provide the name and address of each laboratory or firm as an attachment to this application.

☐ Not Applicable ☐ Applicable, Information is provided.

F. Does the facility discharge any other toxic or injurious chemical substances not listed in Tables 3 through 9 in the appendix ?

☒ No, Continue with Section III.C. ☐ Yes, Data is attached or recorded in Item 9.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

April 29, 1999

TO: Michael Stifler, Supervisor
Cadillac District Office
Surface Water Quality Division

FROM: Bruce R. Walker
Great Lakes and Environmental Assessment Section
Surface Water Quality Division

SUBJECT: Ambar Chemical
Thermal Plume Study Submittal
NPDES Permit #MI0054992

We have reviewed the outfall 001 thermal plume study report submitted February 23, 1999. This study was conducted to fulfill the requirements of Part I.A.4. of the subject permit. Outfall 001 has an authorized flow of 14.5 MGD and discharges barometric condensor cooling water, noncontact cooling water, condensates, softener backwash, and other miscellaneous waters to Manistee Lake. Manistee Lake is listed as a coldwater lake. Our comments and recommendations are below:

RECOMMENDATIONS

The report is lacking any real discussion of the results and how those results relate to the Michigan Water Quality Standards (MQWS). We recommend that the report be revised to include, at a minimum, the items listed below.

- Discussion of the areal extent of each plume.
- Discussion of where and how large of a bottom area is affected by the plume.
- Discussion of each plume relative to its buoyancy.
- Discuss the results of each study relative to MQWS.
- Plots of the field data as described in the plan (isotherms of +20, +10, +5, +2) degrees F; concentration isopleths of 50%, 25%, 10% and 5% effluent based on conductivity data)
- Identify background stations; support the selection of those locations, and accurately delineate background conditions.
- Include effluent flow data for the days just before and during each study.

COMMENTS

The study was conducted and plots were made using degrees Celcius. The MWQS are given in degrees fahrenheit (F). The data need to be presented and analyzed from that perspective. Generally, the stated background conditions, especially temperature, seem to higher than appropriate given the data for some stations which appeared to be outside of the noted plume dimensions. The net effect would be a potential under-representation of the plume area. Not knowing which locations were background stations made interpretation more difficult.

EQ 0101a
(1/03)

99/146 Walker

Comments Attached

ASI ENVIRONMENTAL TECHNOLOGIES, INC.

ENVIRONMENTAL ENGINEERING AND SCIENTIFIC CONSULTANTS

February 23, 1999

Mr. Brian Myers, Environmental Quality Analyst
Michigan Department of Environmental Quality
Surface Water Quality Division
Cadillac District Office
120 W. Chapin Street
Cadillac, Michigan 49601

Surface Water Quality Div. RECEIVED
MAR 04 1999 MAR 04 1999
Administration

RE: AMBAR Chemical, Incorporated
1501 Main Street, Manistee, Michigan
Mixing Zone and Thermal Plume Studies
NPDES Permit No. MI0054992

Dear Mr. Myers:

Enclosed please find two (2) bound copies of the Mixing Zone and Thermal Plume Study for National Pollutant Discharge Elimination System (NPDES) Permit # MI0054992 for the above referenced facility.

If you have any questions please contact the undersigned at (616) 845-0371.

Sincerely,

ASI ENVIRONMENTAL TECHNOLOGIES

Matt C. Bell
Matt C. Bell
Project Manager

MAR - 1 1999

Enclosure

c.c. Mr. Christopher Hissong, AMBAR Chemical, Inc.

xc: J.J. Jones, SWQD, PCS, Lansing 3/3/99
J. Saalfeld, SWQD, GLEAS, Lansing w/ att. (for review)

Corporate Office
239 North Jebavy Drive • Ludington, Michigan 49431 • Phone (616) 845-0371 • Facsimile (616) 845-0426
Traverse City Office
806 Hastings Street • Suite B-1 • Traverse City, Michigan 49686 • Phone/Facsimile (616) 929-9479

Ambar Chemical ... 001 14.5 mgd Condenser cooling water, NCCW, Lift station pump, Contact CW, Ash drainage, etc

MI0054992

T°/MZ Study Review -001 I.A.4 4/1998 Eval

field measurements in °C & mmhos (2°F = 1.1°C) - for Std. comparison

11/97 Study Fig 3 & 4 Table 1 Bkgnd = 9.5°C, 0.300 mmhos, larger plume size

* Suggest what they used as Bkgnd is too ^ for both parameters

Bkgnd T° 19.5? ≠26 8.7-8.1°C down to 10', 0.270 cond. #7 8.1°C, 0.270 down to 5', 19 shown on figure

- looks like largest plume

#11 suggested = 8.3 suggested = 0.275 for bkgnd

3/98 Fig 5&6 Table 2 : Bgnd = 8.6°C ; 0.242 mmhos - looks ok as Bkgnd - smallest plume

* appears Bkgnd Temp test (27.7°F max) { #6 7.7°, 0.241 #14 8.3 0.239

Eff T° 19.4°, 18.2°, 12.4°, 12.5° Cond 0.488, 0.310, 0.315, 0.316 decrease

further dist ok? - appears to be largest plume

7/98 Fig 7/8 Table 3 : Bgnd = 20°C 0.314 mmhos - looks ok for Bkgnd 0.310-0.314 - largest outfall area Thru Lake - smallest plume

Suggest 19.5° as Bkgnd? { #5 19.5°, +0.310 to 20' #15 Rec'r, -0.311 to 5' #9 = 19.5°, +0.310 to 25'

Eff T° 16.9°, 18.2°, 19.3° Cond 0.413, 0.424, 0.419 Stable

- if large thermal effect are depth plots correct?

How is plume mapped? Eff close to Lake T° ; Rec'r 20° Temp early for further offshore measurements = 5' deep

- Cond plume may be bigger than T° plume

If plume is starting, unfair T° inappropriate comparison.

early warning of water

#18 looks like should be alone, but Cond * Overall plume is small w/ possibility the smaller may fill

98 Fig 9&10 Table 4 : Bgnd = 24°C ; 0.400 mmhos - ~5% high? - largest plume

#9 23.3°; 0.350 to 10' #7 = 23.5° on 5'

Eff T° 23.1°, 23.3°, 29.1°, 28.5°; 25.2° Cond 0.582; 0.472; 0.636, 0.62, 0.605 Plume Highest

surface bubble 280 = 25.5° warmer than bkgnd

- Should be largest plume

No dimension in rep't on: 1) Plume size; 2) plume to bottom; 3) conc/segment; 4) Comparison of Std - Bkgnd often not identified, above results suggests used 19.5° for bkgnd T° (assumed 4a).

- No eff plume Rec'r T°, pH, Cond given for preceding study.

11/97 has 3 eff measurements for T° + Cond during study (16.9, 17.2, 18.0°C) (0.373, 0.477, 0.520) Plume

3/98 Appx 4 " "

5/98 has 5 " "

8/98 has 5 " " Rec'r cond & turbidity by far most acc

Plan - Is pH +2.0, 1.5, 2° ; 50, 25, 15, 10, 5% effluent, blank & either - just plotted? w/ bubbles - Calibrated instruments here?

EQ 0101a (1/98)

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

November 10, 1998

TO: Mike Stifler, Supervisor, Cadillac District Office
Surface Water Quality Division

FROM: Diana Butler, Great Lakes and Environmental Assessment Section
Surface Water Quality Division

SUBJECT: AMBAR Chemical-Manistee
NPDES Permit #MI0054992
Aquatic Toxicity Evaluation

Attached are three copies of our staff report #MI/DEQ/SWQ-98/076 for the static acute *Daphnia magna* toxicity evaluation conducted from November 4-6, 1998 on a composite sample of the AMBAR Chemical-Manistee outfall 001 effluent.

The effluent was not acutely toxic to *Daphnia magna*, suggesting that the effluent was meeting the acute aquatic toxicity-related requirements of Rule 1219 of the Part 8 Rules.

We have no recommendations for the facility at this time.

Please provide a copy of this report to the designated facility representative and to the local unit of government if appropriate.

db:yg
Attachments
cc: Dan Dell, Permits Section
Gerald Saalfeld/AMBAR Chemical-Manistee Facility File

Diana Butler/G

STATE OF MICHIGAN

JOHN ENGLER, Governor

DEPARTMENT OF ENVIRONMENTAL QUALITY

"Better Service for a Better Environment"

HOLLISTER BUILDING, PO BOX 30473, LANSING MI 48909-7973

INTERNET: www.deq.state.mi.us

RUSSELL J. HARDING, Director

REPLY TO:
CADILLAC DISTRICT OFFICE
120 CHAPIN ST W
CADILLAC MI 49601

June 22, 1998

RECEIVED
JUL - 1 1998
SURFACE WATER QUALITY DIVISION

Mr. Christopher Hissong
AMBAR Chemical
1501 Main Street
Manistee, Michigan 49660

Dear Mr. Hissong:

We have received your request dated December 29, 1997, regarding reduction in testing frequency. Based on that review, we offer the following relief in test frequency.

	OLD	NEW
oil & grease	2/month	1/year
total nickel	2/month	1/year
total lead	2/month	1/year
total selenium	2/month	1/year
amenable cyanide	2/month	1/year
total phosphorous	2/month	1/month
total zinc	2/month	1/month
total lithium	2/month	1/month
total mercury	2/month	2/year

RECEIVED
SWQD - GLEAS
JUL 01 1998

Reduction in chlorides testing frequency, is still under review.

Testing frequency for total cadmium, total copper and total strontium can not be reduced.

Please review the attached memo for an explanation and other considerations.

If you have any questions, please contact Brian Myers at extension 6263.

Sincerely,

Michael Stifler

Michael E. Stifler
District Supervisor
Surface Water Quality Division
616-775-3960 ext. 6260

cc: J. Stalfeld, SWQD, Lansing
Walker
Facility File

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

May 18, 1998

TO: Michael Stifler, Supervisor, Cadillac District Office
Surface Water Quality Division

FROM: Bruce R. Walker, Great Lakes and Environmental Assessment Section
Surface Water Quality Division

SUBJECT: AMBAR Chemical
Monitoring Data Review
NPDES Permit MI0054992

We have reviewed the December 29, 1997 data submittal from AMBAR. Part I.A.1.f. of the permit allows the permittee to request a reduction in monitoring frequency, to no less than an annual basis, after collecting one year of monitoring data. Monitoring of permit specified analytes has been conducted on a twice per month basis. The permittee has requested reducing the monitoring frequency to twice per year for amenable cyanide, total mercury, and oil and grease and to monthly for all other parameters. Based on our review of the permit, the data submitted, and site specific information from our facility file, we have derived the recommendations listed below.

RECOMMENDATIONS

1. Reduce the monitoring frequency to once per year for amenable cyanide, oil and grease, and total nickel, lead, and selenium. Reduce the monitoring frequency for total mercury to twice per year. The basis for these changes is that these analytes were not detected or were present in low concentrations.

2. Reduce the monitoring frequency to once per month for total phosphorus, total zinc, and total lithium. The basis for these changes is that these analytes were not present at concentrations requiring limitations but were somewhat elevated relative to theoretical limits.

3. Retain the twice per month monitoring for total cadmium, total copper, and total strontium. The monitoring frequency for these metals should not be reduced, as they were much higher, relative to theoretical daily maximum limits, than the other metals monitored.

4. The current collection and analytical method requirements should be retained.

We would like to note that there were apparently a few errors in this submittal and on the daily DMRs. Some data were incorrectly copied from the analytical lab sheets (wrong values or decimal place error) or the maximum values shown were incorrect. The errors both understated and overstated constituent concentrations. The permittee would benefit from an accurate summary of monitoring data.

REASONABLE POTENTIAL CHEMICAL SPECIFIC (p. 2 of 3)

*concentration values in ug/L except as noted; loads in lb/d

Facility: AMBAR CHEM	0	Disch. Rate:	22.4 cfs	95% Ex. Flow:	897 cfs
Outfall:	001			H. Mean Flow:	897 cfs
Date:	3/13/98			90/10 Flow:	897 cfs

Parameter	Monthly Average PEL						Daily Max		PEQ		Decision	
	FCV	load	HHV	load	HCV	load	WV	load	PEL	Avg	Max	Avg	Max
Cadmium & inorg. salt	77	9.241955439	1431.450893	172.7319828	#VALUE!	#VALUE!	#VALUE!	#VALUE!	32	31.2	31.2	monitor 2x/mo	
Copper	190	23.23986184	704674.3411	85043.29727	#VALUE!	#VALUE!	#VALUE!	#VALUE!	66.46925996	10	23	monitor 2x/mo	
Zinc	4200	501.1282933	2421153.9905	292219.24451	#VALUE!	#VALUE!	#VALUE!	#VALUE!	770	27	87	monthly	
Lithium	440.4484286	53.13445824	693703.123	83718.26858	#VALUE!	#VALUE!	#VALUE!	#VALUE!	490	80	171	"	"
Strontium	6,800	197.3158436	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	11000	2,200	4800	monitor 2x/mo	
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0	0		

Cadmium detected by one hit @ 20 ug/L. One hit @ 4.1, 4 @ <1/ug/L x 20 ND. therefore monitor only (PEQ range not limit) and keep @ 2x/mo

Strontium detected has 1 sample > FAV. PEQ range not to be known. 1 Big hit ~4x > than next highest. Therefore monitor only. Next sample of Cd, keep @ 2x/mo.

PELSHEET.XLS
3/97

P. 1

1 — Ambar Chemical
NPDES CA0054682
Wastewater Industrial & Process
Stockton, San Joaquin County

Receiving water: Unnamed slough tributary to Mormon Slough, then to San Joaquin River, Delta, within the Stockton Deep Water Ship Channel

Qs = 1.5 MGD (23.4 cfs)

Qe = 897 cfs above chem & upstream flow

Dilution = 170

Dilution = 3.5

PEQ = Effluent Conc. / Applicable WQO (where 3 more restrictive) or CTR, Basin Plan, Sec. Cal/Fed Laws (whichever)

PEQs

1) Between CTR & Basin Plan, use Basin Plan (e.g. Cu-WER) as PEQ @ Basin levels, e.g. 2x (typ. as compliance) (unless CTR, or more stringent)

2) Between Basin Plan & Drinking Water, use Basin Plan as PEQ (typ. as compliance) (unless DW more stringent, e.g. Nitrate) & use DW as limit or Peak trending compliance

3) Between DW & Sec. Cal/Fed, use DW as PEQ (typ. as compliance) (unless Sec. Cal/Fed more stringent, e.g. Cd 4-day Ave 9.3 ug/L - approx 32 (PEQ upper limit)

Cd Acute limit @ 4.3 ug/L - approx 66 (PEQ upper limit)

Sec. Acute limit @ 13,200 > FAV, use 11,000 PEQ upper limit

positive / over, PEQ, keep monitoring

Strong Basin Plan - Biosolids control

Use Sec. Cal/Fed for Cd - as Acute limit

PROJECTED EFFLUENT QUALITY ANALYSIS (<10 Detectable):
* all values in ug/l

	Cadmium	Copper	Zinc	Lithium	Strontium
Sample Max.	24	16	26	180	3200
Total Samples	26	15	17	11	9
Multiplier	1.3	1.5	1.4	1.7	1.8
PEQ:	31.2	24	36.4	306	5760

PELSHEET.XLS
5/97

REASONABLE POTENTIAL: CHEMICAL SPECIFIC (p. 1 of 2)
*concentration values in ug/L except as noted

Facility: AMBAR CHEM; monitoring data review
Outfall: 001 001 Drinking Water: n Hardness: 170 mg/L CaCO3
Date: 5/13/98 5/13/98 pH: 7.8
TSS: 3.5 mg/L

Parameter	CAS#	Water Quality Values FCV	vd	HNV	vd	HCV	vd	WV	vd	FAV	vd	Dim. Met. Translator	Back-ground Conc.
Cadmium & inorg. salt	7440439	3.311803987	1199707	130	1199706	NA	0	NA	0	15.15384219	1199707	2.1	0
Copper	7440508	14.09355739	1199707	64000	1199704	NA	0	NA	0	44.31283984	1199707	1.5	4
Zinc	7440666	185.2049577	1199707	22000	1199706	NA	0	NA	0	367.4045613	1199707	2.1	13
Lithium	7439932	40	2199706	61000	2199705	NA	0	NA	0	490	2199706	1	0
Strontium	7440246	600	2199803	NLS	0	NA	0	NA	0	11000	2199803	1	0

Pel

PEQ – Effluent Data Summary
(all values in ug/L)

Parameter:	Cadmium & Source	Copper	Source	Zinc	Source	Lithium	Source	Strontium
No. Nondetect	20	6		8		2		0
Data	0.3	2		7		10		200
	0.2	8		6		16		240
	0.29	14		18		74		340
	0.31	8		6		180		570
	24	7		10		100		1300
	4.1	16		8		97		3200
		9		23		86		1970
		6		26		59		1770
		9		10		9		1620
		9		20		10		1460
		6		150		20		230
		22		19		47		210
		6		20		97		500
		40		140		150		1060
		8		100		40		830
		7		11		34		1330
		40		5		25		810
		1				27		1274
		5				13		425
		6				71		630
						21		400
						140		310
						16		240
								320
								530

PELSHEET.XLS
3/97

JECTED EFFLUENT QUALITY ANALYSIS (>10 Detectable):

PARAMETER:		Copper		Zinc		Lithium		Strontium	
TOTAL NO. VALUES:	26	26		26		26		26	
DETECTED:	6	20		18		24		26	
NON-DETECTED:	20	6		8		2		0	
d (% data<detect)		0.23076923		0.30769231		0.07692308		0	
m (means of data >detect)	4.866666667	9.75		21.5555556		65.91666667		1344.961538	
std dev	9.497515055	8.515146381		46.20144335		61.20009		2521.333306	
n	1 30	1	30	1	30	1	30	1	
d*n	0.769213077	0.230769231	7.85385E-20	0.307692231	4.40005E-16	0.076923108	3.81685E-34	0	
p	0.783333333	0.9499809	0.95	0.92777778	0.95	0.945833333	0.95	0.95	
std normal dist fn (Z)	1.7469398	2.44759085	2.33810322	2.44774683	2.29260005	2.44774683	2.41482487	2.44774683	2.44774
Z_p	0.783287803	1.64592053	1.51140713	1.64521144	1.45971766	1.64521144	1.60687113	1.64521144	1.64521
1+(p/m)^2	4.80852111	4.80852111	1.76279456	1.76279456	3.01426718	3.01426718	1.86209732	1.86209732	4.51431585
mu_d^2	1.570358958	1.570358958	0.56690037	0.56690037	1.10033674	1.10033674	0.62170344	0.62170344	1.507253647
mu_d	0.797211445	0.797211445	1.5938171	1.5938171	2.5712696	2.5712696	1.4773596	1.4773596	6.450493872
(sigma_ds)^2	1.570358958	0.507177041	0.56690037	0.04215336	1.10033674	0.10197857	0.62170344	0.03334683	1.507253647
mu_ln	-0.22721445	-0.13713459	1.5938171	1.5938171	2.5712696	3.0622133977	3.8775396	4.0916715	6.450493872
P_95 exponent	1.778379201	1.0043933	3.13405642	2.31610937	4.64456863	3.5978218	5.1438982	4.3921091	8.470034217
P_95 (PEQ)	5.92269779	2.81339884	22.9669545	10.2944959	86.8833414	36.5186049	171.342675	80.810698	4771.062077

NOTES: For purposes of this summary, ^ represents an exponent or superscript while _ represents a subscript.
Variables are defined in Part 12, Rule 1223 (J) (4).

Summary of Selected Amber Mt Spring -001

MZ 0054992

Data from Daily Lab Check Sheets

Date	TP	Cd	Cu	Zn	Se	Li	Sr	Cl⁻	Temp ID ÔQ @ (1030) x̄/max	ȳ/max	
12/96	30/32	<2/<2	2/<4	7/6	<4/<4	<50/10	200/240	71/68			
1/97	17/34	ND/0.3	8/14	18/6	ND/ND	15/ND	345/570	65/140			Daily Lab Check Sheets
2/97	50/120	ND/ND	8/7	ND/10	ND/ND	74/120	1200/2200	300/820			
3/97	190/160	ND/20	ND/16	ND/8	ND/ND	120/97	1,970 max 2,600				
4/97	290/470	ND/ND	9/6	23/26	ND/ND	26/59	1,960 max 5,500				
5/97	36/220	ND/2	9/9	10/20	ND/ND	9/10	2,110 max 4,225	69/83	78/10.5		
6/97	21/12	ND/ND	6/22	150/19	ND/5	20/47	500 1,060	63/140	83/91	8.7/9.7	
7/97	600/40	ND/ND	5/6	ND/20	ND/ND	97/150	1,100 1,610	1,600/130	73/87	8.2/9.8	
8/97	50/70	0.28/0.31	34/8	ND/ND	ND/ND	50/40	1,100 1,610	190/110	70/81	7.3/9.9	Pt's pH in spec? Dup. High value? Contamination
9/97	25/25	ND/ND	ND/ND	ND/ND	ND/ND	24/25	1,274 4,25	240/95	62/67	8/8.3	
10/97	30/19	24/ND	7/1	140/7	ND/ND	27/12	620/420	130/130	56/51	8.2/8.5	
11/97	15/25	ND/ND	5/ND	ND/100	ND/ND	11/21	310/240	55/35	50/63	7.2/9.0	
12/97	17/22	ND/0.1	6/ND	11/5	ND/ND	150/16	320/520	43/71	41/48	7.4/8.8	
	Max Background	10 ND	6 ND	8 ND	25 ND	200	—				
	x̄ Background	6 ppb	20 ppb	10 ppb	11 ppb	24 ppb	26 ppb				

Date

1) Name known anions [illegible] Cl⁻, F⁻ [illegible] ppm

NO_3 [illegible] ppm as nitrate

D_2O [illegible] ‰

2) Name [illegible] Ni

Pb [illegible] ppb

Se

TP [illegible]

3) To Evaluate Cl⁻ Suppose Range s² in Values

7440439	Cd	> 100x	2 ppb
7440508	Cu	~10x s²	2x ppb
7440666	Zn	~30x s²	2x ppb
7439932	Li	~19x s²	2x ppb
7440246	Sr	Range s² in Values	2x ppb

note that were errors in Daily Lab Check Sheets (from new data sheet) & in May values in 12/20/97 letter

IA I.f petition after [illegible] not ≥ 1x/yr

14.5 MGD = 224 ft³/sec min max 897 cfs

Flow 170 rpm

TDS 3.5 ppm

12/20/97 submitted to be monitoring frequency changed to 2x/yr

98/76

To: Facility File

STATE OF MICHIGAN

JOHN ENGLER, Governor

DEPARTMENT OF ENVIRONMENTAL QUALITY

HOLLISTER BUILDING, PO BOX 30473, LANSING MI 48909-7973

INTERNET: http://www.deq.state.mi.us

RUSSELL J. HARDING, Director

REPLY TO:

CADILLAC DISTRICT OFFICE
120 CHAPIN ST W
CADILLAC MI 49601
FAX 616-775-1511

June 20, 1997

RECEIVED
SWQD-GLEAS
JUL 01 1997

Mr. Chris Hissong
Ambar Chemical
1501 Main St.
Manistee, Michigan 49660

Dear Mr. Hissong

We have reviewed the revised work plan for conducting mixing zone and thermal plume study submitted by ASI on April 30, 1997. Based on that review we find the plan approvable.

To stay focused please review our original comments prior to intiating the plan, especially comment 11. Also try to avoid characterizing the plume/zone when production is low.

If you have any questions please contact Brian Myers at 616-775-3960, ext. 6263.

Sincerely,

Michael Stifler

Michael Stifler
District Supervisor
Surface Water Quality Division
616-775-3960 ext. 6260

cc: B. Walker, SWQD, Lansing
C. Rohrer, ASI, Ludington

DP 0100e
v. 10/96

From: WALKERB2--DWRDC
To: MYERSB --DWRDC

Date and time 06/18/97 13:00:28

To: Facility File

From: walkerb2
Subject: ambar chemical plume study plan review
brian,
reviewed the revised plume study plan, dated 4/30/97, and have the following comments.

focus of the plan is much better than first plan. they should review my previous comments (the direct ones and relevant ones from tenneco plan comments) to ensure they stay focused on desired objectives during the field work.

ity doesn't necessarily have to be at full production but at least should be at a pretty significant level of production and at a steady level before and during the field work. trying to avoid characterizing plume when it would be expected to be smaller than average.

temperature and conductivity readings (both effluent and lake) should be made with calibrated instruments. would be preferable to do outfall and lake readings with same instrument(s) as mentioned in previous comments.

recommend that you ok plan as long as they address these and prior comments. call if have questions. thanks.

cc: SUPHICJ--DWRDC
DELLD --DWRDC

SAALFELG--DWRDC

DON'T SAY IT—WRITE IT

RITE-O-GRAM

WRITE IT RIGHT!

TO: BRUCE WALKER
SWQD
LANSING
97/167 WEEK

FROM: BRIAN MYERS
SWQD
CADILLAC

SUBJECT: AMBAR TP/MZ STUDY

OUR JOB NO.

DATE OF MEMO 5/14/97

MESSAGE

PLEASE REVIEW & COMMENT

RECEIVED
SWQD-GLEAS
MAY 15 1997

SIGNED Brian Myers

—DO NOT WRITE BELOW THIS LINE

REPLY

SIGNED DATE

ORIGINAL

SENDER — Retain part 2 for your follow-up, send parts 1 and 3 to addressee.
RECIPIENT — Retain part 1 and return part 3

ASI ENVIRONMENTAL TECHNOLOGIES

ENVIRONMENTAL MANAGEMENT CONSULTANTS

RECEIVED
MAY - 1 1997
SWQD D-5
CADILLAC

April 30, 1997

Mr. Michael Stifler, District Supervisor
Michigan Department of Environmental Quality
Surface Water Quality Division
Cadillac District Office
120 W. Chapin Street
Cadillac, Michigan 49601

RE: AMBAR Chemical, Incorporated, 1501 Main Street, Manistee, Manistee, Michigan
NPDES Permit No. MI0054992

Dear Mr. Stifler:

Enclosed please find one unbound copy of the Revised Work Plan For Conducting Mixing Zone and Thermal Plume Studies for the above referenced site and National Pollutant Discharge Elimination System (NPDES) permit.

If you have any questions please contact me at (616) 845-0371.

Sincerely,

ASI ENVIRONMENTAL TECHNOLOGIES

Christopher A. Rohrer, CHMM
Project Manager

CAR

Enclosure

p.c. Mr. Christopher Hissong, AMBAR Chemical, Inc.

Corporate Headquarters
239 North Jebavy Drive • Ludington, Michigan 49431
Phone (616) 845-0371 • Facsimile (616) 845-0426

AMBAR CHEMICAL, INCORPORATED
1501 MAIN STREET
MANISTEE, MANISTEE COUNTY, MICHIGAN

REVISED WORK PLAN FOR CONDUCTING MIXING ZONE AND THERMAL PLUME STUDIES
For
NPDES PERMIT NO. MI0054992

APRIL 1997

ASI ENVIRONMENTAL TECHNOLOGIES
ENVIRONMENTAL MANAGEMENT ADVISORS

AMBAR CHEMICAL, INCORPORATED
1501 MAIN STREET
MANISTEE, MANISTEE COUNTY, MICHIGAN

REVISED WORK PLAN FOR CONDUCTING
MIXING ZONE AND THERMAL PLUME STUDIES
For
NPDES PERMIT NO. MI0054992

APRIL 1997

Prepared for:
Mr. Christopher Hissong
Process Engineer
AMBAR Chemical, Incorporated
1501 Main Street
Manistee, Michigan 49660

Prepared by:
ASI Environmental Technologies
239 North Jebavy Drive
Ludington, Michigan 49431

ASI ENVIRONMENTAL TECHNOLOGIES
ENVIRONMENTAL MANAGEMENT ADVISORS

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AMBAR CHEMICAL, INCORPORATED
1501 MAIN STREET
MANISTEE, MANISTEE COUNTY, MICHIGAN

WORK PLAN FOR CONDUCTING MIXING ZONE AND THERMAL PLUME STUDIES For NPDES PERMIT NO. MI0054992

April 1997

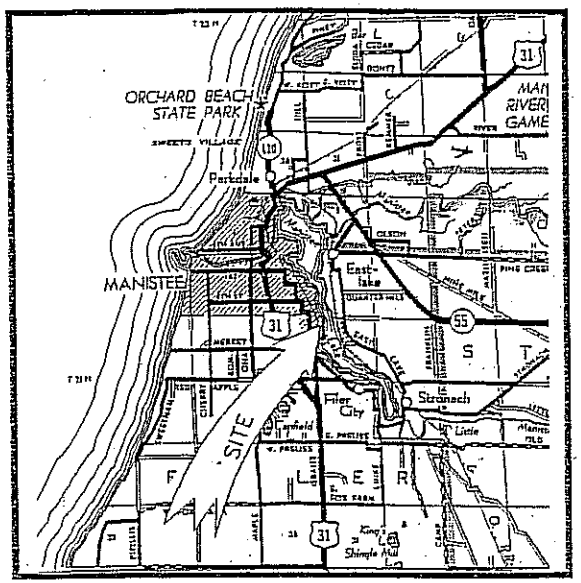
1.0 INTRODUCTION

ASI Environmental Technologies (ASI) was contracted by AMBAR Chemical, Inc. (AMBAR) to prepare a Work Plan for conducting Mixing Zone and Thermal Plume Studies related to the NPDES discharge permit for their manufacturing operation located in Manistee, Manistee County, Michigan (Figure 1). The objective of this work plan is to set forth guidelines by which the studies will be conducted over the course of a one year time frame and to fully document all operational concerns associated with the proper completion of the job. ASI can proceed with the work as outlined in this work plan upon receiving concurrence from the Michigan Department of Environmental Quality (MDEQ), Cadillac District Office.

1.1 Site and Lake Information

The site of interest (facility), located in Manistee Township, just east of the downtown area of Manistee, is a recently acquired facility involved in manufacturing both liquid and dry calcium chloride products. AMBAR utilizes a waste stream from another local manufacturer as its primary feed stock. The facility's property is bounded on the east by the shore of Manistee Lake, on the west by Main Street and to the north and south by fences. The plant was acquired by AMBAR from the Akzo Nobel Salt Company, formerly known as the Hardy Salt Company.

ASI ENVIRONMENTAL TECHNOLOGIES



N

AMBAR CHEMICAL, INC.
MANISTEE, MICHIGAN
PROJECT LOCATION MAP
ASI
DATE: 12-26-96
SCALE: NOT TO SCALE
DRAWING: 96-0129
FIGURE: 1

Manistee Lake is a long, narrow lake which runs for several miles from the southeast to the northwest. The Little Manistee River enters the lake on the southeast end at the town of Stronach. The lake then winds northward through an area containing approximately seven industrial plants. The north end of the lake widens to approximately three quarters of a mile, which is its widest point. At the north end of the lake, the Big Manistee River, separated into three channels, flows out of a large marsh area into the lake. The Manistee River channel then flows out of the northwest side of the lake, through the middle of the town of Manistee and into Lake Michigan.

The location of Outfall 001 from AMBAR Chemical is at the most narrow point of the lake, which spans approximately 700 feet across (Figure 2).

1.2 Purpose and Scope of Work

The purpose of this work plan is to set forth guidelines by which the shape and characteristics of the mixing area of the discharge plume into Manistee Lake can be accurately determined. Simultaneously, the thermal characteristics of the plume will be determined and used to produce accurate maps of the effluent concentration and thermal plumes for various seasons.

The scope of work involves an initial reconnaissance to provide information on general plume location and its extent in Manistee Lake, and then concentrating the sampling effort within those confines to determine isotherms and isopleths (lines of constant concentrations) within the confines of the plume.

An accurate survey and a repeatable transect/grid system established while on the lake using a Global Positioning System (GPS) will serve to give precision and accuracy to the seasonal contour maps generated from the data. At that point, objective decisions can be made concerning proper management of the plume.

2.0 SAMPLING PROTOCOL

The critical portion of this work plan is to establish an accurate and repeatable method of establishing the plume definition and defining isotherms and isopleths while on the lake. Depth, temperature and conductivity readings can be taken at these points. To be able to create maps that represent the seasonal mixing and thermal and concentration plume characteristics of the lake/outfall system, it is essential that seasonal samples be taken and the plume defined.

2.1 Sampling Plan Summary

The proper day for sampling must be chosen carefully with certain considerations made to minimize sampling error and interference that could affect the data. These considerations are as follows:

1. AMBAR Chemical, Inc. must be operating at full production or at a relatively steady rate.
2. The wind must be light or moderate with little or no wave action on Manistee Lake.
3. There must be little or no precipitation.
4. The recreational boating on Manistee Lake must be minimal (No holiday weekends).

Before any sampling begins on a particular day, the following data should be recorded:

- Wind direction and velocity once every hour using a RainWise® Inc. System 10 Remote Weather Station™
- Discharge flow rate from Outfall 001 every 2 hours.
- Temperature and conductivity of discharge from the plant every 2 hours.

Starting at the western shore directly at the outfall location at the AMBAR facility, ASI will take depth and temperature readings at appropriate intervals in order to define the plume area and depths. The sampling scenario will proceed heading easterly directly across the lake until the outer section of the plume is reached as defined by the reconnaissance. Additional samples as necessary (for odd shaped plumes or "fingers") will be taken beyond this point to insure the outer extent of the plume has been reached. This will serve to provide an approximation of the seasonal volumetric flow of water available for dilution and mixing of the Outfall 001 discharge. This will also set a background water temperature and concentration upstream of any impact by the AMBAR discharge. From there, proceeding perpendicular to the ambient lake flow pattern, ASI will take temperature and conductivity readings from within defined plume moving in the direction of flow outward from the discharge until a point is reached where the temperature and concentration is again at the background levels. This will be considered the "toe" of the thermal plume. In a similar manner, the width of the thermal plume will be determined by moving laterally from the direction of the plume discharge until the outward edges are found at the ambient temperature.

Working back inward from the "no influence" boundaries, readings will be taken at appropriate intervals throughout the "zone of influence" to obtain sufficient data for a proper contour map. The data will be charted on a table similar to that shown in Appendix A.

2.2 Establishing the Sampling Grid

ASI intends to initially establish a grid transect stretching across the plume in the Manistee Lake after the initial reconnaissance. This grid will be established using appropriate intervals in order to accurately map isotherms and isopleths. The isotherms established will be +20, +10, +5 and +2 degrees where practical. The isopleths (line of constant concentrations) established will be 50, 25, 15, 10 and +5 percent of effluents where practical. More than one sample may be required with in any single grid zone established in order to define the plume.

Exact point location will be determined with the use of a Magellan GPS ProMARK V™ system. This system will require the use of two units, one on shore and one on the lake, and will provide a location accuracy of ±3 meters and will be used to identify the plume location for the other seasonal mapping.

3.0 SAMPLING PARAMETERS

3.1 Temperature and Concentration vs. Depth

In order to determine the characteristics of the plume, it is critical to know how the temperature and concentration varies with depth and position on the lake.

A YSI 3000 Temperature-Level-Conductivity system will be used for data collection and is an integral temperature, level, and conductivity meter. Upon reaching a sampling point, a probe will be lowered to the bottom of the lake and the temperature and depth recorded. While slowly reeling the probe upwards, the temperature and depth will be recorded at approximately 5 foot intervals. Some discretion can be used to establish a smaller depth interval in shallower areas. At a maximum lake depth of 45 feet, this will give about 9 readings for one sample point.

AMBAR Chemical Thermal Plume/Mixing Zone Study

Transect Number 1, GPS Coordinate_____

Time	Distance from Shore (feet)	Water Depth (feet)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Percent Effluent (temperature)	Wind Direction	Wind Velocity

APPENDIX A

Sample Data Collection Table

ASI ENVIRONMENTAL TECHNOLOGIES

From: WALKERB2--DNRDC Date and time 02/05/97 12:16:55
To: MYERSB --DNRDC

To facility file
Amber Chem

From: walkerb2
Subject: amber plume study plan review
brian, have reviewed and collected comments on the permittee's december, 1996 study plan. the comments below need to be addressed to ensure that objectives of the permit condition are achieved.

1. generally, the plan seems to have a misplaced focus on defining lake characteristics rather than that of the plume itself. this may be due to some of the spec. condition boiler plate which talks about flow and volume determinations. that text is more focussed on riverine discharges. if the consultant feels that determination of lake "flow and direction" is needed to map the plume, they can do that. it may provide some useful info which will help interpret results.
   however, the main intent of the permit condition is to produce accurate maps of the effluent concentration and thermal plumes (which could be different) for the various seasons.

2. the effort on determining grids all the way across the lake and doing all the measurements at all the grids at all depths is overkill. the study should focus on putting the sampling stations where the plume is. back ground temps and conductivities are needed but 3-4 sites are adequate for that purpose.

3. establishing grids is probably not the best way to track the plume. use of transects with accurately defined sampling locations and intervals is what is needed. suggest that determine background conditions, do an initial race n survey to determine general plume location and extent, and then do the focussed transects to map discharge concentration and thermal plumes.
   shooting compass bearings is probably not the best way to locate stations, especially if stations are relatively close together.
   suggest gps or some system which defines transect direction and spacing.

4. plan really doesn't address the issue of concentration gradients (conductivi ty or constituent based). want to look at this in addition to the thermal aspects of the discharge.

5. suggest you forward comments #1-7 from my tenneco review comments as they may help provide additional perspective and so i don't have to write them again.

6. in addition to plotting temp isotherms mentioned in tenneco comments, amber should also plot effluent concentration isopleths. suggest 50, 25, 15, 10,

To: Amber fac. file

From: WALKERB2--DNRDC Date and time 05/28/97 14:09:38
To: NEUERJ --DNRDC

From: walkerb2
Subject: amber monitoring
janice,
permit for amber was issued 11/22/96. they have monitoring in one form or anot her for tds, tss, Cl-, tot. phos, Cd,Cu, Ni, Pb, Zn, Se, Li, Hg, Sr, CN-A. they can petition for reduction in monitoring after one year. As is not in the the monitoring list. no data here to indicate presence or absence in effluent or that its an issue at the facility. if you have reason to believe that it it would be useful to have As data, get with brian myers and present your case to him. if needed, would probably be best to try to get monitoring outside of permit if possible. if you have data, we should probably get a copy for the file along with any letter brian sends to amber. for a reference point, the controlling theoretical limit for the 001 effluent would be 700 ug/l as a daily max limit. unless they start getting up into the hundreds of ug/l, it would probably not be an issue for us. keep us posted! send me an appendix with data!

cc: MYERSB --DNRDC

and 5% effluents. they can determine concentration gradients however they want but they should be determined with a reliable method. dye use is not necessary probably.

In summary, effort should focus on accurately (reasonably) defining nature and extent of plume across the seasons. "winter" survey should account for safety. suggest redraft of plan be submitted due to number and scope of comments.

cc: SAALFELD--DNRDC
DELLO --DNRDC

SUPPHICJ--DNRDC

DON'T SAY IT—WRITE IT

RITE-O-GRAM

WRITE IT RIGHT!

TO: Bruce Walker / ~~Jerry Saalfeld~~
SWQD
Lansing
Walker/Suppnick
97/69

FROM: Brian Myers
SWQD
Cadillac

SUBJECT: AMBAR MZ/TP Study

OUR JOB NO.

DATE OF MEMO 1/2/97

MESSAGE

PLEASE REVIEW AND COMMENT

RECEIVED
SWQD-GLEAS
JAN 06 1997

SIGNED Brian

SENDER — DO NOT WRITE BELOW THIS LINE

REPLY

SIGNED

DATE

ORIGINAL

SENDER — Retain part 2 for your follow-up, send parts 1 and 3 to addressee
RECIPIENT — Retain part 1 and return part 3

ASI ENVIRONMENTAL TECHNOLOGIES

ENVIRONMENTAL MANAGEMENT ADVISORS

RECEIVED
JAN - 2 1997
SWQD - D-6
CADILLAC

December 30, 1996

Mr. Mike Stifler, District Supervisor
Michigan Department of Environmental Quality
Surface Water Quality Division
Cadillac District Office
120 W. Chapin Street
Cadillac, Michigan 49601

RE: Ambar Chemical, Inc., Manistee, MI NPDES Permit # MI0054992

Dear Mr. Stifler:

Enclosed please find one unbound copy of the Work Plan For Conducting Mixing Zone and Thermal Plume Studies for the above referenced site and NPDES permit. ASI Environmental Technologies (ASI) has allowed Ambar to comment on this document, and it is to their satisfaction.

Please contact me at (616) 845-0371 with any questions or comments you may have.

Sincerely,

ASI ENVIRONMENTAL TECHNOLOGIES

Kenneth R. St. John
Chemical Engineer

Enclosure

pc. Mr. Chris Hissong Ambar Chemical, Inc.

xc. M. Parling, PCS 1/2/97

CORPORATE HEADQUARTERS
1100 Conrad Industrial Drive
Ludington, Michigan 49431

Phone (616) 845-0371
Facsimile (616) 845-0426

DISTRICT OFFICE
P.O. Box 59274
Schaumburg, Illinois 60159-0274

Phone (708) 925-0511
Facsimile (708) 925-1619

ASI ENVIRONMENTAL TECHNOLOGIES

ENVIRONMENTAL MANAGEMENT ADVISORS

AMBAR CHEMICAL, INC.
1501 MAIN STREET
MANISTEE, MICHIGAN 49660

WORK PLAN FOR CONDUCTING MIXING ZONE AND THERMAL PLUME STUDIES FOR NPDES PERMIT NO. MI0054992

- Too much effort on "grid" & flow determination, i.e. [illegible]
- Focus on better determination of actual plume (i.e. more [illegible] of in plume area)
- Want accurate sample pt locations, not just w/in a grid
- GPS on triangulation for the location?
- [illegible] address eff [illegible] plume, more focused on just T°

DECEMBER 1996

ASI ENVIRONMENTAL TECHNOLOGIES

ENVIRONMENTAL MANAGEMENT ADVISORS

AMBAR CHEMICAL, INC.
1501 MAIN STREET
MANISTEE, MICHIGAN 49660

WORK PLAN FOR CONDUCTING MIXING ZONE AND THERMAL PLUME STUDIES FOR NPDES PERMIT NO. MI0054992

DECEMBER 1996

Prepared for:
Mr. Chris Hissong
Process Engineer
Ambar Chemical, Inc.
1501 Main Street
Manistee, Michigan 49660

Prepared by:
ASI Environmental Technologies
1100 Conrad Industrial Drive
Ludington, Michigan 49431

ASI ENVIRONMENTAL TECHNOLOGIES
ENVIRONMENTAL MANAGEMENT ADVISORS

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ASI ENVIRONMENTAL TECHNOLOGIES
ENVIRONMENTAL MANAGEMENT ADVISORS

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AMBAR CHEMICAL, INC.
1501 MAIN STREET
MANISTEE, MICHIGAN 49660

WORK PLAN FOR CONDUCTING MIXING ZONE AND THERMAL PLUME STUDIES FOR NPDES PERMIT NO. MI0054992

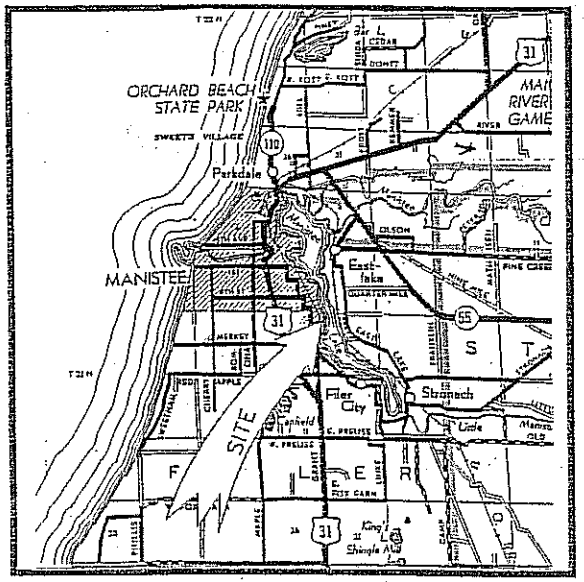
December 1996

1.0 INTRODUCTION

ASI Environmental Technologies (ASI) was contracted by Ambar Chemical, Inc. (Ambar) to prepare a Work Plan for conducting Mixing Zone and Thermal Plume Studies related to the NPDES discharge permit for their manufacturing operation located in Manistee, Manistee County, Michigan (Figure 1). The objective of this work plan is to set forth guidelines by which the studies will be conducted over the course of a one year time frame and to fully document all operational concerns associated with the proper completion of the job. ASI can proceed with the work as outlined in this work plan upon receiving concurrence from the Michigan Department of Environmental Quality (MDEQ), Cadillac District Office.

1.1 Site and Lake Information

The site of interest (facility), located in Manistee Township, just east of the downtown area of Manistee, is a recently acquired facility involved in manufacturing both liquid and dry calcium chloride products. Ambar utilizes a waste stream from another local manufacturer as its primary feed stock. The facility's property is bounded on the east by the shore of Manistee Lake, on the west by Main Street and to the north and south by fences. The plant was acquired by Ambar from the Akzo Nobel Salt Company, formerly known as the Hardy Salt Company.



AMBAR CHEMICAL, INC.	
MANISTEE, MICHIGAN	
PROJECT LOCATION MAP	
ASI	DATE: 12-26-96
	SCALE: NOT TO SCALE
	DRAWING: 96-0123
	FIGURE: 1

Manistee Lake is a long, narrow lake which runs for several miles from the southeast to the northwest. The Little Manistee River enters the lake on the southeast end at the town of Stronach. The lake then winds northward through an area containing approximately seven industrial plants. The north end of the lake widens to approximately three quarters of a mile, which is its widest point. At the north end of the lake, the Big Manistee River, separated into three channels, flows out of a large marsh area into the lake. The Manistee River channel then flows out of the northwest side of the lake, through the middle of the town of Manistee and into Lake Michigan.

The location of Outfall 001 from Ambar Chemical is at the most narrow point of the lake, which spans approximately 700 feet across (Figure 2).

1.2 Purpose and Scope of Work

The purpose of this work plan is to set forth guidelines by which the shape and characteristics of the mixing area of the discharge plume into Manistee Lake can be accurately determined. Simultaneously, the thermal characteristics of the plume will be determined and used to establish the dilutional capability of Manistee Lake on this waste water discharge.

The scope of work involves first determining the ambient currents and thermal clines in Manistee Lake when unaffected by the outfall plume, and then determining how those currents affect the mixing of the water discharge from the facility.

An accurate survey and a repeatable grid system while on the lake will serve to give precision and accuracy to the seasonal contour maps generated from the data. At that point, objective decisions can be made concerning proper management of the plume.

2.0 SAMPLING PROTOCOL

The critical portion of this work plan is to establish an accurate and repeatable method of finding a given sector within the grid while on the lake. Depth, flow velocity and direction, as well as temperature readings can be taken at these points. To be able to create maps that represent the seasonal mixing and thermal plume characteristics of the lake / outfall system, it is essential that data be taken from within the same grid sector each time.

2.1 Sampling Plan Summary

The proper day for sampling must be chosen carefully with certain considerations made to minimize sampling error and interference that could affect the data. These considerations are as follows:

1. Ambar Chemical, Inc. must be operating at full production or at a relatively steady rate.
2. The wind must be light or moderate with little or no wave action on Manistee Lake.
3. There must be little or no precipitation.
4. The recreational boating on Manistee Lake must be minimal (No holiday weekends).

Before any sampling begins on a particular day, the following data should be recorded:

- Wind direction and velocity [2X / day] (Call Manistee Blacker Airport @ (616) 723-8095)
- Discharge flow rate from Outfall 001 [Every 2 hours] (See Chris Hissong).
- Temperature of discharge from the plant [Every 2 hours] (See Chris Hissong).
- Any other unusual characteristics of the discharge concerning conductivity, pH, and dissolved oxygen concentration. [Every 2 hours] (See Chris Hissong).

Starting at the eastern shore directly across from the Ambar facility, ASI will take depth, velocity and temperature readings at approximately 50 foot intervals, heading westwardly directly across the lake, back towards the Ambar facility. This will serve to provide an approximation of the seasonal volumetric flow of water available for dilution and mixing of the Outfall 001 discharge. This will also set a background water temperature upstream of any impact by the Ambar discharge. From there, ASI will take temperature readings from within grid sectors moving in the direction of flow outward from the discharge until a point is reached where the temperature is again at the background temperature. This will be considered the "toe" of the thermal plume. In a similar manner, the width of the thermal plume will be determined by moving laterally from the direction of the plume discharge until the outward edges are found at the ambient temperature.

Working back inward from the "no influence" boundaries, readings will be taken at 50 foot intervals throughout the "zone of influence" to obtain sufficient data for a proper contour map. The data will be collected using a grid similar to that shown in Appendix A.

2.2 Establishing the Sampling Grid

ASI intends to initially establish a grid transect stretching across Manistee Lake to the eastern shore directly across from the plant. This grid will be established tentatively using 50 foot intervals. To cover the entire width of the lake, this grid would be approximately a 15 x 27 sector grid (Figure 3). Of course, the area of the grid that is actually used will be smaller than this, with the intervals being adjusted in the field if necessary for certain areas of the grid.

The initial effort to establish a grid will take place during the winter when the ice on Manistee Lake is at its maximum thickness. Surveying equipment will be used to establish transect lines and grid points from shore utilizing benchmarks on Ambar property. Temporary markers will be used to mark the transect points on the ice. An effort will be made to orient the grid in such a way that the transects run parallel with primary compass bearings, North, South, East and West.

2.3 Determination of Waypoints

Upon establishing the center point of a given grid sector on the ice, ASI will shoot precise compass bearings to at least three highly visible landmarks on shore. The local landmarks utilized may consist of a combination of the following:

- The City of Manistee water tower located just west of the facility.
- A radio mast located just southwest of the facility.
- A radio tower located on the east side of the lake, slightly to the south of the plant.
- The stack from the Morton Salt Company.
- Colored posts established on Ambar property.

Using a triangulation approach will exclusively define each grid sector and will facilitate finding a given sampling area on the grid repeatedly throughout the year.

A table will be utilized to record waypoint data and to relocate points on the grid once actual seasonal sampling begins. Once established, the chart will be laminated so that it can be quickly referred to while in the boat without sustaining any damage.

2.4 Re-Visiting Sampling Locations

When returning in the spring to conduct the first seasonal sampling event, a john boat will be used as the sampling vehicle for the job. A small trolling motor will be used in conjunction with oars to move the boat between sampling locations. A heavy anchor with at least 50 feet of anchor line will be used, since the maximum lake depth is approximately 45 feet.

To find a specific sampling area, the boat operator will move the boat until the navigator on board is satisfied that the compass bearings closely match those recorded for the desired grid point. The anchor will then be dropped and the reference compass bearings shot again. If a small change in position is necessary, the anchor can be lifted slightly from the bottom and the boat position adjusted accordingly.

Following the collection of data from a given grid sector, a small temporary buoy marker can be dropped to mark the sampled point, providing another point of reference from which a neighboring grid sector can be distinguished.

3.0 SAMPLING PARAMETERS

3.1 Temperature vs. Depth

In order to determine the thermal characteristics of Manistee Lake, both the areas those thermally altered by the discharge plume, it is critical to know how the temperature varies with depth.

The instrument which will be used for data collection is an integral temperature, level, and conductivity meter. Upon reaching a sampling point, a probe will be lowered to the bottom of the lake and the temperature and depth recorded. While slowly reeling the probe upwards, the temperature and depth will be recorded at approximately 5 foot intervals. Some discretion can be used to establish a smaller depth interval in shallower areas. At a maximum lake depth of 45 feet, this will give about 9 readings for one sample point. If desired, conductivity readings can be recorded as well if it is observed that there is sufficient variation of this parameter with depth.

In areas of extremely shallow water, the depth reading may not be very accurate. A yardstick or other implement can be used in these situations to measure the depth of the water.

3.2 Water Velocity vs. Depth

In order to integrate the volumetric flow at a cross section in Manistee Lake, sufficient data must be obtained relating to the velocity of flow with depth. As described in the sampling plan summary in section 2.1, ASI will sample straight across a transect from the eastern shore to the western shore of Manistee Lake at its narrowest point. At each point, the velocity will be recorded at each 5 foot depth interval, again working upwards from bottom to top.

The instrument employed will be a turbine type flow meter. The meter will be attached to a non-twisting cord so that the orientation of the meter can be adjusted while below the surface of the water. With the meter lowered to the bottom, the depth will be recorded and the meter oriented until the flow reading is maximized. This will be assumed to be the "normal" direction of flow. The normal flow reading will be recorded for each 5 foot depth interval unless a large change at an in between depth appears.

3.3 Flow Direction and Vector Analysis

While conducting the flow velocity with depth analysis, the meter will be oriented in a direction which will maximize the flow reading. The direction of orientation of the flow meter at this point should be defined by a compass bearing reading. This direction should be recorded at each depth interval, for flow direction vectors may vary significantly with depth. This will allow for detection of flow eddies in the final analysis and mapping effort.

APPENDIX A

Sample Data Collection Grid

ASI ENVIRONMENTAL TECHNOLOGIES
ENVIRONMENTAL MANAGEMENT ADVISORS

From LKERB2--DNRDC
To: L JKSOD--DNRDC

To File

Date and time 09/ /96 10:00:11

From: walkerb2
Subject: ambar
doug, we believe that it is appropriate to include a chloride monitoring rqmt for the permit given that this is a new facility and the potential concern over chlorides for manistee lake. suggest they do composite analysis weekly and allow for reduction in frequency after one year. this should provide data to help characterize this new effluent from a brine processing facility.

cc: SAALFELG--DNRDC MYERSB --DNRDC

From LKERB2--DNRDC
To: E...JKSOD--DNRDC

File

Date and time 10/1 /96 15:58:27

From: walkerb2
Subject: AMBAR draft permit MI0054992(u)
doug, reviewed the 10/11/96 pub notice permit just a few comments.

permit does not reference sampling 001 if have the ash handling overflow to 001 as we discussed. does the permittee understand that permit does not allow this "side" connection to 001?

I.A.3. 2nd sentence. specifies completion date for tox tests which is good. just wondering if need to clarify that want typical effluents tested. issue is if start up difficulties prevent the 4 sets of tests. what happens? could add clause at end of 2nd sentence ..."unless plant start up difficulties delay the testing of typical effluents" or something like that. if you think plant is going to be ok this isn't an issue.

I.A.3.a. & b.
permit says "If tox reqmts of R 57 "AND" R 82 are not being met/close to being exceeded...". wondering if those 2 para's should have the AND replaced with the word "OR" so we don't get into some legal bind. may need to change this in standard language templates for limits, monitoring and TI/RE too as appropriate

cc: SAALFELG--DNRDC DIMONDW --DNRDC

MICHIGA! EPARTMENT OF ENVIRONMENTAL QI ITY

INTEROFFICE COMMUNICATION

May 18, 1998

TO: Michael Stifler, Supervisor, Cadillac District Office
Surface Water Quality Division

FROM: Bruce R. Walker, Great Lakes and Environmental Assessment Section
Surface Water Quality Division

SUBJECT: AMBAR Chemical
Monitoring Data Review
NPDES Permit MI0054992

We have reviewed the December 29, 1997 data submittal from AMBAR. Part I.A.1.f. of the permit allows the permittee to request a reduction in monitoring frequency, to no less than an annual basis, after collecting one year of monitoring data. Monitoring of permit specified analytes has been conducted on a twice per month basis. The permittee has requested reducing the monitoring frequency to twice per year for amenable cyanide, total mercury, and oil and grease and to monthly for all other parameters. Based on our review of the permit, the data submitted, and site specific information from our facility file, we have derived the recommendations listed below.

RECOMMENDATIONS

1. Reduce the monitoring frequency to once per year for amenable cyanide, oil and grease, and total nickel, lead, and selenium. Reduce the monitoring frequency for total mercury to twice per year. The basis for these changes is that these analytes were not detected or were present in low concentrations.

2. Reduce the monitoring frequency to once per month for total phosphorus, total zinc, and total lithium. The basis for these changes is that these analytes were not present at concentrations requiring limitations but were somewhat elevated relative to theoretical limits.

3. Retain the twice per month monitoring for total cadmium, total copper, and total strontium. The monitoring frequency for these metals should not be reduced, as they were much higher, relative to theoretical daily maximum limits, than the other metals monitored.

4. The current collection and analytical method requirements should be retained.

We would like to note that there were apparently a few errors in this submittal and on the daily DMRs. Some data were incorrectly copied from the analytical lab sheets (wrong values or decimal place error) or the maximum values shown were incorrect. The errors both understated and overstated constituent concentrations. The permittee would benefit from an accurate summary of monitoring data.

EQ 0101a
(1/98)

From: John Suppnick
To: WALKERBR
Date: Mon, May 18, 1998 10:43 am
Subject: Ambar Monitoring Data

Brian informed me today that the flow from Ambar was less than 1 MGD when their chloride concentration was high during March and April of 1997. Therefore their load was actually near normal. Therefore, I have no concerns with the data from the standpoint of chlorides and TDS.

CC: DEQ-NLP.DEQ-Cadillac.MYERSBF

RECEIVED
SWQD - GLEAS

JAN 21 1998

From: Bruce Walker
To: DEQ-NLP,DEQ-Cadillac,MYERSBF
Date: Wed, Jan 14, 1998 8:38 am
Subject: Ambar monitoring data review - MI0054992

brian, just got ambar's 12/29/97 request to reduce monitoring frequency for some parameters. To conduct our review under the GLI rules, we need the actual data generated in addition to the general summary table provided by the permittee.

Please have ambar submit the individual sample values for:
Tot. phos; Cd, Cu, Zn, Se, Li, and Sr. I'll get back to you after we review the individual data points. thanks.

CC: DELLD, LAMA

To: Bruce Walker
SWQD
GLEAS
Lansing

From: Brian Myers

As requested

DON'T SAY IT—WRITE IT. **RITE-O-GRAM** WRITE IT RIGHT!

TO: Jerry Sahlfeld
SWQD
Lansing

~~Mike~~ Walker 98/76

FROM: Brian Myers
SWQD
Cadillac

SUBJECT: Ambar Chem - Manistee

OUR JOB NO.

DATE OF MEMO 1/5/98

MESSAGE

Please review and comment

Thanks

SIGNED Brian Myers

SENDER – DO NOT WRITE BELOW THIS LINE

REPLY

RECEIVED
SWQD-GLEAS
JAN 13 1998

AMBAR
CHEMICAL, INC.
1501 Main Street
Manistee, Michigan 49660
(616) 723-6266 -* FAX (616) 723-8840

JAN -2 1998

December 29, 1997

Mr. Mike Stifler, District Supervisor
Cadillac District Office, SWQD, DEQ
120 West Chapin Street
Cadillac, MI 49601

Dear Mr. Stifler:

This letter is in regards to the National Pollutant Discharge Elimination System (NPDES) Permit held by AMBAR Chemical, permit number MI0054992.

Per Section A.1.f, Monitoring Frequency Reduction for Chlorides, Total Phosphorus, Metals, and Oil and Grease, AMBAR Chemical is requesting a reduction in the monitoring frequency of the parameters listed below. Table 1 is a list of each parameter, including the average, high, and low of each parameter concentration.

	Minimum	Average	Maximum
Amenable Cyanide	ND	ND	ND
Chlorides	33	492	~~2100~~ 5,500
Total Phosphorus	0.012	0.111	0.6
Total Cadmium	ND	1.279	24
Total Copper	ND	8.16	~~34~~ 40
Total Nickel	ND	5.24	5.8
Total Lead	ND	2.54	5
Total Zinc	ND	25	150
Total Selenium	ND	4.04	5
Total Lithium	9	59.1	180
Total Mercury	ND	ND	ND
Total Strontium	200	1,492.9	~~11,000~~ 13,200
Oil and Grease	ND	ND	ND

The above data was gathered over a one year period, December 1996 through December 1997.

AMBAR Chemical is requesting that the parameters, all of which are on a bi-monthly testing frequency, be reduced to the following:

1. All items which were non-detectable throughout the entire year, Amenable Cyanide, Total Mercury, and Oil and Grease, be reduced to a bi-annual frequency.

2. All other items be reduced to a monthly frequency.

If you have any questions regarding this letter or the enclosed data, please contact me at 616-723-6266. I look forward to your response.

Best Regards,

Christopher L. Hissong
Process Engineer

cc: Brian Myers, SWQD, MDEQ
Rick Lovas, AMBAR Chemical
Rick Billings, AMBAR, Inc.
Tony Caridi, AMBAR, Inc.
Joseph Quandt, Smith & Johnson

From: Bruce Walker
To: DEQ-NLP,DEQ-Cadillac,MYERS8F
Date: Wed, Jan 14, 1998 8:38 am
Subject: Ambar monitoring data review - MI0054992

brian, just got ambar's 12/29/97 request to reduce monitoring frequency for some parameters. To conduct our review under the GLI rules, we need the actual data generated in addition to the general summary table provided by the permittee.

Please have ambar submit the individual sample values for:
Tot. phos; Cd, Cu, Zn, Se, Li, and Sr. I'll get back to you after we review the individual data points. thanks.

CC: DELLD, LAMA

AMBAR CHEMICAL, INCORPORATED

1501 MAIN STREET

MANISTEE, MANISTEE COUNTY, MICHIGAN

MIXING ZONE AND THERMAL PLUME STUDY, MANISTEE LAKE

For

NPDES PERMIT NO. MI0054992

September 1999

Prepared for:
Mr. Jacob Bialik
Laboratory Manager
AMBAR Chemical, Incorporated
1501 Main Street
Manistee, Michigan 49660

Prepared by:
ASI Environmental Technologies
239 North Jebavy Drive
Ludington, Michigan 49431

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AMBAR CHEMICAL, INCORPORATED
1501 MAIN STREET
MANISTEE, MANISTEE COUNTY, MICHIGAN

MIXING ZONE AND THERMAL PLUME STUDY, MANISTEE LAKE

For

NPDES PERMIT NO. MI0054992

September 1999

1. INTRODUCTION

ASI Environmental Technologies (ASI) has preformed this Mixing Zone and Thermal Plume Study (MZTPS) related to the NPDES discharge permit for the AMBAR Chemical manufacturing operation located in Manistee, Manistee County, Michigan (Appendix A, Drawing 1). The MZTPS was conducted in accordance with NPDES permit requirements, the approved work plan, and the June 15, 1999 MDEQ correspondence. The objective of this study was to delineate the mixing zone and thermal plume as a result of the outfall discharge over the course of a one-year time frame.

1.1. Site Information

The site is located in Manistee, Manistee County, Michigan (Appendix A, Drawing 1). AMBAR is involved in the manufacturing of both liquid and dry calcium chloride, and elemental bromine products and utilizes a waste stream from another local manufacturer as its primary feedstock. The facility is bounded on the east by the shore of Manistee Lake, on the west by Main Street and to the north and south by fences. The plant was acquired by AMBAR from the Akzo Nobel Salt Company, formerly known as the Hardy Salt Company.

AMBAR utilizes a single outfall to discharge waters to Manistee Lake. Outfall 001 is authorized by NPDES permit number MI0054992 to discharge 14.5 MGD of barometric condenser cooling water, non-contact cooling water, condensates, softener backwash, and other miscellaneous waters to Manistee Lake. The location of Outfall 001 is at one of the narrow most portions of the lake, which spans approximately 850 feet across (Appendix A, Drawing 2).

1.2. Lake Information

Manistee Lake is a long, narrow lake that runs for several miles from the southeast to the northwest. The Little Manistee River enters the lake on the southeast end at the town of Stronach. The lake then winds northward through an area containing approximately seven industrial plants. The north end of the lake widens to approximately three quarters of a mile, which is its widest point. At the north end of the lake, the Big Manistee River, separated into three channels, flows out of a large marsh area into the lake. The Manistee River channel then flows out of the northwest side of the lake, through the middle of the town of Manistee and into Lake Michigan.

1.3. Purpose and Scope of Work

The purpose of this MZTPS was to determine and define the shape and characteristics of the mixing area of the discharge plume into Manistee Lake. Simultaneously, the thermal characteristics of the plume were to be determined and used to produce maps of the effluent concentration and thermal plumes for various seasons.

2. METHODOLOGY

A critical portion of the MZTPS was to establish an accurate and repeatable method of establishing the plume definition and defining isotherms and isopleths while on the lake.

2.1. Initial Reconnaissance

In order to identify the general direction and location of the discharge plume an initial reconnaissance of the plume was conducted. Based on wind direction and visible turbulent eddies the general direction and location of the discharge plume was identified, and then the sampling effort was concentrated within these confines to determine isotherms and isopleths (lines of constant concentrations).

2.2. Sampling Methodology

The timing of each sampling event was chosen carefully with certain considerations made to minimize interference that could affect the quality of the data. The factors taken into account include:

- AMBAR Chemical, Inc. must be operating at full production or at a relatively steady rate.
- The wind must be light or moderate with little or no wave action on Manistee Lake.
- There must be no little or no precipitation.
- The recreational boating on Manistee Lake must be minimal (i.e. Sampling was not conducted on holiday weekends).

Before sampling was begun on a particular day, the following data was recorded:

- Wind direction and velocity once every hour using a RainWise® Inc. System 10 Remote Weather Station™
- Daily effluent flow rate from Outfall 001.
- Average temperature and conductivity of discharge from Outfall 001.

Starting at the outfall location at the AMBAR facility, ASI measured depth and temperature at appropriate intervals to define the plume area and depths. The sampling scenario proceed within the area identified in the initial reconnaissance heading outward in all directions to define the aerial extent of the discharge plume. Additional sampling locations were included as necessary for odd shaped plumes or "fingers".

In order to be able to relate the strength the outfall 001 effluent to the conductivity values observed in the plume, a correlation factor was established between existing Total Dissolved Solids (TDS) analytical data and conductivity values expressed in µmhos. The existing Total Dissolved Solids (TDS) analytical data was generated during NPDES permit compliance sampling. Samples were collected and analyzed for both TDS and conductivity. The data was used to develop a effluent specific TDS to Conductivity conversion factor. For outfall 001 the effluent the TDS to Conductivity conversion factor is 1.54. Appendix C contains calculations and data used to develop the conversion factor.

To document that AMBAR was operating at a steady state during each sampling event, daily flow, temperature, and conductivity data is presented in Appendix B, Table 5. The data was compiled from the Daily Discharge Monitoring forms. The Daily Discharge Monitoring forms are included in Appendix D.

Background water temperature and conductivity samples were collected to serve as a reference for naturally occurring waters outside the limits of the AMBAR discharge mixing zone. Several background samples were collected and averaged for each sampling event to obtain numbers representative of background conditions. The background levels were used to identify the areas that were outside of the mixing zone. Discharge plume sampling was conducted until the temperature and concentration reached background levels.

Conductivity and temperature measurements were made with an *YSI 3000* Temperature-Level-Conductivity probe. The probe was calibrated at the beginning of each sampling event against a standard conductivity reference solution and a calibrated thermometer to ensure sampling accuracy. To establish a repeatable and accurate sampling coordinate system, a Magellan

Global Positioning System (GPS) ProMARK V™ unit was utilized. The unit has an accuracy of ±3 meters.

At each sampling point, after recording the GPS reading, the YSI probe was lowered to the bottom of the lake and the temperature and depth were recorded. While slowly reeling the probe upwards, the temperature and depth were recorded at approximately 5-foot intervals. Discretion was used to establish smaller depth intervals in shallower areas or areas with rapid changes in temperature or concentration.

3. RESULTS

ASI measured temperature and conductivity of the discharge plume from Outfall 001 of AMBAR Chemical's Manistee operation. The measurements were collected four times throughout a one-year span and serve to document the condition and size of the plume during each of the four seasons.

3.1. Winter Results

3.1.1. Temperature

The temperature characteristics of the discharge plume from Outfall 001 were measured during the winter on November 6, 1997. The mean temperature of Outfall 001 effluent is 62.93 °F. The mean background temperature of Manistee Lake is 47.84 °F, calculated from three background points (sample numbers: 19, 26, and 34). The background points are identified in Appendix A, Drawing 3. During the winter months the discharge from Outfall 001 is warmer than the background lake temperature. The temperature of the discharge plume relative to the lake temperature would cause the plume to be buoyant. Using the location data from the GPS system and the information from the calibrated thermometer, isotherms of +10, +5, and +2 degrees F were developed representing the plume condition. Appendix A, Drawing 3 represents the thermal plume developed from the sampling data. The data used to develop the isotherm is presented in Appendix B, Table 1.

3.1.2. Conductivity

The conductivity of the discharge plume from Outfall 001 was measured during the winter on November 6, 1997. The conductivity of Outfall 001 effluent was calculated based on data from the NPDES Daily Discharge Monitoring Reports and the conversion factor detailed in Appendix C. The mean conductivity of Outfall 001 effluent is 0.561 mmhos/cm. The mean background conductivity of Manistee Lake is 0.300 mmhos/cm calculated from three background points (sample numbers: 19, 26, and 34). The background points are identified in Appendix A, Drawing 4. The background conductivity is equal to 53% of Outfall 001

effluent strength. The mixing zone required to dilute the plume to the background conductivity covers approximately 3.7 acres of the lake, and is represented by the 53% isopleth. Using the location data from the GPS system and the information from the calibrated conductivity probe, concentration isopleth representing 50% of the effluent strength were developed. Appendix A, Drawing 4 represents the isopleths developed from the sampling data. The data used to develop the isopleths is presented in Appendix B, Table 1.

3.2. Spring Results

3.2.1. Temperature

The temperature characteristics of the discharge plume from Outfall 001 were measured during the spring on March 30, 1998. The temperature of the effluent from Outfall 001 was calculated based on field data recorded during the study. The mean temperature of Outfall 001 effluent is 56.07 °F. The mean background temperature of Manistee Lake is 46.4 °F calculated from three background points (sample numbers: 6, 12, and 14). The background points are identified in Appendix A, Drawing 5. The During the spring months the discharge from Outfall 001 is warmer than the background lake temperature. The temperature of the discharge plume relative to the lake temperature would cause the plume to be buoyant. Using the location data from the GPS system and the information from the calibrated thermometer, isotherms of +8, +6, and +2 degrees F were developed representing the plume condition. Appendix A, Drawing 5 represents the thermal plume developed from the sampling data. The data used to develop the isotherm is presented in Appendix B, Table 2.

3.2.2. Conductivity

The conductivity of the discharge plume from Outfall 001 was measured during the spring on March 30, 1998. The conductivity of Outfall 001 effluent was calculated based on data from the NPDES Daily Discharge Monitoring Reports and the conversion factor detailed in Appendix C. The mean conductivity of Outfall 001 effluent is 0.413 mmhos/cm. The mean background conductivity of Manistee Lake is 0.241 mmhos/cm calculated from three background points (sample numbers: 6, 12, and 14). The background points are shown on Appendix A, Drawing 6. The mixing zone required to dilute the plume to background

conductivity covers approximately 0.95 acres of the lake, and would be represented by the 58% isopleth. Using the location data from the GPS system and the information from the calibrated conductivity probe, concentration isopleths representing 60%, and 70% of the effluent strength were developed. Appendix A, Drawing 6 represents the conductivity plume developed from the sampling data. The data used to develop the isopleths is presented in Appendix B, Table 2.

3.3. Summer Results

3.3.1. Temperature

The temperature characteristics of the discharge plume from Outfall 001 were measured during the summer on May 29, 1998. The mean temperature of Outfall 001 effluent is 67.10 °F. The mean background temperature of Manistee Lake is 68.18 °F, calculated from six background points (sample numbers: 12, 13, 24, 25, 26, and 27). The background points are identified in Appendix A, Drawing 7. The During the summer months the discharge from Outfall 001 is slightly cooler than the background lake temperature. The temperature of the discharge plume relative to the lake temperature would cause the plume to sink to an approximate depth of three to five feet. The plume would affect the lake bottom in areas where the depth is less than five feet. Using the location data from the GPS system, and the information from the calibrated thermometer, isotherms of -1, and -2 degrees F were developed representing the plume condition. Appendix A, Drawing 7 represents the thermal plume developed from the sampling data. The data used to develop the isotherm is presented in Appendix B, Table 3.

3.3.2. Conductivity

The conductivity of the discharge plume from Outfall 001 was measured during the summer on May 29, 1998. The conductivity of Outfall 001 effluent was calculated based on data from the NPDES Daily Discharge Monitoring Reports and the conversion factor detailed in Appendix C. The mean conductivity of Outfall 001 effluent is 0.444 mmhos/cm. The mean background conductivity of Manistee Lake is 0.314 mmhos/cm calculated from six background points (sample numbers: 12, 13, 24, 25, 26, and 27). The background points are shown on

Appendix A, Drawing 8: The mixing zone required to dilute the effluent strength to background concentrations covers 1.18 acres of the lake, and is represented by the 70% isopleth contour. Using the location data from the GPS system and the information from the calibrated conductivity probe, concentration isopleths representing 80% and 70% of the effluent strength were developed. Appendix A, Drawing 8 represents the conductivity plume developed from the sampling data. The data used to develop the isopleths is presented in Appendix B, Table 3.

3.4. Fall Results

3.4.1. Temperature

The temperature characteristics of the discharge plume from Outfall 001 were measured during the fall on August 26, 1998. The mean temperature of Outfall 001 effluent is 80.30 °F. The mean background temperature of Manistee Lake is 74.4 °F calculated from three background points (sample numbers: 9, 10, and 11). The background points are identified in Appendix A, Drawing 9. The During the spring months the discharge from Outfall 001 is warmer than the background lake temperature. The temperature of the discharge plume relative to the lake temperature would cause the plume to be buoyant. Using the location data from the GPS system and the information from the calibrated thermometer, isotherms of +8, +6, and +2 degrees F were developed representing the plume condition. Appendix A, Drawing 9 represents the thermal plume developed from the sampling data. The data used to develop the isotherm is presented in Appendix B, Table 4.

3.4.2. Conductivity

The conductivity of the discharge plume from Outfall 001 was measured during the fall on August 26, 1998. The conductivity of Outfall 001 effluent was calculated based on data from the NPDES Daily Discharge Monitoring Reports and the conversion factor detailed in Appendix C. The mean conductivity of Outfall 001 effluent is 0.696 mmhos/cm. The mean background conductivity of Manistee Lake is 0.388 mmhos/cm calculated from three background points (sample numbers: 9, 10, and 11). The background points are identified in Appendix A, Drawing 10. The mixing zone required to dilute the plume to background

concentration covers 2.41 acres of the lake, and is represented by the 58% isopleth. Using the location data from the GPS system and the information from the calibrated conductivity probe, concentration isopleths representing 60%, 70%, 80%, and 90% of the effluent strength were developed. Appendix A, Drawing 10 represents the conductivity plume developed from the sampling data. The data used to develop the isopleths is presented in Appendix B, Table 4.

3.5. Michigan Surface Water Quality Standards

Public Act 451, Part 4 establishes water quality standards applicable to all waters of the State of Michigan. Manistee Lake is considered an inland lake. This study focused on the conductivity mixing zone and thermal plume characteristics of the discharge from Outfall 001. The conductivity of the water can be directly related to the concentration of dissolved solids in the effluent. The background conductivity ranged from 53 to 70% of Outfall 001 effluent strength. The mixing zone required to dilute the effluent from Outfall 001 to background concentration ranged from 0.95 to 3.7 acres in size during the various seasons.

The temperature of the discharge plume was higher than the background temperature of Manistee Lake during three of the four seasons resulting in a buoyant plume. However, during the summer sampling event the plume was slightly cooler than background lake temperature resulting in a sinking plume. The plume was approximately 1°F below the background temperature causing it to sink, to a depth of 3 to 5 feet, where the plume and the background temperatures equalized.

The Part 31, Section 323.1072 temperature standards for inland lakes are listed below:

- The temperature shall not be increased at the edge of the mixing zone more than 3 °F above natural water temperature.

Manistee Lake listed as CW lake. Then regard interpret as inland WW lake

- Increase the temperature at the edge of the mixing zone to temperatures greater than the listed maximum monthly temperatures.

March = 50 °F May = 70°F August = 85°F November = 60°F

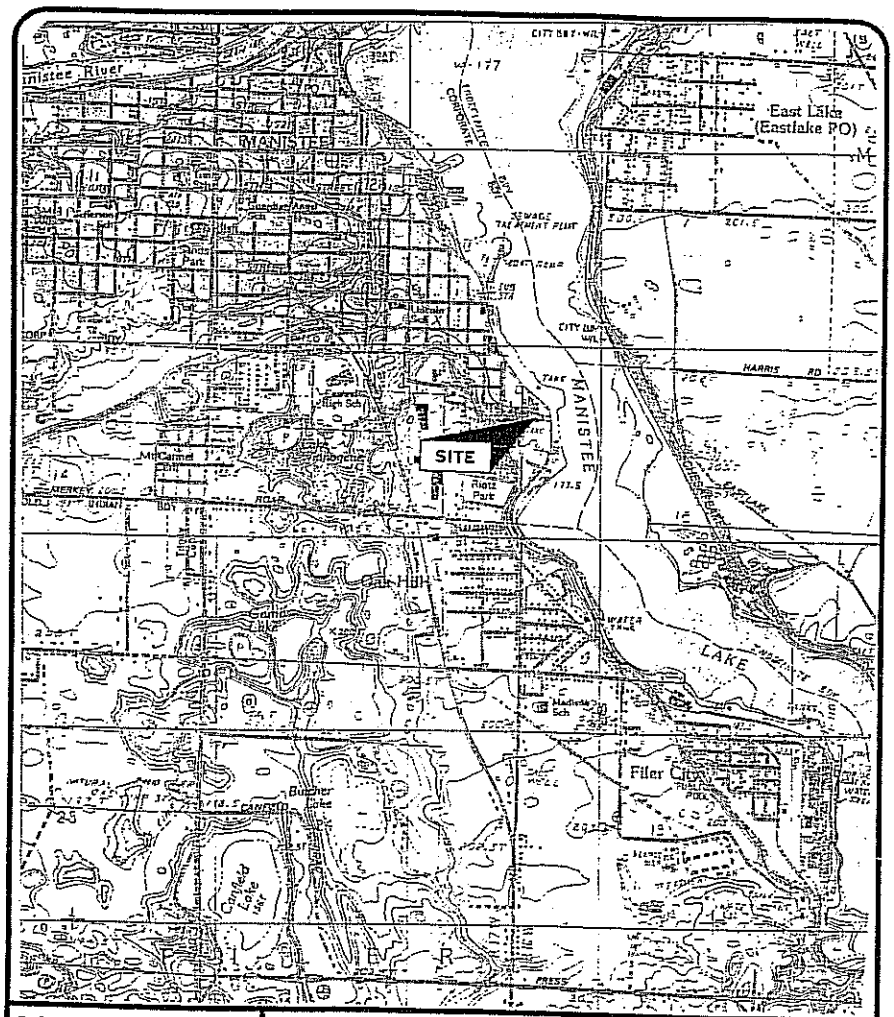
The effluent from Outfall 001 does not cause a violation of these temperature standards.

4. Conclusions

ASI Environmental Technologies has completed a Mixing Zone and Thermal Plume Study (MZTPS) related to the NPDES discharge permit for the AMBAR Chemical manufacturing operation located in Manistee, Manistee County, Michigan.

- The mixing zone resulting from the discharge at Outfall 001 has been delineated and varies seasonally between 0.95 and 3.7 acres in size.
- The temperature does not exceed the monthly maximums listed in Part 31, Section 323.1072.
- The temperature at the edge of the mixing zone does not exceed 3 °F above natural water temperature.

APPENDIX A
DRAWINGS



Reference:
USGS 7.5 MIN QUAD
MANISTEE, MICHIGAN
1982 PROVISIONAL ED.

Scale: 1" = 2000'

N

ASI

239 N. JEBAVY DR., LUDINGTON MI, 49431
806 HASTINGS ST., TRAVERSE CITY 49686

DRAWING 1
SITE LOCATION MAP
AMBAR CHEMICAL, INC.
MIXING ZONE & THERMAL
PLUME STUDY

Date: 2-22-99 | PROJ. NO.:96-0129
Drawing No: SITE_LOC.DWG
Drawn By: MCB | CHK BY:

TABLES

Table 1 - November 1997 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES Permit No. MI0054992
February 1999

Date & Sample No.	Time	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
OUTFALL	9:45 AM	0.5	0.373	16.9	150	3
					South-Southeast	
1	9:52 AM	3	0.279	8.2		
		5	0.278	8.1		
2	10:05 AM	5	0.269	8.1		
		10	0.267	8.0		
		15	0.268	8.0		
		16	0.274	8.1		
3	10:10 AM	3	0.316	8.7		
4	10:12 AM	5	0.283	8.3		
5	10:14 AM	5	0.275	8.2		
		6.5	0.338	8.4		
6	10:16 AM	5	0.282	8.2		
		7	0.315	8.4		
7	10:19 AM	5	0.268	8.1		
		10	0.269	8.1		
		15	0.275	8.1		
8	10:24 AM	3.5	0.318	8.7		
		5	0.303	8.4		
9	10:28 AM	3	0.353	8.7		
10	10:31 AM	2.5	0.278	8.4		
		4	0.313	8.6		

Table 1 - November 1997 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES Permit No. MI0054992
February 1999

Date & Sample No.	Time	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
11	10:36 AM	5	0.273	8.3		
		6	0.279	8.2		
12	10:38 AM	5	0.271	8.3		
		6	0.300	8.2		
13	10:41 AM	2.5	0.328	12.6		
		3	0.309	9.9		
		3.5	0.279	8.6		
		5	0.274	8.4		
14	10:47 AM	1	0.342	13.0	158	8
		2	0.301	12.7	South-Southeast	
		2.25	0.277	9.6		
		2.5	0.272	8.3		
		3	0.274	8.6		
15	10:50 AM	1	0.317	11.5		
		1.5	0.283	10.7		
		2	0.293	8.8		
16	10:53 AM	1	0.295	10.3		
		1.25	0.293	9.8		
		2	0.291	9.5		
		3	0.274	9.1		
		5	0.270	8.2		
		10	0.269	8.1		
		15	0.268	8.1		
		20	0.274	8.3		
17	11:01 AM	1	0.272	8.3		
		5	0.272	8.3		
		10	0.273	8.3		
		15	0.263	8.0		

Table 1 - November 1997 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES Permit No. MI0054992
February 1999

Date & Sample No.	Time	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
18	11:07 AM	1	0.388	11.0		
		2	0.390	11.0		
		3	0.303	9.3		
		4	0.283	8.7		
		5	0.274	8.4		
		10	0.271	8.2		
		13	0.274	8.1		
19	11:12 AM	1	0.288	8.9		
		2	0.305	9.1		
		3	0.296	9.4		
		4	0.279	8.7		
		5	0.271	8.3		
		10	0.270	8.2		
		15	0.270	8.1		
		19	0.325	8.1		
20	11:15 AM	1	0.352	12.5		
		2	0.337	11.5		
		3	0.332	11.5		
		4	0.276	8.7		
		5	0.271	8.3		
		10	0.270	8.2		
		15	0.268	8.1		
		20	0.283	8.1		
21	11:21 AM	1	0.355	11.7		
		2	0.342	10.9		
		3	0.302	9.6		
		4	0.282	8.9		
		5	0.272	8.4		
		10	0.269	8.2		
		15	0.269	8.1		
		20	0.269	8.1		
		23	0.292	8.2		

Table 1 - November 1997 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES Permit No. MI0054992
February 1999

Date & Sample No.	Time	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
22	11:27 AM	1	0.310	9.6		
		2	0.303	9.6		
		3	0.294	9.4		
		4	0.290	9.0		
		5	0.272	8.5		
		10	0.272	8.2		
		15	0.268	8.1		
		20	0.268	8.1		
		25	0.302	8.1		
OUTFALL	11:42 AM	0.5	0.477	17.2	162	9
					South-Southeast	
OUTFALL	12:25 PM	0.5	0.530	16.0	155	7
					South-Southeast	
23	12:31 PM	1	0.373	11.9		
		2	0.349	11.1		
		3	0.320	9.9		
		4	0.283	8.7		
		5	0.277	8.5		
		10	0.272	8.3		
		15	0.271	8.2		
		17	0.290	8.2		
24	12:36 PM	1	0.375	11.3		
		2	0.318	11.0		
		3	0.283	9.2		
		4	0.277	8.6		
		5	0.275	8.5		
		10	0.270	8.2		
		15	0.268	8.1		
25	12:44 PM	1	0.269	7.9		
		2	0.269	8.1		
		5	0.270	8.1		

Table 1 - November 1997 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES Permit No. MI0054992
February 1999

Date & Sample No.	Time	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
		10	0.269	8.1		
		15	0.270	8.1		
26	12:48 PM	1	0.271	8.2		
		2	0.271	8.2		
		3	0.272	8.2		
		5	0.271	8.2		
		10	0.270	8.1		
		20	0.268	8.0		
		24	0.271	8.0		
27	12:52 PM	1	0.400	12.4		
		2	0.293	9.2		
		3	0.279	8.7		
		4	0.276	8.5		
		5	0.276	8.5		
		10	0.270	8.2		
		15	0.268	8.1		
		20	0.270	8.1		
		22	0.272	8.1		
28	12:58 PM	1	0.345	11.3		
		2	0.298	9.3		
		3	0.287	9.0		
		4	0.277	8.6		
		5	0.277	8.5		
		10	0.271	8.2		
		15	0.270	8.1		
		20	0.270	8.1		
		25	0.268	8.0		
		28	0.295	8.1		
29	1:03 PM	1	0.328	10.1		
		2	0.291	9.2		
		3	0.282	8.7		
		4	0.276	8.5		

Table 1 - November 1997 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES Permit No. MI0054992
February 1999

Date & Sample No.	Time	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
		5	0.274	8.4		
		10	0.270	8.1		
		15	0.270	8.1		
		20	0.270	8.1		
		25	0.268	8.1		
		27	0.270	8.1		
30	1:08 PM	1	0.305	9.6		
		2	0.280	8.7		
		3	0.277	8.5		
		4	0.274	8.4		
		5	0.271	8.2		
		10	0.271	8.2		
		15	0.270	8.1		
		20	0.269	8.1		
		25	0.268	8.0		
		28	0.282	8.1		
31	1:13 PM	1	0.352	11.0		
		2	0.287	10.1		
		3	0.286	9.0		
		4	0.282	8.7		
		5	0.276	8.4		
		10	0.274	8.3		
		15	0.272	8.1		
		20	0.271	8.1		
		25	0.271	8.1		
		30	0.270	8.1		
		33	0.282	8.1		
32	1:19 PM	1	0.414	10.9		
		2	0.325	10.0		
		3	0.292	8.3		
		4	0.277	8.4		
		5	0.268	8.3		
		10	0.286	8.3		

Table 1 - November 1997 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES Permit No. MI0054992
February 1999

Date & Sample No.	Time	Sample Depth (feet)	Conductivity (mmhos/com)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
		15	0.298	9.1		
		20	0.288	7.9		
		25	0.287	8.0		
		30	0.281	8.0		
33	1:28 PM	2	0.341	11.7	158	6
		3	0.357	15.7	South-Southeast	
34	1:55 PM	1	0.312	9.5		
		2	0.306	9.5		
		3	0.280	8.6		
		4	0.279	8.4		
		5	0.277	8.4		
		10	0.271	8.2		
		15	0.272	8.2		
		20	0.276	8.1		
		25	0.275	8.1		
		30	0.288	8.1		

Table 2 - March 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
February 1999

Date & Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
OUTFALL	11:14 AM	13.964	2	0.469	14.4	238	7
		18.124				West-Southwest	
1	11:42 AM	14.006	5	0.244	8.6		
		18.128	8.5	0.242	7.5		
2	11:45 AM	14.021	5	0.237	8.5		
		18.091	10	0.238	7.9		
			11	0.238	7.8		
3	11:53 AM	14.017	5	0.239	8.6		
		18.129	10	0.237	8.1		
4	11:53 AM	14.045	5	0.243	8.6		
		18.115	10	0.24	8		
			15	0.242	7.7		
			20	0.242	7.3		
			22.5	0.246	7.2		
5	11:55 AM	14.02	5	0.244	7.8	[illegible]	
		18.133	9.5	0.243	7.5		
6	11:59 AM	13.997	2	0.243	7.7		
		18.155	4.5	0.244	7.7		
7	12:01 PM	14.003	2.5	0.297	11.5		
		18.121					
8	12:03 PM	14.007	2.5	0.271	10	241	8
		18.099	5	0.268	9.6	West-Southwest	
	1:15 PM		2	0.319	13.2	235	6
	OUTFALL					West-Southwest	
9	1:17 PM	13.989	1	0.276	9.5		

Table 2 - March 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
February 1999

Date & Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/com)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
		18.141	2	0.26	9.4		
			5	0.254	9.5		
			5.75	0.242	8.3		
10	1:20 PM	14.021	1	0.254	8.7		
		18.133	2.5	0.25	8.5		
			5	0.25	8.7		
			7.75	0.239	8		
11	1:24 PM	14.009	2.5	0.251	8.7		
		18.096	5	0.248	8.5		
			10	0.242	8.1		
			15	0.241	7.7		
12	1:31 PM	14.1	2.5	0.245	8.7		
		18.109	5	0.238	8.3		
			10	0.24	7.9		
			15	0.241	7.7		
			20	0.241	7.7		
			25	0.242	7.5		
			30	0.243	7.3		
			35	0.245	7.2		
			40	0.347	7.2		
			45	0.445	7.2		
			50	0.44	7.1		
13	1:38 PM	14.052	2.5	0.242	8.6		
		18.107	5	0.239	8		
			10	0.241	7.8		
			15	0.241	7.7		
			20	0.241	7.5		
			25	0.249	7.4		
			30	0.258	7.4		
			35	0.251	7.4		
14	1:45 PM	14.024	2.5	0.239	8.2		

Table 2 - March 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
February 1999

Date & Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/com)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
		18.181	5	0.239	8		
			7.5	0.243	7.8		
15	1:49 AM	14.033	2.5	0.242	8.5		
		18.085	10	0.24	8		
			20	0.24	7.7		
			30				
			40	0.246	7.1		
16	1:55 PM	14.001	1	0.2674	9.2		
		18.124	2.5	0.264	9.5		
			5	0.247	8.4		
			10	0.244	7.8		
			12	0.245	7.6		
17	1:58 PM	14.001	1	0.242	8.4		
		18.129	2.5	0.243	8.1		
			5	0.243	7.7		
			6	0.243	7.7		
18	2:00 PM	14.002	1	0.254	8.7		
		18.12	2.5	0.244	8.4		
			5	0.244	7.7		
			6.75	0.243	7.6		
19	2:02 PM	14.004	1	0.269	9.6		
		18.125	2.5	0.266	9.5		
			5	0.255	8.7		
			5.5	0.252	8.6		
OUTFALL	2:10 PM	13.991	2	0.315	12.4	234	6
		10.171				West-Southwest	
20	2:55 PM	14.019	1	0.271	10		
		18.12	2	0.268	9.5		

Table 2 - March 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
February 1999

Date & Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
21	2:58 PM	14.023					
		18.129	1	0.265	9.8		
			2.5	0.265	9.4		
			3	0.264	9.2		
OUTFALL	3:10 AM		2	0.316	13.5	232	7
						West-Southwest	

Table 3 - May 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
February 1999

Date & Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
OUTFALL	9:28 AM	0555706	2	0.413	18.9	271	3
		4898000				West	
1	9:34 AM	5727	0.5	0.37	19.2		
		8024	1	0.325	19.4		
			2	0.324	19.5		
			2.5	0.319	19.6		
2	9:36 AM	5745	1	0.374	19.2		
		8019	2	0.374	19.3		
			4.5	0.37	19.3		
3	9:40 AM	5778	1	0.372	19.3		
		8025	2.5	0.372	19.4		
			5	0.371	19.3		
4	9:42 AM	5780	1	0.368	19.3		
		8013	2.5	0.369	19.3		
			5	0.366	19.3		
			6.5	0.366	19.3		
5	9:44 AM	5771	1	0.309	19.5		
		8060	2.5	0.307	19.5		
			5	0.311	19.4		
			10	0.308	19.5		
			15	0.312	19.5		
			20	0.315	19.4		
6	9:57 AM	5758	1	0.321	19.6		
		7998	2.5	0.325	19.6		
			3.5	0.331	19.5		
7	9:58 AM	5790	1	0.318	19.7		
		8021	2.5	0.315	19.7		
			4	0.315	19.7		

Table 3 - May 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
February 1999

Date & Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
8	10:00 AM	5785	1	0.311	19.6		
		8004	2.5	0.311	19.7		
			4	0.31	19.6		
9	10:04 AM	5797	1	0.311	19.8		
		8010	5	0.31	19.6		
			10	0.31	19.6		
			15	0.31	19.4		
			20	0.31	19		
			21	0.312	18.8		
10	10:19 AM	5689	0.5	0.314	19.8		
		8020	1	0.313	19.8		
			2.5	0.316	19.6		
11	10:22 AM	5714	0.5	0.386	19.3		
		7996	1	0.373	19.2		
			2.5	0.358	19.4		
12	10:28 AM	6042	0.5	0.313	19.9		
		8015	1	0.312	20		
			2.5	0.312	19.8		
13	10:30 AM	6028	1	0.311	19.7	275	4
		9769	2.5	0.311	19.8	West-Southwest	
			3.5	0.31	19.8		
14	10:33 AM	5703	0.5	0.316	19.7		
		8026	1	0.316	19.7		
			3.75	0.317	19.6		
15	10:36 AM	5668	1	0.31	19.5		
		8022	2.5	0.31	19.5		
			5	0.311	19.5		

Table 3 - May 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
February 1999

Date & Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
16	10:38 AM	5736	1	0.31	19.5		
		8072	2.5	0.31	19.6		
			5	0.309	19.6		
			10	0.313	19.5		
			11.5	0.316	19.5		
17	10:42 AM	5763	1	0.311	19.5		
		8014	2.5	0.317	19.6		
			5	0.327	19.5		
			10	0.324	19.5		
			12.75	0.336	19.5		
OUTFALL	12:05 PM		2	0.424	19.2	274	3
						West-Southwest	
18	12:25 PM	5703	1	0.318	20.1		
		8099	2.5	0.323	19.9		
			4.5	0.371	19.6		
19	12:27 PM	5755	1	0.312	19.9		
		8027	2.5	0.312	19.8		
			5	0.313	19.8		
			10	0.338	19.6		
			12	0.369	19.5		
20	12:32 PM	5785	1	0.313	19.9		
		8033	2.5	0.326	19.9		
			5	0.318	19.7		
			10	0.36	19.6		
21	12:35 PM	5778	1	0.312	20		
		8032	2.5	0.311	19.9		
			5	0.311	19.8		
			10	0.312	19.6		
			15	0.325	19.5		
			20	0.311	18.4		

Table 3 - May 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
February 1999

Date & Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
			24	0.318	17.8		
22	12:40 PM	5753	1	0.313	20		
		8084	2.5	0.313	19.9		
			5	0.312	19.8		
			10	0.314	19.6		
			15	0.332	19.4		
			20	0.313	18.3		
			21.25	0.311	18.1		
23	12:45 PM	5737	1	0.313	20.1		
		8044	2.5	0.313	20		
			5	0.312	19.8		
			10	0.311	19.7		
			15	0.314	19.6		
24	12:55 PM	5848	1	0.315	20.3		
		8099	5	0.313	20		
			10	0.312	19.9		
			15	0.312	19.6		
			20	0.319	19.2		
			25	0.303	18.2		
			30	0.312	17.3		
			35	0.332	16.1		
			40	0.346	14.8		
			42.25	0.353	14.5		
25	1:05 PM	5647	1	0.315	20.3		
		8180	2.5	0.312	20	280	3
			5	0.312	19.8	West-Southwest	
			10	0.311	19.6		
			15	0.311	19.5		
			20	0.314	19.3		
			25	0.318	18.1		
			30	0.313	17.3		
			35	0.336	16.1		

Table 3 - May 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
February 1999

Date & Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
26	1:10 PM	5775	1	0.315	20.3		
		8260	5	0.314	20		
			10	0.313	19.8		
			15	0.311	19.6		
			20	0.315	19		
			25	0.31	18		
			30	0.322	16.8		
			35	0.319	16		
			40	0.347	15		
			41	0.352	14.5		
27	1:20 PM	5900	1	0.315	20.1		
		8235	5	0.314	20		
			10	0.313	19.9		
			15	0.312	19.6		
			20	0.308	18.8		
			25	0.305	17.7		
			30	0.308	17.1		
			35	0.326	15.8		
			40	0.351	14.7		
	1:30 PM	5706	1	0.419	19.3		
	OUTFALL	8000					

Table 4 - August 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
February 1999

Date & Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
OUTFALL	8:55 AM	5706	1	0.54	28.1	238	5
		8000				West-Southwest	
1	9:00 AM	5701	0.5	0.545	28.1		
		8038	1	0.53	28		
			1.5	0.515	27.2		
2	9:03 AM	5725	0.5	0.492	26.7		
		8028	1	0.518	27		
			2	0.499	26.7		
			3	0.477	26		
			3.5	0.451	25.3		
3	9:06 AM	5735	0.5	0.473	26		
		8041	1	0.47	26.3		
			2	0.447	25.1		
			4.5	0.393	23.7		
4	9:11 AM	5754	1	0.476	26		
		8035	2	0.405	24.1		
			5	0.402	23.7		
			6.75	0.396	23.5		
5	9:18 AM	5737	1	0.429	24.3		
		8090	2	0.401	23.8		
			5	0.400	23.5		
			10	0.406	23.2		
			13.5	0.408	22.9		
6	9:22 AM	5696	1	0.419	24.3		
		8060	2	0.405	23.8		
			5	0.398	23.6		
			6.25	0.428	23.4		
7	9:29 AM	5809	1	0.407	23.7		
		8015	2	0.400	23.6		

Table 4 - August 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
February 1999

Date & Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
			5	0.390	23.5		
			6	0.390	23.5		
8	9:34 AM	5802	1	0.395	23.7		
		8030	5	0.387	23.5		
			10	0.379	23.3		
			15	0.383	23.1		
			20	0.37	22.3		
			25	0.369	21.6		
			30	0.388	21.3		
			35	0.408	21.1		
			38	0.565	21.0		
9	9:44 AM	6031	1	0.380	23.3		
		8069	2	0.380	23.4		
			56	0.380	23.3		
			10	0.380	23.3		
			15	0.380	23.2		
			17	0.381	23.1		
10	9:52 AM	5873	1	0.403	24.0	259	7
		8344	5	0.381	23.4	West-Southwest	
			10	0.382	23.3		
			15	0.334	23.3		
			20	0.367	22.6		
			25	0.369	21.9		
			30	0.385	21.3		
			34.5	0.434	21.0		
11	9:59 AM	5747	1	0.405	23.9		
		8212	5	0.382	23.5		
			10	0.377	23.3		
			15	0.376	23.0		
			20	0.365	22.4		
			25	0.367	21.8		
			30	0.376	21.4		
			35	0.400	21.1		

Table 4 - August 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
February 1999

Date & Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
			37	0.406	20.9		
OUTFALL	10:07 AM		0.5	0.673	28.3		
OUTFALL	12:15 AM		0.5	0.626	29.1	235	8
						West-Southwest	
12	12:22 PM	5695	0.5	0.625	29.0		
		8002	1	0.580	28.2		
13	12:25 PM	5759	0.5	0.606	28.5		
		8016	1	0.592	28.2		
			2.25	0.586	27.7		
14	12:30 PM	5705	1	0.560	27.8		
		8044	2	0.480	26.6		
			3	0.387	24.1		
15	12:33 PM	5719	1	0.545	27.2		
		8042	2	0.500	26.6		
			2.5	0.437	25.7		
			3	0.388	24.1		
			4.5	0.386	24.0		
16	12:38 PM	5742	1	0.530	27.2		
		8050	2	0.399	24.4		
			3	0.385	23.9		
			5	0.385	23.9		
			6.5	0.385	23.7		
17	12:43 PM	5725	1	0.465	26.1		
		8101	2	0.451	25.7		
			3	0.420	25.5		
			5	0.382	24.1		
			10	0.380	23.4		

Table 4 - August 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
February 1999

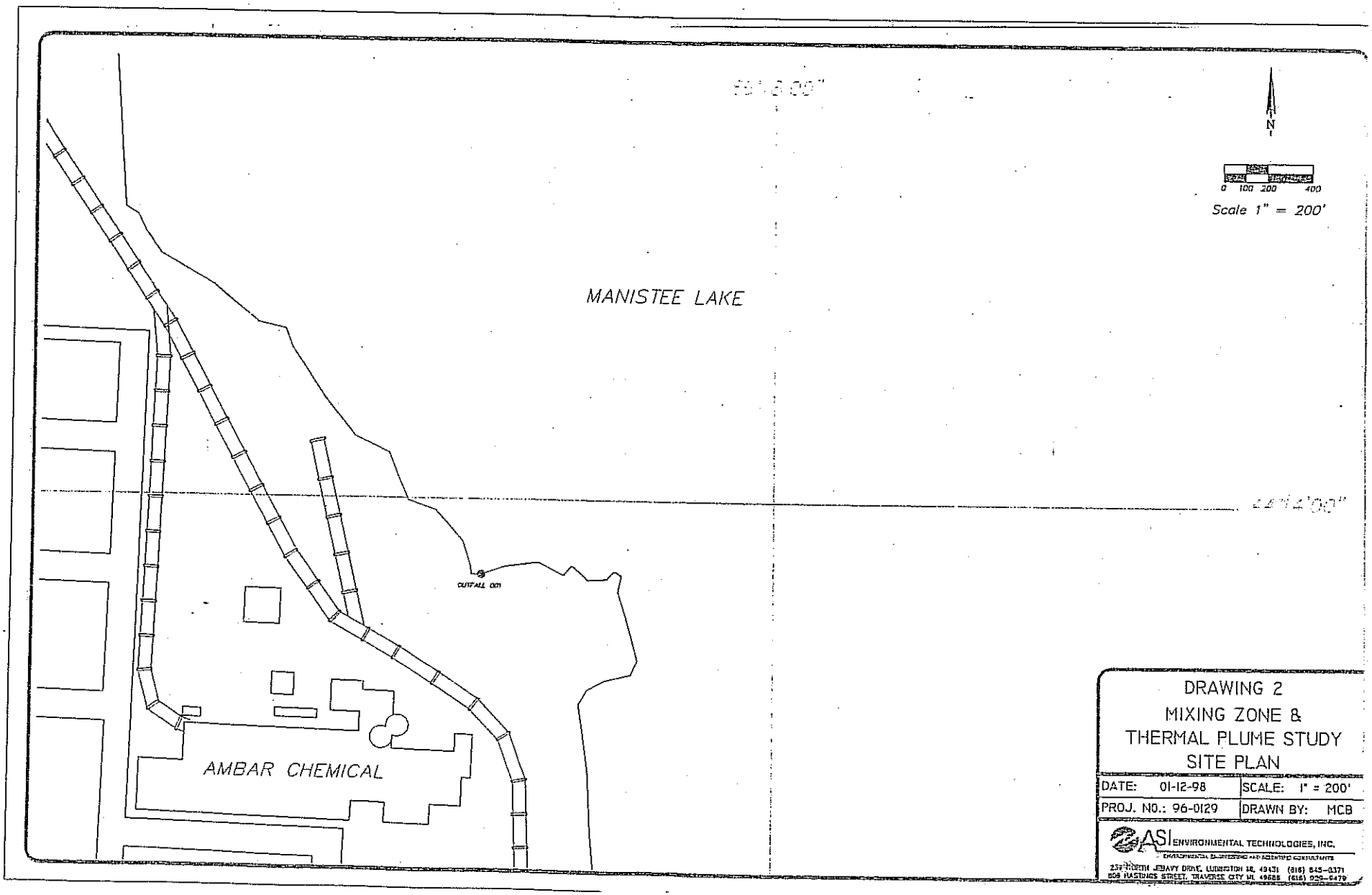
Date & Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
			13	0.395	23.3		
18	12:48 PM	5736	1	0.438	25.4		
		8085	2	0.438	25.5		
			3	0.399	24.4		
			5	0.381	24.0		
			10	0.387	23.5		
			15	0.396	23.2		
			16	0.402	23.1		
19	12:54 PM	5765	1	0.431	25.5		
		8090	2	0.432	25.5		
			5	0.384	24.2		
			10	0.384	23.4		
			15	0.750	23.2		
			18	0.378	22.9		
20	1:00 PM	5758	1	0.428	25.4		
		8091	2.5	0.427	25.3		
			5	0.384	24.0		
			10	0.381	23.4		
			15	0.378	23.1		
			20	0.369	22.3		
21	1:07 PM	5687	1	0.397	24.7		
		8106	5	0.385	24.0		
			10	0.378	23.4		
			15	0.367	22.9		
			20	0.375	22.4		
			30	0.388	21.4		
			35	0.615	21.0		
22	1:14 PM	5782	1	0.415	25.2	242	9
		8054	2.5	0.414	25.2	West-Southwest	
			5	0.386	24.0		
			10	0.382	23.5		
			15	0.374	23.1		

Table 4 - August 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
February 1999

Date & Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
			20	0.365	22.2		
			25	0.374	21.8		
			30	0.393	21.3		
23	1:20 PM	5826	1	0.411	25.1		
		8102	5	0.390	24.2		
			10	0.380	23.5		
			20	0.369	22.2		
			30	0.393	21.3		
			34	0.413	21.0		
OUTFALL	1:28 PM		0.5	0.620	28.5		
24	1:44 PM	5783	1	0.401	25.0		
		8142	5	0.396	24.7		
			10	0.381	23.6		
			20	0.367	22.3		
			30	0.390	21.4		
			37	0.585	21.0		
25	1:51 PM	5777	1	0.400	24.9		
		8132	5	0.394	24.7		
			10	0.381	23.6		
			20	0.366	22.4		
			30	0.382	21.4		
			37	0.414	21.0		
26	1:58 PM	5840	1	0.481	26.5		
		8045	5	0.384	23.9		
			10	0.376	23.5		
			20	0.365	22.1		
			30	0.388	21.4		
			40	0.542	21.0		
27	2:06 PM	5864	1	0.413	24.3		
		8060	5	0.39	24.3		

Table 4 - August 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
February 1999

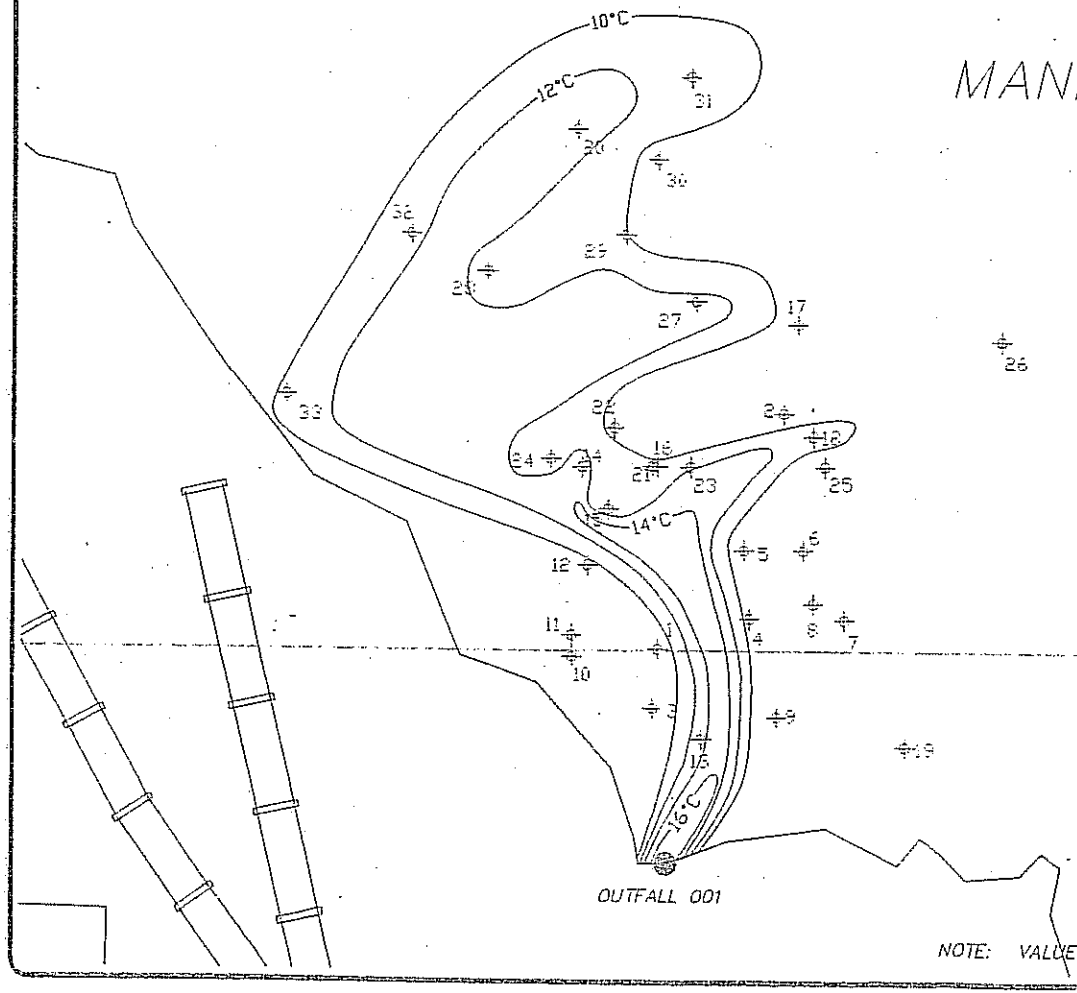
Date & Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Wind Direction (degrees)	Wind Velocity (knots)
			10	0.377	23.5		
			20	0.367	22.4		
			30	0.384	21.4		
			40	0.42	21.0		
			46.5	1.769	20.7		
					Bottom of well		
28	2:14 PM	5851	1	0.415	26.1		
		8018	5	0.382	23.8		
			10	0.378	23.5		
			20	0.366	22.4		
			30	0.384	21.4		
			40	0.440	20.9		
OUTFALL	2:22 PM		0.5	0.905	28.2	249	8
						West-Southwest	



DRAWING 2
MIXING ZONE &
THERMAL PLUME STUDY
SITE PLAN

DATE: 01-12-98	SCALE: 1" = 200'
PROJ. NO.: 96-0129	DRAWN BY: MCB

ASI ENVIRONMENTAL TECHNOLOGIES, INC.
ENVIRONMENTAL ENGINEERING AND SCIENTIFIC CONSULTANTS
2350 NORTH JEBAVY DRIVE, LUDINGTON MI, 49431 (616) 845-0371
808 HASTINGS STREET, TRAVERSE CITY MI, 49686 (616) 929-0479



N

0 50 100 200

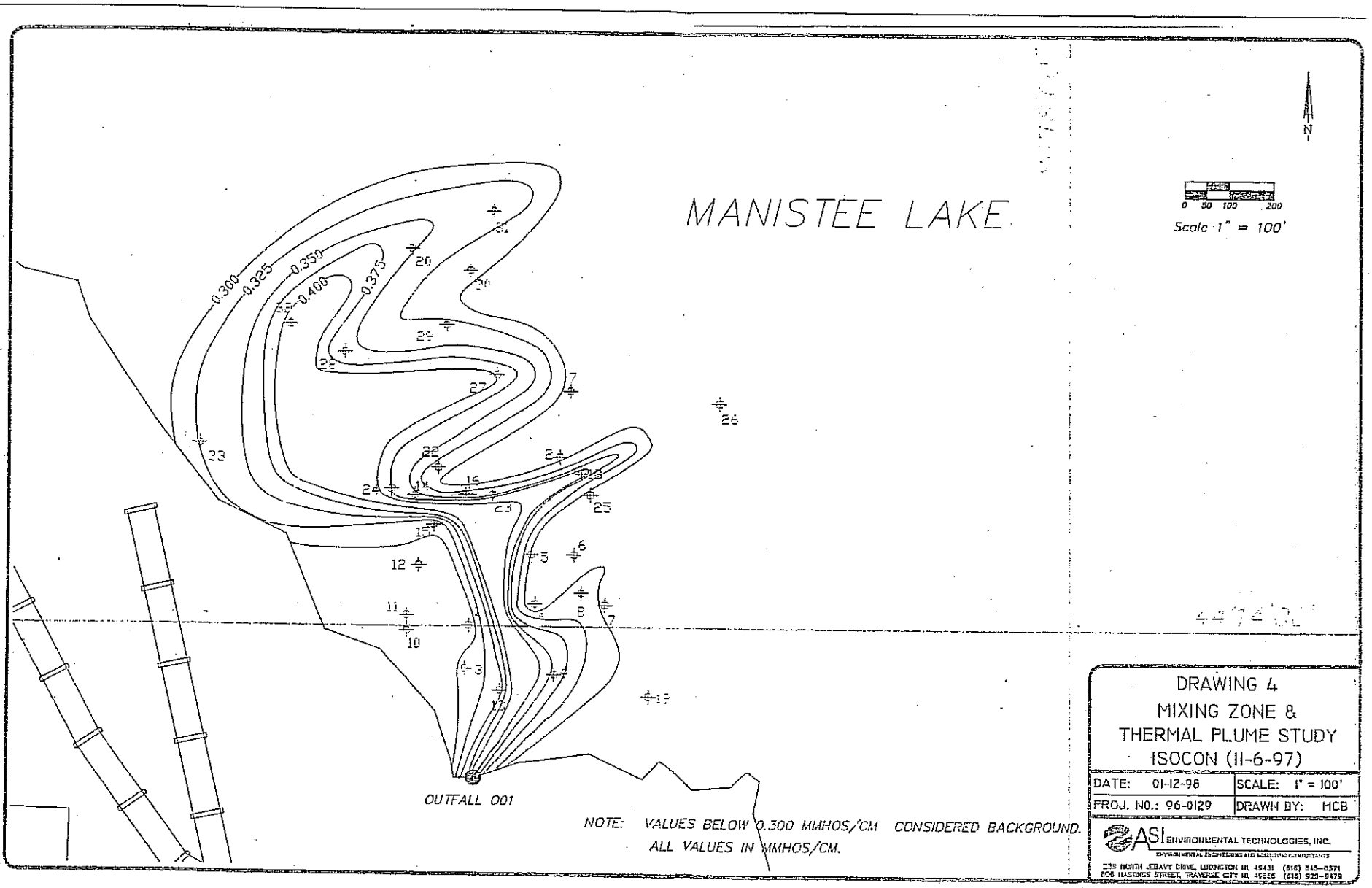
Scale 1" = 100'

NOTE: VALUES BELOW 9.5°C CONSIDERED BACKGROUND.

DRAWING 3
MIXING ZONE &
THERMAL PLUME STUDY
ISOTHERM (11-6-97)

DATE: 01-12-98	SCALE: 1" = 100'
PROJ. NO.: 96-0129	DRAWN BY: MCB

ASI ENVIRONMENTAL TECHNOLOGIES, INC.
ENVIRONMENTAL ENGINEERING AND SCIENTIFIC CONSULTANTS
229 NORTH CEDAR DRIVE, LUDINGTON MI. 49431 (616) 845-0371
208 HASTINGS STREET, TRAVERSE CITY MI. 49525 (616) 922-8470

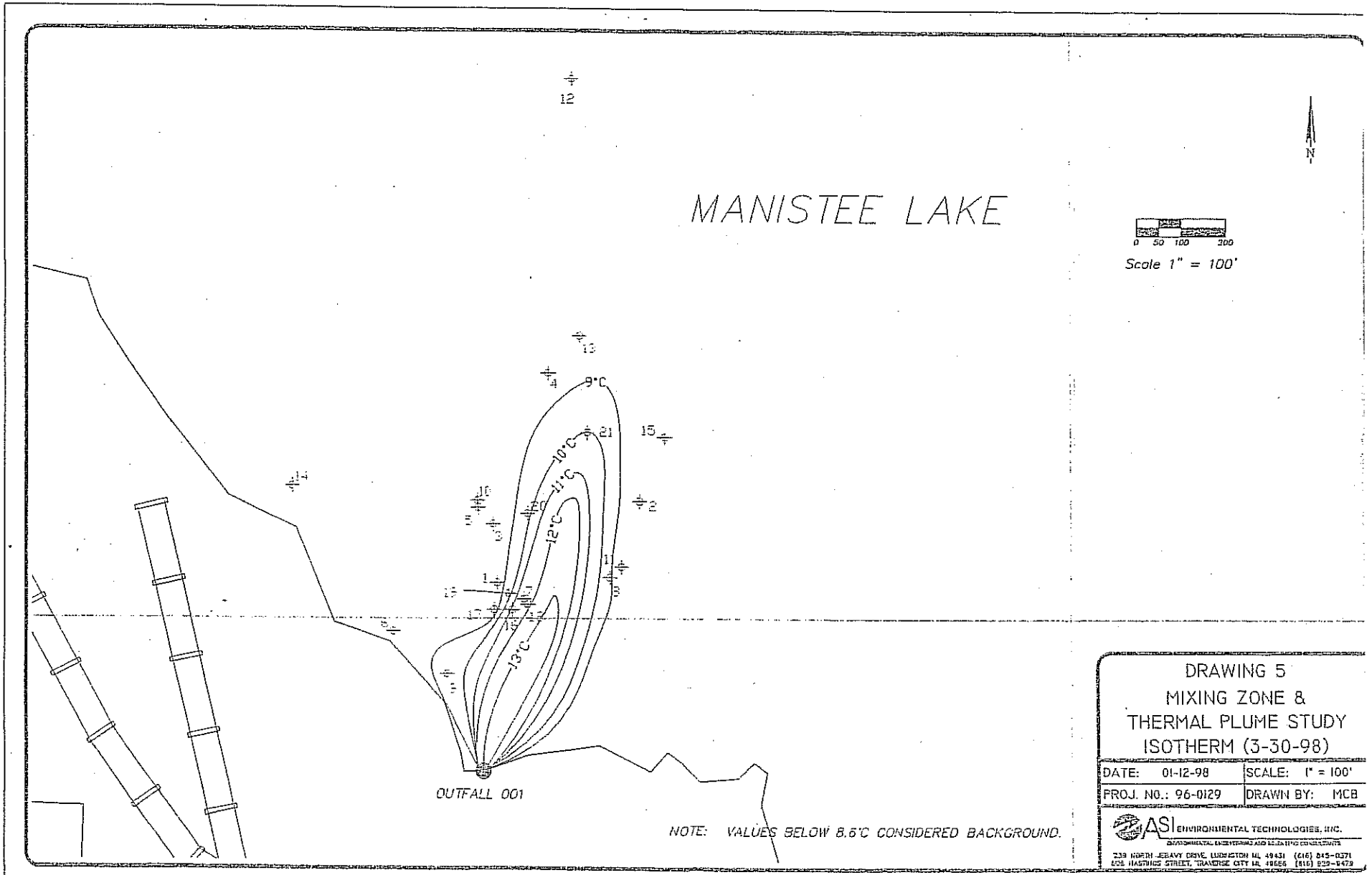


NOTE: VALUES BELOW 0.300 MMHOS/CM CONSIDERED BACKGROUND.
ALL VALUES IN MMHOS/CM.

DRAWING 4
MIXING ZONE &
THERMAL PLUME STUDY
ISOCON (11-6-97)

DATE: 01-12-98	SCALE: 1" = 100'
PROJ. NO.: 96-0129	DRAWN BY: MCB

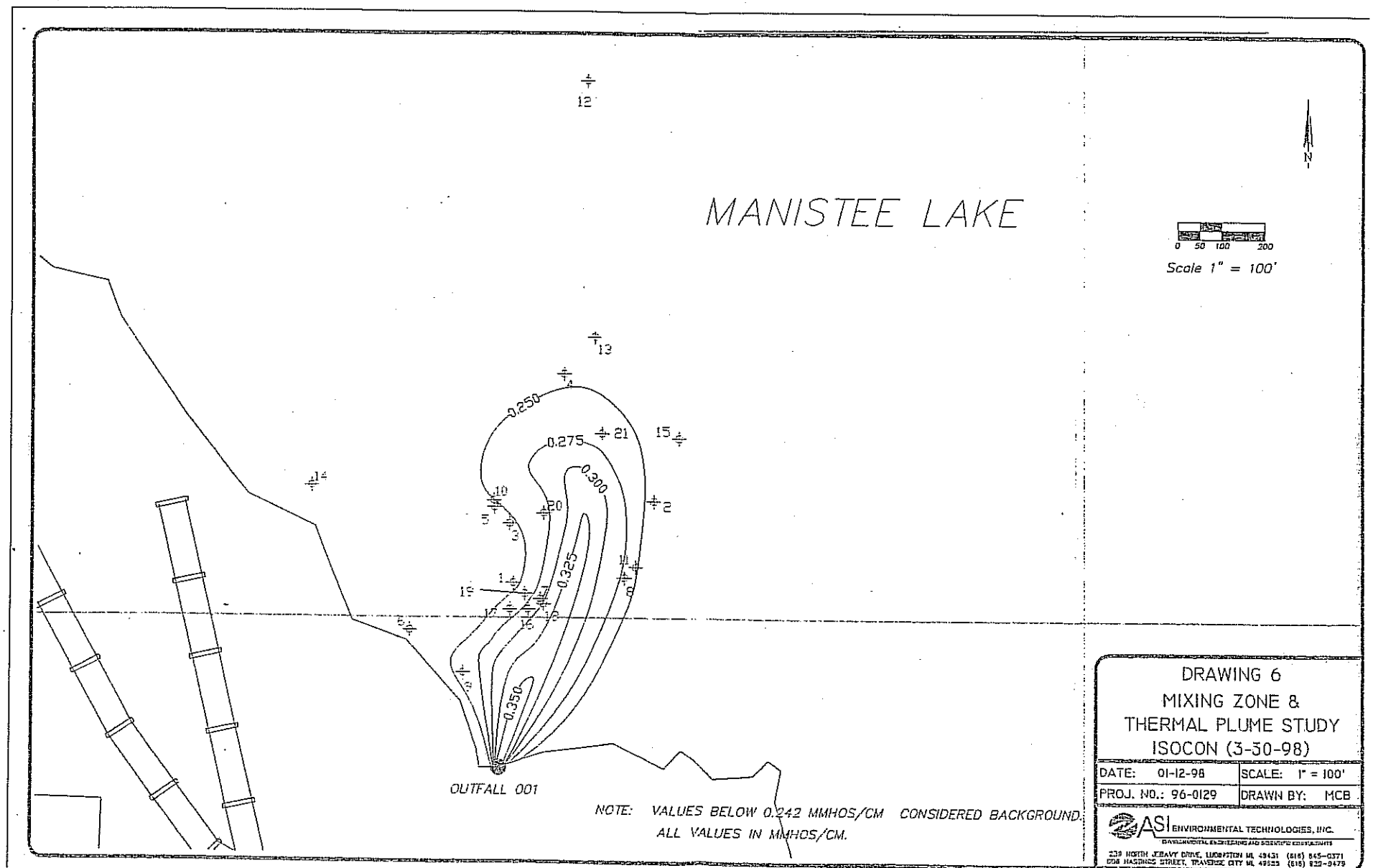
ASI ENVIRONMENTAL TECHNOLOGIES, INC.
ENVIRONMENTAL ENGINEERING AND CONSULTING CONSULTANTS
235 NORTH JEBAVY DRIVE, LUDINGTON MI 49431 (616) 845-0371
806 HASTINGS STREET, TRAVERSE CITY MI 49686 (616) 929-9479



DRAWING 5
MIXING ZONE &
THERMAL PLUME STUDY
ISOTHERM (3-30-98)

DATE: 01-12-98	SCALE: 1" = 100'
PROJ. NO.: 96-0129	DRAWN BY: MCB

ASI ENVIRONMENTAL TECHNOLOGIES, INC.
ENVIRONMENTAL ENGINEERING AND CONSULTING
239 NORTH JEBAVY DRIVE, LUDINGTON MI 49431 (616) 845-0371
204 HASTINGS STREET, TRAVERSE CITY MI 49684 (616) 929-5478

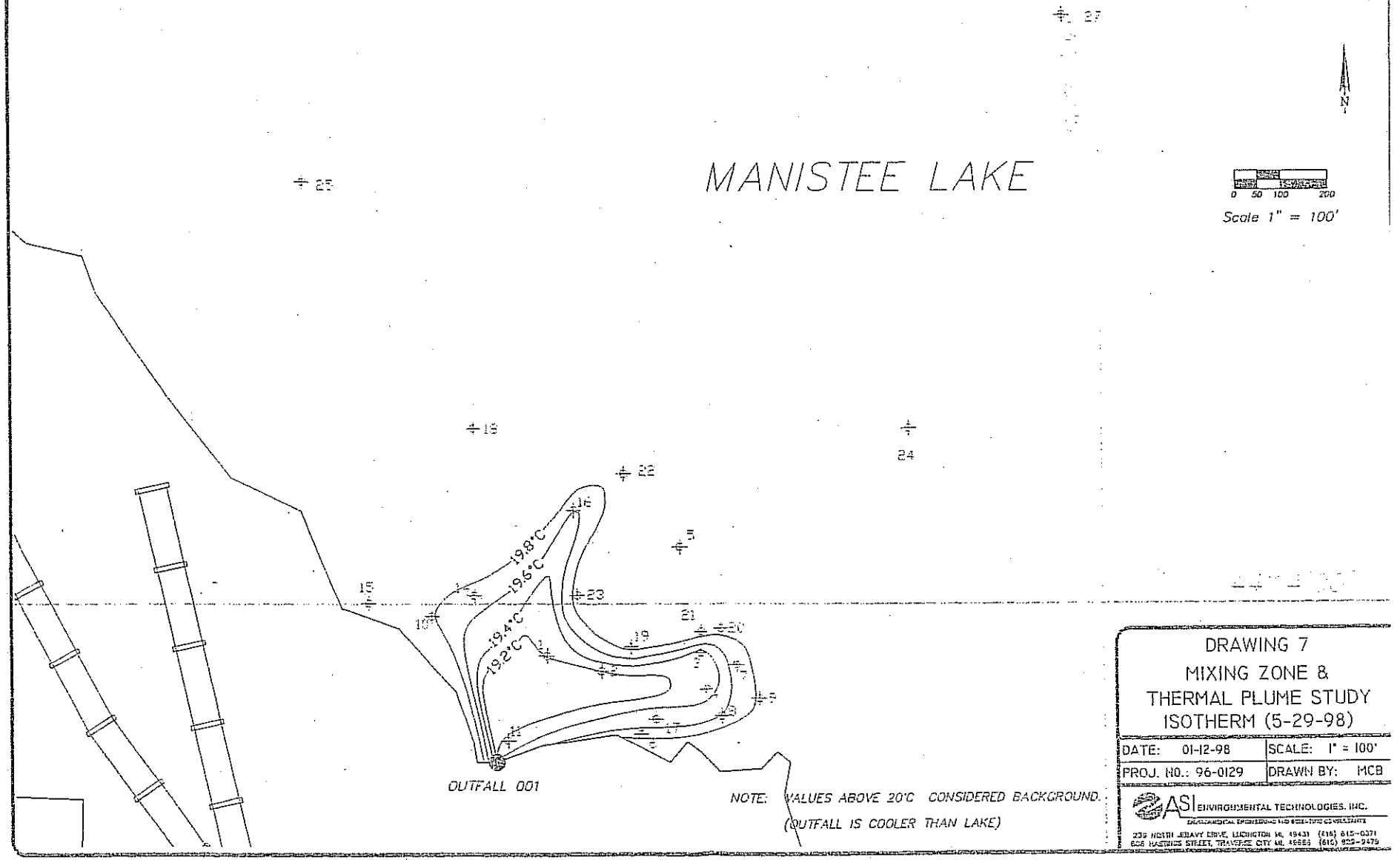


NOTE: VALUES BELOW 0.242 MMHOS/CM CONSIDERED BACKGROUND.
ALL VALUES IN MMHOS/CM.

DRAWING 6
MIXING ZONE &
THERMAL PLUME STUDY
ISOCON (3-30-98)

DATE: 01-12-98	SCALE: 1" = 100'
PROJ. NO.: 96-0129	DRAWN BY: MCB

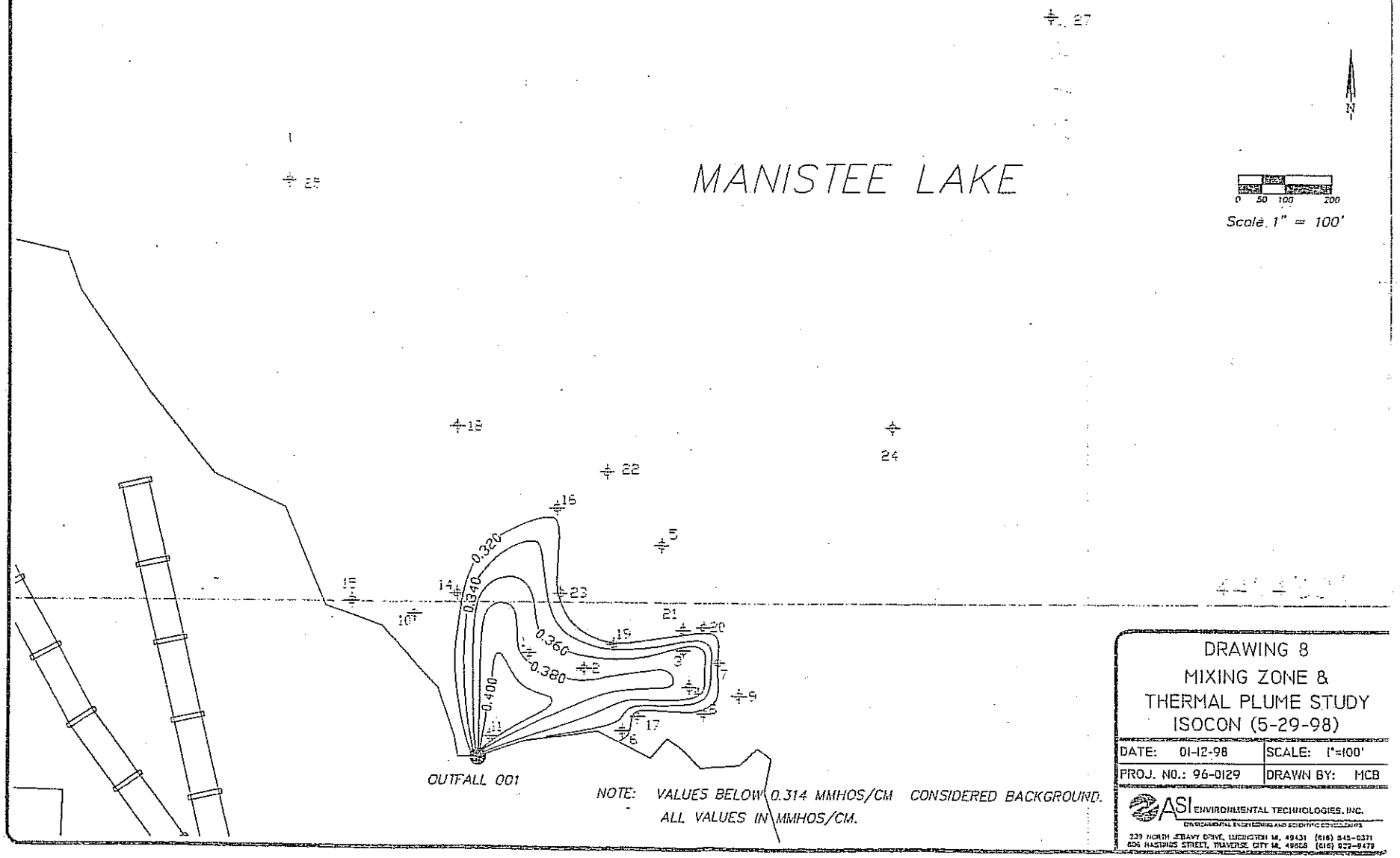
ASI ENVIRONMENTAL TECHNOLOGIES, INC.
ENVIRONMENTAL ENGINEERING AND SCIENTIFIC CONSULTANTS
239 NORTH JEBAVY DRIVE, LUDINGTON MI 49431 (616) 845-0371
208 HASTINGS STREET, TRAVERSE CITY MI 49525 (616) 922-9479



DRAWING 7
MIXING ZONE &
THERMAL PLUME STUDY
ISOTHERM (5-29-98)

DATE: 01-12-98	SCALE: 1" = 100'
PROJ. NO.: 96-0129	DRAWN BY: MCB

ASI ENVIRONMENTAL TECHNOLOGIES, INC.
ENVIRONMENTAL ENGINEERING AND SCIENTIFIC CONSULTANTS
235 NORTH JEDAVY DRIVE, LUDINGTON MI. 49431 (616) 845-0371
606 HASTINGS STREET, TRAVERSE CITY MI. 49684 (616) 922-9279

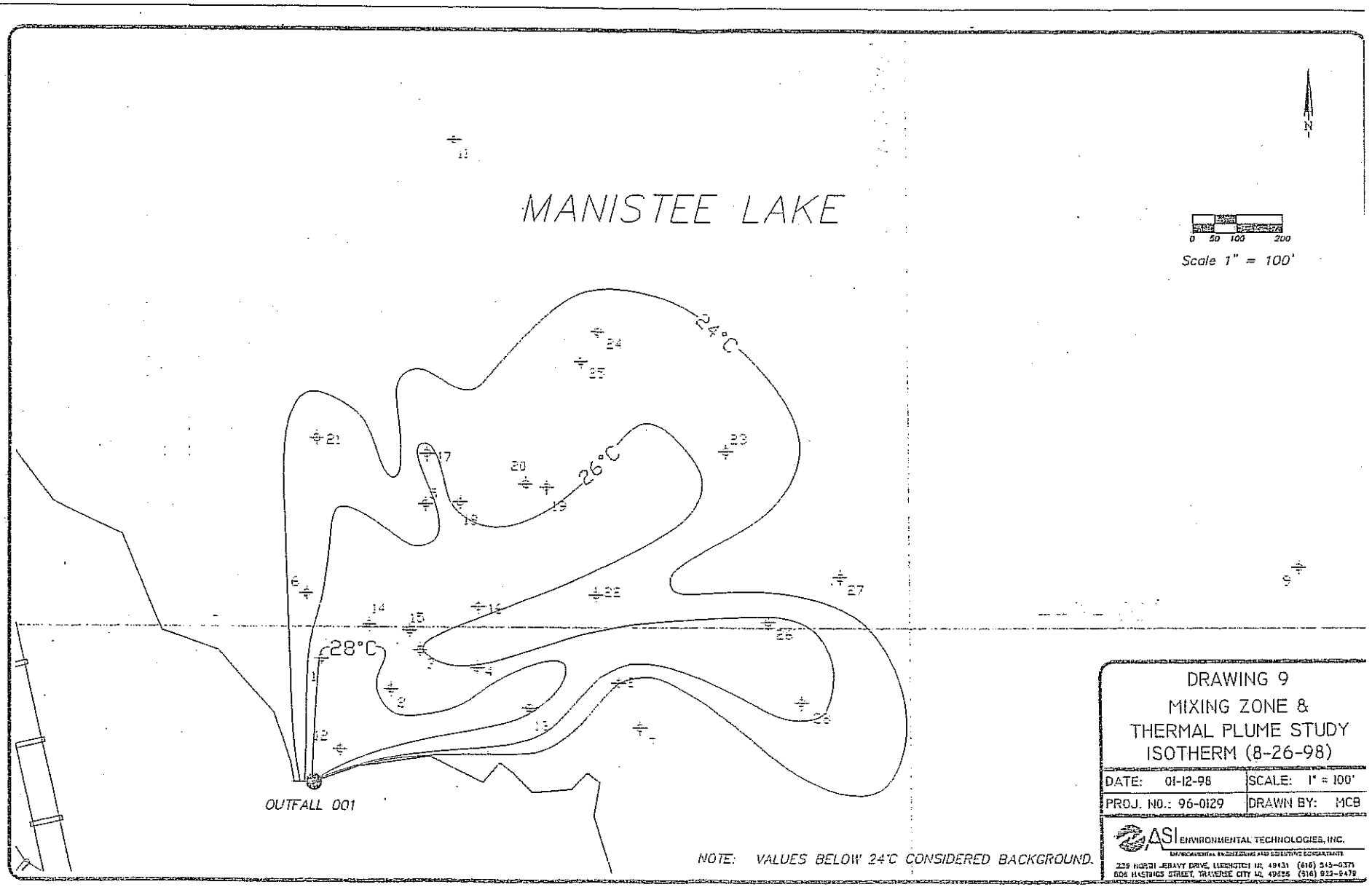


NOTE: VALUES BELOW 0.314 MMHOS/CM CONSIDERED BACKGROUND.
ALL VALUES IN MMHOS/CM.

DRAWING 8
MIXING ZONE &
THERMAL PLUME STUDY
ISOCON (5-29-98)

DATE: 01-12-98	SCALE: 1"=100'
PROJ. NO.: 96-0129	DRAWN BY: MCB

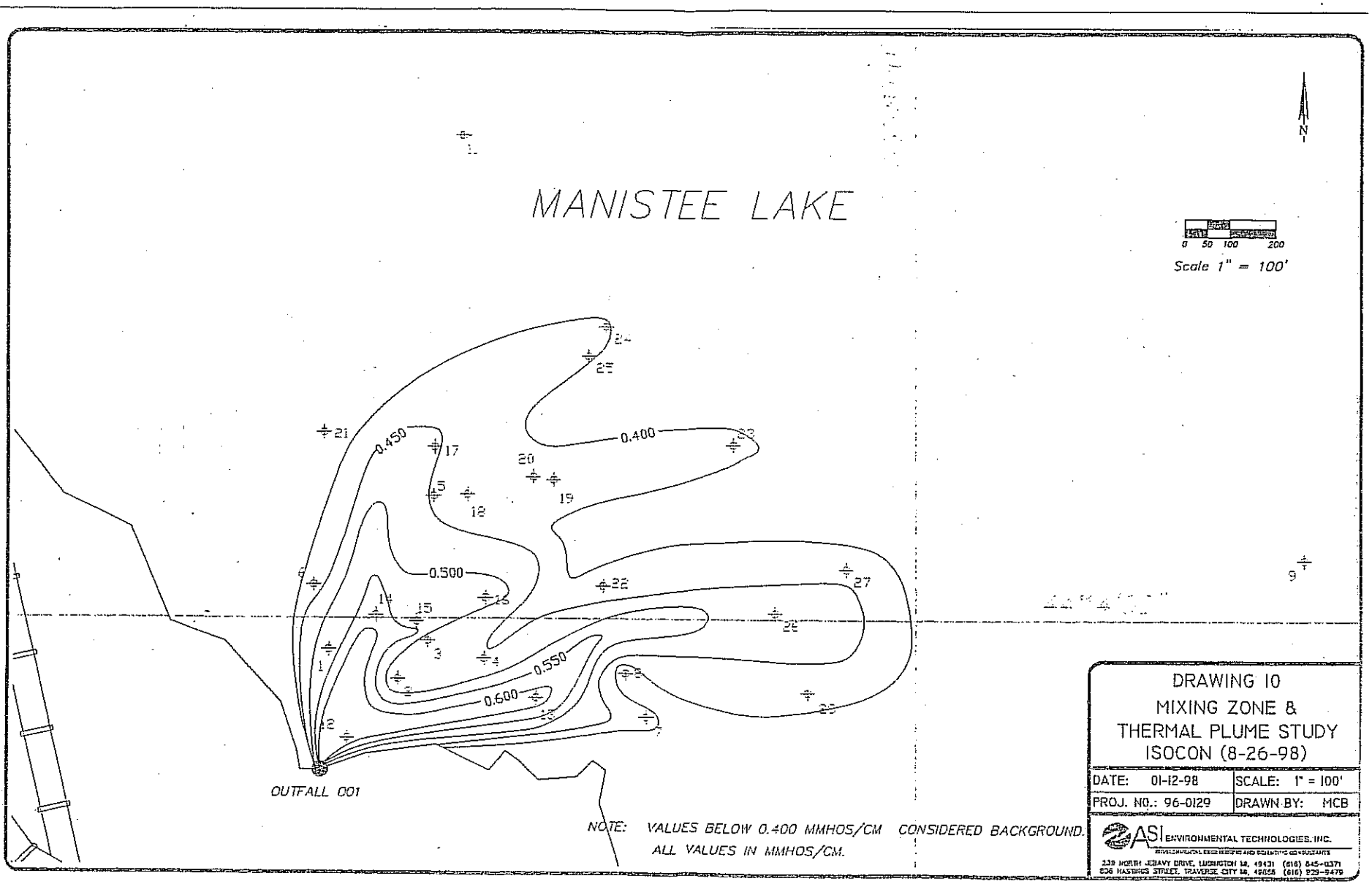
ASI ENVIRONMENTAL TECHNOLOGIES, INC.
ENVIRONMENTAL ENGINEERING AND SCIENTIFIC CONSULTANTS
239 NORTH LEAVY DRIVE, LUDINGTON MI, 49431 (616) 845-0371
606 HASTINGS STREET, TRAVERSE CITY MI, 49686 (616) 922-9479



DRAWING 9
MIXING ZONE &
THERMAL PLUME STUDY
ISOTHERM (8-26-98)

DATE: 01-12-98	SCALE: 1" = 100'
PROJ. NO.: 96-0129	DRAWN BY: MCB

ASI ENVIRONMENTAL TECHNOLOGIES, INC.
ENVIRONMENTAL ENGINEERING AND SCIENTIFIC CONSULTANTS
229 NORTH JERRY DRIVE, LUDINGTON MI, 49431 (616) 845-0371
606 HASTINGS STREET, TRAVERSE CITY MI, 49685 (616) 933-9479



NOTE: VALUES BELOW 0.400 MMHOS/CM CONSIDERED BACKGROUND.
ALL VALUES IN MMHOS/CM.

DRAWING 10
MIXING ZONE &
THERMAL PLUME STUDY
ISOCON (8-26-98)

DATE: 01-12-98	SCALE: 1" = 100'
PROJ. NO.: 96-0129	DRAWN BY: MCB

ASI ENVIRONMENTAL TECHNOLOGIES, INC.
ENVIRONMENTAL ENGINEERS AND SCIENTIFIC CONSULTANTS
239 NORTH JEBAVY DRIVE, LUDINGTON MI, 49431 (616) 845-0371
506 HASTINGS STREET, TRAVERSE CITY MI, 49685 (616) 929-9479

APPENDIX B

TABLES

Table 1 - November 1997 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES Permit No. MI0054992
September 1999

Sample No.	Time	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
OUTFALL	9:45 AM	0.5	0.373	16.9	62.42	150	3
						South-Southeast	
1	9:52 AM	3	0.279	8.2	46.76		
		5	0.278	8.1	46.58		
2	10:05 AM	5	0.269	8.1	46.58		
		10	0.267	8.0	46.40		
		15	0.268	8.0	46.40		
		16	0.274	8.1	46.58		
3	10:10 AM	3	0.316	8.7	47.66		
4	10:12 AM	5	0.283	8.3	46.94		
5	10:14 AM	5	0.275	8.2	46.76		
		6.5	0.338	8.4	47.12		
6	10:16 AM	5	0.282	8.2	46.76		
		7	0.315	8.4	47.12		
7	10:19 AM	5	0.268	8.1	46.58		
		10	0.269	8.1	46.58		
		15	0.275	8.1	46.58		
8	10:24 AM	3.5	0.318	8.7	47.66		
		5	0.303	8.4	47.12		
9	10:28 AM	3	0.353	8.7	47.66		
10	10:31 AM	2.5	0.278	8.4	47.12		
		4	0.313	8.6	47.48		

Table 1 - November 1997 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES Permit No. MI0054992
September 1999

Sample No.	Time	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
11	10:36 AM	5	0.273	8.3	46.94		
		6	0.279	8.2	46.76		
12	10:38 AM	5	0.271	8.3	46.94		
		6	0.300	8.2	46.76		
13	10:41 AM	2.5	0.328	12.6	54.68		
		3	0.309	9.9	49.82		
		3.5	0.279	8.6	47.48		
		5	0.274	8.4	47.12		
14	10:47 AM	1	0.342	13.0	55.40	158	8
		2	0.301	12.7	54.86	South-Southeast	
		2.25	0.277	9.6	49.28		
		2.5	0.272	8.3	46.94		
		3	0.274	8.6	47.48		
15	10:50 AM	1	0.317	11.5	52.70		
		1.5	0.283	10.7	51.26		
		2	0.293	8.8	47.84		
16	10:53 AM	1	0.295	10.3	50.54		
		1.25	0.293	9.8	49.64		
		2	0.291	9.5	49.10		
		3	0.274	9.1	48.38		
		5	0.270	8.2	46.76		
		10	0.269	8.1	46.58		
		15	0.268	8.1	46.58		
		20	0.274	8.3	46.94		
17	11:01 AM	1	0.272	8.3	46.94		
		5	0.272	8.3	46.94		
		10	0.273	8.3	46.94		
		15	0.263	8.0	46.40		

Table 1 - November 1997 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES Permit No. MI0054992
September 1999

Sample No.	Time	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
18	11:07 AM	1	0.388	11.0	51.80		
		2	0.390	11.0	51.80		
		3	0.303	9.3	48.74		
		4	0.283	8.7	47.66		
		5	0.274	8.4	47.12		
		10	0.271	8.2	46.76		
		13	0.274	8.1	46.58		
19	11:12 AM	1	0.288	8.9	48.02		
Background		2	0.305	9.1	48.38		
		3	0.296	9.4	48.92		
		4	0.279	8.7	47.66		
		5	0.271	8.3	46.94		
		10	0.270	8.2	46.76		
		15	0.270	8.1	46.58		
		19	0.325	8.1	46.58		
20	11:15 AM	1	0.352	12.5	54.50		
		2	0.337	11.5	52.70		
		3	0.332	11.5	52.70		
		4	0.276	8.7	47.66		
		5	0.271	8.3	46.94		
		10	0.270	8.2	46.76		
		15	0.268	8.1	46.58		
		20	0.283	8.1	46.58		
21	11:21 AM	1	0.355	11.7	53.06		
		2	0.342	10.9	51.62		
		3	0.302	9.6	49.28		
		4	0.282	8.9	48.02		
		5	0.272	8.4	47.12		
		10	0.269	8.2	46.76		
		15	0.269	8.1	46.58		
		20	0.269	8.1	46.58		
		23	0.292	8.2	46.76		

Table 1 - November 1997 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES Permit No. MI0054992
September 1999

Sample No.	Time	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
22	11:27 AM	1	0.310	9.6	49.28		
		2	0.303	9.6	49.28		
		3	0.294	9.4	48.92		
		4	0.290	9.0	48.20		
		5	0.272	8.5	47.30		
		10	0.272	8.2	46.76		
		15	0.268	8.1	46.58		
		20	0.268	8.1	46.58		
		25	0.302	8.1	46.58		
OUTFALL	11:42 AM	0.5	0.477	17.2	62.96	162	9
						South-Southeast	
OUTFALL	12:25 PM	0.5	0.530	16.0	60.80	155	7
						South-Southeast	
23	12:31 PM	1	0.373	11.9	53.42		
		2	0.349	11.1	51.98		
		3	0.320	9.9	49.82		
		4	0.283	8.7	47.66		
		5	0.277	8.5	47.30		
		10	0.272	8.3	46.94		
		15	0.271	8.2	46.76		
		17	0.290	8.2	46.76		
24	12:36 PM	1	0.375	11.3	52.34		
		2	0.318	11.0	51.80		
		3	0.283	9.2	48.56		
		4	0.277	8.6	47.48		
		5	0.275	8.5	47.30		
		10	0.270	8.2	46.76		
		15	0.268	8.1	46.58		
25	12:44 PM	1	0.269	7.9	46.22		
		2	0.269	8.1	46.58		
		5	0.270	8.1	46.58		

Table 1 - November 1997 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES Permit No. MI0054992
September 1999

Sample No.	Time	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
		10	0.269	8.1	46.58		
		15	0.270	8.1	46.58		
26	12:48 PM	1	0.271	8.2	46.76		
Background		2	0.271	8.2	46.76		
		3	0.272	8.2	46.76		
		5	0.271	8.2	46.76		
		10	0.270	8.1	46.58		
		20	0.268	8.0	46.40		
		24	0.271	8.0	46.40		
27	12:52 PM	1	0.400	12.4	54.32		
		2	0.293	9.2	48.56		
		3	0.279	8.7	47.66		
		4	0.276	8.5	47.30		
		5	0.276	8.5	47.30		
		10	0.270	8.2	46.76		
		15	0.268	8.1	46.58		
		20	0.270	8.1	46.58		
		22	0.272	8.1	46.58		
28	12:58 PM	1	0.345	11.3	52.34		
		2	0.298	9.3	48.74		
		3	0.287	9.0	48.20		
		4	0.277	8.6	47.48		
		5	0.277	8.5	47.30		
		10	0.271	8.2	46.76		
		15	0.270	8.1	46.58		
		20	0.270	8.1	46.58		
		25	0.268	8.0	46.40		
		28	0.295	8.1	46.58		
29	1:03 PM	1	0.328	10.1	50.18		
		2	0.291	9.2	48.56		
		3	0.282	8.7	47.66		
		4	0.276	8.5	47.30		

Table 1 - November 1997 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES Permit No. MI0054992
September 1999

Sample No.	Time	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
		5	0.274	8.4	47.12		
		10	0.270	8.1	46.58		
		15	0.270	8.1	46.58		
		20	0.270	8.1	46.58		
		25	0.268	8.1	46.58		
		27	0.270	8.1	46.58		
30	1:08 PM	1	0.305	9.6	49.28		
		2	0.280	8.7	47.66		
		3	0.277	8.5	47.30		
		4	0.274	8.4	47.12		
		5	0.271	8.2	46.76		
		10	0.271	8.2	46.76		
		15	0.270	8.1	46.58		
		20	0.269	8.1	46.58		
		25	0.268	8.0	46.40		
		28	0.282	8.1	46.58		
31	1:13 PM	1	0.352	11.0	51.80		
		2	0.287	10.1	50.18		
		3	0.286	9.0	48.20		
		4	0.282	8.7	47.66		
		5	0.276	8.4	47.12		
		10	0.274	8.3	46.94		
		15	0.272	8.1	46.58		
		20	0.271	8.1	46.58		
		25	0.271	8.1	46.58		
		30	0.270	8.1	46.58		
		33	0.282	8.1	46.58		
32	1:19 PM	1	0.414	10.9	51.62		
		2	0.325	10.0	50.00		
		3	0.292	8.3	46.94		
		4	0.277	8.4	47.12		
		5	0.268	8.2	46.76		
		10	0.288	8.3	46.94		

Table 1 - November 1997 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES Permit No. MI0054992
September 1999

Sample No.	Time	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
		15	0.298	9.1	48.38		
		20	0.288	7.9	46.22		
		25	0.287	8.0	46.40		
		30	0.281	8.0	46.40		
33	1:28 PM	2	0.341	11.7	53.06	158	6
		3	0.357	15.7	60.26	South-Southeast	
34	1:55 PM	1	0.312	9.5	49.10		
Background		2	0.306	9.5	49.10		
		3	0.280	8.6	47.48		
		4	0.279	8.4	47.12		
		5	0.277	8.4	47.12		
		10	0.271	8.2	46.76		
		15	0.272	8.2	46.76		
		20	0.276	8.1	46.58		
		25	0.275	8.1	46.58		
		30	0.288	8.1	46.58		

Table 2 - March 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
September 1999

Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
OUTFALL	11:14 AM	13.964	0.16	0.316	13.5	56.3	238	7
		18.124					West-Southwest	
1	11:42 AM	14.006	5	0.244	8.6	47.48		
		18.128	8.5	0.242	7.5	45.5		
2	11:45 AM	14.021	5	0.237	8.5	47.3		
		18.091	10	0.238	7.9	46.22		
			11	0.238	7.8	46.04		
3	11:53 AM	14.017	5	0.239	8.6	47.48		
		18.129	10	0.237	8.1	46.58		
4	11:53 AM	14.045	5	0.243	8.6	47.48		
		18.115	10	0.24	8	46.4		
			15	0.242	7.7	45.86		
			20	0.242	7.3	45.14		
			22.5	0.246	7.2	44.96		
5	11:55 AM	14.02	5	0.244	7.8	46.04		
		18.133	9.5	0.243	7.5	45.5		
6	11:59 AM	13.997	2	0.243	7.7	45.86		
Background		18.155	4.5	0.244	7.7	45.86		
7	12:01 PM	14.003	2.5	0.297	11.5	52.7		
		18.121						
8	12:03 PM	14.007	2.5	0.271	10	50	241	8
		18.099	5	0.268	9.6	49.28	West-Southwest	
	1:15 PM		2	0.319	13.2	55.76	235	6
	OUTFALL						West-Southwest	
9	1:17 PM	13.989	1	0.276	9.5	49.1		

Table 2 - March 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
September 1999

Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
		18.141	2	0.26	9.4	48.92		
			5	0.254	9.5	49.1		
			5.75	0.242	8.3	46.94		
10	1:20 PM	14.021	1	0.254	8.7	47.66		
		18.133	2.5	0.25	8.5	47.3		
			5	0.25	8.7	47.66		
			7.75	0.239	8	46.4		
11	1:24 PM	14.009	2.5	0.251	8.7	47.66		
		18.096	5	0.248	8.5	47.3		
			10	0.242	8.1	46.58		
			15	0.241	7.7	45.86		
12	1:31 PM	14.1	2.5	0.245	8.7	47.66		
Background		18.109	5	0.238	8.3	46.94		
			10	0.24	7.9	46.22		
			15	0.241	7.7	45.86		
			20	0.241	7.7	45.86		
			25	0.242	7.5	45.5		
			30	0.243	7.3	45.14		
			35	0.245	7.2	44.96		
			40	0.347	7.2	44.96		
			45	0.445	7.2	44.96		
			50	0.44	7.1	44.78		
13	1:38 PM	14.052	2.5	0.242	8.6	47.48		
		18.107	5	0.239	8	46.4		
			10	0.241	7.8	46.04		
			15	0.241	7.7	45.86		
			20	0.241	7.5	45.5		
			25	0.249	7.4	45.32		
			30	0.258	7.4	45.32		
			35	0.251	7.4	45.32		
14	1:45 PM	14.024	2.5	0.239	8.2	46.76		

Table 2 - March 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
September 1999

Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
Background		18.181	5	0.239	8	46.4		
			7.5	0.243	7.8	46.04		
15	1:49 AM	14.033	2.5	0.242	8.5	47.3		
		18.085	10	0.24	8	46.4		
			20	0.24	7.7	45.86		
			30					
			40	0.246	7.1	44.78		
16	1:55 PM	14.001	1	0.2674	9.2	48.56		
		18.124	2.5	0.264	9.5	49.1		
			5	0.247	8.4	47.12		
			10	0.244	7.8	46.04		
			12	0.245	7.6	45.68		
17	1:58 PM	14.001	1	0.242	8.4	47.12		
		18.129	2.5	0.243	8.1	46.58		
			5	0.243	7.7	45.86		
			6	0.243	7.7	45.86		
18	2:00 PM	14.002	1	0.254	8.7	47.66		
		18.12	2.5	0.244	8.4	47.12		
			5	0.244	7.7	45.86		
			6.75	0.243	7.6	45.68		
19	2:02 PM	14.004	1	0.269	9.6	49.28		
		18.125	2.5	0.266	9.5	49.1		
			5	0.255	8.7	47.66		
			5.5	0.252	8.6	47.48		
OUTFALL	2:10 PM	13.991	2	0.315	12.4	54.32	234	6
		10.171					West-Southwest	
20	2:55 PM	14.019	1	0.271	10	50		
		18.12	2	0.268	9.5	49.1		

Table 2 - March 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
September 1999

Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
21	2:58 PM	14.023						
		18.129	1	0.265	9.8	49.64		
			2.5	0.265	9.4	48.92		
			3	0.264	9.2	48.56		
OUTFALL	3:10 AM		2	0.316	13.5	56.3	232	7
							West-Southwest	

Table 3 - May 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
September 1999

CW Rd 65

Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
OUTFALL	9:28 AM	0555706	2	0.413	18.9	66.02	271	3
		4898000					West	
1	9:34 AM	5727	0.5	0.37	19.2	66.56		
		8024	1	0.325	19.4	66.92		
			2	0.324	19.5	67.1		
			2.5	0.319	19.6	67.28		
2	9:36 AM	5745	1	0.374	19.2	66.56		
		8019	2	0.374	19.3	66.74		
			4.5	0.37	19.3	66.74		
3	9:40 AM	5778	1	0.372	19.3	66.74		
		8025	2.5	0.372	19.4	66.92		
			5	0.371	19.3	66.74		
4	9:42 AM	5780	1	0.368	19.3	66.74		
		8013	2.5	0.369	19.3	66.74		
			5	0.366	19.3	66.74		
			6.5	0.366	19.3	66.74		
5	9:44 AM	5771	1	0.309	19.5	67.1		
		8060	2.5	0.307	19.5	67.1		
			5	0.311	19.4	66.92		
			10	0.308	19.5	67.1		
			15	0.312	19.5	67.1		
			20	0.315	19.4	66.92		
6	9:57 AM	5758	1	0.321	19.6	67.28		
		7998	2.5	0.325	19.6	67.28		
			3.5	0.331	19.5	67.1		
7	9:58 AM	5790	1	0.318	19.7	67.46		
		8021	2.5	0.315	19.7	67.46		
			4	0.315	19.7	67.46		

Table 3 - May 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
September 1999

Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
8	10:00 AM	5785	1	0.311	19.6	67.28		
		8004	2.5	0.311	19.7	67.46		
			4	0.31	19.6	67.28		
9	10:04 AM	5797	1	0.311	19.8	67.64		
		8010	5	0.31	19.6	67.28		
			10	0.31	19.6	67.28		
			15	0.31	19.4	66.92		
			20	0.31	19	66.2		
			21	0.312	18.8	65.84		
10	10:19 AM	5689	0.5	0.314	19.8	67.64		
		8020	1	0.313	19.8	67.64		
			2.5	0.316	19.6	67.28		
11	10:22 AM	5714	0.5	0.386	19.3	66.74		
		7996	1	0.373	19.2	66.56		
			2.5	0.358	19.4	66.92		
12	10:28 AM	6042	0.5	0.313	19.9	67.82		
Background		8015	1	0.312	20	68		
			2.5	0.312	19.8	67.64		
13	10:30 AM	6028	1	0.311	19.7	67.46	275	4
Background		9769	2.5	0.311	19.8	67.64	West-Southwest	
			3.5	0.31	19.8	67.64		
14	10:33 AM	5703	0.5	0.316	19.7	67.46		
		8026	1	0.316	19.7	67.46		
			3.75	0.317	19.6	67.28		
15	10:36 AM	5668	1	0.31	19.5	67.1		
		8022	2.5	0.31	19.5	67.1		
			5	0.311	19.5	67.1		

Table 3 - May 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
September 1999

Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
16	10:38 AM	5736	1	0.31	19.5	67.1		
		8072	2.5	0.31	19.6	67.28		
			5	0.309	19.6	67.28		
			10	0.313	19.5	67.1		
			11.5	0.316	19.5	67.1		
17	10:42 AM	5763	1	0.311	19.5	67.1		
		8014	2.5	0.317	19.6	67.28		
			5	0.327	19.5	67.1		
			10	0.324	19.5	67.1		
			12.75	0.336	19.5	67.1		
OUTFALL	12:05 PM		2	0.424	19.2	66.56	274	3
							West-Southwest	
18	12:25 PM	5703	1	0.318	20.1	68.18		
		8099	2.5	0.323	19.9	67.82		
			4.5	0.371	19.6	67.28		
19	12:27 PM	5755	1	0.312	19.9	67.82		
		8027	2.5	0.312	19.8	67.64		
			5	0.313	19.8	67.64		
			10	0.338	19.6	67.28		
			12	0.369	19.5	67.1		
20	12:32 PM	5785	1	0.313	19.9	67.82		
		8033	2.5	0.326	19.9	67.82		
			5	0.318	19.7	67.46		
			10	0.36	19.6	67.28		
21	12:35 PM	5778	1	0.312	20	68		
		8032	2.5	0.311	19.9	67.82		
			5	0.311	19.8	67.64		
			10	0.312	19.6	67.28		
			15	0.325	19.5	67.1		
			20	0.311	18.4	65.12		

Table 3 - May 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
September 1999

Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
			24	0.318	17.8	64.04		
22	12:40 PM	5753	1	0.313	20	68		
		8084	2.5	0.313	19.9	67.82		
			5	0.312	19.8	67.64		
			10	0.314	19.6	67.28		
			15	0.332	19.4	66.92		
			20	0.313	18.3	64.94		
			21.25	0.311	18.1	64.58		
23	12:45 PM	5737	1	0.313	20.1	68.18		
		8044	2.5	0.313	20	68		
			5	0.312	19.8	67.64		
			10	0.311	19.7	67.46		
			15	0.314	19.6	67.28		
24	12:55 PM	5848	1	0.315	20.3	68.54		
Background		8099	5	0.313	20	68		
			10	0.312	19.9	67.82		
			15	0.312	19.6	67.28		
			20	0.319	19.2	66.56		
			25	0.303	18.2	64.76		
			30	0.312	17.3	63.14		
			35	0.332	16.1	60.98		
			40	0.346	14.8	58.64		
			42.25	0.353	14.5	58.1		
25	1:05 PM	5647	1	0.315	20.3	68.54		
Background		8180	2.5	0.312	20	68	280	3
			5	0.312	19.8	67.64	West-Southwest	
			10	0.311	19.6	67.28		
			15	0.311	19.5	67.1		
			20	0.314	19.3	66.74		
			25	0.318	18.1	64.58		
			30	0.313	17.3	63.14		
			35	0.336	16.1	60.98		

Table 3 - May 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
September 1999

Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
26	1:10 PM	5775	1	0.315	20.3	68.54		
Background		8260	5	0.314	20	68		
			10	0.313	19.8	67.64		
			15	0.311	19.6	67.28		
			20	0.315	19	66.2		
			25	0.31	18	64.4		
			30	0.322	16.8	62.24		
			35	0.319	16	60.8		
			40	0.347	15	59		
			41	0.352	14.5	58.1		
27	1:20 PM	5900	1	0.315	20.1	68.18		
Background		8235	5	0.314	20	68		
			10	0.313	19.9	67.82		
			15	0.312	19.6	67.28		
			20	0.308	18.8	65.84		
			25	0.305	17.7	63.86		
			30	0.308	17.1	62.78		
			35	0.326	15.8	60.44		
			40	0.351	14.7	58.46		
	1:30 PM	5706	1	0.419	19.3	66.74		
	OUTFALL	8000						

Table 4 - August 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
September 1999

Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
OUTFALL	8:55 AM	5706	1	0.54	28.1	82.58	238	5
		8000					West-Southwest	
1	9:00 AM	5701	0.5	0.545	28.1	82.58		
		8038	1	0.53	28	82.4		
			1.5	0.515	27.2	80.96		
2	9:03 AM	5725	0.5	0.492	26.7	80.06		
		8028	1	0.518	27	80.6		
			2	0.499	26.7	80.06		
			3	0.477	26	78.8		
			3.5	0.451	25.3	77.54		
3	9:06 AM	5735	0.5	0.473	26	78.8		
		8041	1	0.47	26.3	79.34		
			2	0.447	25.1	77.18		
			4.5	0.393	23.7	74.66		
4	9:11 AM	5754	1	0.476	26	78.8		
		8035	2	0.405	24.1	75.38		
			5	0.402	23.7	74.66		
			6.75	0.396	23.5	74.3		
5	9:18 AM	5737	1	0.429	24.3	75.74		
		8090	2	0.401	23.8	74.84		
			5	0.400	23.5	74.3		
			10	0.406	23.2	73.76		
			13.5	0.408	22.9	73.22		
6	9:22 AM	5696	1	0.419	24.3	75.74		
		8060	2	0.405	23.8	74.84		
			5	0.398	23.6	74.48		
			6.25	0.428	23.4	74.12		
7	9:29 AM	5809	1	0.407	23.7	74.66		
		8015	2	0.400	23.6	74.48		

Table 4 - August 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
September 1999

Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
			5	0.390	23.5	74.3		
			6	0.390	23.5	74.3		
8	9:34 AM	5802	1	0.395	23.7	74.66		
		8030	5	0.387	23.5	74.3		
			10	0.379	23.3	73.94		
			15	0.383	23.1	73.58		
			20	0.37	22.3	72.14		
			25	0.369	21.6	70.88		
			30	0.388	21.3	70.34		
			35	0.408	21.1	69.98		
			38	0.565	21.0	69.8		
9	9:44 AM	6031	1	0.380	23.3	73.94		
Background		8069	2	0.380	23.4	74.12		
			5	0.380	23.3	73.94		
			10	0.380	23.3	73.94		
			15	0.380	23.2	73.76		
			17	0.381	23.1	73.58		
10	9:52 AM	5873	1	0.403	24.0	75.2	259	7
Background		8344	5	0.381	23.4	74.12	West-Southwest	
			10	0.382	23.3	73.94		
			15	0.334	23.3	73.94		
			20	0.367	22.6	72.68		
			25	0.369	21.9	71.42		
			30	0.385	21.3	70.34		
			34.5	0.434	21.0	69.8		
11	9:59 AM	5747	1	0.405	23.9	75.02		
Background		8212	5	0.382	23.5	74.3		
			10	0.377	23.3	73.94		
			15	0.376	23.0	73.4		
			20	0.365	22.4	72.32		
			25	0.367	21.8	71.24		
			30	0.376	21.4	70.52		
			35	0.400	21.1	69.98		

Table 4 - August 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
September 1999

Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
			37	0.406	20.9	69.62		
OUTFALL	10:07 AM		0.5	0.673	28.3	82.94		
OUTFALL	12:15 AM		0.5	0.626	29.1	84.38	235	8
							West-Southwest	
12	12:22 PM	5695	0.5	0.625	29.0	84.2		
		8002	1	0.580	28.2	82.76		
13	12:25 PM	5759	0.5	0.606	28.5	83.3		
		8016	1	0.592	28.2	82.76		
			2.25	0.586	27.7	81.86		
14	12:30 PM	5705	1	0.560	27.8	82.04		
		8044	2	0.480	26.6	79.88		
			3	0.387	24.1	75.38		
15	12:33 PM	5719	1	0.545	27.2	80.96		
		8042	2	0.500	26.6	79.88		
			2.5	0.437	25.7	78.26		
			3	0.388	24.1	75.38		
			4.5	0.386	24.0	75.2		
16	12:38 PM	5742	1	0.530	27.2	80.96		
		8050	2	0.399	24.4	75.92		
			3	0.385	23.9	75.02		
			5	0.385	23.9	75.02		
			6.5	0.385	23.7	74.66		
17	12:43 PM	5725	1	0.465	26.1	78.98		
		8101	2	0.451	25.7	78.26		
			3	0.420	25.5	77.9		
			5	0.382	24.1	75.38		
			10	0.380	23.4	74.12		

Table 4 - August 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
September 1999

Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
			13	0.395	23.3	73.94		
18	12:48 PM	5736	1	0.438	25.4	77.72		
		8085	2	0.438	25.5	77.9		
			3	0.399	24.4	75.92		
			5	0.381	24.0	75.2		
			10	0.387	23.5	74.3		
			15	0.396	23.2	73.76		
			16	0.402	23.1	73.58		
19	12:54 PM	5765	1	0.431	25.5	77.9		
		8090	2	0.432	25.5	77.9		
			5	0.384	24.2	75.56		
			10	0.384	23.4	74.12		
			15	0.750	23.2	73.76		
			18	0.378	22.9	73.22		
20	1:00 PM	5758	1	0.428	25.4	77.72		
		8091	2.5	0.427	25.3	77.54		
			5	0.384	24.0	75.2		
			10	0.381	23.4	74.12		
			15	0.378	23.1	73.58		
			20	0.369	22.3	72.14		
21	1:07 PM	5687	1	0.397	24.7	76.46		
		8106	5	0.385	24.0	75.2		
			10	0.378	23.4	74.12		
			15	0.367	22.9	73.22		
			20	0.375	22.4	72.32		
			30	0.388	21.4	70.52		
			35	0.615	21.0	69.8		
22	1:14 PM	5782	1	0.415	25.2	77.36	242	9
		8054	2.5	0.414	25.2	77.36	West-Southwest	
			5	0.386	24.0	75.2		
			10	0.382	23.5	74.3		
			15	0.374	23.1	73.58		

Table 4 - August 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
September 1999

Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
			20	0.365	22.2	71.96		
			25	0.374	21.8	71.24		
			30	0.393	21.3	70.34		
23	1:20 PM	5826	1	0.411	25.1	77.18		
		8102	5	0.390	24.2	75.56		
			10	0.380	23.5	74.3		
			20	0.369	22.2	71.96		
			30	0.393	21.3	70.34		
			34	0.413	21.0	69.8		
OUTFALL	1:28 PM		0.5	0.620	28.5	83.3		
24	1:44 PM	5783	1	0.401	25.0	77		
		8142	5	0.396	24.7	76.46		
			10	0.381	23.6	74.48		
			20	0.367	22.3	72.14		
			30	0.390	21.4	70.52		
			37	0.585	21.0	69.8		
25	1:51 PM	5777	1	0.400	24.9	76.82		
		8132	5	0.394	24.7	76.46		
			10	0.381	23.6	74.48		
			20	0.366	22.4	72.32		
			30	0.382	21.4	70.52		
			37	0.414	21.0	69.8		
26	1:58 PM	5840	1	0.481	26.5	79.7		
		8045	5	0.384	23.9	75.02		
			10	0.376	23.5	74.3		
			20	0.365	22.1	71.78		
			30	0.388	21.4	70.52		
			40	0.542	21.0	69.8		
27	2:06 PM	5864	1	0.413	24.3	75.74		
		8060	5	0.39	24.3	75.74		

Table 4 - August 1998 Data
Mixing Zone Thermal Plume Study, Manistee Lake
for
NPDES No. MI0054992
September 1999

Sample No.	Time	GPS Coordinates (minutes)	Sample Depth (feet)	Conductivity (mmhos/cm)	Temperature (°C)	Temperature (°F)	Wind Direction (degrees)	Wind Velocity (knots)
			10	0.377	23.5	74.3		
			20	0.367	22.4	72.32		
			30	0.384	21.4	70.52		
			40	0.42	21.0	69.8		
			46.5	1.769	20.7	69.26		
28	2:14 PM	5851	1	0.415	26.1	78.98		
		8018	5	0.382	23.8	74.84		
			10	0.378	23.5	74.3		
			20	0.366	22.4	72.32		
			30	0.384	21.4	70.52		
			40	0.440	20.9	69.62		
OUTFALL	2:22 PM		0.5	0.605	28.2	82.76	249	8
							West-Southwest	

Table 5
AMBAR Chemical
Manistee, Michigan
Discharge Characteristics During Sampling Events

Date	Daily Flow Outfall 001 (MGD)	Average Temperature Outfall 001 (°F)	Total Dissolved Solids Outfall 001 (mg/L)	TDS to Conductivity Conversion Factor*	Conductivity Outfall 001 (µmhos/cm)
11/4/97	6.46	60.80	340	1.54	523.6
11/5/97	6.35	58.93	288	1.54	443.52
11/6/97	6.59	62.93	364	1.54	560.56
3/28/98	8.80	50.96	256	1.54	394.24
3/29/98	8.85	51.73	236	1.54	363.44
3/30/98	8.86	56.07**	268	1.54	412.72
5/27/98	8.87	69.40	548	1.54	843.92
5/28/98	8.90	67.20	484	1.54	745.36
5/29/98	8.86	67.10	288	1.54	443.52
8/24/98	8.89	79.96	496	1.54	763.84
8/25/98	8.88	82.90	408	1.54	628.32
8/26/98	8.88	80.30	452	1.54	696.08

Notes:

*See Appendix C for information on the Conversion Factor

** Based on field data.

Appendix D contains copies of Outfall 001 data

APPENDIX C

TDS TO CONDUCTIVITY

AMBAR Chemical TDS to Conductivity
Conversion Factor Worksheet

DATE	TDS (mg/L)	Conductivity (µmhos/cm)	
7/26/99	572	895	1.564685
7/27/99	576	912	1.583333
7/28/99	532	822	1.545113
7/29/99	552	838	1.518116
7/30/99	556	848	1.525180

MAX	1.583333
MIN	1.518116
MEAN	1.547285

AMBAR CHEMICAL

RECEIVED
AUG 06 1999
By

August 3, 1999

Mr. Mattew Bell
ASI Environmental Technologies
239 North Jebavy Drive
Ludington, MI 49431

Dear Mr. Bell:

Please find included in this letter the conductivity verses total dissolved solids (TDS) data you requested for the Ambar Chemical outfall. The data was gathered by using retainer samples of daily TDS sample bottles for 7/26, 7/27, 7/28, 7/29, and 7/30/99. The TDS for each sample was prepared as outlined in the Standard Operating Procedure for TDS, using a Cole Parmer Laboratory Oven, Model Number 05015-54. The samples were then tested for conductivity, using a Fisher Scientific Digital Conductivity Meter, Model Number 96183917. Prior to the conductivity testing, the meter was calibrated within 0.5% error using Myron L. Company 445 µmho standard, part number 442-300. Attached is a copy of the laboratory standard operating procedure for TDS and a copy of the laboratory data log for the TDS samples used.

The data is as follows:

Date	TDS (mg/L)	Conductivity (µmho)
7/26/99	572	895
7/27/99	576	912
7/28/99	532	822
7/29/99	552	838
7/30/99	556	848

Also attached are Ambar Chemical DMR forms for the dates you requested. The forms include temperature, TDS, flow volume, and pH as requested.

If you have any further questions or data requirements, please do not hesitate to contact me at 231/723-6266 extension 212.

Sincerely,

Christopher Hissong
Ambar Chemical

SOP FOR TOTAL DISSOLVED SOLIDS
DRIED AT 180 degrees C
STANDARD METHOD 2540 C

AMBAR CHEMICAL
RELEASE DATE: 04/18/98
REVISED: 10/07/98

SOP FOR TOTAL DISSOLVED SOLIDS DRIED AT 180° C
STANDARD METHOD 2540 C

1. SCOPE AND APPLICATION

1.1 This method is applicable to surface and saline waters, domestic and industrial wastes.
1.2 The LOD is 10 mg/L.
1.3 The analytical range is from 10 to 20,000 mg/L.
1.4 The approximate analytical time required to analyze one sample is 3 hours.

2. METHOD SUMMARY

2.1 A well-mixed sample is filtered through a standard glass fiber filter. The filtrate is evaporated and dried to constant weight at 180 degrees C.

2.2 If Residue, Non-Filterable is being determined, the filtrate from that method may be used for Residue, Filterable.

3. COMMENTS

3.1 Highly mineralized waters containing significant concentrations of calcium, magnesium, chloride and/or sulfate may be hydroscopic and will require prolonged drying, desiccation and rapid weighing.

3.2 Samples containing high concentrations of bicarbonate will require careful and possibly prolonged drying to insure that all the bicarbonate is converted to carbonate.

3.3 Too much residue in the evaporating dish will crust over and entrap water that will not be driven off during drying. Total residue should be limited to about 200 mg.

4. SAFETY ISSUES

4.1 All laboratory personnel are required to wear lab coats, safety glasses, and protective gloves.

5. SAMPLE COLLECTION, PRESERVATION, CONTAINERS AND HOLDING TIMES

5.1 Preservation of the sample is not practical; analysis should begin as soon as possible. Refrigeration or icing , to minimize microbiological decomposition of solids, is recommended.

5.2 Samples may be collected in either plastic or glass containers.

5.3 The holding time of samples for Filterable Residue is 7 days.

6. APPARATUS

6.1 50 ml graduated cylinder
6.2 50 ml beakers
6.3 Glass fiber filter discs, 2.1 cm
6.4 Gooch crucible adapter.
6.5 Suction flask, 500 ml
6.6 Drying oven, 180° C
6.7 Dessiccator
6.8 Analytical balance, capable of weighing to 0.1 mg
6.9 Gooch crucible
6.10 Vacuum pump

7. PROCEDURE

7.1 Preparation of glass fiber filter disc: Place the disc into bottom of a suitable Gooch crucible. While vacuum is applied, wash the disc with three successive 20 ml volumes of distilled water. Remove all traces of water by continuing to apply vacuum after water has passed through. Discard washing.

7.2 Preparation of evaporating dishes: If Volatile Residue is also to be measured, heat the clean dish to 550° for one hour in a muffle furnace. If only Filterable Residue is to be measured, heat the clean dish to 180° for one hour. Cool in desiccator and store until needed. Weigh immediately before use.

7.3 Assemble the filtering apparatus and begin suction. Shake the sample vigorously and rapidly transfer 25 ml to the funnel by means of a 50 ml graduated cylinder. If total filterable residue is low , a larger volume may be filtered.

7.4 Filter the sample through the glass fiber filter.

7.5 Dry the sample for at least one hour at 180°. Cool in a desiccator and weigh. Repeat the drying cycle until a constant weight is obtained or until weight loss is less than 0.5 mg.

8. QA/QC REQUIREMENTS

8.1 For every matrix of up to ten samples, there must be one duplicate performed on a sample.
8.2 There must be a blank analyzed every day of analysis.
8.3 The % RPD for duplicate samples must be at or below 20% or within 1 * LOD.

9. CALCULATIONS

9.1 Calculate filterable residue as follows:

$$\text{filterable residue, mg/L} = \frac{(A-B) \times 1{,}000}{C}$$

Where:

A = weight of dried residue + dish in mg
B = weight of dish in mg
C = volume of sample used in ml

9.2 To calculate RPD:

$$\frac{|\text{sample result} - \text{duplicate sample result}|}{(\text{sample result} + \text{duplicate sample result})/2} * 100$$

10. REPORTING

10.1 All results will be reported as mg/L.
10.2 All results shall be reported to two significant figures.

11. REFERENCES

11.1 Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1989, Total Dissolved Solids Dried at 180° C, Method 2540 C.

TOTAL DISSOLVED SOLIDS

DATE 7-31-99 ANALYST QB UNITS ~~mg/L~~ µg/L LOD _____

VESSEL ID	SAMPLE ID	SAMPLE DATE	C SAMPLE VOLUME	A TOTAL WEIGHT	B VESSEL WEIGHT	RESULT
19	Blank	7-31-99	25 ml	86.6508	86.6485	52
21	IN	7-24-99		50.8320	50.8178	568
4	OUT	7/24		51.2350	51.2209	564
2	IN	7/25		50.6090	50.5957	532
8	OUT	7/25		51.6354	51.6194	640
12	IN	7/26		51.6181	51.6057	496
3	OUT	7/26		48.3592	48.3449	572
14	IN	7/27		48.1813	48.1698	460
1	OUT	7/27		48.9394	48.9250	576
6	IN	7/28		50.7780	50.7673	428
5	OUT	7/28		49.0793	49.0660	532
7	IN	7/29		48.5721	48.5620	404
22	OUT	7/29		50.9810	50.9672	552
11	IN	7/30		48.3445	48.3335	440
10	OUT	7/30		51.8149	51.8005	556

CALCULATION: $\frac{(A-B) \times 1000}{C} \times 1000$

APPENDIX D

OUTFALL 001 EFFLUENT INFORMATION

Michigan Department of Natural Resources: Surface Water Quality Division and Waste Management Division

Daily Discharge Monitoring Report

Permit Number MI0054992

Permittee Name: Ambar Chemical, Inc.

Permittee Address: 221 Rue DeJean, Suite 301

City, State, Zip Code: Lafayette, LA 70505

Facility Name and Location (If different than Permittee): Ambar Chemical - Manistee, 1501 Main Street, Manistee, MI 49660

Monitoring Period: 97/11/01 (year/month/day) to 97/11/30 (year/month/day)

Discharge Number: 001

parameter	Flow (001)	pH	Observation	Temperature C01	Heat Addition	Flow (in)	Temperature (in)	Dissolved Solids 001	Dissolved Solids 001	Dissolved Solids (in)	Net Dissolved Solids	Net Dissolved Solids	Suspended Solids	Suspended Solids
limit	14.504	6.5 - 9.0	report	report	85.0	report	report	report	report	report	40,340	report	report	report
unit	MGD	S.U.	daily	°F	MBtu/hr	MGD	°F	lbs/day	mg/L	mg/L	lbs/day	average wgt.	lbs/day	mg/L
1	7.33	7.92	1	59.5 59.7 59.4	25.58	6.79	48.5	21,275.7	348	168	11,763.7	180.0		
2	0.77	7.95	1	56.8 59.2 58.3	25.13	0.57	50.1	23,112.6	310	184	9,957.6	132.0		
3	6.55	7.96	1	57.6 57.9 58.1	22.65	6.04	49.6	24,025.9	340	180	11,554.5	156.0		
4	6.46	7.96	1	60.4 61.0 61.0	31.02	6.00	45.2	18,335.4	340	196	8,519.2	144.0		
5	6.35	7.92	1	58.6 58.8 58.2	31.00	5.45	43.6	15,254.3	288	186	6,701.7	100.0		
6	6.59	7.83	1	62.0 63.1 63.1	29.79	6.19	48.6	26,010.9	364	338	3,075.6	20.0		
7	6.95	7.82	1	59.4 59.4 59.0	30.72	6.50	48.6	26,017.0	346	352	1,050.7	-4.0		
8	6.82	7.95	1	59.0 59.7 59.7	30.78	6.35	48.5	22,075.7	300	292	4,513.2	48.0		
9	6.83	7.77	1	58.3 60.1 59.7	30.26	6.82	49.1	12,077.0	164	240	-5,701.8	-76.0		
10	6.13	7.26	1	47.0 47.1 46.8	0.00	6.07	51.9	8,547.4	128	124	-302.0	4.0		
11	5.91	7.52	1	46.7 46.7 46.7	0.00	5.67	51.6	10,854.2	220	112	4,616.5	100.0		
12	3.13	7.53	1	46.0 46.8 46.8	0.00	4.24	47.7	8,698.6	256	260	-2,510.2	-4.0		
13	3.15	7.53	1	46.0 46.4 46.4	0.00	4.26	46.2	14,295.7	544	576	-8,274.1	-32.0		
14	6.23	7.60	1	46.2 46.4 46.4	1.36	6.07	45.7	17,473.7	336	316	1,461.6	20.0		
15	6.43	7.51	1	46.0 44.6 45.3	3.48	5.74	44.3	10,942.4	316	260	4,483.2	56.0		
16	6.31	7.48	1	46.0 44.3 43.6	1.36	5.79	44.3	15,041.6	320	268	3,892.8	52.0	140.5	11.0
17	6.23	7.44	1	42.8 42.8 43.2	0.00	5.67	44.2	16,849.6	324	292	2,551.9	32.0		
18	6.35	7.48	1	43.3 43.5 43.0	0.00	6.41	44.2	11,440.7	216	264	-2,675.6	-48.0		
19	6.26	7.43	1	52.9 53.6 54.0	25.81	6.37	44.0	19,625.6	284	200	5,660.5	84.0		
20	6.03	7.56	1	43.0 43.2 43.2	0.00	6.48	44.5	18,750.2	280	244	1,476.4	36.0		
21	6.15	7.40	1	42.4 42.4 42.4	0.00	6.45	44.4	14,423.3	212	280	-5,329.5	-68.0		
22	6.10	7.11	1	41.2 40.7 40.6	0.00	6.47	42.7	15,042.7	236	188	2,655.2	48.0		
23	6.10	7.05	1	39.7 39.6 39.4	0.00	6.50	41.8	14,596.8	216	216	-724.1	0.0		
24	8.69	7.44	1	47.6 47.5 47.5	16.25	8.94	41.8	13,349.8	184	192	-993.8	-8.0		
25	6.76	7.62	1	46.2 46.0 45.3	11.20	8.02	42.5	12,576.1	172	172	-372.0	0.0	0.0	0.0
26	6.59	7.42	1	45.7 45.0 45.1	9.21	8.02	42.3	15,953.6	220	184	2,259.0	36.0		
27	7.10	7.45	1	39.4 39.6 39.6	0.00	6.95	40.6	20,300.5	344	408	-3,263.7	-64.0		
28	7.23	7.24	1	40.0 40.5 40.6	0.00	7.09	41.3	16,172.2	268	220	3,163.5	48.0		
29	7.37	7.50	1	40.6 40.4 40.5	0.00	7.21	41.5	16,467.0	260	212	3,735.6	56.0		
30	7.23	7.37	1	40.4 40.4 40.6	0.00	7.11	41.5	12,068.0	200	200	204.3	0.0		
Total	216.25	N/A	1	N/A N/A N/A	326.38	216.82	N/A	491,264.3	8,360	7,276.0	65,070.1	N/A	N/A	N/A
Minimum	3.13	7.05	1	39.4 39.6 39.4	0.00	4.24	40.6	8,547.4	128	112.0	-8,274.1	-76.0	0.0	0.0
Average	7.21	7.57	1	46.6 46.8 46.5	10.88	7.23	45.5	16,375.5	279	242.5	2,169.0	36.1	70.2	5.5
Maximum	8.69	7.96	1	62.0 63.1 63.1	31.02	9.02	51.9	26,017.6	544	576.0	11,763.7	180.0	140.5	11.0

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. See 18 U.S.C. 1001 and 33 U.S.C. 1319.

(For multiple monitoring locations per outfall, there is an 18 U.S.C. and/or maximum imprisonment of between 6 months and 3 years.)

Richard Lovas, Plant Manager
Printed Name and Title of Principle Executive Officer or Authorized Agent

Signature of Principle Executive Officer or Authorized Agent

Date: 12-8-97

Michigan Department of Natural Resources: Surface Water Quality Division and Waste Management Division

Daily Discharge Monitoring Report

Permit Number: MI0054992

Permittee Name: Ambar Chemical
Permittee Address: 16025 Northchase, Suite 1600
City, State, Zip Code: Houston, TX 77060

Facility Name and Location (if different than Permittee): Ambar Chemical - Manistee, 1501 Main Street, Manistee, MI 49660

Monitoring Period: 3/1/98 (year/month/day) to 3/31/98 (year/month/day)

Discharge Number: 001

day	Flow (001) 14.504 MGD	pH 6.5 - 9.0 S.U.	Observation report daily	Temperature 001 report °F	Heat Addition 95.0 MBtu/hr	Flow (In) report MGD	Temperature (In) report °F	Dissolved Solids 001 report lbs/day	Dissolved Solids 001 report mg/L	Dissolved Solids (In) report mg/L	Net Dissolved Solids 40,340 lbs/day	Net Dissolved Solids report average mg/L	Suspended Solids report lbs/day	Suspended Solids report mg/L
1	8.82	7.85	1	48.4 49.0 48.8	7.15	9.00	44.2	22,447.3	305	185	6,540.4	120.0		
2	8.79	7.98	1	44.2 48.2 48.2	9.59	9.12	44.7	22,000.0	300	181	8,222.1	119.0		
3	8.75	8.01	1	43.3 44.1 44.7	4.09	8.94	43.7	23,585.8	323	179	10,233.3	144.0		
4	8.95	7.90	1	44.2 44.2 44.4	3.35	8.90	43.2	14,279.8	191	174	1,240.0	17.0		
5	8.78	7.60	1	47.5 48.2 48.2	12.05	8.88	43.6	13,560.0	185	173	740.3	12.0		
6	8.77	7.08	1	47.1 47.3 47.3	10.93	9.28	43.3	13,679.8	187	175	131.3	12.0		
7	8.79	7.74	1	48.2 45.9 41.0	8.57	9.49	43.8	14,008.7	191	182	-411.8	9.0		
8	8.77	8.54	1	45.9 41.4 44.0	7.38	9.63	43.2	14,057.3	192	180	-899.8	8.0		
9	8.73	7.16	1	44.4 44.1 44.0	9.25	9.38	41.2	13,115.7	180	172	-351.3	8.0		
10	8.18	7.40	1	43.5 43.5 43.1	7.14	8.22	40.7	11,050.5	162	140	833.7	13.0	0.0	0.0
11	8.55	7.68	1	41.4 41.4 41.8	4.53	8.79	39.8	27,564.8	392	284	7,144.9	108.0		
12	8.72	7.89	1	44.1 44.1 44.2	10.87	8.78	40.7	17,481.6	240	236	180.4	4.0		
13	8.58	8.08	1	44.0 44.3 44.4	10.32	8.49	38.3	26,027.3	376	270	11,346.4	150.0		
14	8.59	7.60	1	50.9 38.5 40.8	33.71	8.68	38.3	18,339.8	258	224	2,152.5	32.0		
15	8.73	7.60	1	48.1 48.2 47.8	27.75	8.71	38.0	31,758.5	436	184	18,391.7	252.0		
16	8.77	8.08	1	43.7 43.9 43.9	11.20	8.32	39.8	25,749.0	352	216	8,949.8	136.0		
17	8.76	8.73	1	45.7 45.7 45.7	12.28	8.89	41.2	13,730.2	188	172	846.9	16.0		
18	8.79	8.06	1	45.8 45.6 45.4	12.01	9.10	41.0	22,010.0	300	276	865.4	24.0		
19	8.76	8.08	1	42.0 42.0 42.0	1.92	8.89	41.3	25,800.7	352	288	3,957.4	64.0		
20	9.09	8.01	1	43.1 43.3 43.3	8.50	9.23	40.3	23,053.1	304	264	2,719.3	40.0		
21	8.79	8.18	1	42.8 45.0 43.3	12.33	8.87	40.5	21,130.4	288	264	1,580.0	24.0		
22	8.78	8.14	1	43.9 44.2 43.3	9.57	8.82	40.7	18,452.8	252	248	-1,482.3	4.0		
23	8.80	8.19	1	41.8 41.3 44.2	8.58	9.01	41.8	20,273.2	276	244	708.7	32.0	0.0	0.0
24	8.80	8.50	1	42.8 43.1 44.8	10.43	9.57	41.0	22,333.5	304	200	8,309.1	104.0		
25	8.80	8.17	1	45.7 45.7 45.9	10.70	8.61	41.8	33,500.3	458	340	6,238.2	118.0		
26	8.87	8.30	1	48.0 48.0 48.2	18.81	8.85	41.4	25,178.8	340	276	2,069.2	64.0		
27	8.40	8.09	1	40.0 40.0 41.2	0.00	8.89	41.2	41,523.2	588	388	16,670.1	200.0		
28	8.00	8.05	1	50.2 51.4 51.3	20.06	8.42	41.8	16,001.0	258	208	2,448.0	40.0		
29	8.85	8.00	1	51.6 52.2 51.4	20.52	8.70	41.5	17,434.3	236	208	488.9	28.0		
30	8.60	8.10	1	48.1 48.1 48.1	17.95	8.92	41.8	19,814.4	280	288	-1,714.1	8.0		
31	8.81	8.13	1	51.3 51.3 51.6	28.02	8.87	41.4	14,415.7	198	178	-85.5	20.0		
Total	271.34	N/A	1	N/A N/A N/A	307.10	284.95	N/A	647,448.4	8,872	8,052.0	121,058.0	N/A	N/A	N/A
Minimum	8.18	7.10	1	40.0 38.5 40.0	0.00	8.22	38.0	11,050.5	162	149.0	-1,714.1	4.0	0.0	0.0
Average	8.75	7.07	1	45.4 45.9 45.1	12.49	9.10	41.4	20,885.4	288	221.0	3,905.0	87.3	0.0	0.0
Maximum	9.09	8.54	1	51.8 52.2 51.8	33.71	9.97	44.7	41,523.2	588	340.0	16,670.1	200.0	0.0	0.0

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment. See 18 U.S.C. 1001 and 33 U.S.C. 1319.
(Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)

4/9/97

Michigan Department of Natural Resources: Surface Water Quality Division and Waste Management Division

Daily Discharge Monitoring Report

Permit Number: MI0054992

Permittee Name: Ambar Chemical
Permittee Address: 16025 Northchase, Suite 1600
City, State, Zip Code: Houston, TX 77060

Facility Name and Location (if different than Permittee): Ambar Chemical - Manistee, 1501 Main Street, Manistee, MI 49660

Monitoring Period: 98/05/01 (year/month/day) to 98/05/31 (year/month/day)

Discharge Number: 001

day	Flow (001) 14.504 MGD	pH 6.5 - 9.0 S.U.	Observation report daily	Temperature 001 report °F	Heat Addition 95.0 MBtu/hr	Flow (In) report MGD	Temperature (In) report °F	Dissolved Solids 001 report lbs/day	Dissolved Solids 001 report mg/L	Dissolved Solids (In) report mg/L	Net Dissolved Solids 40,340 lbs/day	Net Dissolved Solids report average mg/L	Suspended Solids report lbs/day	Suspended Solids report mg/L
1	8.81	7.69	1	52.9 54.1 53.4	0.82	8.70	53.7	18,088.3	320	300	2,150.2	20.0		
2	7.78	7.44	1	54.6 55.0 55.1	4.05	8.28	53.1	16,628.2	258	278	-2,453.0	-20.0		
3	7.78	7.53	1	53.0 54.5 55.9	6.07	7.58	53.4	16,967.8	292	300	-4.2	-8.0		
4	8.32	8.01	1	54.8 55.0 54.0	1.81	8.83	54.9	29,899.8	428	238	12,888.5	192.0		
5	8.32	7.45	1	58.6 58.1 54.5	10.89	8.53	54.4	33,308.2	488	208	11,978.7	180.0		
6	8.25	7.88	1	53.1 55.8 58.4	2.03	8.45	55.3	27,545.4	400	240	10,817.3	160.0		
7	8.93	7.45	1	61.3 62.1 62.8	23.37	9.35	54.4	25,627.8	344	548	-17,113.9	-204.0	521.0	7.0
8	9.09	7.80	1	60.1 60.1 60.3	18.99	9.59	54.3	20,929.8	278	284	-1,807.9	-8.0		
9	9.26	6.54	1	62.6 64.0 66.2	32.01	9.74	54.9	23,178.8	300	478	-13,541.0.	-178.0		
10	8.84	6.55	1	58.8 58.5 57.0	8.27	9.83	55.8	25,965.8	352	188	11,204.0	172.0		
11	8.83	7.88	1	63.5 63.7 63.3	19.53	9.63	56.8	22,392.0	304	188	7,201.5	116.0		
12	8.89	7.67	1	64.0 63.1 63.3	22.44	9.54	55.9	18,612.4	224	120	7,059.7	104.0		
13	8.84	7.88	1	58.6 61.2 62.7	18.18	9.89	56.1	17,414.4	236	164	4,154.2	72.0		
14	8.84	7.63	1	60.0 63.1 61.0	16.53	9.60	57.1	35,097.8	488	168	22,533.2	320.0		
15	8.73	7.68	1	55.1 58.8 58.4	3.54	9.51	57.3	37,312.9	512	272	15,719.0	240.0		
16	8.84	7.49	1	60.1 59.8 60.2	11.30	9.51	58.1	25,092.7	340	438	-9,494.9	-98.0		
17	8.80	7.45	1	60.4 60.6 61.0	9.43	9.43	57.8	44,272.4	598	240	25,389.1	358.0		
18	8.83	7.59	1	60.2 60.5 60.0	22.07	9.29	58.3	77,478.9	1,040	424	44,602.3	616.0		
19	8.87	7.51	1	60.1 64.4 67.1	22.94	9.49	58.8	35,813.2	484	324	10,188.8	160.0		
20	8.86	7.58	1	60.7 67.1 67.8	20.71	9.35	57.4	42,270.8	572	400	11,054.3	172.0		
21	8.93	7.61	1	60.1 68.2 67.9	30.05	9.12	57.4	62,447.2	704	452	18,040.5	252.0		
22	9.23	7.51	1	53.8 53.8 59.0	5.40	9.40	57.9	51,742.8	672	480	13,745.5	192.0		
23	8.85	7.57	1	60.1 60.4 61.8	8.83	9.09	58.4	40,963.9	638	412	15,745.8	224.0		
24	8.84	7.52	1	60.8 60.0 60.8	0.06	9.60	58.0	51,905.8	704	480	13,404.4	224.0		
25	8.81	7.04	1	63.8 63.3 63.3	14.28	9.59	58.6	39,120.4	532	404	8,793.0	128.0		
26	8.87	7.88	1	68.7 69.7 70.0	31.50	9.60	58.8	41,134.1	558	452	4,951.4	104.0	2365.3	32.0
27	8.87	7.84	1	70.1 68.7 69.4	27.84	9.67	60.1	40,555.4	548	392	8,237.0	158.0		
28	8.80	7.54	1	67.3 66.9 67.4	21.01	9.48	59.5	35,947.0	484	320	10,880.8	164.0		
29	8.86	7.65	1	66.8 67.4 67.1	21.54	9.50	59.6	21,289.8	288	204	5,121.1	84.0		
30	8.88	7.44	1	60.6 60.3 60.4	0.83	9.40	60.3	20,405.8	278	180	6,200.1	98.0		
31	8.82	7.47	1	60.4 60.8 60.6	0.55	9.30	60.4	20,308.3	278	220	3,228.6	58.0		
Total	268.54	N/A	1	N/A N/A N/A	452.60	284.51	N/A	1,016,445.2	13,926	9,880.0	250,400.2	N/A	N/A	N/A
Minimum	8.73	6.54	1	51.9 54.1 53.4	0.00	8.20	53.1	10,612.4	224	120.0	-13,541.0	-178.0	2,365.3	7.0
Average	8.69	7.54	1	61.7 61.8 62.1	14.60	9.18	56.8	32,788.8	449	318.7	8,367.7	134.0	2,365.3	19.5
Maximum	9.26	8.01	1	70.1 69.7 70.0	32.01	9.83	60.4	77,478.9	1,040	548.0	44,602.3	616.0	2,365.3	32.0

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment. See 18 U.S.C. 1001 and 33 U.S.C. 1319.
(Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)

Richard Lovas — Plant Manager

Principal Executive Officer or Authorized Agent

Date 6/9/98

MICHIGA ...PARTMENT OF ENVIRONMENTAL ... JTY

INTEROFFICE COMMUNICATION

August 28, 1996

TO: Dan Dell
Permits Section
Surface Water Quality Division

FROM: Bruce R. Walker
Great Lakes and Environmental Assessment Section
Surface Water Quality Division

Subject: Ambar Chemical, Inc.
Expedited New Use WQBEL Review
MI0054992

We have reviewed the July 17, 1996 permit application for the subject facility. The purpose of this review was to determine what water quality based permit conditions are necessary for this facility. This facility will be a new use discharge although it will be operated out of the former AKZO Nobel Salt plant site. Because of the lack of effluent information supplied in the application, we also reviewed the available information on the previous AKZO operations and discharges, and other brine related operations, to gain some other possible perspectives on the new operation. Although the new operation will be using the existing facility and equipment, it will not be directly comparable to the AKZO operation for two reasons. Ambar will be producing different brine derived products than AKZO. Additionally, Ambar will be using a different brine source as its raw material. Although the exact source, and eventual fate, of the brine has not been clearly identified to district staff, it appears that Ambar will be using high strength, waste brine from Martin Marietta instead of the brine which was previously extracted from AKZO's wells. As a result of the above factors, we have a general idea of what Ambar may discharge but a considerable uncertainty remains regarding the actual physical, chemical, and toxicological characteristics of the effluent.

The applicant is requesting an authorized flow of 14.504 mgd. The application describes the proposed discharge as continuous, 24 h/day for 365 day/year, and comprised of contact and noncontact cooling waters. The receiving water will be Manistee Lake, a coldwater lake, which has an average hardness and suspended solids level of 170 and 3.5 ppm, respectively. The lake is shallow (≤ 1 M) in the first 60-80 feet offshore from the discharge location. Process and cooling waters will be drawn from Manistee Lake while domestic and sanitary related water needs will be handled by the City of Manistee. The AKZO permit file listed the mixing zone as a semi-circle with a 500' radius although previous toxicant calculations had been completed on a zero mix basis.

Michigan Department of Natural Resources: Surface Water Quality Division and Waste Management Division
Daily Discharge Monitoring Report

Permit Number MI0054992

Facility Name: Amber Chemical
Facility Address: 15025 Northchase, Suite 1600, Houston, TX 77060

Facility Name and Location (if different than Permittee): Amber Chemical - Manistee, 150-1 Main Street, Manistee, MI 49660

Monitoring Period: 98/08/01 to 98/08/31 (yy/mm/dd)

Discharge Number: 001

Parameter	Flow (001): MGD	pH: S.U.	Conductivity: report daily	Temperature (air): report °F	Temperature (water): report °F	Dissolved Solids (tds): report mg/L	Dissolved Solids (tds): report lb/day	Total Suspended Solids: report lb/day	Total Suspended Solids: report mg/L	Ammonia: report lb/day	Ammonia: report mg/L
Limit	14.504	6.5 - 9.0	report	report	report	report	report	40,340	report	report	report
Average											
Maximum											
Total	275.21	N/A	N/A	31	N/A	N/A	464.88	30.4.10	10.11	76.1	41,827.0	504	424.0	13,903.1	216.0	510.3	7.0
Average	8.86	7.03	1	1	76.3	76.3	15.00	9.18	9.81	73.7	24,952.7	336	240.0	8,030.5	103.3	407.9	5.5
Maximum	8.72	7.39	1	1	76.5	76.5	4.42	9.18	9.81	73.7	24,952.7	336	240.0	8,030.5	103.3	407.9	5.5
1	8.05	7.43	1	1	76.7	76.7	14.40	9.82	13.5	73.0	23,435.5	316	223	4,328.1	84.0		
2	8.50	7.55	1	1	76.8	77.5	13.59	9.94	13.5	73.0	24,364.7	328	240	4,464.7	86.0		
3	8.88	7.39	1	1	76.2	76.6	16.33	9.66	12.7	72.7	27,664.6	376	208	3,477.9	68.0		
4	8.66	7.47	1	1	79.1	76.0	17.66	10.07	12.1	72.1	20,922.5	291	312	2,708.9	70.0		
5	8.07	7.07	1	1	81.5	80.8	25.15	10.07	12.3	72.5	20,422.4	278	240	-6,827.5	-72.0		
6	8.09	7.66	1	1	81.2	81.2	24.38	9.94	12.5	72.5	24,825.9	333	376	1,720.3	50.0		
7	8.90	7.47	1	1	77.8	78.1	14.87	9.85	12.7	72.7	23,663.2	440	320	8,101.2	120.0		
8	8.92	7.51	1	1	78.1	77.2	11.40	10.01	12.2	72.2	27,397.9	368	320	7,078.1	136.0		
9	8.89	7.66	1	1	77.1	76.2	10.25	10.04	13.9	73.4	33,537.7	492	316	6,346.4	144.0	519.3	7.0
10	8.00	7.07	1	1	81.5	80.5	21.91	9.90	12.3	73.4	29,995.6	404	280	-2,185.8	24.0		
11	8.88	7.67	1	1	81.3	79.9	24.90	10.00	12.3	73.1	33,167.1	448	424	3,095.0	68.0		
12	8.08	7.58	1	1	78.8	78.6	11.35	10.05	12.9	72.9	32,605.0	440	352	-750.1	16.0		
13	8.67	7.54	1	1	74.1	73.5	4.43	9.57	12.9	73.4	25,745.0	348	312	5,144.3	120.0		
14	8.88	7.62	1	1	73.1	73.4	10.24	9.94	12.9	73.4	32,012.2	432	312	5,144.3	120.0		
15	8.88	7.60	1	1	73.0	73.2	10.77	9.81	12.9	73.2	30,706.6	416	340	2,838.9	76.0		
16	8.88	7.60	1	1	73.1	73.4	8.13	9.76	13.0	73.4	26,743.4	356	288	5,270.1	100.0		
17	8.88	7.60	1	1	70.2	70.2	8.13	9.77	13.0	73.2	29,202.2	380	300	4,827.9	92.0		
18	8.88	7.53	1	1	77.2	76.4	11.88	9.77	13.0	73.2	29,413.7	344	288	1,167.8	50.0		
19	8.85	7.52	1	1	77.5	77.6	14.80	10.09	12.9	73.2	29,413.7	344	304	707.7	40.0		
20	8.84	7.64	1	1	70.9	70.4	14.91	9.75	13.0	73.2	26,437.5	344	288	3,525.5	68.0		
21	8.89	7.60	1	1	76.4	76.2	10.21	9.57	13.2	73.2	24,050.7	336	288	3,525.5	68.0		
22	8.89	7.65	1	1	73.9	74.1	9.54	9.48	13.0	74.0	41,827.6	664	368	11,127.1	176.0		
23	8.91	7.66	1	1	71.1	71.2	4.72	9.55	12.9	73.5	31,214.2	460	320	8,000.1	132.0		
24	8.92	7.72	1	1	77.4	77.6	5.00	9.58	12.9	73.1	30,010.6	484	372	9,276.9	112.0		
25	8.89	7.73	1	1	76.2	76.2	13.56	9.60	12.9	73.0	36,814.4	480	368	12,144.1	160.0	200.0	4.0
26	8.88	7.93	1	1	81.9	81.9	24.36	9.76	12.9	73.2	30,739.7	400	240	10,680.2	160.0		
27	8.88	7.40	1	1	80.2	80.1	14.87	9.16	13.0	73.2	33,495.7	452	264	13,316.1	188.0		
28	8.72	7.80	1	1	77.5	77.5	5.43	8.60	12.9	73.0	25,697.1	356	292	2,494.5	64.0		
29	8.88	7.65	1	1	81.9	81.7	24.85	9.30	12.7	73.7	29,508.9	400	312	5,360.2	88.0		
30	8.89	7.85	1	1	82.9	82.9	22.44	9.73	12.9	74.2	30,307.8	516	300	13,903.1	216.0		
31	8.88	7.57	1	1	83.3	83.0	28.68	10.11	12.9	74.2	33,324.4	436	268	9,711.6	160.0		
	8.89	7.64	1	1	82.8	83.1	26.53	10.03	12.9	74.0	32,853.4	444	280	9,426.7	164.0		
	8.87	7.64	1	1	82.8	83.1	26.53	10.03	12.9	74.0	32,853.4	444	280	9,426.7	164.0		

Effective Date: 10/98

Permittee Name: Amber Chemical
Facility Address: 15025 Northchase, Suite 1600, Houston, TX 77060

Facility Name and Location (if different than Permittee): Amber Chemical - Manistee, 150-1 Main Street, Manistee, MI 49660

Monitoring Period: 98/08/01 to 98/08/31 (yy/mm/dd)

Discharge Number: 001

Permit Number: MI0054992

Discharge Number: 001

One additional potential situation needs metals monitoring. The plant flow description in the permit has an overflow connection from the ash handling system to the 001 outfall. This connection is described as not being used during normal operations. We recommend that the above mentioned 001 effluent metals sampling also be required whenever the overflow contributes to the 001 effluent wastestream. This would be in addition to the twice monthly monitoring already specified for the 001 effluent. This monitoring is necessary to determine if the overflow connection causes significant changes in the character of the 001 effluent.

6. 001 Effluent toxicity monitoring - An acute and chronic toxicity monitoring condition. This condition is necessary to characterize the new use discharge. Language for this condition can be adopted from the same condition which is in the initial, draft pre-public notice permit for the Morton Salt facility. Mr. Al Lam can be of assistance on this condition.

7. 001 Effluent total phosphorous monitoring - Twice monthly monitoring of effluent samples. This monitoring is necessary to determine if the new use discharge will be contributing significant amounts of phosphorous to the receiving water.

All monitoring, except for temperature and oil and grease samples, shall be conducted on 24-hour composite samples and use EPA approved analytical methods.

We also recommend that the permit contain a clause, again similar to the one in the Morton Salt permit, that allows the permittee the flexibility to request a reduction in the monitoring frequency for total phosphorous, metals, and oil and grease after one year of monitoring has been completed.

Please contact me if you have any questions regarding these recommendations.

cc: Mike Stifler/Cadillac District Office
Jerry Saalfeld/Ambar Chemical, Inc. Facility File

James R. Walker

(Ambar Chemical, Inc) 1 of 1
New Use
MI 0054992

Background
- Reopening of Previn AK20 plant, AK20 mainly lime for new product
- Will not be mining lime for raw material; will be using high strength waste lime from Martin Marietta to extract calcium make 4 diff $CaCl_2$ products.
- Leftover lime will be returned to M^2 for disposal (current daily hauling)
- New use, diff product from diff raw material than previous operation + also will have diff Qe than previous operation. Will be producing 4 calcium chloride products and will have large Qe, too. Application does not indicate any (as opposite to NaCl products)

Effluent
- One outfall 001
- Contains contact + NCCW
- Requesting 14.504 MGD; same 24 h/d; 365 d/yr (AK20 applied for 12.5 mgd; 356 d/yr)
- Permit appl very poorly filled out. Almost no data re: specific effl quality, only chronic data. Attached old AK20 permit app + application
- Limited @ AK20 as it's hard to get idea of what may be present. However since different lime source + diff products now, AK20 data is not accurate picture.
- Using Manistee Lake water as supply for NCCW, cooling. Contact water due to entrainment of lime constituents from flowing lost plant production process. Evaporation within effluent volume due to H_2O extracted from lime in magnesium process.
- Nothing for AK20 in last (1991) NPDES effluent permit appl. like Cu, Zn + Fe is sig. pollutants + effluent

Receiving water
- Manistee Lake, low lake, typical TSS of 170 ± 5.5 ppm, reported from previous permit renewal of other facilities in the lake
- 001 has previous MZ of 500' rad semi-mix (partial mix), but prior to move by GLEAS in the review. AK20 did MZ/IP Plume study in 1979 (attached)

Toxicity Data

No tox (acute or chronic) seen in last five 39-45 acute & chronic tests by MSNA & EPA on the prior AKZO effluent

Race/Basis

1) Eff. T° monitor: ≥ 3x/d or continuous, carry forward last AKZO BTU limit.
Basis: Need to characterize new plant eff. w/ respect to T° regime. Previous BTU limit will provide upper limit for heat addition until, and if, another determination is necessary.

2) Intake T° monitoring - need intake T° to calculate loadings

3) Thermal Plume & mixing - New, thermal Qe - need to characterize & also will allow better evaluation of potential toxicity/thermal issues that may arise in future. Will be consistent w/ conditions in other related permits too.

O&G monitoring - O&G detected in AKZO in past CLI's

5) Metal Monitoring - Use same list as for Mort Salt & Perf. Chem - add Sr. Sr added cause using Martin Marietta brine & lots of Sr in their 003 effluent. AKZO had some hits for Cu all in past. Last AKZO application listed sig acute of Zn, Se & Cu as used/stored/produced. The Morton list covers these analytes except for Sr. New Qe from new plant need to characterize the effluent.

Due to possible Ash Pond effluent contribution to 001, also require sampling of 001, for same metals, whenever ash pond has overflow to 001. Need to see how ash pond overflow affects 001 make up.

6). Tox monitoring - combined acute/chronic condition. New industrial Qe w/o characterization - need to assess. Monitor, rather than limit, however. Also, tox has been observed @ other brine facilities in this area.

7) TP monitoring - to assess if phos is an issue @ this facility
- just 2x/month cause was not sig prob per AKZO CLI data
- Include because of diff brine source & operation

Except for, T° & O&G, all monitoring to be 24 hr. comp samples, EPA approved analytical methods

Allow for ↓ monitoring frequency after 1 year for O&G, TP & metals, only characterized/estimated.

Rec. based on limited tox info, review of previous AKZO info, info & experience of other salt plants in the lake

From: WALKERB2--DNRDC
To: ERICKSOD--DNRDC

Date and time 09/09/96 15:22:23

From: walkerb2
Subject: amber chem permit
doug, since this new use permit is supposed to be a rush, and it is parallel to other operations on the lake, I want to give you some initial recommendations based on the other facilities so you can get started. I suspect these will be close to what the final recommendations will be.

temp- daily monitoring w/ at least 3 measurements/day if not continuous monitoring. report daily avg and daily max on daily form. on dmr report mo. avg and max. standard reopener clause too.

tox. monitoring- use same language is in current pre-pn draft permit for morton salt. al lam has this facility.

metals monitoring- same as with morton salt but add strontium to list with a rdl (tentatively) of 50 ug/l.

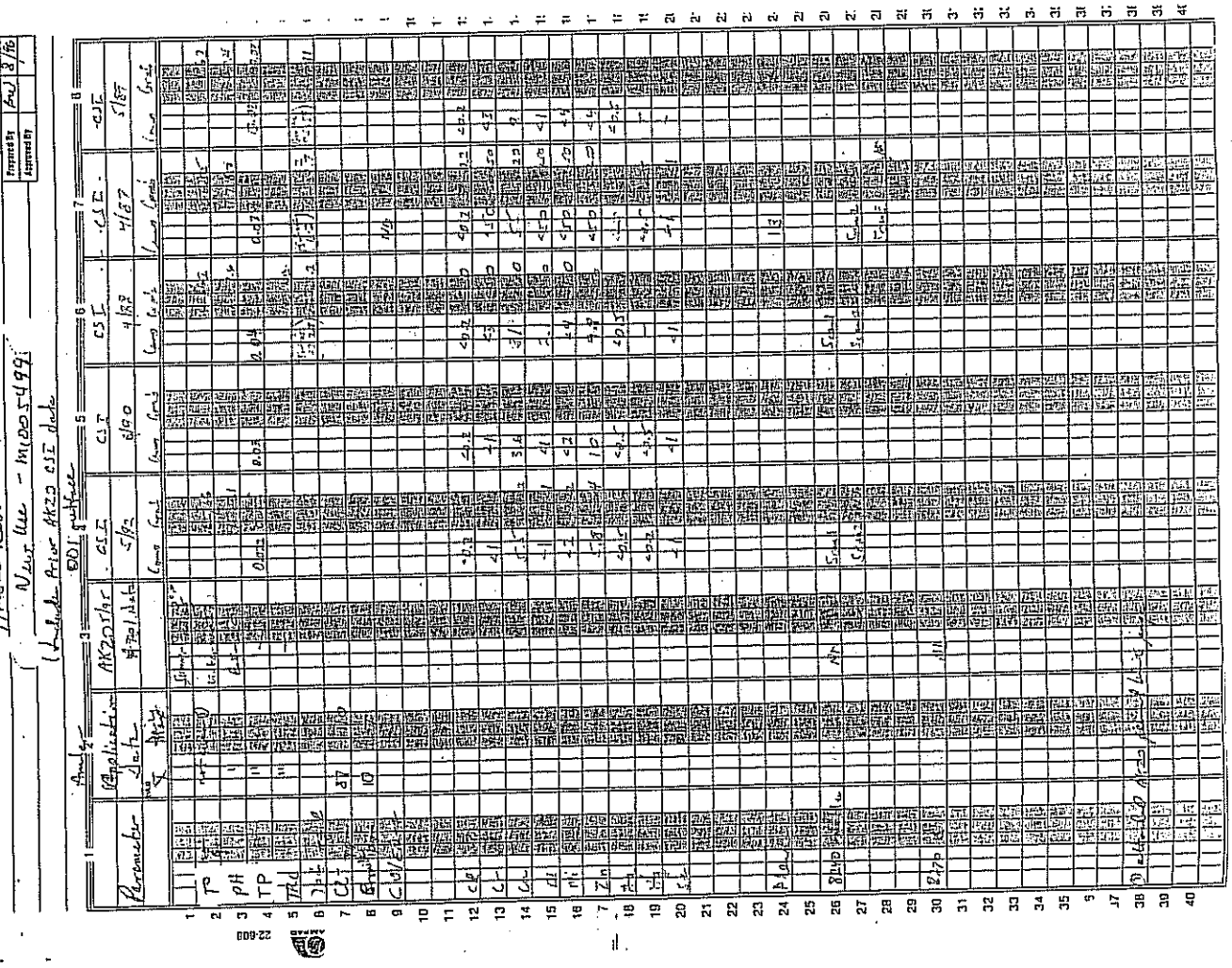
thermal plume and mixing study-same as with morton salt.reopener clause too which allows conditions changed for toxicants, temp or toxicity.

Tot. phos monitoring. weekly.

all monitoring, except temp, should be on 24 hr comp samples.

after I get time to review facility in more depth, I will notify you of any additions/deletions to these initial recs. call if need more clarification.

cc: DELLD --DNRDC
LAMA --DNRDC
SAALFELG--DNRDC
SUPPNICJ--DNRDC



AMBAR CHEMICAL, INCORPORATED

1501 MAIN STREET

MANISTEE, MANISTEE COUNTY, MICHIGAN

MIXING ZONE AND THERMAL PLUME STUDY, MANISTEE LAKE

For

NPDES PERMIT NO. MI0054992

February 1999

Prepared for: Mr. Jacob Bailik
Laboratory Manager
AMBAR Chemical, Incorporated
1501 Main Street
Manistee, Michigan 49660

Prepared by: ASI Environmental Technologies
239 North Jebavy Drive
Ludington, Michigan 49431

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AMBAR CHEMICAL, INCORPORATED
1501 MAIN STREET
MANISTEE, MANISTEE COUNTY, MICHIGAN

MIXING ZONE AND THERMAL PLUME STUDY, MANISTEE LAKE

For

NPDES PERMIT NO. MI0054992

February 1999

1. INTRODUCTION

ASI Environmental Technologies (ASI) was contracted by AMBAR Chemical, Inc. (AMBAR) to conduct a Mixing Zone and Thermal Plume Study (MZTPS) related to the NPDES discharge permit for their manufacturing operation located in Manistee, Manistee County, Michigan (Drawing 1). The objective of this study was to delineate the mixing zone and thermal plume as a result of the outfall discharge over the course of a one year time frame.

1.1. Site Information

The site of interest (facility), located in Manistee Township, just east of the downtown area of Manistee, is involved in the manufacturing of both liquid and dry calcium chloride products. AMBAR utilizes a waste stream from another local manufacturer as its primary feed stock. The facility is bounded on the east by the shore of Manistee Lake, on the west by Main Street and to the north and south by fences. The plant was acquired by AMBAR from the Akzo Nobel Salt Company, formerly known as the Hardy Salt Company.

1.2. Lake Information

Manistee Lake is a long, narrow lake which runs for several miles from the southeast to the northwest. The Little Manistee River enters the lake on the southeast end at the town of Stronach. The lake then winds northward through an area containing approximately seven

industrial plants. The north end of the lake widens to approximately three quarters of a mile, which is its widest point. At the north end of the lake, the Big Manistee River, separated into three channels, flows out of a large marsh area into the lake. The Manistee River channel then flows out of the northwest side of the lake, through the middle of the town of Manistee and into Lake Michigan.

The location of Outfall 001 from AMBAR Chemical is one of the most narrow portions of the lake, which spans approximately 850 feet across (**Drawing 2**).

1.3. Purpose and Scope of Work

The purpose of this MZTPS was to determine and define the shape and characteristics of the mixing area of the discharge plume into Manistee Lake. Simultaneously, the thermal characteristics of the plume were to be determined and used to produce accurate maps of the effluent concentration and thermal plumes for various seasons.

2. METHODOLOGY

The most important portion of the MZTPS was to establish an accurate and repeatable method of establishing the plume definition and defining isotherms and isopleths while on the lake.

2.1. Initial Reconnaissance

In order to identify the general direction and location of the discharge plume an initial reconnaissance of the plume was conducted. Based on wind direction and visible turbulent eddies the general direction and location of the discharge plume was identified, and then the sampling effort was concentrated within these confines to determine isotherms and isopleths (lines of constant concentrations).

2.2. Sampling Methodology

The timing of each sampling event was chosen carefully with certain considerations made to minimize interference that could affect the quality of the data. The factors taken into account include:

1. AMBAR Chemical, Inc. must be operating at full production or at a relatively steady rate.
2. The wind must be light or moderate with little or no wave action on Manistee Lake.
3. There must be no little or no precipitation.
4. The recreational boating on Manistee Lake must be minimal (i.e. Sampling was not conducted on holiday weekends).

Before any sampling was begun on a particular day, the following data was recorded:

- Wind direction and velocity once every hour using a RainWise® Inc. System 10 Remote Weather Station™
- Discharge flow rate from Outfall 001 every 2 hours.
- Temperature and conductivity of discharge from the plant every 2 hours.

Starting at the outfall location at the AMBAR facility, ASI measured depth and temperature at appropriate intervals in order to define the plume area and depths. The sampling scenario proceed within the area identified in the initial reconnaissance heading outward in all directions

to define the aerial extent of the discharge plume. Additional sampling locations were included as necessary for odd shaped plumes or "fingers". To establish a repeatable and accurate sampling coordinate system, a Magellan Global Positioning System (GPS) ProMARK V™ unit was utilized. The unit has an accuracy of ±3 meters.

In addition to the plume characterization sampling, background water temperature and concentration samples were collected to serve as a reference point for naturally occurring waters outside the limits of the AMBAR discharge plume. Several background samples were collected and averaged to obtain numbers representative of natural conditions. The background levels were used to identify the areas that were outside of the mixing zone. Discharge plume sampling was conducted until the temperature and concentration reached background levels.

Conductivity and temperature measurements were made with a *YSI 3000* Temperature-Level-Conductivity probe. The probe was calibrated against a standard conductivity reference solution and a calibrated thermometer to ensure sampling accuracy.

At each sampling point, after recording the GPS reading, the YSI probe was lowered to the bottom of the lake and the temperature and depth were recorded. While slowly reeling the probe upwards, the temperature and depth were recorded at approximately 5 foot intervals. Discretion was used to establish smaller depth intervals in shallower areas or areas with rapid changes in temperature or concentration.

3. RESULTS

ASI measured temperature and conductivity of the discharge plume from Outfall 001 of AMBAR Chemical's Manistee operation. The measurements were collected four times throughout a one year span and serve to document the condition and size of the plume during each of the four seasons.

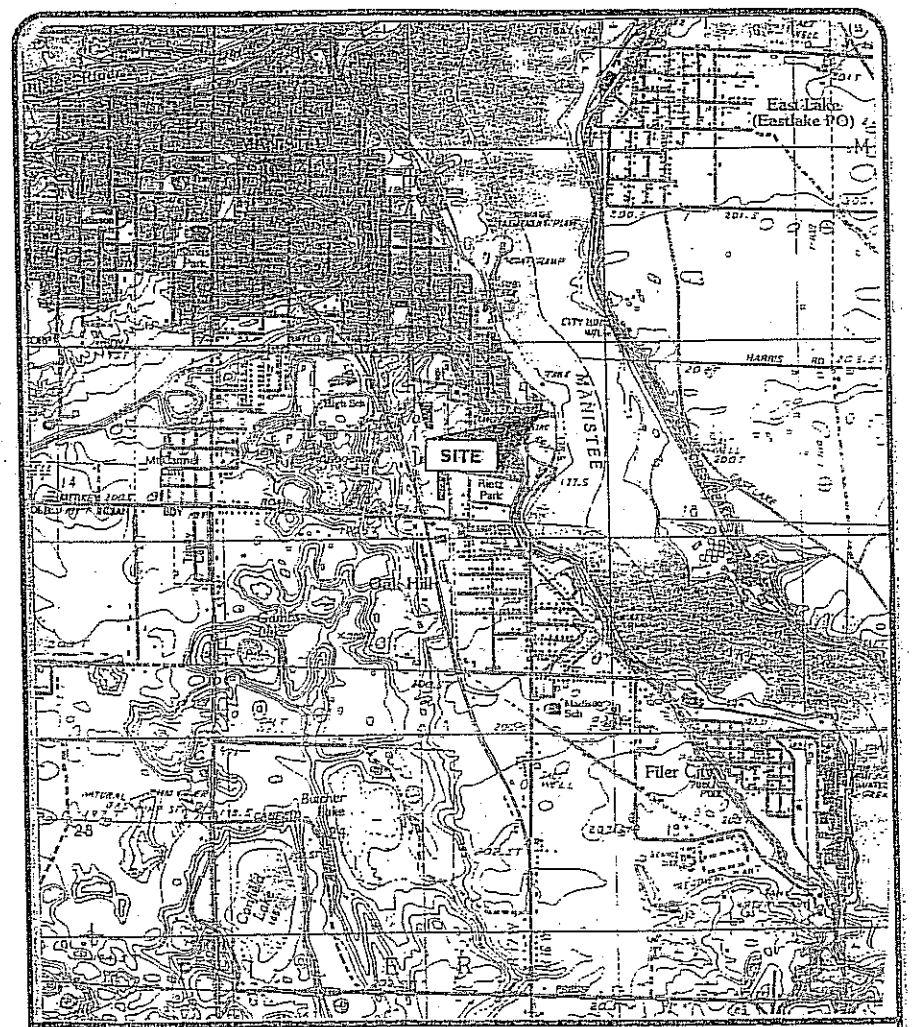
3.1. Temperature

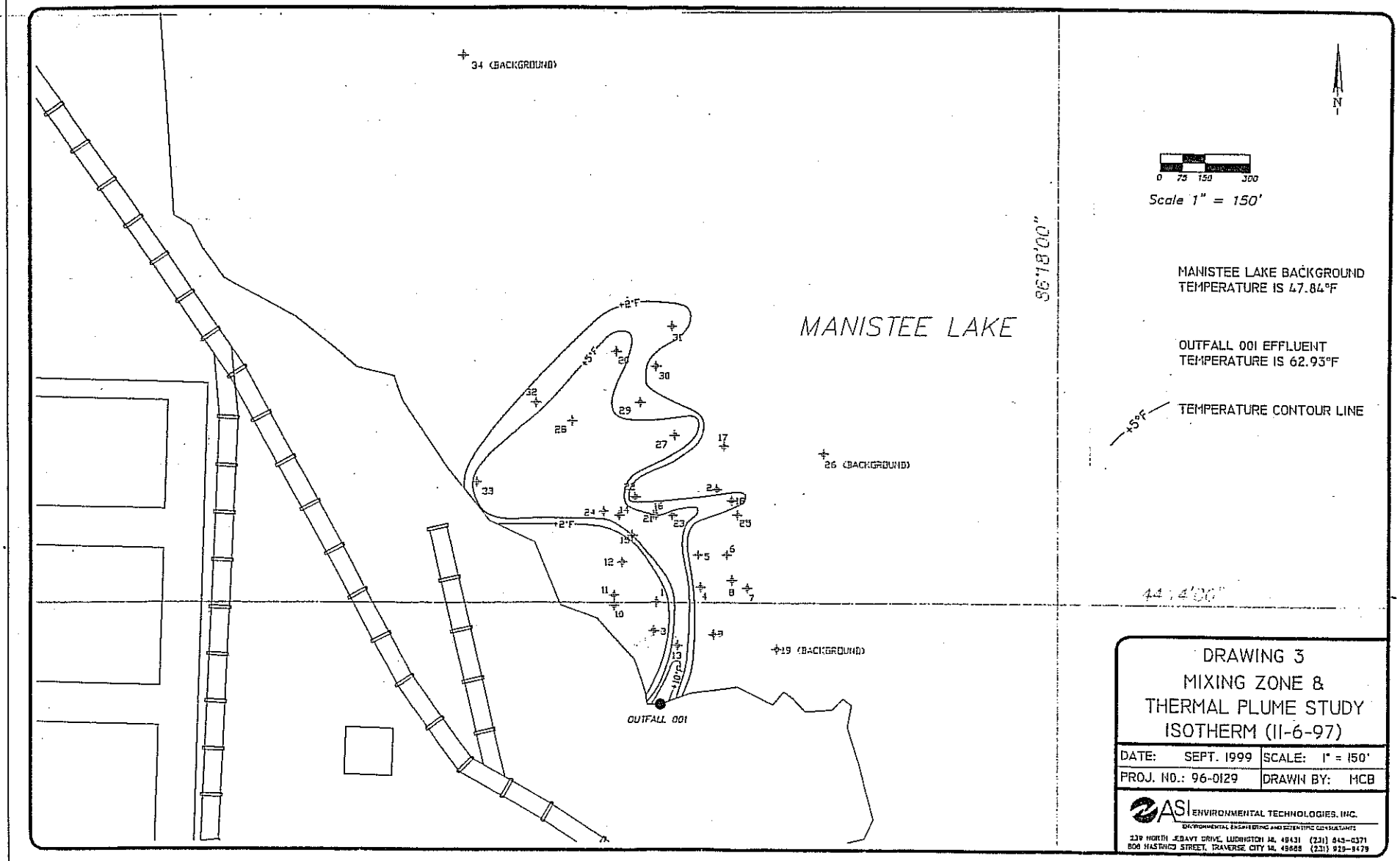
The mean temperature of Outfall 001 is 19.58°C. The mean background temperature of Manistee Lake is 15.53°C. During the summer months the discharge from Outfall 001 is cooler than the mean lake temperature. During the winter months the discharge from Outfall 001 is warmer than the mean lake temperature. Using the location data from the GPS system and the information from the calibrated probe, isotherms were developed representing the plume condition. Drawings 3,5,7,and 9 represent the isotherms developed. The data used to develop the isotherms is presented in Tables 1-4.

3.2. Conductivity

The mean conductivity of Outfall 001 is 0.448 mmhos/cm. The mean background conductivity of Manistee Lake is 0.314 mmhos/cm. Using the location data from the GPS system and the information from the calibrated probe, isopleths were developed representing the plume condition. Drawings 4,6,8,and 10 represent the isopleths developed. The data used to develop the isopleths is presented in Tables 1-4.

DRAWINGS

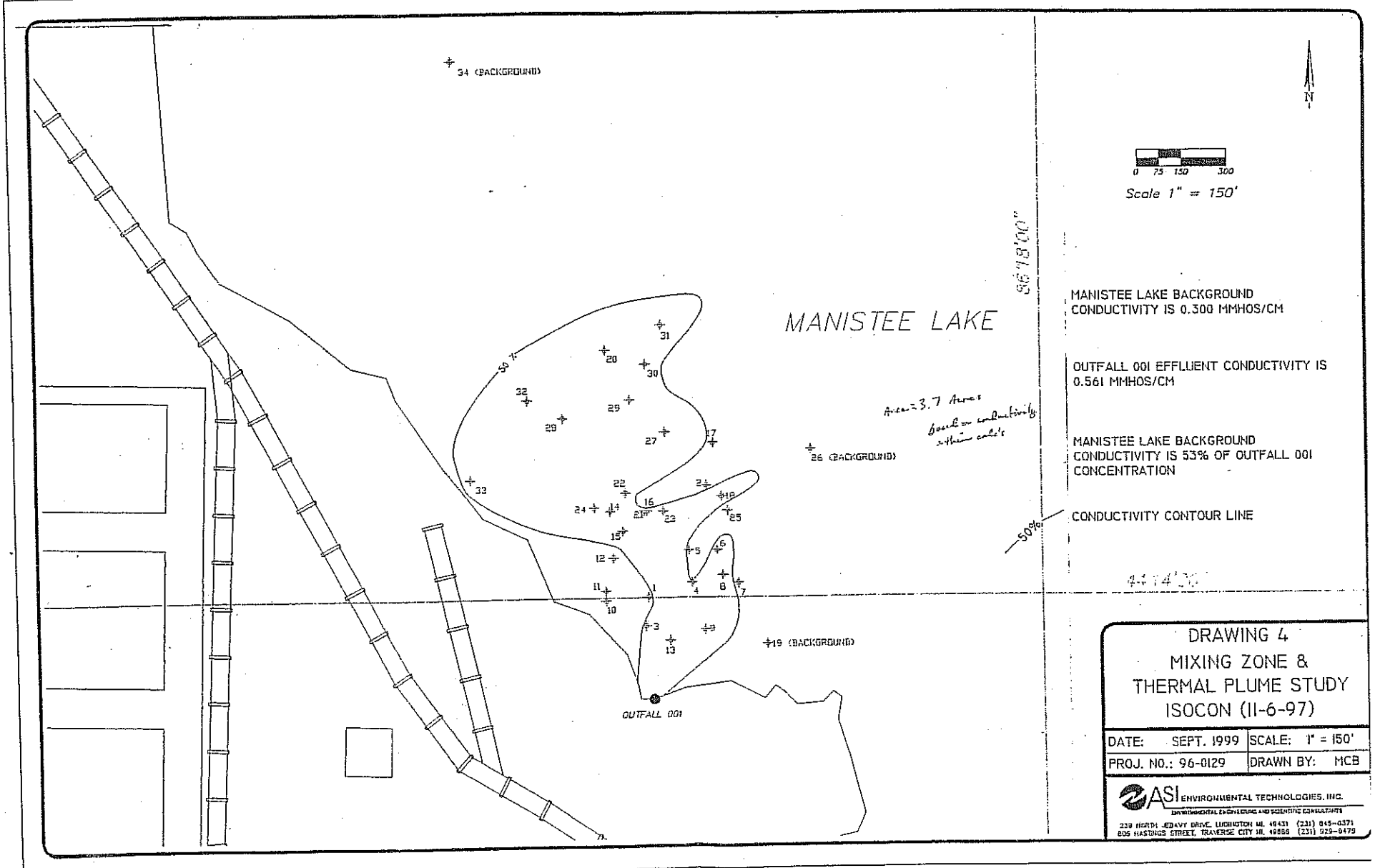

East Lake
(Eastlake PO)
SITE
MANISTEE
Filer City
Reference:
USGS 7.5 MIN QUAD
MANISTEE, MICHIGAN
1982 PROVISIONAL ED.
Scale: 1" = 2000'
N
ASI
239 N. JEBAVY DR., LUDINGTON MI, 49431
806 HASTINGS ST., TRAVERSE CITY 49686
DRAWING 1
SITE LOCATION MAP
AMBAR CHEMICAL, INC.
MIXING ZONE & THERMAL
PLUME STUDY
Date: 2-22-99
PROJ. NO.:96-012S
Drawing No: SITE_LOC.DWG
Drawn By: MCB
CHK BY:



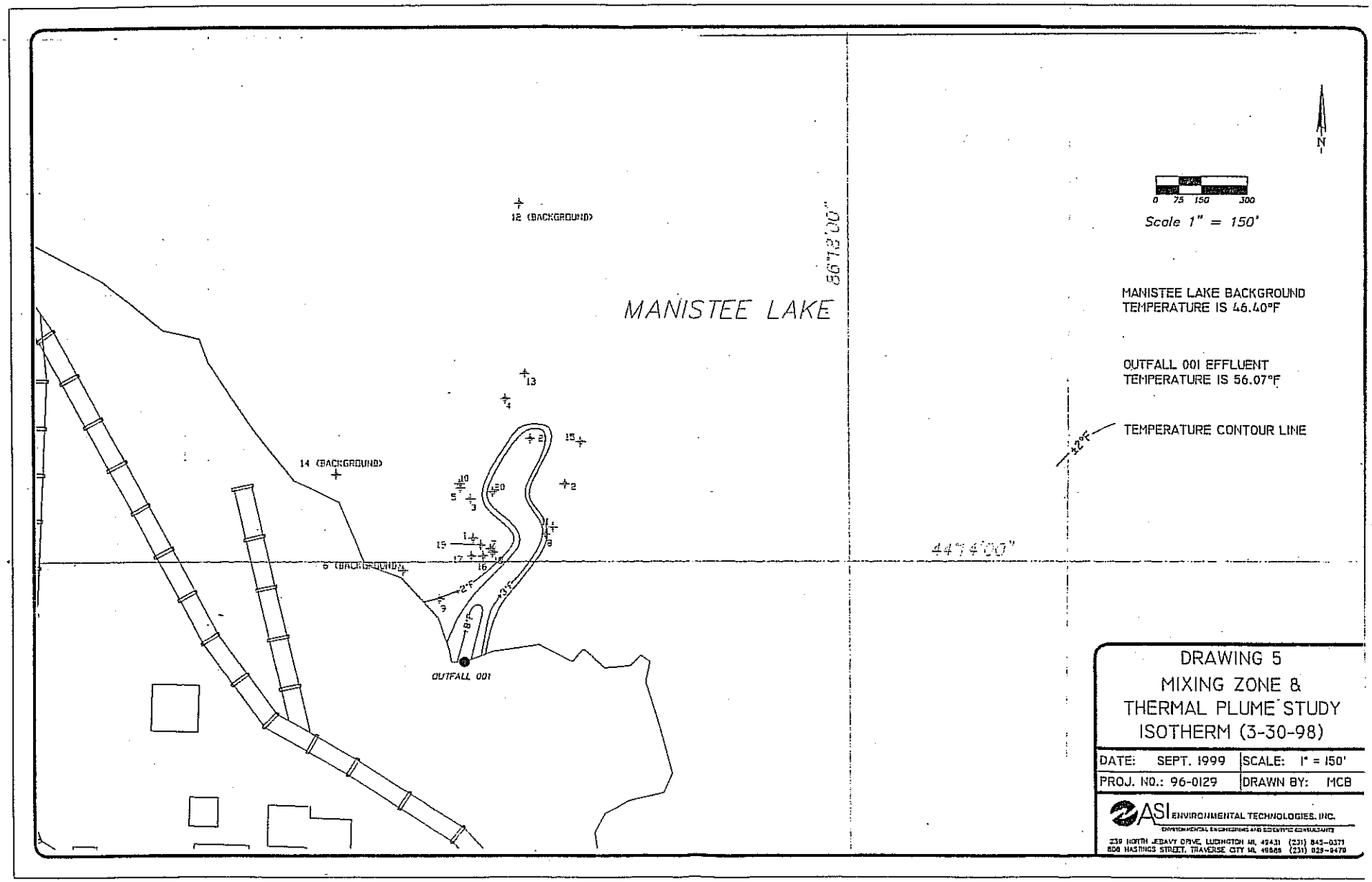
DRAWING 3
MIXING ZONE & THERMAL PLUME STUDY
ISOTHERM (11-6-97)

DATE: SEPT. 1999	SCALE: 1" = 150'
PROJ. NO.: 96-0129	DRAWN BY: MCB

ASI ENVIRONMENTAL TECHNOLOGIES, INC.
ENVIRONMENTAL ENGINEERING AND SCIENTIFIC CONSULTANTS
239 NORTH JEDAVY DRIVE, LUDINGTON MI, 49431 (231) 845-0371
808 HASTINGS STREET, TRAVERSE CITY MI, 49686 (231) 929-9479



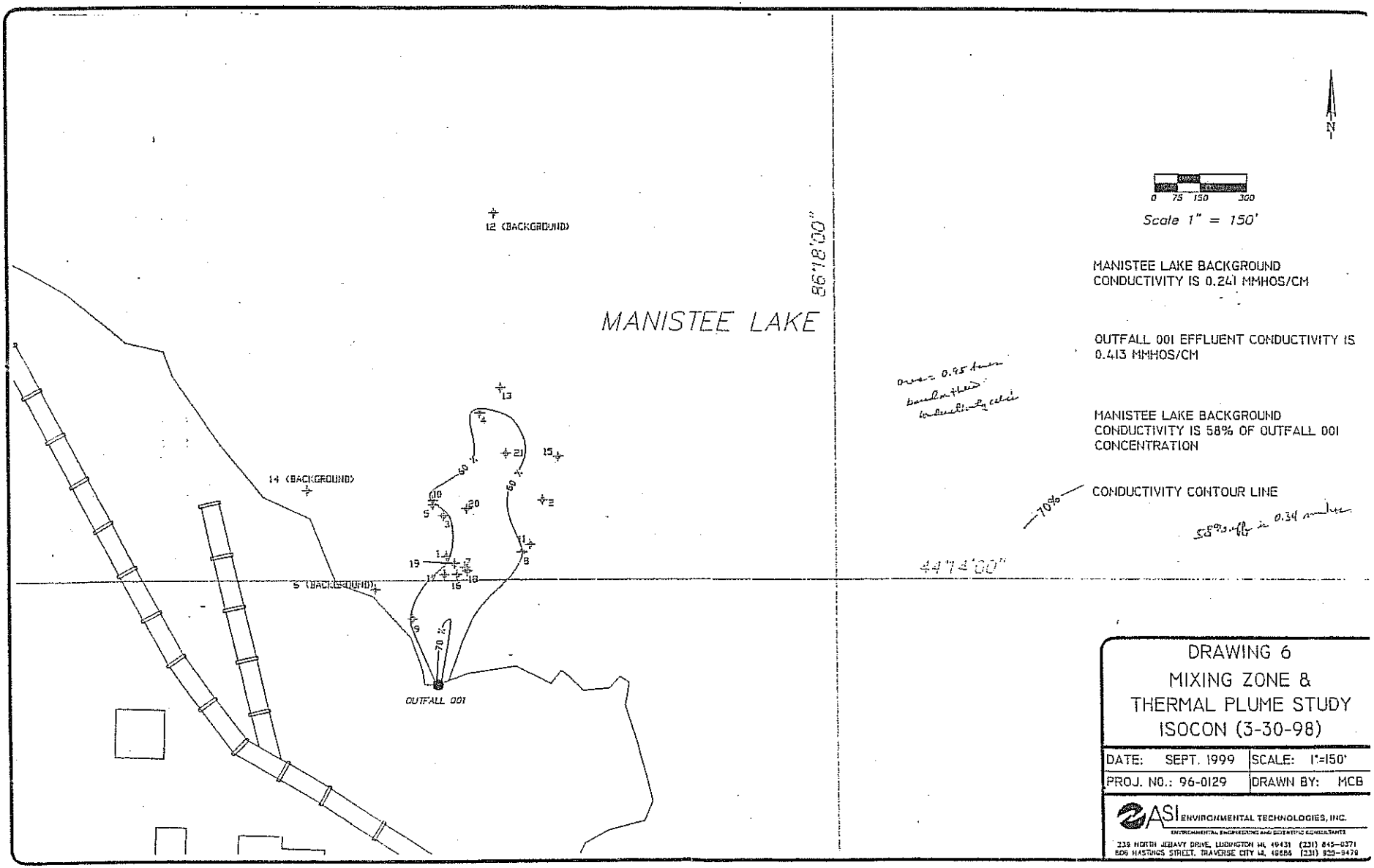
34 (BACKGROUND)
MANISTEE LAKE
26 (BACKGROUND)
19 (BACKGROUND)
OUTFALL 001
50%
N
0 75 150 300
Scale 1" = 150'
MANISTEE LAKE BACKGROUND CONDUCTIVITY IS 0.300 MMHOS/CM
OUTFALL 001 EFFLUENT CONDUCTIVITY IS 0.561 MMHOS/CM
MANISTEE LAKE BACKGROUND CONDUCTIVITY IS 53% OF OUTFALL 001 CONCENTRATION
CONDUCTIVITY CONTOUR LINE
DRAWING 4
MIXING ZONE &
THERMAL PLUME STUDY
ISOCON (11-6-97)
DATE: SEPT. 1999
SCALE: 1" = 150'
PROJ. NO.: 96-0129
DRAWN BY: MCB
ASI ENVIRONMENTAL TECHNOLOGIES, INC.



DRAWING 5
MIXING ZONE & THERMAL PLUME STUDY ISOTHERM (3-30-98)

DATE: SEPT. 1999	SCALE: 1" = 150'
PROJ. NO.: 96-0129	DRAWN BY: MCB

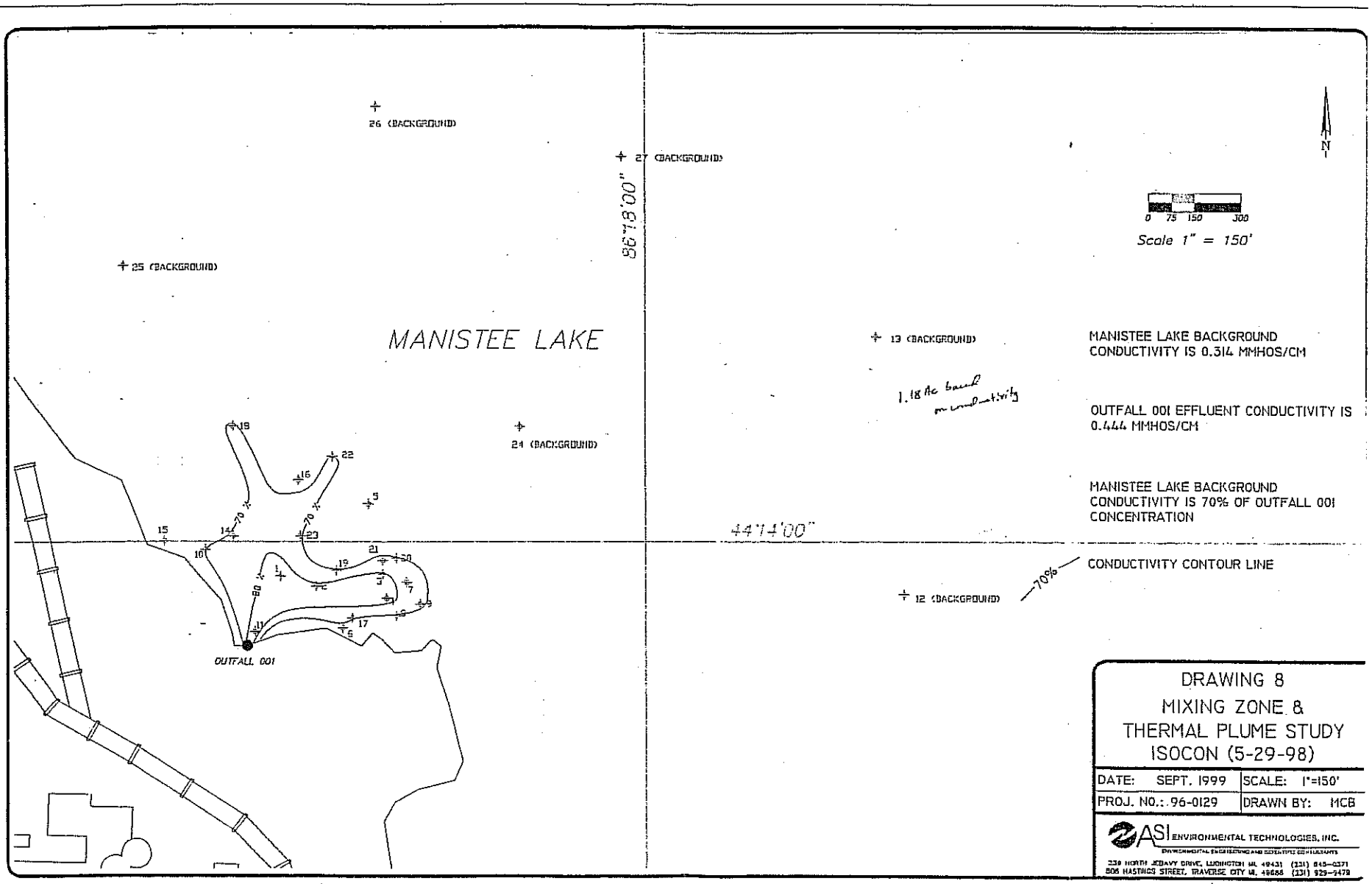
ASI ENVIRONMENTAL TECHNOLOGIES, INC.
ENVIRONMENTAL ENGINEERING AND SCIENTIFIC CONSULTANTS
239 NORTH JEBAVY DRIVE, LUDINGTON MI 49431 (231) 845-0371
808 HASTINGS STREET, TRAVERSE CITY MI 49686 (231) 929-9479



DRAWING 6
MIXING ZONE &
THERMAL PLUME STUDY
ISOCON (3-30-98)

DATE: SEPT. 1999	SCALE: 1"=150'
PROJ. NO.: 96-0129	DRAWN BY: MCB

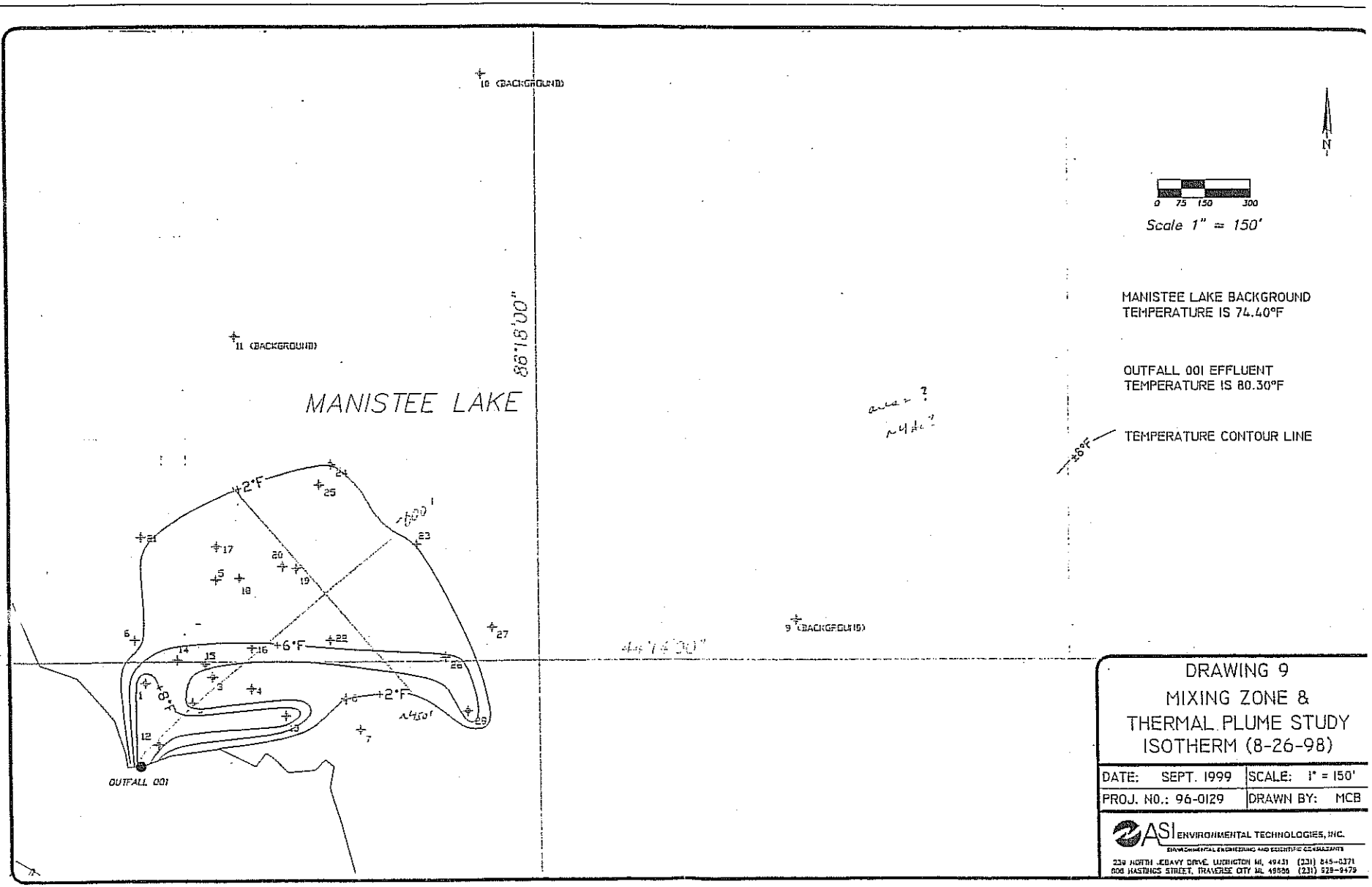
ASI ENVIRONMENTAL TECHNOLOGIES, INC.
ENVIRONMENTAL ENGINEERING AND SCIENTIFIC CONSULTANTS
339 NORTH JEBAVY DRIVE, LUDINGTON MI, 49431 (231) 845-0371
606 HASTINGS STREET, TRAVERSE CITY MI, 49684 (231) 935-9478

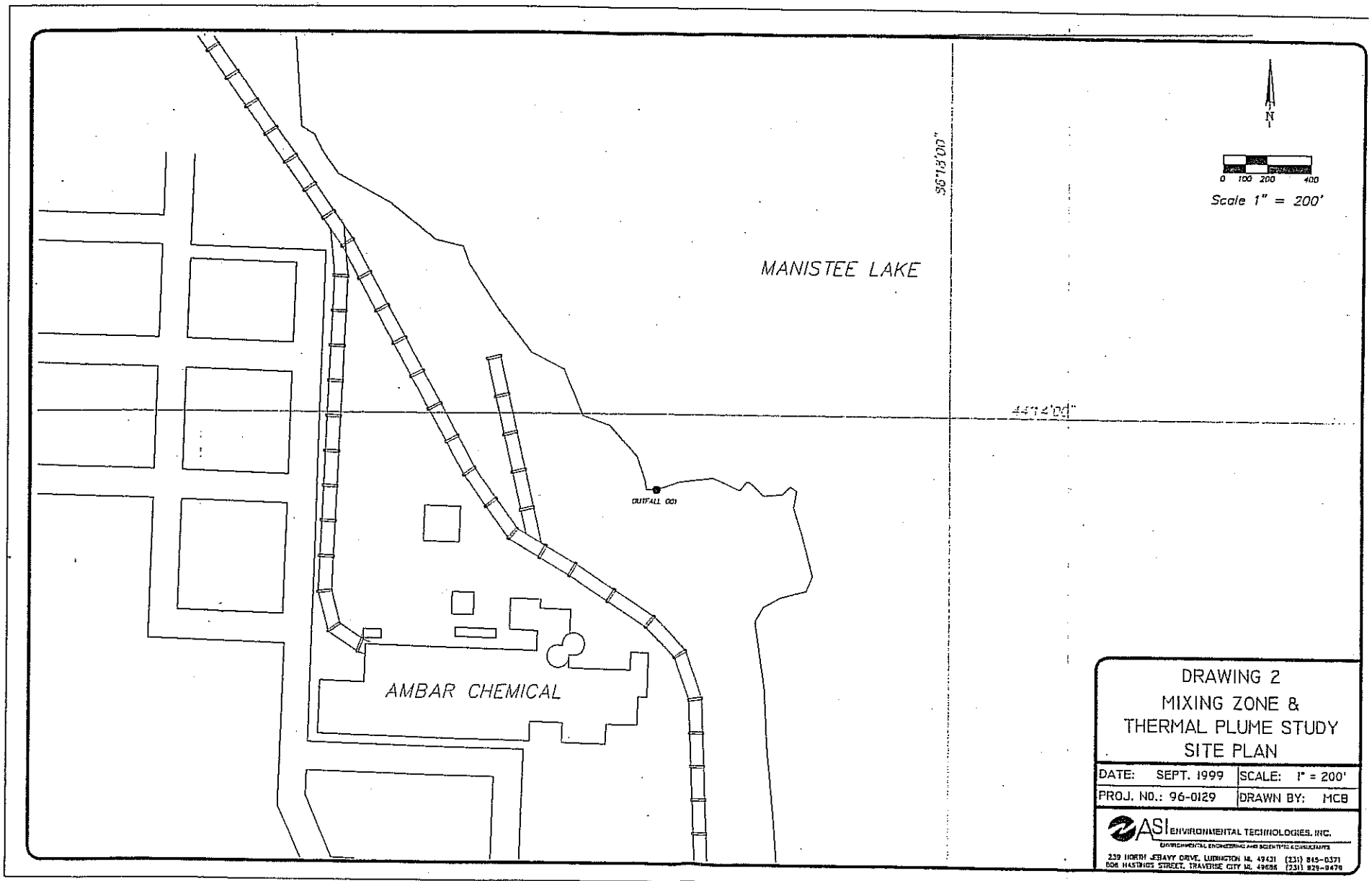


DRAWING 8
MIXING ZONE & THERMAL PLUME STUDY
ISOCON (5-29-98)

DATE: SEPT. 1999	SCALE: 1"=150'
PROJ. NO.: 96-0129	DRAWN BY: MCB

ASI ENVIRONMENTAL TECHNOLOGIES, INC.
ENVIRONMENTAL ENGINEERING AND SCIENTIFIC CONSULTANTS
230 NORTH JEBAVY DRIVE, LUDINGTON MI. 49431 (231) 845-0371
806 HASTINGS STREET, TRAVERSE CITY MI. 49686 (231) 929-7479

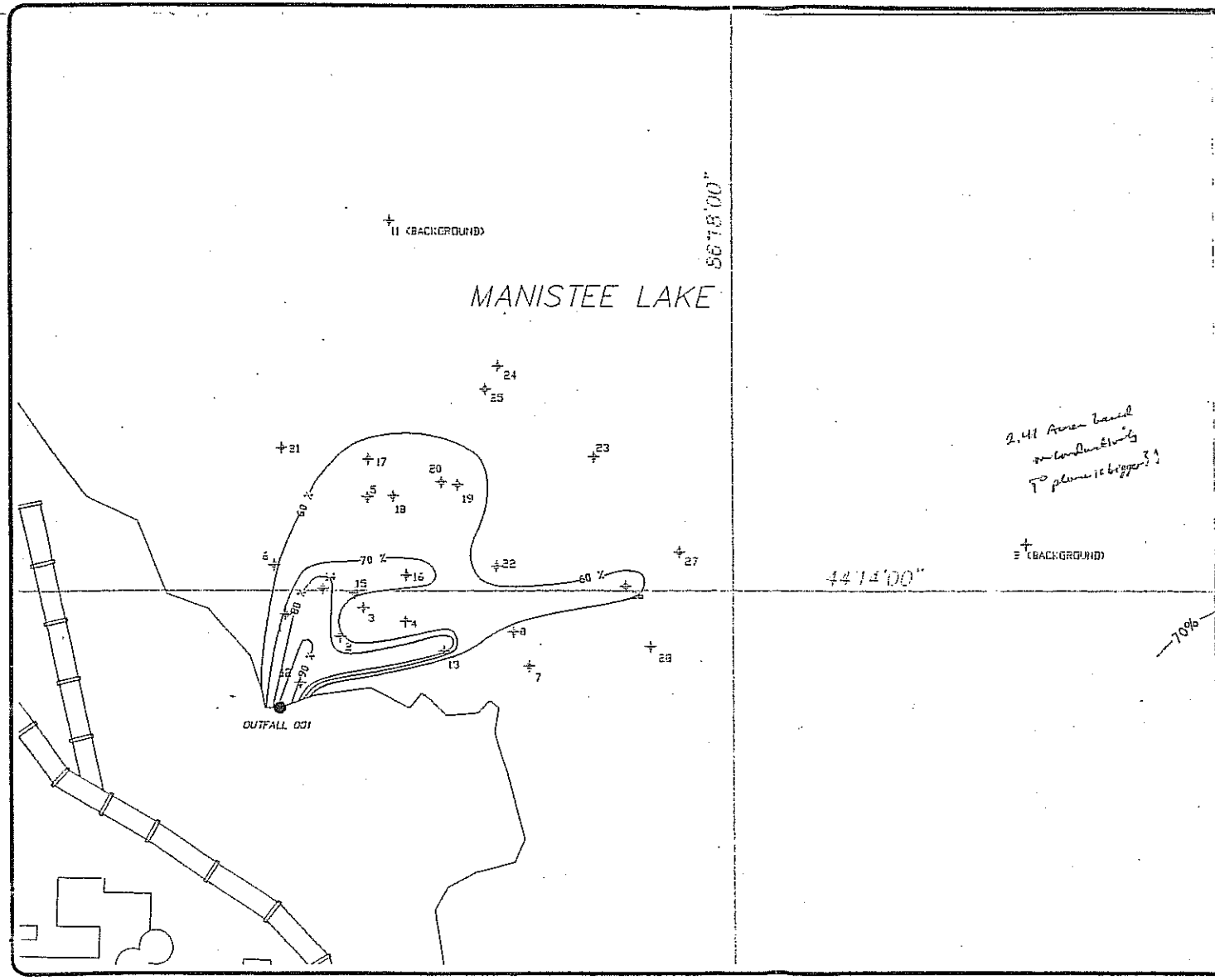

10 (BACKGROUND)
11 (BACKGROUND)
9 (BACKGROUND)
MANISTEE LAKE
86°18'00"
44°14'30"
+2°F
+6°F
+8°F
+2°F
OUTFALL 001
N
0 75 150 300
Scale 1" = 150'
MANISTEE LAKE BACKGROUND
TEMPERATURE IS 74.40°F
OUTFALL 001 EFFLUENT
TEMPERATURE IS 80.30°F
TEMPERATURE CONTOUR LINE
DRAWING 9
MIXING ZONE &
THERMAL PLUME STUDY
ISOTHERM (8-26-98)
DATE: SEPT. 1999
SCALE: 1" = 150'
PROJ. NO.: 96-0129
DRAWN BY: MCB
ASI ENVIRONMENTAL TECHNOLOGIES, INC.
ENVIRONMENTAL ENGINEERING AND SCIENTIFIC CONSULTANTS
239 NORTH JEBAVY DRIVE, LUDINGTON MI. 49431 (231) 845-0371
806 HASTINGS STREET, TRAVERSE CITY MI. 49686 (231) 929-9479



DRAWING 2
MIXING ZONE &
THERMAL PLUME STUDY
SITE PLAN

DATE: SEPT. 1999	SCALE: 1" = 200'
PROJ. NO.: 96-0129	DRAWN BY: MCB

ASI ENVIRONMENTAL TECHNOLOGIES, INC.
ENVIRONMENTAL ENGINEERING AND SCIENTIFIC CONSULTANTS
239 NORTH JEBAVY DRIVE, LUDINGTON MI. 49431 (231) 845-0371
806 HASTINGS STREET, TRAVERSE CITY MI. 49686 (231) 929-9478



MANISTEE LAKE BACKGROUND CONDUCTIVITY IS 0.388 MMHOS/CM

OUTFALL 001 EFFLUENT CONDUCTIVITY IS 0.696 MMHOS/CM

MANISTEE LAKE BACKGROUND CONDUCTIVITY IS 56% OF OUTFALL 001 CONCENTRATION 58% on Fig 10

CONDUCTIVITY CONTOUR LINE

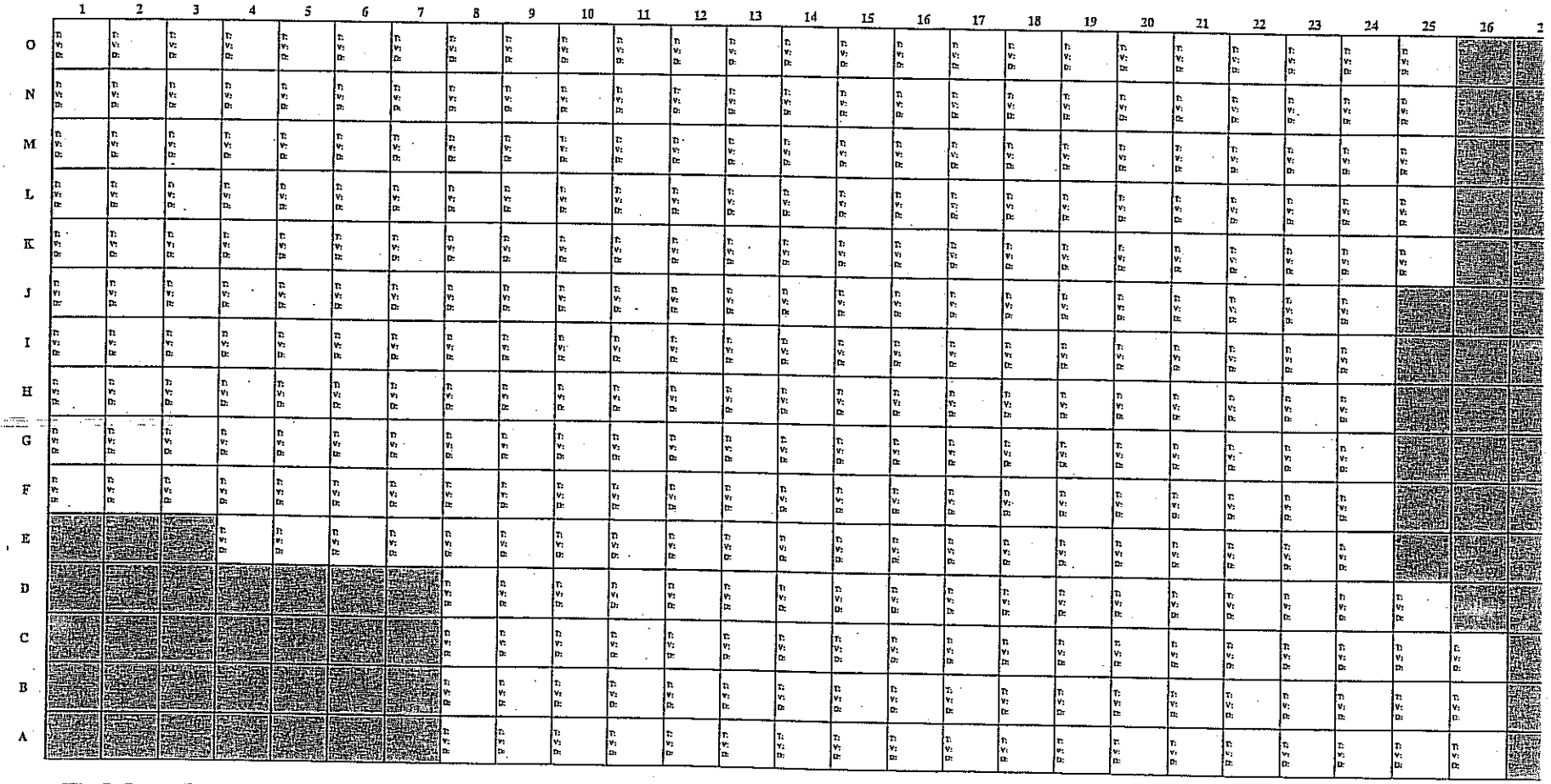
2.41 Acres based on conductivity [illegible] plume is bigger?

DRAWING 10
MIXING ZONE &
THERMAL PLUME STUDY
ISOCON (8-26-98)

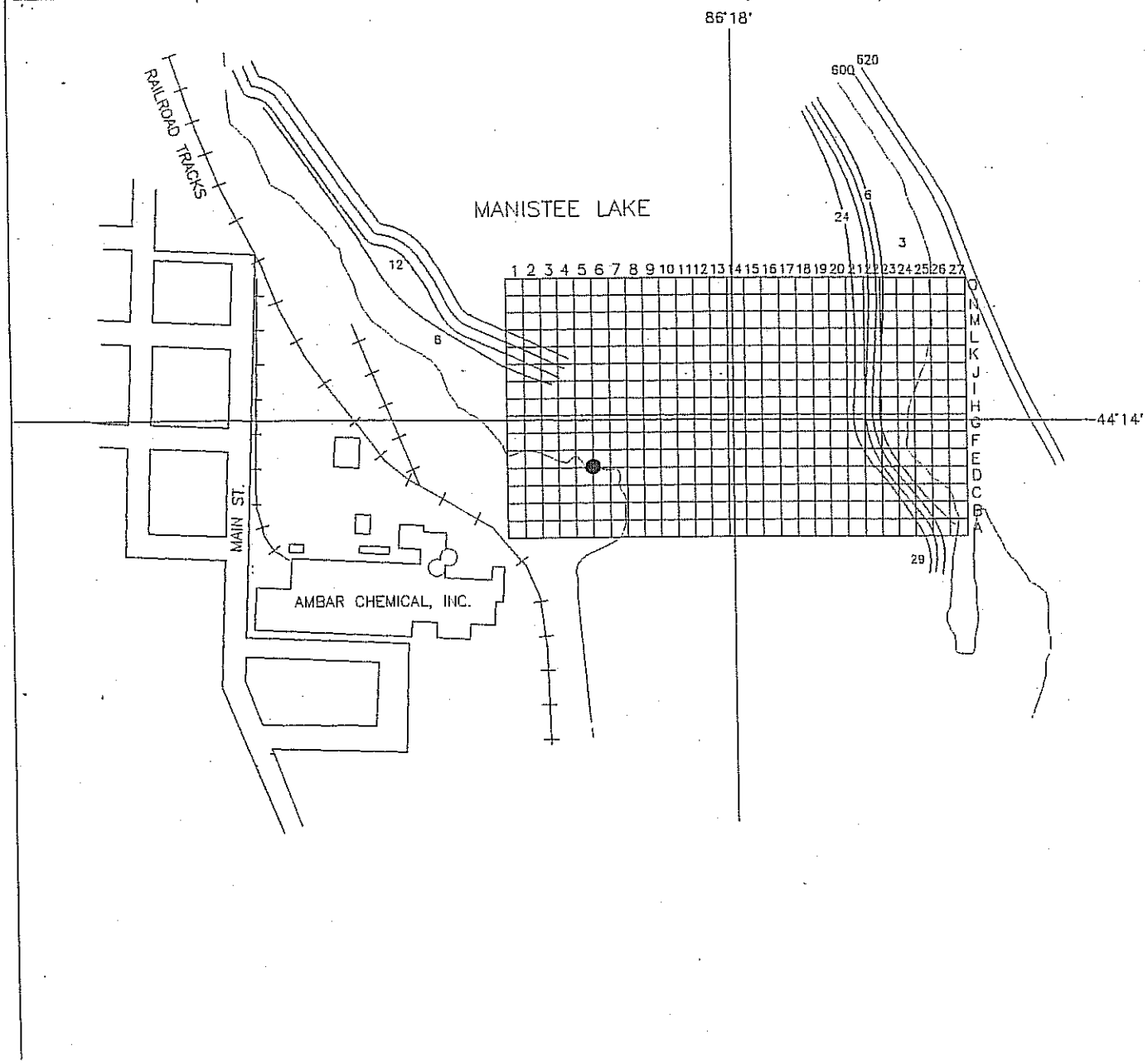
DATE: SEPT. 1999	SCALE: 1"=150'
PROJ. NO.: 96-0129	DRAWN BY: MCB

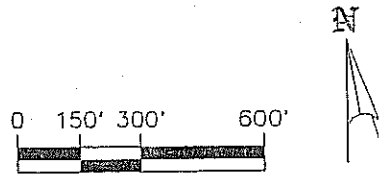
ASI ENVIRONMENTAL TECHNOLOGIES, INC.
ENVIRONMENTAL ENGINEERING AND SCIENTIFIC CONSULTANTS
239 NORTH JEBAVY DRIVE, LUDINGTON MI. 49431 (231) 845-0371
806 HASTINGS STREET, TRAVERSE CITY MI. 49686 (231) 929-9479

Ambar Thermal Plume & Mixing Zone Study Data Collection Table

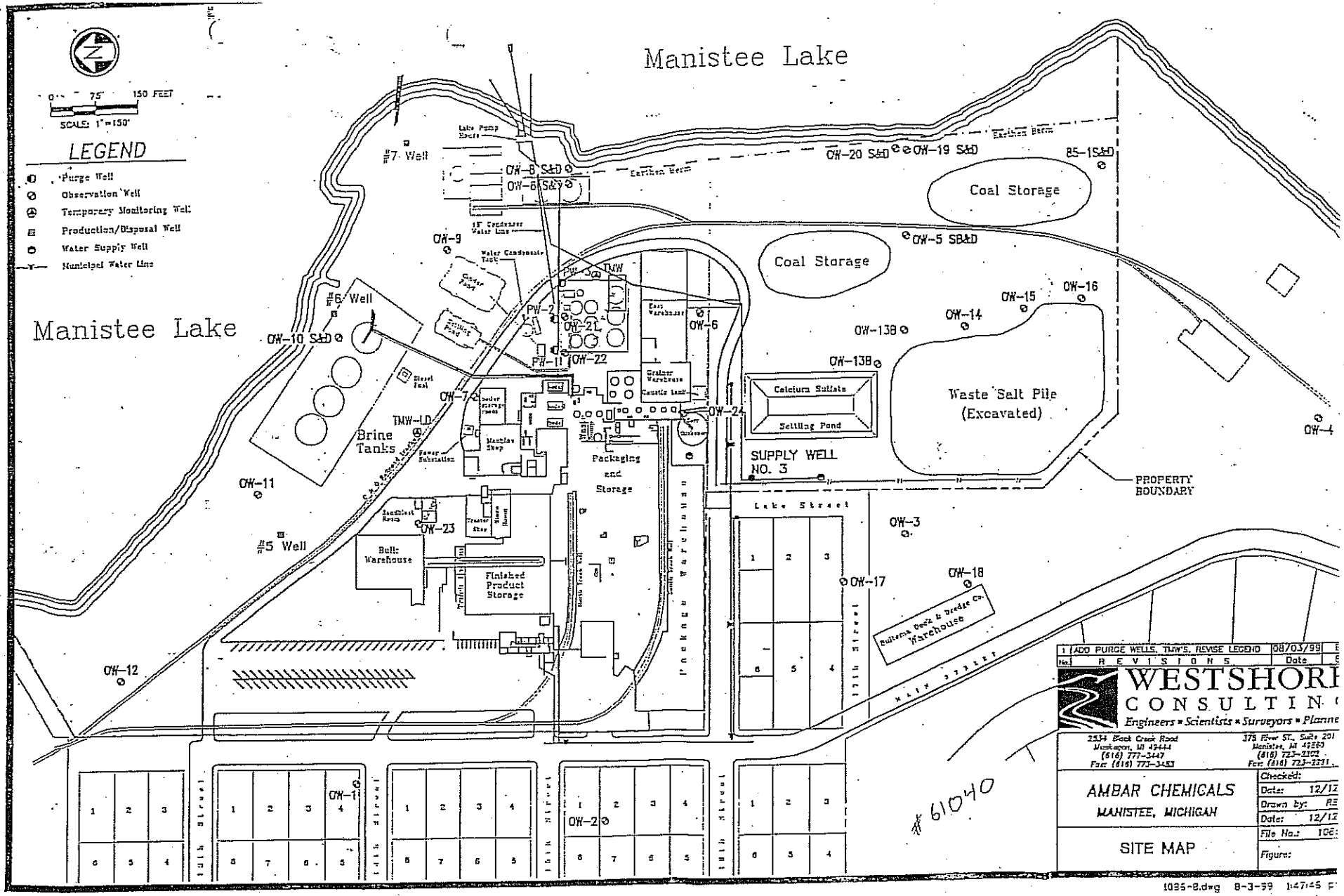


KEY: T = Temperature (F) V: Velocity (ft/sec) D: Flow Direction (Degrees)

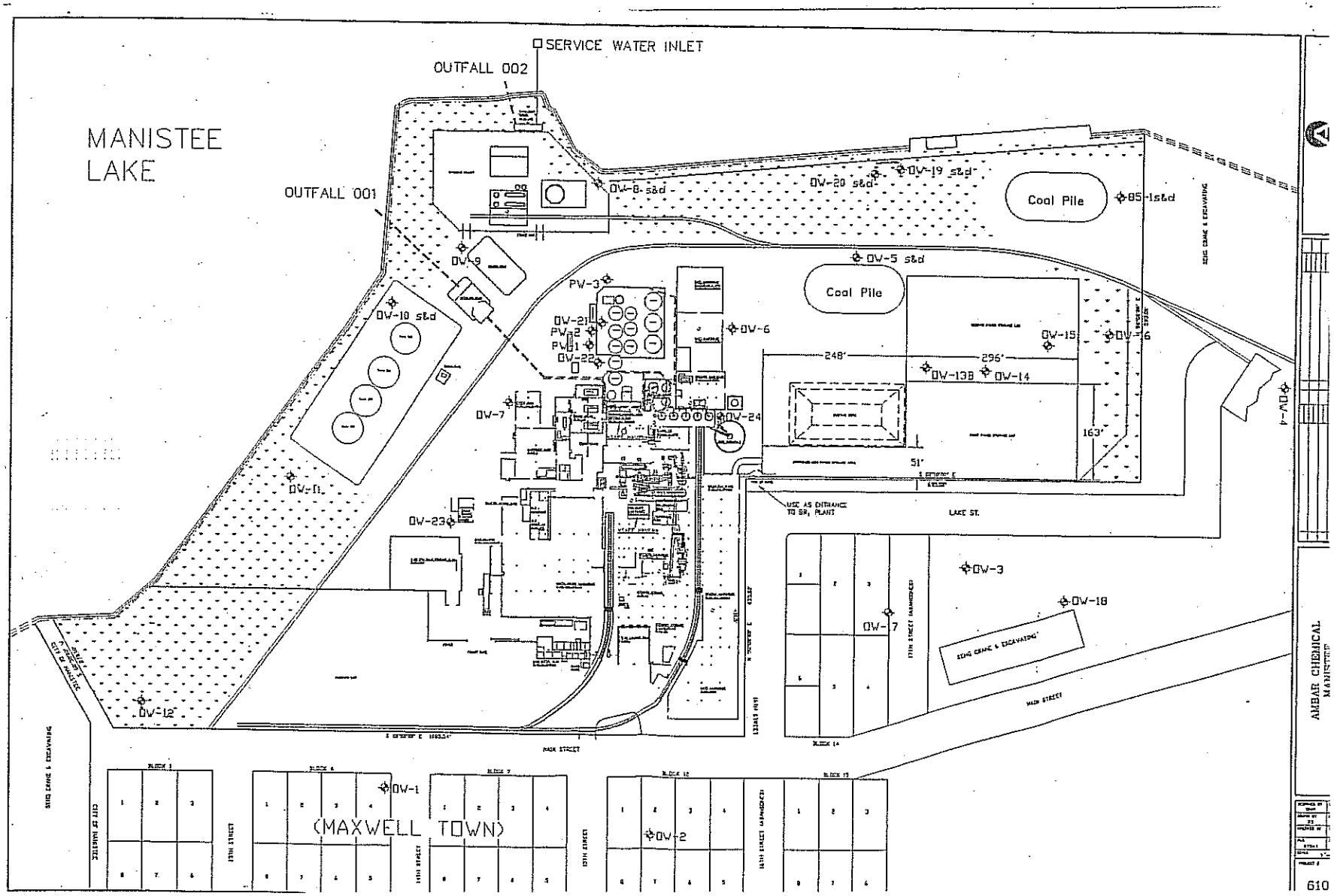


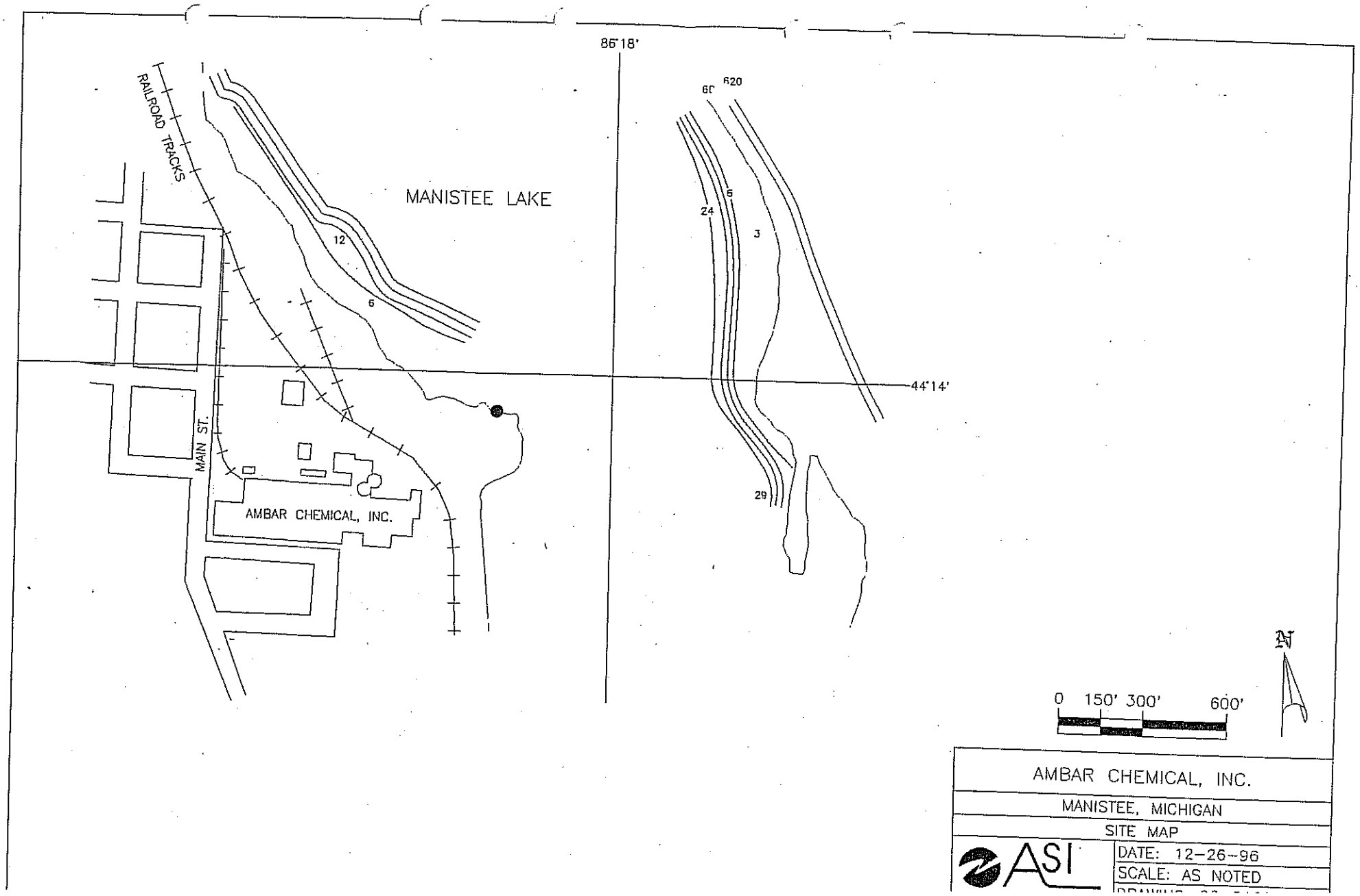


AMBAR CHEMICAL, INC.	
MANISTEE, MICHIGAN	
TENTATIVE GRID OVERLAY ON LAKE	
ASI	DATE: 12-26-96
	SCALE: AS NOTED
	DRAWING: 96-0129



Manistee Lake
Manistee Lake
0 75 150 FEET
SCALE: 1"=150'
LEGEND
Purge Well
Observation Well
Temporary Monitoring Well
Production/Disposal Well
Water Supply Well
Municipal Water Line
#7 Well
#6 Well
#5 Well
OW-8 S&D
OW-6 S&D
OW-20 S&D
OW-19 S&D
85-1S&D
Earthen Berm
Coal Storage
Coal Storage
OW-5 SB&D
OW-9
OW-10 S&D
PW-2
PW-3
TMW
OW-21
OW-22
PW-11
OW-6
OW-15
OW-16
OW-14
OW-13B
OW-13B
Waste Salt Pile
(Excavated)
Calcium Sulfate
Settling Pond
OW-7
OW-24
TMW-LD
Brine Tanks
Packaging and Storage
SUPPLY WELL NO. 3
PROPERTY BOUNDARY
OW-4
OW-11
OW-23
Bulk Warehouse
Finished Product Storage
Lake Street
OW-3
OW-17
OW-18
Warehouse
OW-12
OW-1
OW-2
#61040
1 ADD PURGE WELLS, TMW'S, REVISE LEGEND 08/03/99
No. REVISIONS Date
WESTSHORE
CONSULTING
Engineers • Scientists • Surveyors • Planne
2534 Black Creek Road
Muskegon, MI 49444
(616) 777-3447
Fax: (616) 773-3453
375 River St., Suite 201
Manistee, MI 49660
(616) 723-2102
Fax: (616) 723-2331
AMBAR CHEMICALS
MANISTEE, MICHIGAN
SITE MAP
Checked:
Date: 12/12
Drawn by: RE
Date: 12/12
File No.: 106
Figure:
1035-8.dwg 8-3-99 1:47:45


SERVICE WATER INLET
OUTFALL 002
MANISTEE LAKE
OUTFALL 001
OW-8 s&d
OW-20 s&d
OW-19 s&d
Coal Pile
B5-1s&d
OW-9
OW-5 s&d
PW-3
OW-10 s&d
OW-21
PW-2
PW-1
OW-22
OW-6
Coal Pile
OW-15
OW-16
248'
296'
OW-13B
OW-14
OW-7
OW-24
163'
51'
OW-11
OW-23
USE AS ENTRANCE TO SR. PLANT
LAKE ST.
OW-4
OW-3
OW-18
OW-7
OW-12
MAIN STREET
OW-1
(MAXWELL TOWN)
OW-2
AMBAR CHEMICAL
610



AMBAR CHEMICAL, INC.

MANISTEE, MICHIGAN

SITE MAP

ASI

DATE: 12-26-96

SCALE: AS NOTED

City of Manistee

231-723-2558
FAX 231-723-1546

70 Maple Street • P.O. Box 358 • Manistee, Michigan 49660

Mr. Mark Dougher
Little River Band of Ottawa Indians
375 River Street
Manistee, Michigan 49660

RE: Freedom of Information Act ("FOIA") Request

Your recent request for public record(s) under the Michigan Freedom of Information Act ("FOIA"), MCL §15.231 et seq, as amended, is hereby:

☑ Granted, requested record(s) enclosed. Please remit $50.60 to cover costs.

☐ Granted, however the cost of responding to your request is estimated to exceed $50.00, therefore a deposit of _____ (1/2 estimated cost) will be required. Upon receipt of your deposit, the requested record(s) will be provided.

☐ Granted, your name will be placed on a subscription list for future issuances of the requested record(s) disseminated on a regular basis. This subscription shall be valid for six (6) months and shall be renewable only upon written request each six (6) months.

☑ Denied, requested records(s) exempt from disclosure for the following reason(s):

- ☐ A public record does not exist under the name given or by another name reasonably known by the FOIA Coordinator.
- ☐ Requested record(s) are of a personal nature and the disclosure of the information would constitute a clearly unwarranted invasion of an individual's privacy.
- ☐ Requested record(s) would prevent the body from complying with Section 444 of subpart 4 of part C of the General Education Provisions Act, 20 USC 1232g.
- ☐ Requested record(s) are trade secrets or commercial or financial information voluntarily provided to an agency for developing governmental policy.
- ☑ Requested record(s) are subject to the attorney-client privilege.
- ☐ Requested record(s) are subject to the physician-patient, psychologist-patient, minister, priest, or Christian Science practitioner privilege, or other privilege recognized by statute or court rule.
- ☐ Requested record(s) are a bid or proposal to enter into a contract or agreement prior to the time established for submission or pubic opening.
- ☐ Requested record(s) are appraisals of real property to be acquired prior to an agreement for purchase, or less than three (3) years after the appraisal date.
- ☐ Requested record(s) are medical, counseling, or psychological facts or evaluations which would disclose an individual's identity.
- ☑ Requested record(s) are communications and notes within a public body or between public bodies of an advisory nature to the extent that they cover other than purely factual materials and are preliminary to a final determination of policy or action.
- ☐ Requested record(s) are testing data for determining whether bidder's products meet specifications.
- ☐ Requested record(s) are records of security measures.
- ☐ Requested record(s) are information relating to a civil action in which the requesting party and the public body are parties.
- ☐ Requested record(s) would disclose the social security number of an individual.

☑ Granted in part, Denied in part, see above for explanation, record(s) enclosed.

☐ Due to unusual circumstances, as stated below, we are extending the period to respond to your request by ten (10) business days, your request will be granted, denied, or granted in part and denied in part by _____. (Response Date)

- ☐ The need to search for, collect, or appropriately examine or review a voluminous amount of separate and distinct public records pursuant to a single request.
- ☐ The need to collect the requested public records from numerous field offices, facilities, or other establishments which are located apart from the particular office receiving or processing the request.

If your request for record(s) is denied, you may submit a written appeal, specifically stating "appeal" and stating the reasons for appeal, to the Manistee City Council, or seek judicial review under Section 10 of the Act within 180 days after the public body's final determination. Within ten (10) days of receiving a request for an appeal, the Manistee City Council shall a) reverse the denial; b) issue a written notice upholding the denial; c) reverse in part and uphold in part by written notice; or d) issue a notice extending by ten (10) business days the time to decide the appeal. The Manistee City Council is considered to have received your appeal at its first regularly scheduled meeting following the submission of the appeal in writing.

If after judicial review, the Circuit Court determines that the City of Manistee has not complied fully with the disclosure requirements, the Court shall award reasonable attorneys' fees, costs, and disbursements. If the Court determines that the City of Manistee has arbitrarily and capriciously violated the Act, the Court shall award punitive damages in the amount of $500.00.

A copy of this request will be kept on file for no less than one (1) year.

Dated: 1-27-04

Mitch Deisch, City Manager
FOIA Coordinator

H:\Document_H\BCG\CITY\FOIA-RES.DOC

1/23/04

NLP

- 425 MW/100% muni owned
  x 200 MW MPPA
  x 50 MW MSCPA
  x 175 MW Tondu
- 530 assed value
- 265 taxable value
- If taxed as private
- 5.4 million City (20.5)
- 10.6 mill others (40.0)
- 16.0 million annual

DEPT AFFECTED

- DPW - streets / sewers / lines
- WWTP - treatment
- WTP - potable water / lines
- Fire - sara title - inspections / fires / non-fire emergencies
- Police - ? citizen complaints
- CMO - ? citizen complaints
- CD - planning / site plan assurances / permits
- Bridge - openings
- Finance - CSF payments
- Road Comm - outside city streets

PROS 100% Public

- 60 jobs
- construction period revenue
- possible brownfield clean up / gen chem
- eliminate coal run off to m. lake
- possible CSF
- no tax appeals
- no IFTs
- no brownfield funds used
- help WWTP fund / expansion
- clean up gen chem aesthetics
- follows master plan
- bridge opening fee

CONS

- environmental concerns
- aesthetics of new site
  x 400 ft stack
  x 250 ft bldg
- continuation of heavy ind along L Manistee
- possible affect on tourism
- possible affect on community perception
- bridge openings
- governmental relationships hurt
- property values
- subsidize ind in other communities

COMMUNITY NEEDS

- millage reduction $175K / per mill 2003/04
- additional capital for projects $
- work toward being debt free
- stabilize financial picture
- maintain / improve community services

Mitch Deisch

From: Joe Tondu [joe@tonducorp.com]
Sent: Monday, October 20, 2003 10:45 AM
To: Mitch Deisch
Cc: Meagan Bobier Kempf; jim tondu; Beverly Baker
Subject: Northern Lights Ownership

Mitch,
I received your request for information on the percentage of ownership in the Northern Lights Project that might be allocated to Municipals. At the present we have almost every potential buyer in the State of Michigan looking at the Northern Lights Project. This includes municipals, cooperatives, investor owned utilities, and major industrial users. Todate all we have is expressions of interest. No one has yet firmly committed to participate in the project. Also we have not yet developed an ownership structure. I am aware that municipals are tax exempt. I can assure you that the in any ownership arrangement we ultimately create, the City of Manistee will have an increase in their tax receipts as a result of the Northern Lights Plant.

Joe

Williams & Works

♦ a tradition of service ♦

- Engineers
- Planners
- Surveyors

MEMORANDUM

TO: John Rose, Community Development Director
City of Manistee

FROM: Jay Kilpatrick, AICP, PCP

DATE: December 24, 2003

RE: Revised and Expanded Possible Conditions for Approval of Northern Lights Project

Based on our discussion with Brian this week, here is an expanded and revised list of possible conditions. As before, please regard this as a working memo until we have further discussions with Tondu and you can get any further direction from the City.

Potential Conditions on Special Land Use Approval (in no particular order)

1. Fuel source limited to low-sulfur coal only from the Powder River Basin or another source yielding coal of not more than _____ (x% or y parts per million??) sulfur.
2. Copy of an approved NPDES permit for discharge of process water and disclosure of discharge limits. No process or cooling water to be discharged to the municipal system unless by mutual agreement between the City and the applicant.
3. Copy of an approved MDEQ and EPA air emissions permit and disclosure of emission limits.
4. Copy of an approved Army Corps of Engineers permit and MDEQ permit for shoreline improvements and disclosure of the permits particulars.
5. A copy of the approved MDEQ site remediation plan including all site clean-up standards shall be provided to the City.
6. Submission of final engineered site plan prior to start of construction (see below)
7. Executed agreement or other documentation committing to pay a community service fee to be negotiated. The terms of which shall include agreement to provide the City with copies of the annual audited financial statements.

Phone (616) 224-1500 • Fax (616) 224-1501
549 Ottawa Ave., N.W. • Grand Rapids, MI 49503

8. Agreement to provide the City with copies of periodic air and water quality monitoring reports that may be required under any permits issued.
9. Install groundwater monitoring wells to acquire baseline contaminate information and provide quarterly monitoring of groundwater quality to the City.
10. Noise levels to be maintained below 65 decibels at the property line and applicant to provide the City with a sound meter for monitoring purposes.
11. City to review and approve the location of power transmission line. (Would the City like to take a position that a submerged line is preferred??)
12. Establishment of a Performance Bond to the benefit of the City to assure satisfactory completion of the facility in accord with the requirements of all permits, the special land use permit and the site plan.
13. Establishment of a site reclamation fund to be built from annual contributions by applicant until it reaches an established amount.
14. All coal conveyors to include dust mitigation systems, including the self-unloading equipment on the freighters.
15. Final approval of the fire suppression system by the City Fire Chief.
16. All coal freighters shall be prohibited from discharging ballast water in the Manistee River Channel or in Manistee Lake.
17. The applicant shall agree to pay all bridge opening fees necessitated by its operations.
18. The applicant will research the feasibility of installing a peregrine falcon nesting box on its stack and, if such research proves the installation is feasible, applicant will proceed with such installation.

Potential Conditions on Site Plan Approval (in no particular order).

1. Submit final engineered site plan meeting requirements of the ordinance and incorporating any permit provisions.
2. Limitation of outdoor coal pile height to 50 feet.
3. Improvement to the landscape plan as outlined in Brian Sousa's memo of November 12, 2003
4. Minor adjustments to the site plan may be approved by the Zoning Administrator per the suggested standards included in my memo of November 13, 2003.

City of Manistee

Northern Lights Project

Community Service Fee Analysis

Ownership (Priv - MPPA)	Taxable Percent	Item	SEV	Taxable	City Tax 20.5259	Other Tax 40.1181	Total Taxes 60.642
		Estimated Project Cost	$ 530,000,000				
100% - 0%	100%	Taxable Value	$ [illegible]	$ 265,000,000	$ 5,439,364	$ 10,630,767	$ 16,070,130
100% - 0%	75%	Pollution Controls (25% of cost)	$ (132,500,000)				
			$ 397,500,000	$ 198,750,000	$ 4,079,523	$ 7,973,075	$ 12,052,598
100% - 0%	37.5%	IFT on Remaining (-50%)	$ 198,750,000	$ 99,375,000	$ 2,039,761	$ 3,986,537	$ 6,026,299
75% - 25%	28.1%		$ 149,062,500	$ 74,531,250	$ 1,529,821	$ 2,989,903	$ 4,519,724
50% - 50%	18.8%		$ 99,375,000	$ 49,687,500	$ 1,019,881	$ 1,993,269	$ 3,013,149
25% - 75%	9.4%		$ 49,687,500	$ 24,843,750	$ 509,940	$ 996,634	$ 1,506,575
0% - 100%	0%	100% Owned by MPPA	$ -	$ -	$ -	$ -	$ -

Community	MW**	Payment	$ per MW	
Holland	230	$ 2,000,000	[illegible]	
Grand Haven	72	$ 1,000,000	[illegible]	
Traverse City	20**	$ 1,000,000	$ 50,000	excluded
Petoskey	10**	$ 1,000,000	$ 100,000.00	excluded
Portland	4	$ 33,950	[illegible]	
Lansing 512 / 165 / 507	507	$ 4,729,288	[illegible]	
	507	$ 7,400,000	[illegible]	
Bay City	33.3**	$ 1,000,000	$ 30,030	excluded
Average			$ 12,577	
MANISTEE	425	$ 5,345,225	$ 12,577	

6,640,000

(20.8599 mills)

Port Sheldon Twp (Campbell) (Part municipal) (790 MW)	Taxable	Summer	Winter	Total
	$ 241,244,000	$ 5,031,501	$ 3,895,901	$ 8,927,402

TONDU

November 13, 2003

Mr. Mitch Deisch
City Manager
City of Manistee
P. O. Box 358
Manistee, Michigan 49660

Dear Mitch:

This letter is to provide you with additional information on the current status of the Northern Lights Project's potential investors. At the present time, we do not know who will be the final investors in the project. I am, however, hopeful some of the ownership will be held by Michigan municipal utilities. Currently, there are a number of municipals reviewing possible ownership, but they cannot make a final decision until a lot more work has been completed on the project. No one can discuss a firm commitment until we have clear title to the proposed site, access to the electric transmission wires, and finalize cost and performance numbers on the project. This work is estimated to cost about $2 million and will take about another year to complete.

The actual process is completed step by step. We approach the project in this fashion to minimize our risk and identify any fatal flaws before all of the development costs are incurred. Our first tasks are to acquire the property, the use permits, the transmission access, and the air permit. When these tasks are finished, we can begin the engineering. The majority of our development budget is for engineering and we cannot start this work until the facts about the site and the required permits are determined.

As each task is completed, the confidence and commitment levels of the potential investors increases. Before the engineering is started, we expect each potential investor to reaffirm their interest with a written commitment to participate. These commitments will have outs for the investors, but they will focus mostly on our ability to deliver on our promises and projections. When that happens, I will have a better idea of who will actually participate in the Northern Lights Project and be able to have a serious discussion about our property taxes with the City of Manistee.

Mitch, I recognize your concern about property taxes due the City of Manistee if municipals participate in the Northern Lights Project. I would like to reassure and commit to you that I will not participate in a power plant project in Manistee that does not have a written agreement with the City of Manistee that clearly defines the property tax obligation of that project. This is not an optional agreement since there is no way I could convince bankers, investors, or myself to make a capital investment in Manistee or anywhere in Michigan without such an agreement. The tax system in Michigan is dysfunctional and simply confiscatory to any new capital investment. The property taxes on a project like the Northern Lights Plant would, if calculated by Mr. Richard Reed, be many times greater than the total income I could ever hope to receive from the project. These stark facts make it impossible for me to proceed unless I reach an agreement with the City of Manistee in advance of building a power plant.

TONDU CORPORATION
14701 ST. MARY'S LANE
SUITE 625
HOUSTON, TEXAS 77079
(832) 379-4222
FAX (832) 379-4333

I have made it clear to every potential investor in the Northern Lights Project, including the municipals, that we will have an agreement over property taxes with the City of Manistee before we proceed. I have informed the municipals who are considering participating in the Northern Lights Project that a "Community Services" commitment will be required from them to provide a reasonable payment to the City of Manistee in lieu of property taxes.

We do not yet know what we will be able to afford in terms of a property tax payment. The electric power business is a very competitive business with razor thin margins. We will make significantly less money than the Indian Casino, and we will have less negative impacts on the community than they do. That does not mean we cannot pay taxes, just that they have to be equitable.

Our economic impact on the community will be substantial, much more than General Chemical's ever was. Total annual expenditures for labor, and operating and maintaining the Northern Lights Power Plant exclusive of fuel, are estimated to be almost $20 million per year, most of which should end up in Manistee county. While we will be much less profitable than the Casino, we will pay our people decent living wages, about three times what we are told the Casino pays its employees. I can assure you that the taxes we will pay the City of Manistee will be larger than the amounts currently paid by the Casino or General Chemical.

Mitch, I hope this letter addresses any concerns you may have about our commitment to pay our fair share of property taxes to the City of Manistee. I should have enough tentative commitments from potential investors by next spring to be able to work out with you a mutually acceptable agreement on property taxes. We have generated a lot of enthusiasm for this project from a large number of potential investors. With the City's support and your leadership in addressing concerns of the many different constituents of the area, we are confident we will make this project a success.

I will be in town next week and look forward to seeing you then.

Sincerely,

Joe Tondu
President

90% Annualized

1/6/04

Jim Ford, Jim Tondo, Ed, Mitch, Bruce, Jon

phase I agmt exp end of yr

200-250 - MUNI's

ca 175 yet to be marketed

PHASE II

need site / sp use permit before ? need Air Quality No

firm bids from ~~[illegible]~~ contractors

springerville AZ - similar plant

permitting in place

engineering - up to 25 million

capital costs
operating costs
margin

ca. $2 million to arrive at Phase III

have all permits, have commitments from all players,

load growth = 2.5% / year

Phase III fuel cost / escalator for labor / etc for private contracts

Pilot = 4-5 mil.

700

21 mil max

defining moment

prison vision perception Jackson / Louis

clean up future process

WWTP potential assistance

COMMUNITY	MEGAWATTS	GENERAL FUND ANNUAL CONTRIBUTION
Holland Loren Howard	230 MW various methods of production coal/gas	$2,000,000
Grand Haven Jon Hofman	.72 MW coal burning	$1,000,000 5% gross revenue
Traverse City Jim Cooper 932-4560	Do not produce Electricity need 20 MW/day	$1,000,000 5% of gross revenue
Petoskey George Korthauer	Do not produce electricity need 10 MW/day	$1,000,000
Portland Tom Dempsey	Hydro plant 2.75 Kilowatt Diesel 3.8MW	$33,950
Lansing John Striker	507 MW two facilities (342 + 165)	4% of retail + wholesale revenue 2003 $8,728,288 2002 $7,400,000
Bay City Chris Ball	33.3 MW Gas do not use them, to expensive	$1,000,000 4% of gross revenue

Port Sheldon Township Consumer Energy Power Plant/part municipally owned 25%

Taxable value 2003 $241,244,000

Summer 2003 taxes Real property only $5,031,601 (20.8569 mills)

Winter 2003 taxes Real Property only $3,895,801

ED,
has some changes. Please make yours + Fax back 723-1546. Have a good few days off.

November 28, 2003

Mr. Joe Tondu, President
Tondu Corporation
14701 St. Mary's Lane
Suite 652
Houston, TX 77079

Block Look

Mr. Gary Zimmerman, General Manager
Michigan Public Power Agency
809 Centennial Way
Lansing, MI 48917-9277

Dear Gentlemen:

For the past several weeks City administration, legal council and elected officials have been working non-stop on the Northern Lights Project (NLP). The issues and impacts to Manistee are enormous, which requires the process for permitting this facility that much more critical.

Permitting the facility is underway by the various agencies, City Planning Commission, MDEQ and USEPA. The one area that is still up in the air is payments in lieu of taxes/community service fee (CSF) or more simply put the revenue the City of Manistee will receive from this facility being located with the City limits. What is the appropriate amount is the question at hand. This letter is being drafted to both Tondu and MPPA, due to our legal council beliefs that until MPPA officially signs on for this project, they have no legal standing to negotiate a CSF.

To this end of establishing an acceptable CSF, the City has researched existing MPPA member communities regarding megawatts of electricity generated or needed and their annual contribution to the community's general fund. In addition, Port Sheldon Township was contacted to see what taxes the Campbell 3 Plant annually pays. Comparing the Campbell 3 plant to the NLP is difficult when considering megawatts generated (Campbell 3 790MW / Northern Lights 425 MW), so we compared the facilities based upon their SEV. The NLP has not been assessed, but it is safe to assume it will be between 200-400 million dollars, possible considerably higher. All of this research is provided for your review, including the taxes the NLP would pay if fully taxed in the City of Manistee.

Please be assured, the City of Manistee is not contemplating or even discussing the full taxable value. We are looking for an equitable CSF comparable to the other communities. Different than the MPPA communities, the City of Manistee also has the responsibility of looking out for the other taxing entities that would have benefited from a non-exempt plant.

The question is, how much are you willing to pay annually to the City of Manistee as a CSF. How this is split up between MPPA and Tondu Corporation is not our concern. This question will require Tondu Corporation and MPPA to cooperatively come to an answer and present it to the City of Manistee.

Guarantees from both Tondu Corporation and MPPA have been made that a deal will be made with the City. These have been of great comfort and are appreciated. However, now is the time to put it in writing. ~~Unless there is an agreed to CSF in writing and approved by all parties, a condition will be placed on the Special Use Permit and issuance of any building permit.~~ Unless there is a CSF agreement in place, a Special Use Permit could only be issued conditionally. This would make the permit subject to an agreement at a later date.

We will continue to work cooperatively with all parties for the sting of this facility.

If you have any questions, please contact me at 231-723-2558.

Sincerely,

Mitchell D. Deisch
City Manager
mdeisch@ci.manistee.mi.us

Enclosures:

cc. Mayor Richard Mack
City Attorney Bruce Gockerman
Finnance Director Ed Bradford
Community Development Dir. Jon Rose
Hart City Manager, Shea Charles

City of Manistee

Northern Lights Project Analysis

Construction	$ 526,436,000								
Sales & Use	$ 1,000,000								
Admin Building	$ 1,500,000								
Natural Gas Connect	$ 500,000								
Electric Interconnect	$ 8,000,000								
Transmission System Upgrades	$ 2,500,000								
Site Acquisition	$ 4,600,000								
Railroad Re-Location	$ 500,000								
Site Work	$ 9,500,000	1,318,908.24							
Rolling Stock	$ 1,600,000								
Spare Parts	$ 3,700,000								
Equipment & Supplies	$ 700,000								
	$ 560,536,000								
Insurance & Bonding	$ 7,960,000								
G & A Development	$ 3,000,000								
General Legal	$ 500,000								
Environmental Permitting	$ 1,000,000								
Preliminary Engineering	$ 1,500,000								
Start-Up Costs	$ 2,400,000								
Owners Construction Mgt	$ 3,120,000								
Working Capital	$ 8,200,000								
Development Fee	$ 7,000,000								
Construction Interest	$ 61,500,000								
Escalation	$ 1,500,000								
	$ 97,000,000								
Contingency	$ 41,784,000								
	$ 700,000,000								

Fixed Costs						
Direct Labor	$ 0.84	$ 2,800,000	23.2%	4.60%	2.74%
Indirect Labor	$ 0.30	$ 1,000,000	8.4%	1.66%	0.99%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Plant Expenses	$ 0.20	$ 671,000	5.6%	1.10%	0.66%
Management Expenses	$ 0.12	$ 390,000	3.2%	0.64%	0.38%
Plant Insurance	$ 0.84	$ 2,827,000	23.4%	4.65%	2.77%
Coal Line of Credit	$ 0.05	$ 172,000	1.4%	0.28%	0.17%
Capital Expenditures	$ 0.12	$ 400,000	3.3%	0.66%	0.39%
Annual Maintenance	$ 0.72	$ 2,400,000	19.9%	3.95%	2.35%
Major Maintenance Escrow	$ 0.30	$ 1,000,000	8.3%	1.64%	0.98%
Annual Fixed Costs	$ 3.60	$ 12,068,000	100.0%		

Variable Costs	$/MWh				
Fuel	$ 12.58	$ 42,151,806	86.5%	69.31%	41.27%
Coal Handling	$ 0.08	$ 268,056	0.5%	0.44%	0.26%
NOx Catalyst	$ 0.38	$ 1,273,266	2.6%	2.09%	1.25%
Aqueous Ammonia	$ 0.16	$ 536,112	1.1%	0.88%	0.52%
Lime	$ 0.39	$ 1,306,773	2.7%	2.15%	1.28%
Bags	$ 0.13	$ 435,591	0.9%	0.72%	0.43%
SOx Credits	$ 0.14	$ 469,098	1.0%	0.77%	0.46%
Water Treatment Chem	$ 0.22	$ 737,154	1.5%	1.21%	0.72%
Wastewater Treatment	$ 0.02	$ 67,014	0.1%	0.11%	0.07%
Ash Handling	$ 0.40	$ 1,641,843	3.4%	2.70%	1.61%
Ash Sales	$ (0.04)	$ (134,020)	-0.3%	-0.22%	-0.13%
Annual Variable Costs	$ 14.55	$ 48,752,605	100.0%	100.00%	
Total Operations & Maint	$ 18.15	$ 60,820,685			
Est. Debt Service	$ 12.33	$ 41,324,362			40.46%
Est. Cost Per MWh	$ 30.48	$ 102,145,047			100.00%

Mitch Deisch

From: Shea Charles [scharles@ci.hart.mi.us]
Sent: Tuesday, November 25, 2003 6:44 PM
To: Mitch Deisch
Subject: RE:

Hi Mitch,

Our peak load runs about 12 MW our base runs 4-5 MW. Our curve load is not that good because we have large seasonal users. We budget 3.8% of gross revenues as our PILOT, which generates about $90K. We adjusted the amount upwards last year by about $50K after a rate study.

Shea

-----Original Message-----
From: Mitch Deisch [mailto:mdeisch@ci.manistee.mi.us]
Sent: Tuesday, November 25, 2003 7:08 AM
To: Shea Charles
Subject:

Shea,

Could you please tell me the megawatt's that are used by Hart, which includes your hydro power, in other words, how much electricity do you need to supply to your customers? Second, what is the power portions annual contribution to the Hart general fund? You indicated that it was not high enough, could you speculate on what you believe it will be in the upcoming fiscal year?

Thanks for the assistance.

Mitch Deisch, City Manager
City of Manistee

Mitch Deisch

From: Joe Tondu [joe@tonducorp.com]
Sent: Tuesday, December 09, 2003 11:59 AM
To: Mitch Deisch; jim tondu; Jim Ford; Beverly Baker; Meagan Bobier Kempf
Subject: Property Tax Agreement

Mitch:
After thinking about it I believe that it might settle some rumors and make a lot of people feel more comfortable if we execute a letter agreement committing Tondu Corporation and Manistee Salt Works Development Corporation to not proceed with the construction of a coal fueled power plant in Manistee without first agreeing with the City to the amount of property tax or a Community Services Payment in the event that a tax exempt entity owns the project. I have made this statement to you and the Planning Commission, but I am sure that a lot of people would like to see this in writing. I suggest that you have your lawyer prepare the draft agreement. This should not be a long agreement and I think it might work better if it came from your office first.

Your letter was right in that the Munis have not yet committed to participate in the project and as the land owner I believe that the Manistee Salt Works Development Corporation will be the party to the agreement. However, I am also willing to commit Tondu Corporation to provide additional assurance to the City.

I will be in Manistee this Friday and maybe we can talk about it then.

Sincerely,

Joe

Mitch Deisch

From: Mitch Deisch
Sent: Wednesday, December 10, 2003 4:07 PM
To: Joe Tondu
Cc: gzimmerman@mpower.org
Subject: RE: Property Tax Agreement

Joe,

Thank you for your e-mail yesterday morning. I have given quite a bit of thought to this issue and agree that we need to come to an agreement. I will have Bruce Gockerman, City Attorney begin drafting the agreement. The key to the agreement will be the amount or formula for determining the amount of annual Community Service Fee. Once completed, I will forward this draft agreement to you for your review. Please know, that if Tondu Corp/MPPA, believes that the Community Service Fee should be 500K or around this number, the City will not agree.

Simply put, if 100% municipal owned, the thought of a 425 megawatt power plant in my backyard, not paying taxes, for the purpose of providing lower electricity to other communities is not very appealing. This project carries both positive aspects (jobs/economy)and negative aspects (social concerns, tourisms, use of City services and environmental). The area missing is the direct financial impact, which is taxes. The Community Service Fee compensates for the exempt facility. The benefits of the economy and CSF needs to outweigh the negative aspects of this plant.

Sincerely,

Mitch Deisch, City Manager
City Manager

-----Original Message-----
From: Joe Tondu [mailto:joe@tonducorp.com]
Sent: Tuesday, December 09, 2003 11:59 AM
To: Mitch Deisch; jim tondu; Jim Ford; Beverly Baker; Meagan Bobier Kempf
Subject: Property Tax Agreement

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Your letter was right in that the Munis have not yet committed to participate in the project and as the land owner I believe that the Manistee

Salt Works Development Corporation will be the party to the agreement. However, I am also willing to commit Tondu Corporation to provide additional assurance to the City.

I will be in Manistee this Friday and maybe we can talk about it then.

Sincerely,

Joe

Mitch Deisch

From: Mitch Deisch
Sent: Monday, December 15, 2003 7:42 AM
To: wrenando@cityofjackson.org
Subject: City of Manistee

Warren,

I do not believe we have actually met, I am Mitch Deisch, Manistee City Manager for the past 2.5 years. I was recommended to contact you by our Police Chief Dave Bachman, who as you know was previously employed by the Jackson PD.

I have read several articles about Jackson recently and your negotiations with Consumers Energy and the surrounding townships. My request is to learn from your vast experience in negating and structuring these very complex issues. The reason for the request is that Manistee has a enormous issue before us. The issue and fact as we know them are as follows:

Proposed construction of 425 Megawatt Power Plant located within the City of Manistee. Proposed construction cost 700 Million, proposed Taxable value 530 Million (could be much less with pollution credits, IFT's and Brownfield credits). Proposing that 60 jobs will be created, 4 million annual salary and 12 millions in areas retail sales (trucking, Great Lake Shipping ect.) The real kicker is that the plant will be owned at least 50% to possible 100%, by the Michigan Public Power Agency, which could make the plant completely tax exempt.

At 530 million the tax rate would be 16 million annually, 5.4 million to City (20.5 mills) and 16.6 to County and other agencies (40 mills). This is a huge blow. The power plant corporation is currently seeking a Special Use Permit from the Planning Commission, I see this as our only hammer to work out a Community Service Fee or Payment in lieu of taxes.

My belief is that the known environmental and social impacts need to be outweighed by the positive direct financial impacts.

I have heard you speak numerous times at MGLMA meetings and Dave Bachman ensures me that you are a top level negotiator, hence the e-mail and the request for some of your time.

Thank you for considering to share some insights with the City of Manistee.

Mitch Deisch, City Manager
City of Manistee

December 22, 2003

Mr. Joe Tondu
Tondu Corporation
14701 St. Mary's Lane, Suite 625
Houston, Texas 77079

Dear Mr. Tondu:

As we discussed last week, the City of Manistee looks forward to meeting with Tondu Corporation representatives on January 6, 2004. Subsequent to this meeting the City felt it was still important to work on the attached draft Community Service Fee Agreement.

Many of the agreement fundamentals are based upon the research conducted by the City of Manistee that includes contacting Michigan Public Power Agency (MPPA) members, reviews of the draft Phase I Report, and conversations with Tondu Corporation, MPPA and MSCPA.

It is important to remember that while Michigan law allows municipalities to jointly own power generating facilities and hold them exempt from real and personal property taxes; the City of Manistee Zoning Ordinance, Special Use Permit section allows the City to make decisions on a variety of issues, including economic impact.

To this end, the City is willing to learn as much as possible from all sides on this issue. Currently the two figures offered are: $500,000 by Tondu and $400,000 by MPPA/MSCPA (as identified in the Phase I report obtained from the City of Holland BLP website). These offers are absolutely not acceptable to the City. Taking this to a logical comparison, a private fully taxed facility assessed at 530 million would pay approximately 16 million dollars. The amount offered by Tondu and MPPA/MSCPA is approximately 3% of this amount. Further illustration of the low annual amount offered would be documentation obtained from the Holland BLP which indicates that for every $1,000,000 in community service fees, the cost to supply electricity to the power grid will increase by less than 1% in 2008 dollars.

Every department in the City of Manistee will be impacted by this development, by the enormous size of the project and its long-term impacts. We believe the requested amount is reasonable.

As we have from the start, the City of Manistee looks forward to continuing to work with Tondu Corporation in an honest, open and professional manner. I look forward to meeting with you on January 6, 2004.

Season Greetings,

CITY OF MANISTEE

Mitchell D. Deisch, City Manager
mdeisch@ci.manistee.mi.us

MDD:cl

Attachment

cc. Gary Zimmerman, MPPA
J. P. Bierl, MSCPA
Mayor Richard Mack
Members of the City Council
City Attorney Bruce Gockerman
Community Development Officer Jon Rose
Finance Director Ed Bradford

HC

City of Manistee
70 Maple Street • P.O. Box 358 • Manistee, Michigan 49660
231-723-2558
FAX 231-723-1546

December 29, 2003

Mr. Joe Tondu
Tondu Corporation
14701 St. Mary's Lane, Suite 625
Houston, Texas 77079

Dear Mr. Tondu:

As we discussed last week, the City of Manistee looks forward to meeting with Tondu Corporation representatives on January 6, 2004. Subsequent to our conversation, the City felt it was still important to work on the attached draft Development and Community Service Fee Agreement.

Many of the agreement fundamentals are based upon the research conducted by the City of Manistee that includes contacting Michigan Public Power Agency (MPPA) members, reviewing the draft Phase I Report, accessing available fees and taxes paid to other host communities, and conversations with Tondu Corporation, MPPA and MSCPA.

While it is important to remember that Michigan law allows municipalities to jointly own power generating facilities that may be exempt from real and personal property taxes; it is equally important to recognize that the City of Manistee Zoning Ordinance, Special Use Permit section allows the City to make decisions on a variety of issues, including economic impacts a contemplated development may have on the community.

To this end, the City is willing to learn as much as possible from all sides on this issue. Currently the two figures offered as a Community Service Fee are: $500,000 by Tondu and $400,000 by MPPA/MSCPA (as identified in the Phase I report obtained from the City of Holland BLP website). These offers are absolutely unacceptable to the City. A private fully taxed facility assessed at 530 million dollars would pay approximately 16 million dollars to various taxing jurisdictions. The amount offered by Tondu and MPPA/MSCPA is approximately 3% of this amount. Further, documentation obtained from the Holland BLP which indicates that for every $1,000,000 in Community Service Fees, the cost to supply electricity to the power grid will increase by less than 1% in 2008 dollars.

By its nature and size, the proposed Northern Lights Project will impact every department in the City of Manistee, along with all of the City's environs and citizens. These impacts will be both short and long term. The amounts suggested by Tondu and MPPA/MSCPA as a Community Service Fee simply are inadequate. We believe the suggested amounts specified in the draft document are reasonable.

As we have from the start, the City of Manistee looks forward to continuing to work with Tondu Corporation in an honest, open and professional manner. I look forward to meeting with you on January 6, 2004.

Season Greetings,

CITY OF MANISTEE

Mitchell D. Deisch, City Manager
mdeisch@ci.manistee.mi.us

MDD:cl

Attachment

cc. Gary Zimmerman, MPPA
J. P. Bierl, MSCPA
Mayor Richard Mack
Members of the City Council
City Attorney Bruce Gockerman
Community Development Officer Jon Rose
Finance Director Ed Bradford

DRAFT- FOR DISCUSSION PURPOSES ONLY

Letter of Understanding
&
Development Agreement

This Agreement entered into this ____ day of January, 2004 by and between the City of Manistee ("City)", a Michigan Municipal Corporation, 70 Maple Street, Manistee, Michigan and Tondu Corporation ("Tondu"), a Texas Corporation, 14701 St. Mary's Lane, Suite 652, Houston, Texas;

Whereas, Tondu, through Manistee Saltworks Development Corporation ("MSWDC"), a Michigan Corporation of 14701 St. Mary's Lane, Suite 652, Houston, Texas, is seeking to develop a certain electrical power generating facility ("Facility") commonly called The Northern Lights Project ("NLP") in the City on real estate commonly called "The General Chemical Site"; and

Whereas, there is currently before the City's Planning Commission a special use permit application for the General Chemical Site by MSWDC for construction and operation of the Facility; and

Whereas, Tondu and MSWDC will need certain federal and/or state air and water quality permits, as well as local City Special Use Permits and building permits before construction of the Facility can commence; and

Whereas, it is uncertain if Tondu and/or MSWDC will obtain all necessary local, state and federal permits for the construction and operation of the Facility; and

Whereas, the Facility's construction, existence and operation will have significant social, environmental and economic impacts, both foreseeable and unforeseen, to the City of Manistee, its citizens and others; and

Whereas, Tondu and MSWDC contemplate the development, ownership and operation of the Facility, in whole or in part, with others, including without limitation, the Michigan Public Power Agency ("MPPA") and Michigan South Central Power Agency ("MSCPA") that may make some or all of the real and personal property of the Facility exempt from local Ad Valorem property taxes pursuant to MCL 460.801. et seq. (Michigan Energy Employment Act of 1976); and

Whereas, the Facility, whether owned privately or by an entity with municipal tax exempt status, will require City services, including but not limited to Police and Fire protection, other emergency services, roads, sewers and water services, which services can be provided only at significant and great cost to the City and its taxpayers and citizens;

Now, Therefore, the City and Tondu mutually agree that if all the required local, state and federal permits, licenses and other approvals are obtained and construction of the Facility commences, as follows:

1. Recitals Part of Agreement.
   The forgoing recitals are not merely introductory or explanatory, but are an important part of this agreement and are incorporated herein.

2. Community Service Fee.
   (a) Tondu or MSWDC or those owning any direct or beneficial interest in the Facility shall pay an annual Community Service Fee ("CSF") for all years after completion of the NLP an amount not less than Four Million Five Hundred Thousand ($4,500,000.00) Dollars. (Editors Note: this could read: " an amount equal to 5% of Gross Revenues received by all entities owning an interest in NLP and/or the Facility". If using this, we have to have an auditing provisions so we can verify sales).
   (b) The CSF shall apply, except as provided for in Paragraph 3 below, for all taxable years in which the Facility is placed into operation, is ready for operation, is capable of operation or continues operation.

   (b) Such CSF shall be adjusted each taxable year by a factor equal to the State of Michigan Inflation Rate Multiplier used in the Capped Value Formula and Headlee Amendment Millage Reduction Formula

3. Interim Community Service Fee During Construction.
   Tondu or MSWDC will pay, or cause to be paid, to the City Five Hundred Thousand ($500,000.00) annually as an Interim Community Service Fee ("ICSF") on July 1st of each year during construction of the NLP Facility, commencing in the year in which all required approvals have been obtained and continuing until the plant is ready to commence electrical generation. Such ICSF shall cease to apply on January 1st of the year following completion of construction.

4. Conditions Precedent.
   Tondu's or MSWDC's obligations under this agreement are conditioned upon

   (a) Tondu or MSWDC obtaining all necessary and required local land use permits, including a Special Use Permit and Building Permits and all necessary and required State and Federal permits, including but not limited to water and air discharge permits.
   (b) Tondu or MSWDC meeting and compling with all conditions of any Special Use Permit that is issued by the City of Manistee Zoning Commission;

   (c) Obtaining of financing by Tondu or MSWDC to commence construction of the Facility and construction actually begins.

5. Limit of City Obligations & Conditions.
   Tondu and MSWDC acknowledge that nothing herein obligates the City to approve or issue the Special Use Permit that has been applied for by MSWDC regarding the NLP. Such application shall process through the Manistee City Planning Commission as provided by the City's Zoning Ordinance and this agreement is intended to cover only that circumstances where the NLP has obtained all local, state and federal permits and licenses that may apply to the Facility and the NLP.

   The City's acceptance of the amount of CFS from Tondu and/or MSWDC, as provided for herein, is contingent upon:
   (a) Tondu or WSWDC or it's assignees paying the CSF provided for herein;

   (b) the acceptance of this Agreement and the CSF by MPPA, MSCPA or other municipal ownership entitlement entity.

   (c) These conditions are specifically to be made part of the conditions of any Special Use Permit that might be issued by the Planning Commission; and

   (d) Tondu and/or MSWDC commence and complete construction within the time specified in the special use permit.

   (e) Tondu and/or MSWDC, or any successors operate and maintain the Facility in conformity with all local, state and federal land use, special use, air and water and other permits.

6. Duration of Agreement.
   This Letter of Understanding and Development Agreement shall continue in full force and effect until changed by the mutual written agreement of the Parties or the NLP is dismantled and removed from the Site without replacement.

7. Applicable Law & Dispute Venue.
   This shall be interpreted in accordance with the laws of the State of Michigan. Any dispute arising under or out of this agreement as to its meaning, application or enforcement shall be exclusively within the jurisdiction of the 85th Michigan District Court if the amount in controversy is less than $25,000.00 or the 19th Michigan Judicial Circuit Court, Manistee, Michigan if the dispute involves more than $25,000.00.

8. Entire Agreement.
The Parties acknowledge and agree that this is the entire agreement between them concerning the subject matter hereof, to wit: Community Service Fees and there are no other agreements between them concerning CSF, expressed in writing or oral that have not been incorporated herein. The Parties may amend or alter this agreement only in writing signed by both Parties.

9. Binding Effect.
This agreement shall be binding on the respective Parties and their respective heirs, successors and assigns. Tondu and MSWDC acknowledge and agree that for purposes of this agreement the terms 'successors and/or assignees' includes all persons or entities that may become an owner or beneficial owner of the NLP or Facility, including, but without limitation, the Michigan Public Power Agency or any other municipal entitlement agency.

10. Representations by Signatories.
The persons signing this agreement represent and warrant that they have obtained all necessary approvals by their respective governing boards or councils and that this agreement has been approved by each respective governing board and authorization for execution has been given to the signatories.

In Witness Whereof, this Letter of Understanding is executed on the date(s) indicted next to the signatures and is effective on the date when both parties have signed.

City of Manistee

_____
Mitchell D. Deisch
City Manager

Date:

Tondu Corporation & MSWDC

_____
Joe Tondu, President

Date:

C:CDT\TonduDevelopmentAgreement3-A.doc

City of Manistee
70 Maple Street • P.O. Box 358 • Manistee, Michigan 49660
231-723-2558
FAX 231-723-1546

December 1, 2003

Mr. Joe Tondu, President
Tondu Corporation
14701 St. Mary's Lane, Suite 652
Houston, TX 77079

Mr. Gary Zimmerman, General Manager
Michigan Public Power Agency
809 Centennial Way
Lansing, MI 48917-9277

Gentlemen:

For the past several weeks City administration, legal council and elected officials have been working nonstop on the Northern Lights Project (NLP). The issues and impacts to Manistee are enormous, which makes the process for permitting this facility that much more critical.

Permitting applications for the facility are underway by the various agencies: City Planning Commission, MDEQ and USEPA. One area that is still up in the air is a payment in lieu of taxes(PILT) community service fee (CSF) or more simply put, the revenue the City of Manistee will receive from this facility being located within the City limits. What is the appropriate amount is the question at hand. This letter is being drafted to both Tondu and MPPA, due to our legal council's belief that until MPPA officially signs on for this project, they have no legal standing to negotiate a CSF.

To the end of establishing an acceptable CSF, the City has researched existing MPPA member communities regarding megawatts of electricity generated or needed and their annual contribution to the community's general fund. In addition, Port Sheldon Township was contacted to see what taxes the Campbell 3 Plant annually pays. Comparing the Campbell 3 plant to the NLP is difficult when considering megawatts generated (Campbell 3 -790MW / Northern Lights- 425 MW), so we compared the facilities based upon their SEV. The NLP has not been assessed, but it is safe to assume it will be between 200-400 million dollars, possibly considerably higher. All of this research is provided for your review, including the taxes the NLP would pay if fully taxed in the City of Manistee.

Please be assured the City of Manistee is not contemplating or even discussing the full taxable value. We are looking for an equitable PILT/CSF comparable to the other communities. Different from the MPPA communities, the City of Manistee also has the responsibility of looking out for the other taxing entities that would have benefitted from a nonexempt plant.

The question is, what is an appropriate amount to pay annually to the City of Manistee as a CSF? How this is split up between MPPA and Tondu Corporation is not our concern. This question will require Tondu Corporation and MPPA to cooperatively come to an answer and present it to the City of Manistee.

Verbal assurances and guarantees from both Tondu Corporation and MPPA have been made that an acceptable deal will be made with the City. These have been of great comfort and are appreciated. However, now is the time to put it in writing. Unless there is a PILT/CSF agreement in place, a Special Use Permit could only be issued conditionally. This would make the permit subject to an agreement at a later date.

We will continue to work cooperatively with all parties for the Planning Commission's Special Use Permit review of this facility. If you have any questions, please contact me at 231-723-2558.

Sincerely,

CITY OF MANISTEE

Mitchell D. Deisch, City Manager
mdeisch@ci.manistee.mi.us

MDD:cl

Enclosures

cc. Mayor Richard Meck
City Attorney Bruce Gockerman
Finance Director Ed Bradford
Community Development Officer Jon Rose

City of Manistee

Northern Lights Project

Community Service Fee (CSF) / PILT Analysis

IF SUBJECT TO AD VALOREM TAXES

Ownership	Taxable Percent	Item	True Cash Value TCV	Initial SEV Taxable Value	City Tax 20.5	Other Tax 40.1	Total Taxes 60.6
100% Private	100%	Taxable Value	$ 530,000,000	$ 265,000,000	$ 5,439,354	$ 10,630,767	$ 16,070,120

IF 100% MUNICIPALLY-OWNED

Community	MW (1)	PILT - CSF	PILT - CSF Per MW	
Holland	230	$ 2,000,000	[illegible]	
Grand Haven	72	$ 1,000,000	[illegible]	
Traverse City	20 (1)	$ 1,000,000	$ 50,000	High outlier excluded from average calculation
Petoskey	10 (1)	$ 1,000,000	$ 100,000.00	High outlier excluded from average calculation
Portland	4	$ 33,950	[illegible]	
Lansing 2003	507	$ 6,728,288	[illegible]	
Lansing 2002	507	$ 7,400,000	[illegible]	
Bay City	33.3 (1)	$ 1,000,000	$ 30,030	High outlier excluded from average calculation
[illegible]			$ 12,577	
MANISTEE	425	$ 5,345,225	$ 12,577	

EXAMPLE OF MIXED OWNERSHIP FACILITY

Port Sheldon Twp	Taxable Value	Summer	Winter	Total
Campbell 780 MW	$ 241,244,000	$ 5,031,601	$ 3,895,801	$ 8,927,402

Notes: (1) Municipalities' power usage. They do not generate electricity themselves.

ALL

City of Manistee

231-723-2558
FAX 231-723-1546

70 Maple Street • P.O. Box 358 • Manistee, Michigan 49660

November 20, 2003

Mr. Joe Tondu, President
Tondu Corporation
14701 St. Mary's Lane
Suite 625
Houston, TX 77079

Dear Joe:

Thank you for the letter received on November 17, 2003 (dated November 13, 2003) regarding municipal ownership in the Northern Lights project and a subsequent level of Community Service Fee (CSF) paid to the City of Manistee.

Your letter went a long way in showing Tondu's commitment toward understanding the City's concerns over a partial or fully exempt facility. There is no doubt that regardless of percentages of municipal ownership, City services will be used by the Northern Lights facility. Fire and Police are the most obvious, but history shows that all levels of City government are used by industry.

Based upon this knowledge, I would like to propose that the City and Tondu enter into a formal Letter of Understanding (LOU) regarding the level of CSF to be paid to the City of Manistee. It is important that the City and Tondu mutually agree prior to the Planning Commission voting on the Special Use Permit.

My trust in you as a person or Tondu as a corporation is not an issue or concern, it is a simple matter that it is in the best interest of the City of Manistee to have a written agreement.

Attached is a LOU that the City is proposing to Tondu Corporation. I believe this LOU protects both the City of Manistee and Tondu Corporation. The LOU works well for 100% municipal ownership in the Northern Lights project. If less than 100% municipal ownership is achieved then prorating and further discussions will need to happen. This LOU will require City Council approval.

The LOU is not an ultimatum, rather the continuation of the City and Tondu working through this complicated process for siting this facility. As we have from the start, the City of Manistee will continue to work with Tondu on the project.

Please feel free to contact me if you have any questions.

Sincerely,

Mitchell D. Deisch
City Manager

cc. Mayor Richard Mack
Bruce Gockerman, City Attorney

LETTER OF UNDERSTANDING
BETWEEN
TONDU CORPORATION
AND
CITY OF MANISTEE

This agreement entered into the ___day of _____, 2003 between The City of Manistee, 70 Maple Street, Manistee, MI 49660 ("City") and Tondu Corporation, 14701 St. Mary's Lane, Suite 652, Houston, TX 77079 ("Tondu"):

Whereas, Tondu anticipates building the Northern Lights Power Plant project, an approximately 425 Megawatt Power Plant, on property located with the boundaries of the City; and

Whereas,
Tondu has indicated that municipalities may own, directly, indirectly or beneficially between 50% and 100% of the Northern Lights project such that the real estate, equipment and fixtures will or may be eligible for certain Ad Valorem real and personal property exemption(s) pursuant to the Michigan Energy Employment Act of 1976, MCL 460.801, et seq., or any other similar statute that has the effect of exempting, in whole or in part, the project from Ad Valorem property taxes; And

Whereas, if constructed, the Northern Lights project will require City services being used to service the Northern Lights facilities, including but not limited to road, sewer, water, police and fire services and otherwise will have a significant economic and social impact on the City, its services and citizens;

Now, Therefore, the City and Tondu mutually agree that if the Northern Lights Project is constructed within the City of Manistee with municipal ownership tax exemptions, that.

1. Tondu will pay an annual Community Service Fee (CSF) for all years after completion of the Northern Lights Project an amount not less than$1,950,000. Such CSF will be paid quarterly on January 1, April 1, July 1, and October 1 of each year.

2. Such CSF will be adjusted each taxable year by a factor equal to the State of Michigan Inflation Rate Multiplier used in the "Capped Value" formula and Headlee Amendment Millage Reduction Formula.

3. Tondu will pay to the City $200,000 annually on (Insert Date) during construction of the Northern Lights project.

4. If a portion of the plant is privately owned and part is subject to municipal ownership/use exemptions the annual Community Service Fee will be reduced pro-rata as to that percentage or part of the facility with municipal exemption entitlements. That portion of the plant owned without such municipal exemption

entitlements shall be assessed and taxed, and taxes paid, in accordance with then existing Ad Valorem real and personal tax law of the State of Michigan.

5. This Letter of Understanding shall continue in full force and effect until changed by the mutual written agreement of the Parties or the Project is dismantled and removed without replacement.

6. Each representative of the Parties signing this agreement warrant and represent to the other that before signing they have received specific and unqualified authority from their respective governing boards to inter into and sign this Letter of Understanding Agreement.

7. This agreement shall be binding on the respective Parties, their heirs, successors and assigns.

City of Manistee	Tondu Corporation
_____	_____
Mitchell D. Deisch City Manager	Joe Tondu, President
_____	_____
Date	Date

h:\data2_n\bcg\city\misc\letter of understanding.tonducorporation-2.doc

1. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

Property Taxes (Continued)

The taxable value at December 31, 2000 was $1,098,268,929. An amount of $1,020,055,229 provides a City-wide valuation equivalency that allows for a uniform millage rate across all taxable properties, including tax-abated properties. The tax levy was based on the following rates:

	Millage Rate Used	Authorized Millage Rate By Either State Law or City Charter	
General Operating	8.8389		
Property Acquisitions	.2500		
Street Development and Improvement	1.0000		
Sidewalk Development and Improvement	.2500		
Municipal Capital Projects	1.1000		
Debt Service General Obligation	1.1108		
	12.5497	16.2027	(1)
		17.5000	(City Charter)
Dial-A-Ride/MAX	.2500	.5959	(1)
		.6000	(2)
Library Support/Debt Service	1.3830	1.4898	(1)
		1.5000	(3)

(1) Formula limitation required by 1978 State Constitutional amendment.

(2) Voter-approved limitation dated November 3, 1998.

(3) Library support agreement between City of Holland, Park Township, Holland Township, Laketown Township and Herrick District Library dated March 21, 1997.

Electric Utility Fund Transfer to the General Fund

The City Charter authorizes an annual operating transfer from the Electric Utility Fund to the General Fund. The current formula for determining this transfer is based upon 3.5 percent of Electric Utility Fund budgeted revenues of the same fiscal year. For fiscal year 2002, a cash operating transfer of $2,136,000 was made.

Compensated Absences

City employees are granted vacation, sick and longevity pay in varying amounts based on length of service, which are compensable upon termination of employment except during resignation or discharge for disciplinary cause.

Vacation hours are credited to each employee on the anniversary date of hire. The number of hours is dependent upon years of service.

Agenda

Board of Directors Meeting

HOLLAND BOARD OF PUBLIC WORKS

625 HASTINGS AVENUE
Holland, Michigan
December 1, 2003
4:00 p.m.

Call to order.

1.	AGENDA	# 1 Base Load Resource Options Report (Power Resources Department)

Accommodations are available for the disabled public. If you need a hearing assistance device or other aid, please contact the Holland Board of Public Works, 625 Hastings Avenue, Holland, MI 49423, 616/355-1520 in advance of this Board meeting.

HOLLAND BOARD OF PUBLIC WORKS

December 1, 2003

AGENDA ITEM: #1 Base Load resource Options Report
(Power Resources Department)

ACTION: No Action – Information Only

SUMMARY: The Power Resources Department staff has developed a report detailing the feasibility of two base load resource options. The attached documents include reports from both the internal staff and consultants and other parties.

There is no action required at this time. This information is being provided in preparation for a request for action at the December Board of Directors regular meeting. Opportunity will be provided for questions and discussion.

Tim Morawksi, P.E.
General Manager

HOLLAND BOARD OF PUBLIC WORKS

Staff Report

The Status of Base Load Resource Options

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I. Staff Executive Summary – HBPW Staff
II. Northern Lights Phase I Report – Tondu Corporation
III. Independent Review of Northern Lights Phase I – RW Beck
IV. Circulating Fluidized Bed Executive Summary – Cummins & Barnard
V. Independent Review of Circulating Fluidized Bed – RW Beck
VI. Load Forecast and Report – RW Beck
VII. Assessment of Impact on Net Income – RW Beck

HOLLAND BOARD OF PUBLIC WORKS
Power Resources Department

November 17, 2003

Base Load Resource Options Report

History

The Power Resources Department staff hired consultants R.W. Beck in the spring of 2001 to perform a supply side resource evaluation. This assessment considered the economic, environmental, reliability and risk factors of various power supply options. The study concluded that the Holland Board of Public Works should pursue a joint ownership of sixty to one hundred megawatts of coal-fired generation. Shortly after the completion of the report, staff became aware of a couple of potential projects that were being developed as mine-mouth plants in Kentucky and Illinois, and that might serve to provide us with the additional megawatts that we need. One of these options has since dissolved and the other has significant risk involved with the uncertainty of transmission service into Michigan, and is not being seriously considered at this time.

In the spring of 2002, staff began pursuing two other options. The first is a proposed four hundred twenty-five megawatt coal plant situated in the Manistee, Michigan area. The second option under consideration is the development of a coal unit at the James De Young Generating Station. Development efforts on both of these options have centered on a fatal flaw analysis approach, along with some work towards understanding the environmental and transmission interconnection issues with either option. This report provides detail on each option along with an analysis of the impact on rates and net income for the electric utility.

NORTHERN LIGHTS

Background & Phase I

The Tondu Corporation, developer and part owner of the existing TES Filer City sixty-megawatt coal plant located near Lake Manistee in Filer Township, Michigan, desired to build a larger plant on the adjacent Drop Forge property. Tondu, the City of Holland and eventually Michigan Public Power Agency (MPPA) and Michigan South Central Power Agency (MSCPA) had begun discussions about the proposed development. At the time, Tondu had developed some preliminary cost estimates for the plant that looked very favorable. Tondu and the interested parties agreed to perform a Phase I development effort to better determine the potential of a successful plant development. Certain key issues such as land options, air permit development, business structure, transmission connectivity and refined cost estimates were to be resolved during this phase. This effort, begun early this year, is now complete. Presently, the project is at a point where individual participants must make a determination of their level of commitment in terms of the number of megawatts they desire from this facility.

The Holland BPW Board has been given a packet of information regarding the details of this plant. Included in those documents is a Phase I report from Tondu Corporation and the independent review of that report from R. W. Beck. This presentation highlights some of the key areas and developments that have brought us to this point.

When the project was initially conceived, it was proposed to be a three hundred-fifty megawatt facility. This limitation was due to the size of the Drop Forge property next to the existing TES Filer City plant. During the first couple months of the development, Tondu became aware that the General Chemical plant, also situated near Lake Manistee, but located in the City of Manistee, was interested in selling its property. This site holds significant advantages over the Drop Forge site, including the presence of an existing coal dock and room to accommodate a larger (four hundred twenty-five megawatt) plant. Subsequently, an option agreement was executed for this property on September 9, 2003.

Environmental Considerations

Building a coal plant requires a significant investment in emission control equipment to provide for the protection of the environment. This proposed plant will have Best Available Control Technology (BACT) to control air emissions. This includes a high efficiency baghouse for particulate capture, selective catalytic reduction for oxides of nitrogen removal and a dry scrubber for sulfur dioxide removal. In addition, the plant will be built to accommodate future installation of mercury control technologies when they become technologically proven. NTH Consulting was hired to perform air quality impact modeling for this plant and to develop and submit the air permit application. This application was submitted in September, 2003. An extensive review process has begun at the Michigan Department of Environmental Quality and the process will involve public comment periods. The anticipated time frame for issuing a permit is approximately nine months.

Another key factor for constructing a new resource is whether you can export the power on to the transmission grid. The Midwest Independent System Operator (MISO) oversees the generator interconnection request process for this geographic area. There is a procedure in the open access transmission tariff for initiating this request. Cummins & Barnard and Commonwealth Associates were hired to develop the interconnection request and to review the results of any studies that result from the request. The normal timeframe for this work is specified in the tariff to be sixty days from the application date. This timeframe was exceeded by Michigan Electric Transmission Company, the owner of the transmission system where the generator will interconnect. It wasn't until August that the report was received. The report also failed to take into consideration the increase in plant size that was a result of changing locations. Therefore, we

were unable to complete the second part of the generator interconnection study, before the end of the Phase I timeline. The good news, however, is that there were only a few minor upgrades that were identified to be needed on the transmission system to accommodate the generator. In Phase II, Holland will have to submit a request to MISO for the delivery of this generator's power into Holland. It is anticipated that certain network upgrades could be made to allow power to flow into Holland.

The project's success will also hinge on the amount of public support that will come from both the local and state communities. The project has already been presented to the Michigan Economic Development Commission and has received a high priority status. Also, two town meetings have been held to educate the Manistee community about the plant and about air quality issues. In general, the response from the local community has been positive.

Staffing

This plant will create around 60 full-time jobs and provide a significant amount of construction labor during the three-year construction cycle. In addition, almost all of the labor unions, associated with the construction of power plants, have signed agreement for this job. It is anticipated that there will be opposition at some point, as a result of the air permitting process. To date, no national groups have commented on this project.

Costs

Finally, the capital and fixed and variable operation and maintenance expense estimates were refined through the Phase I development. These costs are represented in the Phase I report and adjusted in the R. W. Beck review. In summary, the anticipated cost in 2008 dollars, from the unit will be in the $35 per megawatt hour area. This is the most attractive power supply option staff has found.

Phase II

There are several issues that are being resolved by entering Phase II. One of these is the project structure. It is intended that the unit will be fully owned by the participating municipal agencies. Tondu will not have an ownership interest in the plant. Rather, Tondu will have a thirty-year purchased power contract for two hundred megawatts. Further, Tondu will provide an up front cash payment for that portion of the plant capacity. Tondu will also be obligated to pay the ongoing fixed and variable operations and maintenance costs for its portion of the plant. At the conclusion of thirty years, the power supply contract with Tondu ends and the entire unit output reverts to the municipal owners. Tondu's ability to provide financing is a critical piece to the success of the plant development. That financing ability will be based on the strength of power supply resale contracts that Tondu puts in place with other utilities and marketers. In any event, the municipals will be protected because Tondu will be providing money up front.

It is recognized that the Tondu Corporation is the developer of the project, with an incentive based fee system in place for the development work. At financial closing, Tondu would receive one percent of the project development cost (approximately $7 Million). At commercial operation, Tondu would receive another two percent ($14 Million).

Tondu would also be funding 200/425 megawatts with money up front, essentially paying themselves about $9.9 Million. The municipals would be funding $11.1 Million.

Also, the two percent payment at financial closing is at risk. If construction costs overrun and expend the project contingency, any additional payments to complete the project will come from the two percent development fee. This fee is still being negotiated and may change depending on Tondu's role during the remainder of the development process.

Other Phase II activities include selecting a contractor for the construction, developing the operating entity between the municipal agencies, submitting all other permits, and preparing the site for construction. The Phase II budget is estimated around $10 Million. If Holland committed to one hundred megawatts, the cost to it would be $425,000. This money would not be recoverable Holland decided to back out.

The Phase II agreement will also contain language to provide for the survivability of the project should something prevent Tondu Corporation from continuing in the development. To date, the permit applications and the land purchase option is in the name of the Manistee Saltworks Corporation, a subsidiary of Tondu Corporation. The Phase II agreement will pledge the assets of this corporation to the municipal entities upon Tondu's departure from the project.

ADDITIONAL COAL RESOURCE at JAMES DE YOUNG

Background

Concurrent to studying Northern Lights, HBPW staff has been evaluating the feasibility of installing a new coal resource at the James De Young Generating Station. Early this year the Board hired Cummins & Barnard to perform a study to identify the capital and operating costs associated with the installation of a circulating fluidized bed coal resource. This study was completed in June and has been reviewed by R. W. Beck. (See attached.)

Cummins & Barnard proposed the installation of the new unit in the footprint of the existing Unit 1 and Unit 2 area of the plant. This was the original plant that was constructed in 1940. It was also recognized that the Unit 3 boiler space could also be utilized, allowing for a slightly larger unit and providing additional efficiency improvement and coal specification flexibility. The utilization of the Unit

3 space in addition to the Unit 1 and 2 areas seems to provide the best overall option if the desired course of action is to build at James De Young. The addition would allow for a seventy-(70) megawatt unit to be installed.

The proposed boiler type is a circulating fluidized bed (CFB) technology. This type of unit is environmentally more efficient and allows for more fuel specification flexibility. A CFB unit can be designed to burn waste coals, wastewater treatment plant sludge, tires, wood or coal. The ability to burn wastewater treatment plant sludge provides an additional benefit to the wastewater utility. In terms of value added to fuel, the sludge has no value or potentially negative value in that there must be a significant amount of drying in the furnace before the heating value of the sludge is realized. The evaluation of the cost effectiveness of the sludge burning lies in the capital cost of sludge processing and piping to the power plant versus the avoided cost of the land disposal of the sludge. If there is any net benefit, this could be applied to the evaluation between the two coal resource options. Tires and wood waste are other options that should be evaluated if the Board opts to continue development of the CFB. However, the percentage of the fuel stream that would comprise tires and wood is estimated to be no more than 2-3 percent. Therefore, the impact on the overall cost of the CFB option is not significantly impacted by these alternative fuel choices.

Environmental Considerations

The CFB process is environmentally efficient in part because the coal burns at a lower temperature than in a pulverized coal facility such as Northern Lights. This retards the formation of thermal oxides of nitrogen. Also, the 1800 degree firing temperature is the optimum point to allow limestone to react with the sulfur in the coal, thus reducing the sulfur dioxide formation in the furnace.
The proposed unit would also have post-combustion equipment to further scrub out oxides of nitrogen. This device is a selective non-catalytic reduction system. Essentially, aqueous ammonia is sprayed in the exhaust stream before the gases exit the boiler.

This unit would also have a baghouse for particulate capture. It is estimated that the unit could perform as well as the Northern Lights facility for all criteria pollutant removal.

A concern for the CFB is that Ottawa County will be classified as a non-attainment area for ozone starting in the summer of 2004. This means that any new emission source that emits more than 100 tons of any pollutant would need to find another source that could reduce its output so that there is no net impact to the ambient air quality in the county. Since it is suggested that Unit 3 be shut down, the new unit could claim available emission credits from that resource. Even though the new unit is seven times the size of Unit 3, the environmental efficiency should make up for the fact that there is more coal being burned. Actually, there would most likely be a reduction in overall emissions. For the CFB unit additional work would need to be done to more fully evaluate the air emission impacts of the new unit. HBPW staff did not attempt to address this in as much detail as the Northern Lights plant until the economic impact of each resource option was more fully understood.

The electrical interconnection of the CFB would be made into a new substation that is planned to be built across Pine Avenue. The cost of relocating that substation was not part of the capital cost estimate since the substation relocation is already in the plans for the Transmission and Distribution department.

Since the existing power plant is utilizing all of the heat rejection capability of Lake Macatawa allowed by the Department of Environmental Quality, this unit would have to use cooling towers. Plume abatement measures of increased fan size, taller structures and air reheating before exit have been taken into consideration and are represented in the cost estimate. Another measure that could reduce the plume during the winter months, would be the expansion of the snow-melting district. This would have to be studied in more detail and is not represented in this cost estimate.

Staffing

Staffing additions are minimal in relation to the Northern Lights plant. Of the six positions that would be added, three are for additional operators, one for a maintenance technician and two fuel handlers. Also, since the west end of the plant is being renovated for the installation of a new unit, an administration building would be added in the location of the existing substation. All of these modifications to the office space requirements are included in the cost estimate.

R. W. Beck performed a review of the Cummins & Barnard study and found that some costs needed to be adjusted. In addition, R. W. Beck provided some cost information to increase the turbine and auxiliary equipment sizes to match the largest boiler size. These adjustments were made before evaluating the impact of this resource on the net income for the utility going forward. The capital cost of the CFB is expected to be $131.7 Million with an annual fixed operations and maintenance cost of $1.8 Million and a variable operations and maintenance cost of $24.75 per megawatt-hour. This makes the all in cost at full dispatch, approximately $40 per megawatt-hour.

RESULTS OF DISPATCH & SENSITIVITY ANALYSIS

After the appropriate adjustments to the capital and operating cost estimates were made, an evaluation of the impact on net income was made. The first step in doing this was to verify that our previous load forecast was still adequate. RW Beck was hired to develop an econometric model in order to generate a load forecast. That study is complete and the report is attached. In short, the study still shows that there will be steady increases in energy demand over the current

planning horizon. The new energy and peak demand forecasts were incorporated into the net income evaluation spreadsheet. RW Beck was employed to critique and adjust the spreadsheet as necessary. Also, RW Beck ran several sensitivity analyses to better understand the range of issues that might show one option to be more favorable than another. These findings are also included as an attachment to this report. The next few paragraphs highlight those findings.

The results of the evaluation of the impact on net income shows that Northern Lights unit has an economic advantage over the circulating fluidized bed option. All resources, however, have a significant impact on net income starting with the year that each resource begins commercial operation. The staff evaluated different levels of entitlement from the Northern Lights project. The findings show that while the smaller (60 Megawatt) entitlement is a better fit in the first few years, the larger (100 Megawatt) entitlement performs better in the later years. This is because the sixty-megawatt Northern Lights option needs additional capacity from either market or natural gas resources to meet the load growth needs.

Our staff also evaluated the necessary rate increases to keep the net income at a satisfactory level throughout the planning period of 20 years. Below is a table that summarizes potential rate increases for income stabilization applied to the base case.

Annual Rate Increase to Accomplish Target Net Income/Revenue

	Annual Rate Increase		
Net Income per Revenue Percent	100 Megawatt Northern Lights	60 Megawatt Northern Lights	James De Young CFB Unit
8.0%	0.6%	0.7%	1.0%
10.0%	0.8%	0.9%	1.2%
12.0%	1.0%	1.1%	1.4%
14.0%	1.2%	1.3%	1.6%
16.0%	1.4%	1.5%	1.8%

In addition, the best and worst-case scenario of inflationary increases was tested for income stabilization. The following chart shows the annual rate increases needed to establish a 12% net income per revenue ratio.

	Annual Rate Increases for 12% Net Income/Revenue		
Case	100 MW Northern Lights	60 MW Northern Lights	James De Young CFB
Best	0.1%	0.0%	0.3%
Worst	2.3%	2.3%	2.7%

The spreadsheet does a lot to address the economic factors that influence the next resource decision. There are other factors that the Board must consider as well. Some of the less obvious advantages of the Northern Lights facility are the prospect of obtaining additional base load generation after no more than thirty years. While that might seem like a long time, the oldest unit in operation at James De Young is fifty years old. There would be a significant advantage to having low cost power without the burden of high capital expense. Another advantage for Northern Lights is the economy of scale to help offset the cost of future improvements to meet additional regulation requirements that may come along.

The CFB unit also has a set of advantages that are somewhat less tangible than the straight economic comparison. The prospect of burning wastewater treatment plant sludge can significantly benefit the wastewater utility. Having an additional resource within the city boundaries would provide additional reliability and system support. Finally, the additional heat rejection needs could provide an opportunity to expand the existing snow-melting district.

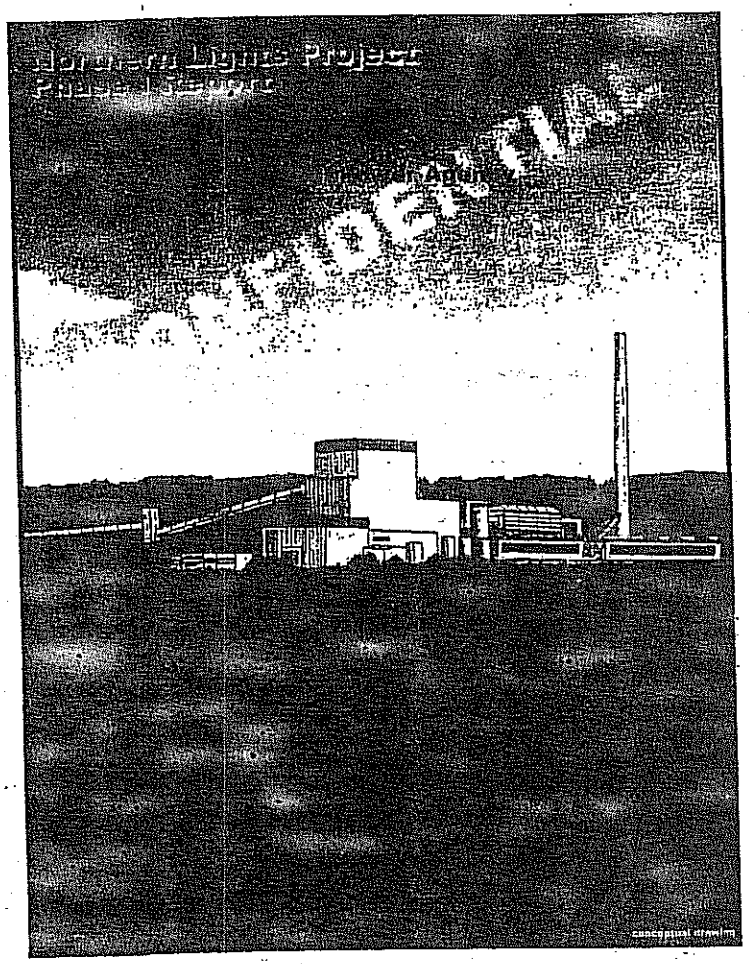
NEXT STEPS

The earlier discussion listed steps that would be taken under the second phase of the Northern Lights development. If, however, the CFB is the desired option, there are some additional activities that need to commence. As was mentioned before, the air permit work is much further along for the Northern Lights facility. Staff has received a proposal from NTH Consultants to perform an analysis of the air regulations that would impact the CFB and determine a permitting strategy to meet those regulations. This estimate is $12,500. It is estimated that the actual drafting and filing of the permit would take an additional $50,000. Also, Cummins & Barnard did not do an extensive amount of soils and foundation assessment for the CFB unit. This is a crucial element to the amount of structural improvements that would have to be made to support the new unit. The estimate for this work would be $20,000.

The intent of this discussion was to lay out all of the information that the staff has received on both of these resource options. The Board will have the next month to review the information and ask any questions it might have to better prepare for a decision by next month's meeting.

David G. Koster
Power Resources Director

11-17-03
Date



November 4, 2003

Confidential

This document is strictly confidential and subject to confidentiality under Section 17 of the Cooperation Agreement among Tondu Corporation, Michigan Public Power Agency and Michigan South Central Power Agency. This "Phase I Report" for the Northern Lights Project is not a sales brochure or any other similar kind of presentation and is not intended to be used as such. All of the calculations, projections, estimates, analyses, and statements made herein are believed to be accurate; however, Tondu Corporation makes no representation as to their accuracy. Many of the representations herein are the opinion of Tondu Corporation and therefore subject to interpretive error.

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Appendices

Appendix A ..... Tondu Resumes
Appendix B ..... Required Permits
Appendix C ..... Base Case Model
Appendix D ..... Development Schedule

1.0 EXECUTIVE SUMMARY

Background

Tondu Corporation ("Tondu") developed the TES Filer City Station Power Plant in Manistee County, Michigan (the "Filer City Plant") which began commercial operations in 1990. Since then, Tondu has envisioned the development of a larger coal fueled power plant in the Manistee area. Access to existing infrastructure, Great Lakes shipping, 345 kV transmission lines, surplus low cost landfill, supportive local population and a favorable location for permitting makes the Manistee area a rare, and possibly the last, remaining site for a new coal fueled power plant in Michigan.

In late 2002, Tondu approached the Michigan Public Power Agency ("MPPA") and the Michigan South Central Power Agency ("MSCPA") to inquire about their interest in purchasing power from a new coal fueled power plant to be located in Manistee. MPPA and MSCPA, collectively referred to as the "Joint Agencies" and individually as a "Joint Agency," indicated they would evaluate participating in such a project if they were involved in its development and ownership. These terms were agreed to in the January 2003 Cooperation Agreement (the "Cooperation Agreement") between Tondu and the Joint Agencies.

The Cooperation Agreement provides for funding a feasibility analysis of developing a coal-fueled power plant in the Manistee, Michigan area (the "Northern Lights Project" or the "Project"). Upon the completion of this first phase effort ("Phase I"), the Joint Agencies have the option of completing its development in a joint venture with Tondu ("Phase II") and becoming the sole owner of the Project. This report is a summary of the findings of Phase I (the "Report") and describes the Phase II effort required to complete the development of the Northern Lights Project.

Project Overview

The Northern Lights Project involves the development, construction, operation, and maintenance of a 425 MW (nominal net output) coal fueled power plant to be located in Manistee, Michigan (the "Northern Lights Plant" or the "Plant"). The Plant site (the "Plant Site") consists of approximately 50 acres of land located on Manistee Lake less than 1/8 miles from 345 kV transmission lines. The System Impact Study was completed by Michigan Electric Transmission Company ("METC") and no major issues were identified. The Plant will consist of a single pulverized coal boiler and a full condensing steam turbine. Exhaust gases will feed into a dry spray scrubber and a high efficiency baghouse. A selective catalytic reduction ("SCR") aqueous ammonia injection system will be used for NO_x control.

The Plant will be fueled by Southern Powder River Basin low sulfur coal delivered via self-unloading lake vessels to the coal dock located on the Plant Site (the "Coal Dock"). The Plant will require approximately 1.8 million tons per year of coal with an expected firm annual electricity output of approximately 3,351 GWh. The Plant Site contains adequate space to store 120 days of coal for the winter months when the Great Lakes are frozen. Lime for SO_2 scrubbing will be delivered via truck from lime producers in Manistee, Detroit or Huron, Ohio. Bottom ash will be sold for use in the construction industry and the scrubber and fly ash will be disposed of in a nearby landfill.

An engineering, procurement and construction ("EPC") contractor (the "EPC Contractor") will build the Plant under the terms of a construction agreement (the "EPC Agreement"). The EPC Agreement will provide for the EPC Contractor to design, engineer, procure the equipment and construction materials, construct, start-up, and complete performance testing for the Plant. To assure the Plant meets its performance expectations, the EPC Contractor will be required to commit to a fixed turnkey pricing, completion by a date certain, extensive performance testing, and be subject to liquidated damages for non-performance. These assurances will minimize construction and initial performance risk.

Environmental Permits

The air permit (the "Air Permit") application was filed on September 10, 2003 and is expected to be issued by the summer of 2004. The remaining permits will be secured as required.

Total Project Cost

The Project cost including all development, financing, construction, and start-up expenses (the "Total Project Cost") is projected to be approximately $1,647 per kW of capacity or $700 million. While confidence in this estimate is high, it is still a preliminary projection and subject to change as the final Project agreements are completed. Prior to the close of the construction financing, it is projected that over 86% of the Total Project Cost will be incurred development costs or fixed through various contracts and cost guarantees.

Project Ownership and Financing

If the Joint Agencies exercise their option to participate in the Northern Lights Project, they will become the sole owners of the Plant as joint tenants in common. Up to 250 MW of the Plant's capacity will then be available for the Joint Agencies member municipal utilities ("Participating Municipals") to acquire. To capture additional efficiencies of scale and to provide for future electric generating capacity, the Plant will be sized greater than the current needs of the Participating Municipals. This excess energy output will be purchased by Tondu under the terms of a 30-year wholesale energy purchase agreement (the "Wholesale Energy Purchase Agreement"). The Joint Agencies will issue tax-exempt bonds to finance the portion of the Plant's cost purchased by the Participating Municipals. The balance of the capital requirements will be paid by Tondu under the terms of the Wholesale Energy Purchase Agreement. Any future finance requirements for changes-in-law (e.g. additional environmental controls) will be secured through additional debt financings or from cash flow from operations.

Economic Potential

The total cost of electricity for the Joint Agencies, including the cost of tax exempt financing, delivered by the Northern Lights Plant to the 345kV interconnection point is projected to be approximately $32/MWhr in 2008.

Phase II

If the Joint Agencies elect to participate in the Northern Lights Project, the parties will enter into a project consulting agreement (the "Project Consulting Agreement") that sets forth how the parties will work together during Phase II. The objective of Phase II is to complete the development of the Northern Lights Project. To accomplish this objective, the following tasks will be required.

- Organize the Project Development Management Systems
- Assemble the Project Development Teams
- Secure the Plant Permits
- Complete the Electrical Interconnection Agreement
- Complete the EPC Agreement
- Complete the Coal Acquisition Agreements
- Complete the Support Agreements
- Reconfirm the Project Financial Projections
- Exercise the Options to Acquire the Plant Site
- Close the Project Financing

Phase III

Phase III begins with the closing of the Project financing. The objectives of Phase III are to design, construct, and start-up the Plant; hire and train the management, operating and maintenance employees for the Plant. During Phase III, Tondu will lead a Project construction management team to complete the Phase III tasks.

Development Timetable

If the Joint Agencies proceed with Phase II, the Plant's construction will begin as soon as the required permits are secured, which is expected in late 2004 to early 2005, and the Project financing is closed. The Plant's construction is scheduled for 42 months with commercial operations beginning in the first quarter of 2008.

2.0 PROJECT PARTICIPANTS

2.1 Tondu Corporation

Tondu is an industrial development company based in Houston, Texas that develops, owns and operates cogeneration and independent power plants. As a developer, Tondu brings together all of the elements required to make a business succeed. Tondu has been successful in identifying opportunities, assembling development teams, documenting transactions, investing in project development, raising the required financing, and managing projects.

Tondu is 100% owned by Robert J. Tondu. Its assets include cash, real estate, and investments. Its most significant asset is its interest in the Filer City Plant which is described in greater detail below. Through affiliated entities, Tondu owns approximately 40% of the Filer City Plant. Appendix A contains resumes of the key personnel.

Tondu Corporation has substantial hands-on experience in business development, marketing, investing, contract documentation, engineering, finance, and organization and operations management. We work in teams contributing our particular expertise to the total effort. In addition, we have a trusted group of associated organizations and individuals who we utilize to provide specific expertise for defined tasks that become part of the team. These relationships provide access to a wide range of engineers, lawyers, technical specialists and experts. The team format allows flexibility to call upon the expertise needed to meet the ongoing challenges; such as engineers skilled in the target technology, lawyers specialized in finance and contract documentation, experts in environmental permitting and public relations, and people with the proven ability to identify, train and direct the people needed to operate and maintain our facilities to the highest standards.

The predecessor company to Tondu was started in 1978 and focused on identifying and capitalizing on emerging businesses. In the late 70s and early 80s, Tondu was active in the exploration and production of oil and gas. Tondu is no longer active in the oil and gas industry and entered the emerging independent power industry in the mid 1980s. Over the next ten years, Tondu developed highly successful, first-of-a-kind independent power plants in the United States and Canada. These projects collectively represent a total investment exceeding $220 million. The following is a brief description of these projects.

Filer City Plant
The Filer City Plant is a coal and wood waste fueled facility with a rated net output of 60 MW and 50,000 pounds of 600 psi steam per hour. It was the first major industrial focused cogeneration power plant developed in the state of Michigan. Tondu identified the Filer City Plant project and was the project's developer.

As the first major cogeneration power plant in Michigan to receive Qualifying Facility status under federal regulations, contested Michigan Public Service Commission rate hearings for the Filer City Plant were required to approve the electricity rates proposed in its power purchase agreement. These hearings resulted in setting a favorable precedent for Qualifying Facility electricity rates in the state of Michigan. In addition to leading the defense of these hearings, Tondu organized a lobbying effort and actively supported the successful enactment of state legislation to encourage the development of independent power plants in Michigan. Based on the success of these rate hearings and the promulgation of the supporting state legislation, over 1,400 MW of new Qualifying Facilities were subsequently developed in Michigan.

Principal Agreements - Electricity from the Filer City Plant is sold under a 35-year contract to Consumers Power Company and steam is sold under contract to Packaging Corporation of America for use in their adjacent paper mill.

Financing - Tondu closed the construction financing for the Filer City Plant on August 25, 1988. The Prudential Insurance Company of America provided $78 million of the project's $87 million total cost as debt with a 19-1/2 year term and a fixed interest rate. Tondu led the effort to obtain the debt and equity for this project.

Performance - Since beginning commercial operations in June 1990, the Filer City Plant has met or exceeded its performance targets in all but one year of operation.

Technology - The Filer City Plant is fueled with 90% coal, and 10% wood waste and chipped tires. The facility uses standard stoker boilers and dry gas scrubbers with a high-pressure extraction turbine. The plant is operated by 28 full time employees under the management of a limited partnership and an affiliate of Tondu is co-general partner.

Development Responsibilities - Tondu identified the project and was responsible for negotiating all of the project contracts including the site acquisition agreement, coal dock lease, steam sale agreement, power purchase agreement, coal purchase agreement, power interconnection agreement, and the financing documentation. In addition, Tondu obtained the required environmental permits and actively participated in the project's construction management.

Ownership and Management - Tondu owns approximately 40% of the Filer City Plant through an affiliate. As co-general partner, Tondu is jointly responsible with the other major equity owner for the plant's continued operation and maintenance.

Williams Lake Plant
The Williams Lake Plant is a 60 MW wood waste fueled electricity generating plant that consumes approximately 600,000 green tons of bark, sawdust and other wood waste products per year. The wood waste fuel is provided by five surrounding sawmill operations that collectively process over one billion board feet of lumber per year.

Principal Agreement - Electricity from the Williams Lake Plant is sold under a 25-year electricity purchase agreement to The British Columbia Hydro and Power Authority.

Financing - Tondu led the effort to secure financing and closed the Cdn. $135 million non-recourse debt and Cdn. $15 million equity financing on May 2, 1991. The debt was provided by a group of Canadian insurance companies and pension funds with a fixed rate and a 22-year term. When the Williams Lake Plant financing was completed in 1991, it was the largest independent power plant financing ever completed in Canada and second largest non-recourse financing in Canadian history. It was also the first Canadian non-recourse transaction funded by financial institutions prior to the completion of construction.

Performance - The Williams Lake Plant began commercial operation in April 1993 and exceeded all performance expectations during the period that Tondu was involved with the project.

Technology - The Williams Lake Plant is fueled with 100% wood waste and uses standard water wall boilers with a hydro grate fuel feed system. An electrostatic precipitator controls particulate emissions. Electricity is generated by a full condensing high-pressure steam turbine. The plant was operated by 30 full time employees under the management of a limited partnership and a Tondu affiliate was a co-general partner until August 1997.

Development Responsibilities - Tondu identified the project and led the negotiations for the principal contracts including the power purchase agreement, the turnkey construction contract and the project financing. Tondu also directed the engineering and construction of the project as well as the development of the operation and maintenance organization including staffing, training and plant policies and procedures.

Ownership and Management - Tondu controlled 33% and through affiliates owned 25% of the equity in the Williams Lake Plant until August 1997. Tondu sold its interest in the project to BC Gas, one of the investment partners Tondu brought into the project.

2.2 Michigan Public Power Agency

MPPA was enabled by and operates under Act No. 448, Public Acts of Michigan, 1976, as amended (the "Act"). The Act authorized the creation by municipalities engaged in generation, transmission or distribution of electricity of a joint action agency for the purpose of undertaking the planning, financing, development, acquisition, construction, reconstruction, improvement, betterment, operation, or maintenance of a project or projects to supply electric power and energy for present or future needs of its members or as a supplemental method of obtaining the benefits and assuming the responsibilities of ownership in a project. Such projects may be financed by the issuance of bonds and notes.

The Michigan Public Power Association (the "Association") was formed in 1977 by municipalities in Michigan as a non-profit corporation to study the feasibility of developing a joint agency as defined in the Act. The efforts of the Association resulted in MPPA being formed in late 1978. MPPA is a body corporate and politic of the State of Michigan. Any Michigan municipality engaged in the generation, transmission or distribution of electricity may join MPPA, if such municipality's governing body adopts an appropriate resolution and such municipality obtains unanimous approval of the governing bodies of MPPA's members.

The following are MPPA's thirteen members:

City of Bay City
City of Charlevoix
Village of Chelsea
City of Grand Haven
City of Harbor Springs
City of Hart
City of Holland
City of Lansing
City of Lowell
City of Petoskey
City of Portland
City of Traverse City
City of Zeeland

In addition to the above municipalities, the City of Wyandotte is presently in the process of joining MPPA as a member. The Cities of St. Louis and Eaton Rapids, both of which were previously MPPA members but withdrew from the organization, are presently involved in Phase I of the Northern Lights Project. Both St. Louis and Eaton Rapids have indicated they would rejoin MPPA as members if the Northern Lights Project proceeds and these cities will participate in the Project.

Other MPPA Projects

Belle River Project
Eleven of MPPA's members (Bay City, Charlevoix, Chelsea, Hart, Holland, Lansing, Lowell, Petoskey, Portland, Traverse City and Zeeland) are participants in the Belle River Project, consisting of (i) a 37.22% undivided ownership interest in Belle River Unit No. 1 ("Belle River 1"), a coal-fired electric generating unit which is part of a two-unit generating station in St. Clair County, Michigan, ("Belle River") and which has been designed to achieve a net demonstrated capability of 652 MW and an undivided ownership interest in certain common and joint facilities associated with Belle River; (ii) an undivided ownership interest in certain 120 kV and higher transmission lines of the Edison transmission system; and (iii) an undivided ownership interest in certain 345 kV and extra high voltage ("EHV") transmission lines which are currently part of MEPC's transmission system. Belle River 1 began commercial operation on August 1, 1984. Edison also constructed Belle River Unit No. 2 ("Belle River 2") which is essentially identical to Belle River 1. Belle River 2 began commercial operation on July 9, 1985.

Campbell Project
Ten of MPPA's members (Bay City, Charlevoix, Chelsea, Harbor Springs, Hart, Holland, Lowell, Petoskey, Portland and Traverse City) are participants in the Campbell Project consisting of (i) a 4.80% undivided ownership interest in the 770MW (nameplate rating) James H. Campbell Unit No. 3 ("Campbell 3"), a coal-fired generating plant operated by Consumers Energy company ("Consumers") in Ottawa County, Michigan, (ii) an undivided ownership interest in certain designated EHV transmission lines, (iii) an undivided ownership interest in the coal stockpile for Campbell 3 and (iv) rights under a back-up requirements agreement to back-up capacity and energy to be supplied by Consumers from its other generating units and other available resources. Campbell 3 was placed in commercial operation on September 17, 1980.

Campbell 3 is located on a site that consists of approximately 1,028 acres and is situated in Port Sheldon Township in Ottawa County, Michigan between the Cities of Holland and Grand Haven. Two coal-fired generating units owned by Consumers share the site with Campbell 3.

Power Pool Project
Eight of MPPA's members (Charlevoix, Grand Haven, Harbor Springs, Lansing, Lowell, Petoskey, Traverse City, and Zeeland) are participants in MPPA's Power Pool Project. The Power Pool Project, which went into operation on August 1, 1992, allows Power Pool participants to pool their generating resources and electrical loads. The Power Pool uses economic dispatch principles in determining the moment-by-moment output of the generating resources, along with any purchases of energy from third party resources, so as to obtain the lowest overall electric energy cost for the Power Pool that is reasonably attainable at any given point in time. MPPA's Power Pool is also part of a larger pool known as the Municipal Cooperative Coordinated Pool ("MCCP"). The MCCP includes Wolverine Power Supply Cooperative, Inc. and allows for joint capacity planning and opportunity energy exchange to achieve lower energy costs.

Combustion Turbine Project No. 1
Five of MPPA's members (Charlevoix, Harbor Springs, Lowell, Petoskey and Traverse City) are participants in MPPA's Combustion Turbine Project No. 1 ("CT Project No. 1"). CT Project No. 1 is located on a 10 acre parcel of land in Kalkaska Township in Kalkaska County, Michigan, approximately 1.6 miles southwest of the town of Kalkaska. This site is on the edge of a large parcel of land presently owned by Coral Energy, LLC ("Coral") that is zoned industrial and used for the production of commercial propane gas from natural gas. The combustion turbine generating unit in the CT Project No. 1 has a nominal net output rating of 50 MW. The combustion turbine generating unit, called a "Twin Pac" is comprised of two Pratt & Whitney simple cycle FT8-1 aeroderivative natural-gas fired combustion turbines which drive a single electrical generator. The guaranteed net electrical output of the combustion turbine generating unit is 46,480 kW at site elevation, 90°F ambient temperature and 65% relative humidity, and is expected to increase to about 60,000 kW at site

elevation, 20°F ambient temperature and 80% relative humidity. Pratt & Whitney has sold a number of the Twin Pacs, and has passed the 1,000,000 hour milestone of operating experience with the design. The CT Project No. 1 went into commercial operation on December 1, 2002.

MPPA Resumes

Gary L. Zimmerman
Gary Zimmerman is General Manager of the Michigan Public Power Agency and Executive Vice President of the Michigan Municipal Electric Association. He joined MPPA in 1990 after helping to form the 29-member Illinois Municipal Electric Agency and serving as its General Manager for six years. Mr. Zimmerman has over 30 years of electric utility background and holds a bachelors degree in electrical engineering and a masters in business administration. He is a registered professional engineer.

Daniel E. Cooper
Daniel Cooper is the Engineering Manager of the Michigan Public Power Agency. He joined MPPA as Engineering Manager in 1992. Prior to joining MPPA, Mr. Cooper was an Executive Engineer with the consulting firm of R. W. Beck, where Mr. Cooper was employed for 12 years. Mr. Cooper has over 30 years of electric utility experience and holds a bachelors degree in electrical engineering along with a masters in business administration. He is a registered professional engineer in the states of Michigan and Indiana.

David J. Naberhuis
David Naberhuis is Financial Manager of the Michigan Public Power Agency. He joined MPPA as Financial Manager in 1983. Prior to joining MPPA, Mr. Naberhuis was an Assistant Finance Officer for two years with the Comptroller Division of NBD Bank, N.A.

2.3 Michigan South Central Power Agency

MSCPA was also enabled by and operates under the Act. MSCPA was created in 1978 by five municipalities located in south central Michigan as a non-profit joint action agency as defined in the Act. MSCPA is a body corporate and politic of the State of Michigan. Any Michigan municipality engaged in the generation, transmission or distribution of electricity may join MSCPA, if such municipality's governing body adopts an appropriate resolution and such municipality obtains unanimous approval of the governing bodies of MSCPA's members.

The following are MSCPA's five members:

Village of Clinton
City of Coldwater
City of Hillsdale
City of Marshall
Village of Union City

To meet the needs of its members, MSCPA utilizes energy supplied from the energy sources listed below as well as third party purchases from various industry participants. During the past fiscal year (2002-2003), MSCPA members consumed over 644,000 MWh of energy with a non-coincident peak demand of 125 MW. In addition to generation assets, MSCPA holds an undivided ownership interest in the METC EHV transmission line, which provides MSCPA with 90 MW of transmission service across the METC system; and substation facilities and transmission lines in Coldwater, Hillsdale, Marshall and Union City. This combination of generation and transmission assets aid in providing economic stability for each of MSCPA's member communities.

MSCPA Energy Sources

Endicott Generating Station
The Endicott Generating Station is a 55 MW pulverized coal fired unit located near the center of MSCPA's membership in Litchfield, Michigan. This unit began its commercial operation in December of 1982 and consumes an average of 165,000 tons of eastern bituminous coal annually. The facility utilizes a wet limestone scrubber for air emission control. The Endicott Generating Station supplies approximately one half of MSCPA's annual energy requirements and is 100% owned and controlled by the five MSCPA members of Clinton, Coldwater, Hillsdale, Marshall and Union City.

State Street Generating Station

The State Street Generating Station was completed in June of 2001 and consists of nine portable diesel fired units which combine for a total of 16.5 MW. Located inside the city limits of Coldwater, this plant is utilized to supply peaking and emergency power as needed. The State Street Generating Station is 100% owned and controlled by the MSCPA members of Clinton, Coldwater, Hillsdale, and Marshall.

Garfield Generating Station
The Garfield Generating Station consists of nine portable diesel fired units totaling 15.5 MW, also located inside the city limits of Coldwater. This plant, expected to be completed in the fall of 2003, will also supply peaking and emergency power as needed. The Garfield Generating Station is expected to be 100% owned and controlled by the five MSCPA members of Clinton, Coldwater, Hillsdale, Marshall and Union City.

Member Generation
MSCPA members have a total of twenty generators capable of supply over 43 MW of internal generation which is dispatched by MSCPA on an economic basis. A breakdown of these generating units shows eleven generators with dual fuel capability (the ability to operate on either diesel fuel or natural gas) that can provide 37 MW of intermediate and peaking capacity, five oil only units which provide 5.7 MW of peaking capacity, and four small hydro units which provide 0.5 MW of seasonal energy supply.

Long Term Energy Supply Contract
Throughout its history, MSCPA has utilized various long-term power purchase agreements to augment its power supply portfolio. Currently, a 30 MW round the clock agreement with Constellation Power Source provides approximately 35 percent of MSCPA's members annual energy needs. This agreement expires at the end of 2008.

MSCPA Resumes

J. P. Bierl
J. P. Bierl is General Manager of the Michigan South Central Power Agency. He joined MSCPA in 1983 after helping to form MSCPA as a consultant working with the engineering firm of Campbell DeBoe. Mr. Bierl has over 30 years of electric utility background and holds a bachelors degree in electrical engineering.

Glen E. White
Glen White is Assistant General Manager of the Michigan South Central Power Agency. He joined MSCPA as its Fuel Procurement Analyst in 1987. Prior to joining MSCPA, Mr. White worked for an Ohio coal company for 8 years. Mr. White has over 15 years of electric utility experience and holds a bachelors degree in business management and an associates degree in accounting.

Lorna Nenciarini
Lorna Nenciarini is Director of Finance for the Michigan South Central Power Agency. Prior to joining MSCPA in 2001, she was Deputy Finance Director for the City of Portage. Ms. Nenciarini has over 15 years experience in municipal finance. She is a Certified Cash Manager, a Certified Government Financial Manager, and holds a masters degree in business administration.

2.4 Consultants and Supporting Organizations

The following organizations were either consulted or retained to assist Tondu and the Joint Agencies in the investigation of the Project and the preparation of this Report.

Cummins & Barnard, Inc.

Cummins & Barnard ("C&B") is a consulting engineering firm with offices in Ann Arbor, Michigan. C&B was founded in 1932, and provides complete engineering and consulting services for power generation, project development and facilities engineering. C&B completed the conceptual design of the Plant and provided general engineering consulting for the Project. C&B also assisted in preparing the electrical interconnection and Air Permit application, and negotiating a union project labor agreement.

NTH Consultants, Ltd.
NTH Consultants, Ltd. ("NTH") is an infrastructure and environmental engineering firm. NTH provided consulting services on the environmental requirements for the Project, and assisted in the preparation and filing of the Air Permit.

R. W. Beck, Inc.
Since 1942, R. W. Beck has provided services to the public and private sectors in the areas of energy, water resources, solid waste and telecommunications. Their practices include management and technical consulting, financial analyses, marketing, risk management, owner's engineering, planning, design and litigation support relating to energy, water resources, solid waste and telecommunications. R. W. Beck's clients include the financial community, energy companies, project developers, industry and government, as well as public and private utilities. R. W. Beck was retained by the Joint Agencies to provide an independent review of the feasibility of the Project.

Marsh & McLennan
Marsh & McLennan is an integrated insurance brokerage organization providing services to financial and commercial enterprises, multinational corporations, specialized industries and municipal, state, national and international governmental bodies. Their offices are in 80 countries worldwide and are staffed by nearly 22,000 employees. Marsh & McLennan provided insurance consulting for Tondu.

Howard & Howard
Howard & Howard has approximately 100 attorneys with offices throughout Michigan and in Illinois. They specialize in many areas of law, including environmental, general business, municipal/public sector, public and structured finance, real estate and tax. Howard & Howard advised Tondu on various legal matters concerning the Project.

Dickinson Wright
Founded in 1878, Dickinson Wright has grown from a two-man practice into one of the nation's leading law firms. Based in Michigan, the firm has a regional presence with offices in Detroit, Bloomfield Hills, Lansing, Grand Rapids, Ann Arbor and Washington, D.C. Dickinson Wright has a staff of nearly 200 attorneys and over 200 support staff with an array of legal, professional and business backgrounds. Clients represent all segments of the public and private sectors, and range from leaders of the Fortune 500 to small, emerging entrepreneurships and from state governmental agencies to small municipalities. Dickinson Wright provided advice to the Joint Agencies on financing and structural matters for the Project.

Morgan Stanley
Since 1997, Morgan Stanley has combined the complementary skills and resources of two powerful organizations: Morgan Stanley, established in New York in 1935, and Dean Witter, established in 1924 in San Francisco. Their distinguished pedigrees encompass a record of historic firsts: in national and international expansion, in the use of technology, and in the development of new financial tools and techniques that have redefined the meaning of financial services for individual, institutional and investment banking clients. Morgan Stanley provided input on the financing issues facing the Project.

Marketing Resource Group, Inc.

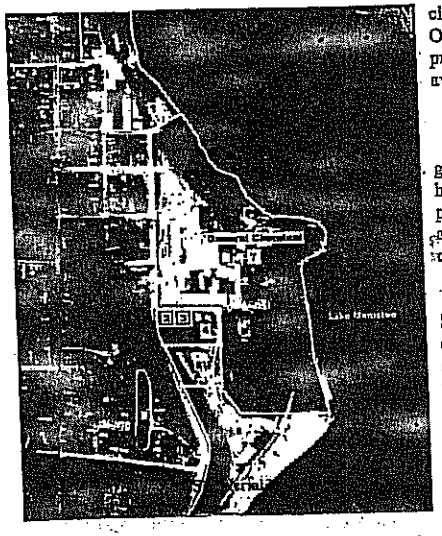
Marketing Resource Group, Inc. ("MRG") is a full-service public relations and political consulting firm based in Lansing, Michigan. MRG advised Tondu on media relations, local and state politics, and public relations strategies.

Muchmore, Harrington, Smalley & Associates, Inc.
Muchmore, Harrington, Smalley & Associates is a Lansing-based lobbying and government relations firm with extensive experience in legislative, regulatory and administrative matters in Michigan. The firm advised Tondu on local, state and federal government strategy.

3.0 PROJECT DESCRIPTION

3.1 Plant Site

The Plant Site is approximately 50 acres (see Figure 1) and is located in the City of Manistee on Manistee Lake (see Figure 2). The Plant Site contains a recently abandoned salt manufacturing plant, an abandoned boat building plant, two small businesses, two houses, and a coal and aggregate storage dock. The Coal Dock is capable of receiving coal from self-unloading lake vessels (see Figure 3). Adjacent to the Coal Dock are about 20 acres of open land suitable for fuel storage sufficient to meet the winter coal inventory requirements for the Plant. The Plant Site is served by the CSX Railroad and an all-weather paved road. The Manistee county airport is located approximately 6 miles from the Plant Site.



The Plant Site is located in a northern climate area with freezing weather common from October through April. Moderate weather prevails during the other months with rainfall averages of 31 inches per year.

The site is well drained with water level approximately 8 feet below surface grade. The surface grade is flat with sandy soil and has a substratum suitable for construction purposes. The Plant Site is zoned for industrial use and already approved for coal storage and an existing coal fueled power plant.

Adequate land is available on the Plant Site to provide for lay down during the Plant's construction period. The Manistee county and surrounding area has sufficient housing and facilities to accommodate the required construction workers.

Plant Site Acquisition
The Plant Site consists of seven parcels of property including the largest parcel, which is currently owned by General Chemical Company (see Figure 1). Tondu has reached agreements for options to purchase the General Chemical site and four other parcels comprising the Plant Site. These options have 20 to 22 month exercise periods. The remaining two parcels are houses not critical to the Plant's development and will be purchased when appropriate.

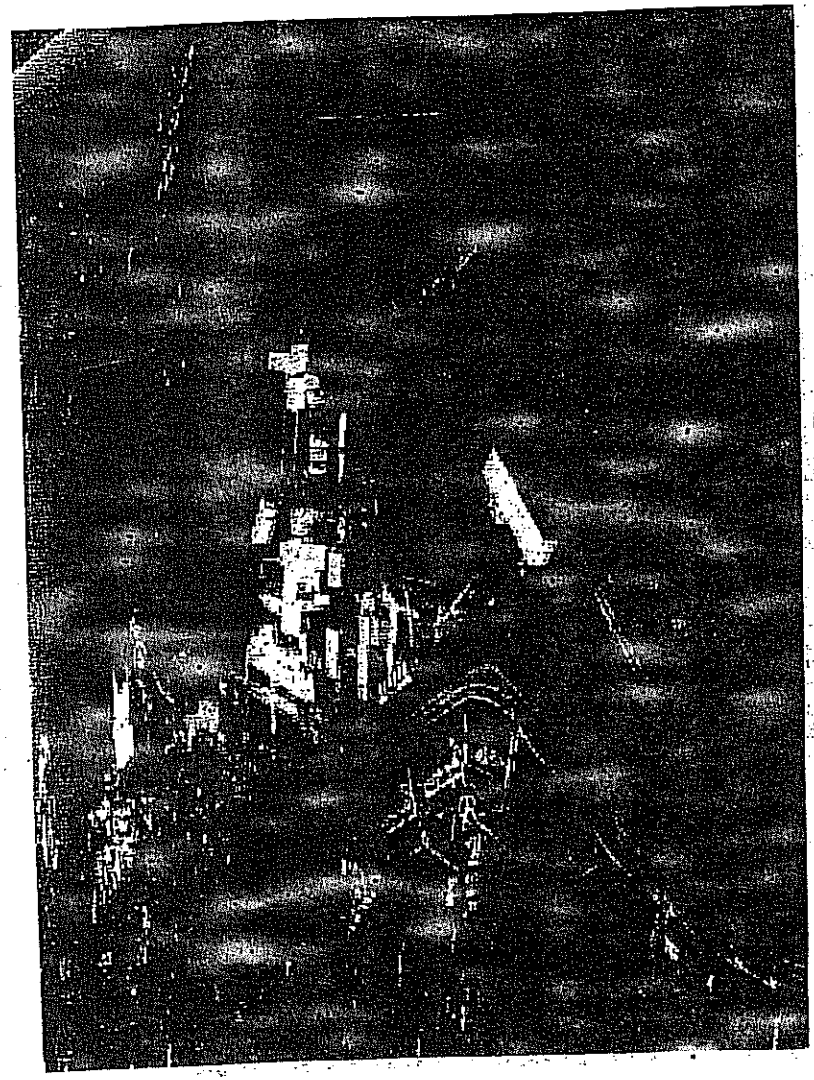


Figure 2 - Aerial Photo of Plant Site

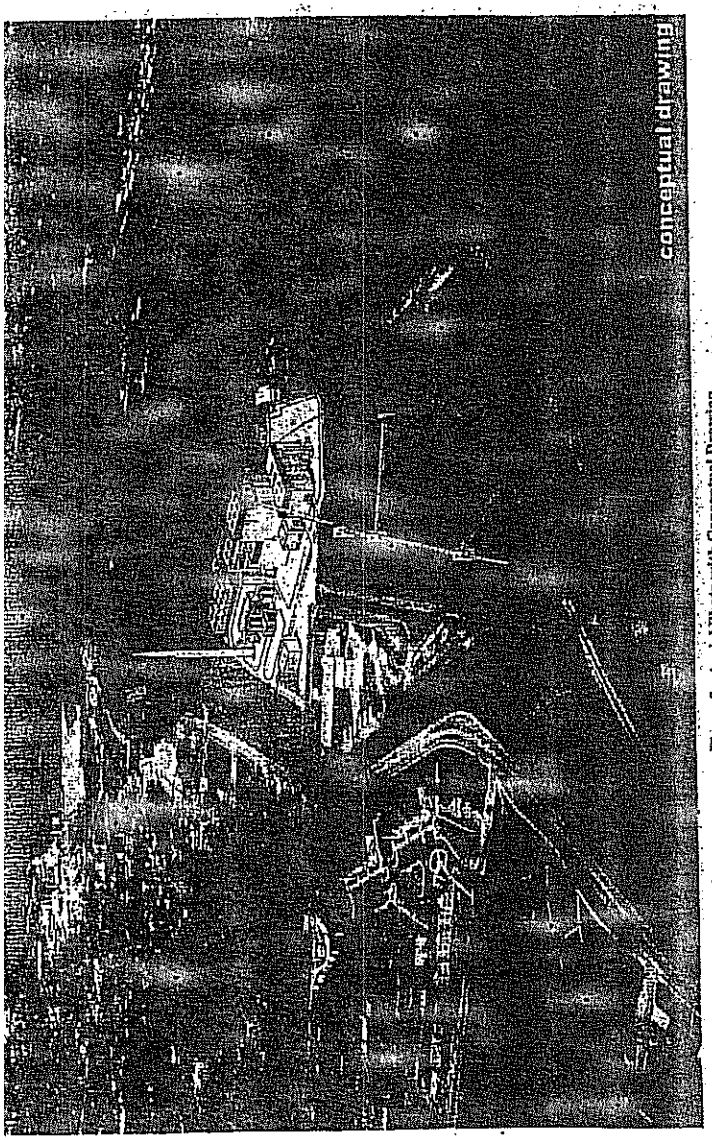


Figure 3 - Aerial Photo with Conceptual Drawing

3.2 Approvals and Permits

There are a number of permits that have to be secured before the Plant can begin construction. Key among these is the Air Permit. The application for the Air Permit was filed on September 10, 2003 and is expected to require nine to twelve months to complete. The Plant Site will require a Special Use Permit issued by the City of Manistee Planning Commission. This permit is expected take about 90 days to secure and should be issued by early December 2003. The remaining required permits will be applied for as required. A list of the required approvals and permits is included in Appendix B.

3.3 Fuel Supply

The Plant is being designed to burn Southern Power River Basin ("SPRB") coal located in a large region centered near Gillette, Wyoming. The Plant will require 230 tons of coal per hour or 1.8 million tons per year.

The United States Department of Energy estimates there are over 43 billion tons of recoverable coal reserves in Wyoming which is in the SPRB. At the current production rate of about 375 million tons per year, there are well over 100 years of recoverable coal reserves remaining in the SPRB. The 1.8 million tons per year required for the Plant is less than one-half of one percent of the current production and will not have a material impact on the mining capacity or total recoverable reserves in the Southern Powder River Basin coal fields.

The acquisition and delivery of coal from the coal mine to the coal bunkers at the Plant Site will involve five separate segments: coal acquisition, rail transportation, transloading, lake freighters, and coal handling.

Coal Acquisition

The following are brief descriptions of the four major coal-mining companies that are active in the Southern Power River Basin.

Peabody Coal Company ("Peabody") (www.peabodyenergy.com) is the largest supplier of SPRB coal. Peabody mines SPRB coal from its North Antelope Rochelle, Caballo, and Rawhide mines in northern Wyoming. The North Antelope Rochelle mine is the largest coal mine in the United States and produced 75.4 million tons in 2002. The Caballo mine produced over 25 million tons during the same year. Peabody recently reopened the smaller Rawhide mine to increase SPRB production, with output in 2002 of 3.5 million tons. Peabody reports proven reserves of SPRB coal of 2.5 billion tons, a 24 year supply at current production rates. Peabody is a publicly traded company listed on the NYSE (ticker symbol BTU) with annual revenues of $2.7 billion in 2002 and a market capitalization of $1.6 billion. Peabody's debt is rated Ba1 by Moody's.

Kennecott Energy Company ("Kennecott") (www.kenergy.com) is the second largest producer of SPRB coal. Kennecott produces coal from four mines in the SPRB: Antelope, Cordero Rojo, Jacobs Ranch, and Spring Creek. In total, these mines produce 116 million tons per year and have proven reserves in excess of 1 billion tons. Kennecott is a wholly owned subsidiary of Rio Tinto, plc (www.riotinto.com), and a major international minerals exploration and production company. Rio Tinto trades ADRs on the NYSE under the symbol RTP. Rio Tinto has a market capitalization of in excess of $29 billion. Rio Tinto's debt is rated Aa3 by Moody's.

Arch Coal Company ("Arch") (www.archcoal.com) is the third largest supplier of SPRB coal. Arch's Black Thunder mine produced 65 million tons in 2002. The Black Thunder mine has proven recoverable reserves of coal in excess of 1.3 billion tons, a 20 year supply at current production rates. Arch is publicly traded on the NYSE (ticker symbol ACI) with annual revenues of $1 billion and a market capitalization of $1.1 billion. Arch's debt is rated Ba2 by Moody's.

RAG Coal International ("RAG") (www.rag-coalinter.de/index_e.htm) is the fourth largest producer of SPRB coal. RAG produces coal from its Eagle Butte and Belle Ayr mines. The Eagle Butte mine produces approximately 25 million tons per year and the Belle Ayr mine produces 18 million tons per year. RAG is a privately held German company.

Rail Transportation

There are two possible routes to move the coal from the Southern Powder River Basin to the Plant Site. The first is via rail to the KCBX Terminal in Chicago where the coal will be transloaded to lake freighters and then delivered to the Plant Site. The second option is to ship the coal via rail to the Superior Midwest Energy Terminal near Duluth, Minnesota (the "Superior Terminal") and then via lake freighters to the Plant Site.

Coal will be shipped in unit trains made up of 123 cars and carrying a total of 14,000 tons per unit train. The trip from the coal mine to either lake location will take about two and half days depending on location of the coal mine, weather, and other logistic issues. Approximately 130 unit trainloads will be required each year to provide the Plant's coal requirements.

Two railroads and a new proposed rail line are expected to compete for this business. The Union Pacific Railroad Company ("Union Pacific") (www.up.com) services all of the mines in the SPRB (stock symbol UNP) and connects with the KCBX Terminal. The Burlington Northern Railroad Company ("Burlington Northern") (www.burlingtonnorthern.com) also serves all of the mines in the SPRB (stock symbol BN) and connects with the Superior Terminal and the KCBX Terminal.

Recently, the DM&E Railroad Company ("DM&E") (www.dme.com) proposed the construction of a new rail line extension into the SPRB to compete for transporting coal to the eastern markets. This rail line extension has received all of its required permits and is currently defending an appeal of these permits in federal court. The decision on this appeal is expected by year-end 2003 and if favorable this new rail line would be operational in 2008. Figure 4 illustrates the rail and Great Lake routes for transporting coal to the Plant.

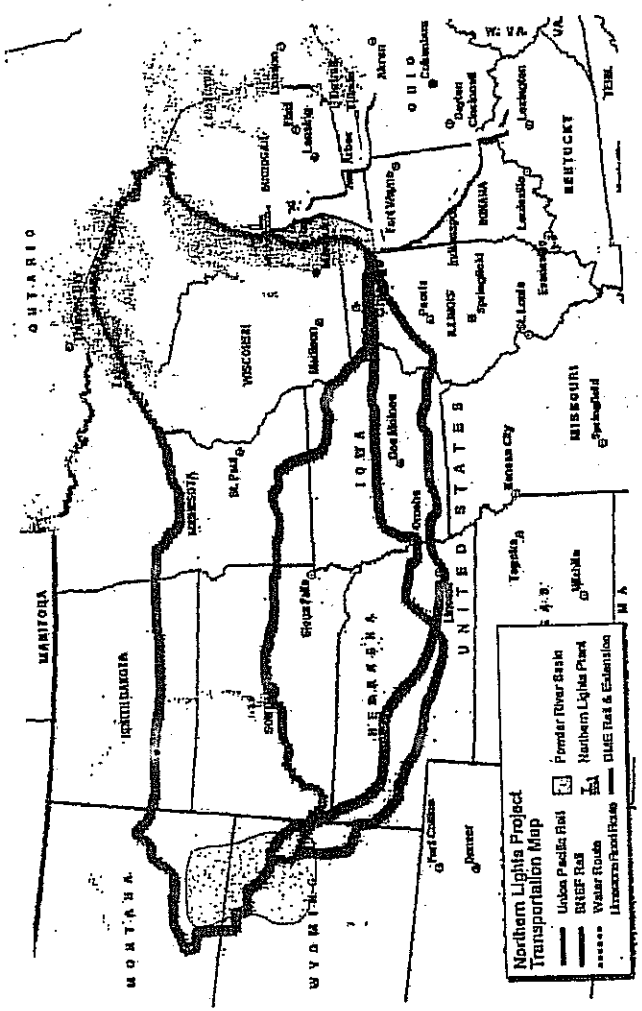


Figure 4 - Coal and Lime Transportation Map

Transloading
When the trains arrive at their destination, the coal will be transferred from the rail cars to lake freighters. This "transloading" function will be performed at the KCBX Terminal or the Superior Terminal.

The KCBX Terminal is a privately owned subsidiary of the Koch Company ("Koch") (www.Koch.com). Koch is one of the largest privately owned companies in the United States with revenues in excess of $25 billion. In the mid 1990s, the KCBX Terminal was transloading approximately 7.4 million tons per year of bulk cargo. Over the last few years, the KCBX Terminal has lost business and the tonnage handled at the KCBX Terminal has been reduced to approximately 3.7 million tons per year, so there is considerable excess capacity.

The Superior Terminal (www.midwestenergy.com) is the largest coal-shipping terminal on the Great Lakes and shipped over 18 million tons in 2002. The Superior Terminal is wholly owned by the Detroit Edison Company ("DTE") (www.dte.com). The Superior Terminal has the capacity to handle 25 million tons per year.

Lake Freighters
At the transloading facilities, coal will be unloaded from trains and loaded onto self-unloading lake freighters to transport the coal on the Great Lakes to the Coal Dock. Each shipment will be between 12,000 and 14,000 tons depending on the water depth and holding capacity of the various ships. Larger lake freighters can carry more coal, but these larger vessels cannot enter Lake Manistee to reach the Plant Site.

Great Lakes freighters travel about 13 to 15 miles per hour and can make the 175-mile trip from Chicago to Manistee in about 12 hours. The trip from the Superior Terminal to Manistee is about 675 miles and will take approximately 3 days to complete. Chicago is the main destination port for limestone, cement, and aggregate produced in northern Michigan. Ships transport these materials to Chicago and return empty to pick up another load. Manistee is between Chicago and the northern Michigan ports. Therefore, moving coal from Chicago to Manistee will be a backhaul opportunity for the shipping companies. The Superior Terminal trip will require a dedicated ship, and presently has no backhaul opportunity.

There are 16 ships that operate on the Great Lakes that can deliver coal to the Plant Site. If dedicated ships are used, the Plant's coal requirements could be met with only one ship at the KCBX Terminal or with four ships at the Superior Terminal. These ships are owned by the following four companies:

Oglebay Norton Marine Services Company ("Oglebay Norton") (www.oglebaynorton.com) owns twelve ships, of which six are capable of supplying coal to the Plant Site. Oglebay Norton is a publicly traded company with a current market capitalization of $14 million. The company is currently under considerable financial stress and its debt is rated Caa1 by Moody's.

Interlake Steamship Company Lakes Company (www.mormac.com) ("Interlake") has one vessel that can service the Plant Site.

American Steamship Company ("American Steamship") (www.americansteamship.com) operates a fleet of lake freighters and three are capable of delivering coal to the Plant Site. These ships are dispatched through a pooling agreement with Oglebay Norton. American Steamship is a subsidiary of GATX Corporation ("GATX"). GATX is a publicly traded company with a market capitalization of $1 billion.

Lower Lakes Transportation ("Lower Lakes") is a private company with six ships operating on the Great Lakes, all of which can deliver coal to the Plant Site.

After a ship arrives at the Coal Dock, it will take approximately 4 to 5 hours to unload. A 300-foot conveyor boom will be used to unload coal at rates of up to 3,000 tons per hour.

Lake freighters operating out of the KCBX Terminal are generally closed for winter weather from January 15 through March 15, averaging 60 closed days per year. The shipping season for the Superior Terminal is closed from December 1 through April 1 or about 120 closed days per year. About 130 ship loads of coal will be required each year. This represents 13 ships per month during a 10 month shipping season.

Coal Handling
After the coal is unloaded on the Coal Dock, Plant employees will use bulldozers and a stacker loader conveyor system will move the coal to a storage area. The coal will then be compacted to minimize dust creation and to prevent spontaneous combustion. The coal will then be fed into a reclaimer hopper where it will be conveyed to the Plant's coal storage silos.

Fuel Supply Summary
There are ample coal reserves to support the needs of the Plant over its life and there are multiple competing options for the delivery of coal from the coal mines to the Plant Site. The availability of coal is not expected to be a limiting factor in the life of the Plant.

3.4 Lime Supply

The Plant will consume approximately two tons of activated or burnt lime per hour with a design $CaCO_3$ content of 93% for a fuel with 0.5% sulfur content at MCR. This represents approximately one ton of lime per 212 MW of net electricity output.

There are three options to supply lime to the Plant. First, the Carmeuse Lime Company has lime production plants in Detroit, Michigan, and Butler and Maysville, Kentucky. Second, the Huron Lime Company is a private company with a 1,000-ton per year lime facility located in Huron, Ohio. Finally, Tondu is currently evaluating the development of a new lime production facility in Manistee. This facility will be a standalone plant or a joint venture with Martin Marietta at their facility on the east side of Manistee Lake.

With a 90% annual Capacity Factor, the Plant will consume approximately 15,800 tons of lime per year. The amount of lime provided from each supplier will depend on the quality of the lime and its delivered cost. A certain amount of lime is expected to be purchased from each supplier regardless of quality and price to provide backup supply in the event of a shut down at a particular lime plant and to keep competitive pressure on the other suppliers.

Lime will be shipped to the Plant Site in enclosed dedicated trucks. Each truck will deliver between 52 and 56 tons per load and the Plant will require about six truckloads per week. The lime will be unloaded pneumatically from the lime trucks in about 2 hours. Depending on the location of the purchasers, the same trucks may then haul the bottom ash from the Plant to purchasers in the Detroit and Toledo areas. There are several trucking companies that are expected to bid for the business of hauling lime.

3.5 Ash Disposal

The Plant is expected to generate 16.5 tons of ash per hour at full load or approximately 130,000 tons per year in a normal year. This ash is divided into bottom ash, scrubber ash, and fly ash. Bottom ash can be sold as a concrete additive, but the scrubber and fly ash will be disposed of at a local landfill.

Bottom Ash
The bottom ash produced by the Plant is expected to be non-hazardous and non-leachable. At full load, the Plant will produce approximately 2.5 tons per hour of bottom ash or approximately 19,710 tons per year. It is assumed the bottom ash will meet commercially acceptable standards and will be sold as a concrete additive. Tondu has received indications of interest from potential buyers with a proposal to purchase the bottom ash at a current price of $6 per ton.

Scrubber Ash
The dry sprayer scrubber is estimated to generate approximately 4 tons per hour of ash. This material will be non-hazardous and disposed of at a local landfill.

Fly Ash
The Plant is calculated to generate approximately 10 tons of fly ash per hour with a bulk density of 37 lbs per cubic foot or about one-half ton per cubic yard. The fly ash will be non-hazardous and deposited at a local landfill.

Shoreline Landfill
The first landfill option is to use the county landfill (the "Shoreline Landfill") located 4.5 miles from the Plant Site. Tondu currently sends ash from the Filer City Plant to this landfill for disposal under the terms of a long-term agreement. This agreement provides for the disposal of fly ash at a tipping fee of $5.30 per yard in 2004 dollars escalating at 1% per year. This agreement is a 10-year commitment with extensions thereafter. The Shoreline Landfill has over 12 million cubic yards of permitted landfill space. Even with the additional 220,000 cubic yards of ash from the Plant, there will be sufficient capacity to last over 30 years. In addition, the Shoreline Landfill owns adjacent property with the ability to double the available landfill space to over 60 years remaining life.

Shoreline Landfill is owned by Allied Waste Industries (http://www.alliedwaste.com/), a NYSE traded (Symbol AW) with a $1.6 billion market capitalization operating 166 landfills throughout the United States.

TES Landfill
The second landfill option is to use a permitted ash landfill site in Stronach Township (the "TES Landfill") that is owned by the TES Filer City Station Limited Partnership. This facility is located 5.8 miles via paved road from the Plant Site and has a design capacity of 2.8 million cubic yards. The primary use of the TES Landfill will be to maintain competitive pricing at the Shoreline Landfill and use if the Shoreline Landfill is unexpectedly closed or unavailable for use by the Plant. While no agreements are planned to be completed for the use of the TES Landfill, such an agreement is believed to be readily available if problems occur with the Shoreline Landfill.

Figure 5 shows the location of both landfill options and the Plant.

Ash Hauling
Ash hauling trucks will carry 50 cubic yards per load. The trucks will be loaded in an enclosed building. The trip to the landfill, unloading, and return to the Plant will take approximately 45 minutes. At a minimum, each truck will be able to make 7 trips per day. Three trucks will be required to haul ash to the landfill. It is expected that an Ash Hauling Agreement will be entered into with a local trucking company to provide this service.

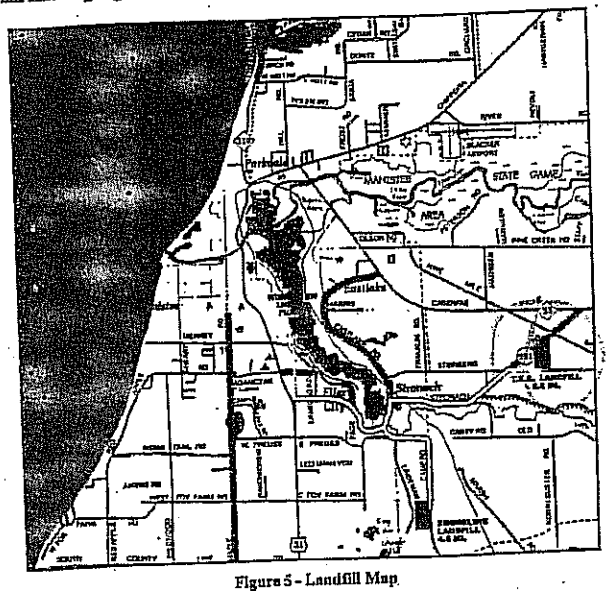


Figure 5 - Landfill Map

3.6 Water Acquisition and Disposal

The Plant will require approximately 6,000,000 gallons per day at full load for cooling water makeup and service water. The Plant will produce about 500 gallons per minute or approximately 720,000 gallons per day of wastewater for disposal. The cooling water makeup will come from Lake Manistee. The wastewater disposal will either be handled by a dedicated on-site wastewater disposal facility or disposed of by the City of Manistee at their adjacent wastewater disposal plant.

4.0 PLANT DESCRIPTION

The Project will utilize standard pulverized coal technology similar to a large number of coal-fired plants throughout the U.S. As such, the engineering and technical feasibility is assured.

The complete Northern Lights Project Definition is presented in the Cummins & Barnard report dated October 28, 2003 (the "C&B Report"). The following is a brief technical description of the Project.

4.1 Design Conditions

Ambient Conditions
The Northern Lights facility will be designed for the following ambient operating conditions consistent with Manistee, Michigan.

Site Elevation	600 ft amsl
Annual Average Temperature	47.1°F
Annual Average Maximum Temperature	55.5°F
Annual Average Minimum Temperature	37.9°F
1% Maximum Dry Bulb Temperature	86°F
1% Mean Coincident Wet Bulb Temperature	72°F
1% Minimum Dry Bulb Temperature	2°F
Average Annual Rainfall	31.1 inches
Seismic Zone	Zone 1
Design Wind Speed	90 mph

Operating Parameters
Estimated performance for the Project is included in the C&B Report. A heat balance for the design condition along with a mass balance around the cycle is provided. Expected net Plant output at valves wide open ("VWO") conditions is 425 MW with a net heat rate of 9,544 Btu/kWH ("HHV"). The facility will also be designed for operation at a 5 percent overpressure ("OP") condition (VWO + 5% OP).

The Project will be designed for application as a base load facility with an expected annual capacity factor of 92 percent including planned and forced outages. The facility will be designed for 10 cold starts, 25 warm starts and 50 hot starts per year. The facility is expected to have excellent efficiency between 75% and 100% of capacity. It will be able to operate as low as 30% capacity and ramp-up output at approximately 3% per minute.

Design fuel
The design fuel is Southern Powder River Basin coal. The design fuel analysis and range of fuels accounted for in the facility design is as follows:

Ultimate Analysis	Unit	Design	Minimum	Maximum
Ash	% wt (wet)	5.52	3.75	8.67
Hydrogen	% wt (wet)	3.63	3.09	4.09
Total Carbon	% wt (wet)	52.43	47.64	53.85
Nitrogen	% wt (wet)	0.75	0.43	0.98
Sulfur	% wt (wet)	0.3	0.12	0.65
Chloride	% wt (wet)	0.02	0.00	0.05
Oxygen	% wt (wet)	11.2	10.58	13.77
Moisture	% wt (wet)	26.15	24.7	30.8
Mercury	ppm	0.09	0.05	0.14
Grindability		51	50	70
#Ash/MMBtu	lb/MMBtu	6.27	4.12	10.14
#SO2/MMBtu	lb/MMBtu	0.68	0.33	1.52
Heating Value	Btu/lb (HHV)	8800	8239	9100
Ash Composition				
Silicon Dioxide	(% Dry)	31.91	18.3	45.1
Aluminum Oxide	(% Dry)	14.84	11.85	20.46
Titanium Dioxide	(% Dry)	1.17	1.01	1.7
Calcium Oxide	(% Dry)	24.67	14.5	32.9
Iron Oxide	(% Dry)	6.71	3	9.2
Magnesium Oxide	(% Dry)	5.11	2.99	7.4
Potassium Oxide	(% Dry)	1.25	0.0	1.25
Sodium Oxide	(% Dry)	1.58	0.56	2.42
Sulfur Trioxide	(% Dry)	9.94	4.26	18.2
Phos Pentoxide	(% Dry)	1.25	0.3	3.02
Strontium Oxide	(% Dry)		0.0	0.71
Barium Oxide	(% Dry)		0.52	0.76
Undetermined	(% Dry)	1.57	–	–

Water
Water supplied to the Plant will be sourced from Lake Manistee with potable water supplied from the city water system. A Plant water balance is included in the C&B Report outlining the expected average water utilization for the facility. The design lake water analysis utilized for Plant design is as follows:

Lake Water Analysis		Design
pH		7.9
Specific Conductance @ 25°C	umhos	338
P-Alknlinity, as $CaCO_3$	ppm	0
M-Alkalinity, as $CaCO_3$	ppm	138
Total Sulfur, as SO_4	ppm	13.6
Chloride, as Cl	ppm	12.2
Total Hardness, as $CaCO_3$	ppm	165
Calcium Hardness, as $CaCO_3$	ppm	111
Magnesium Hardness, as $CaCO_3$	ppm	54
Copper, as Cu	ppm	0.05
Iron, as Fe	ppm	1.1
Sodium, as Na	ppm	8.8
Total Inorganic Phosphate, as PO_4	ppm	0.3
Ortho-Phosphate, as PO_4	ppm	0.2
Silica, as SiO_2	ppm	9.2

Approximately 4,200 gallons per minute ("gpm") of water will be drawn from Lake Manistee via one of two 100 percent lake water pumps and will be forwarded to a clarification system for removal of suspended solids. Two 50 percent capacity clarifiers and filtration package units will be provided with one clarifier surge tank. 3,950 gpm from the surge tank will be forwarded to the cooling tower for makeup and 250 gpm to the 400,000-gallon service/fire water storage tank sized for a two-hour supply of fire water with additional storage for service water. Utilization of the cooling tower basins for fire water storage will be also be examined. From the service water storage tank, water will be forwarded to one of two 100 percent capacity reverse osmosis/electro-deionization systems for makeup to the steam cycle. All pumps provided in these systems will be provided as two 100 percent capacity pumps. A condensate polishing system will also be provided with one 50 percent capacity train.

A 250,000 gallon demineralized water storage tank is provided for storage of water required for start-up of the system. In addition, a 250,000-gallon condensate storage tank will be provided to accept condensate overflow from the condenser.

Wastewater Discharge
Wastewater from the Plant will be minimized to the greatest extent possible through the recycling of water to the cooling tower basin and/or use as water addition to the dry scrubber system utilized for SO_2 removal in the flue gas. Remaining wastewater will be collected in wastewater sumps and will be treated to adjust pH and to remove suspended solids, oils, and heavy metals prior to returning the water to Lake Manistee. Total discharge is expected to average 500 gallons per minute.

Coal pile and site runoff ponds will be sized to hold rainfall in accordance with the maximum 24-hour accumulation based upon a 10-year occurrence and will be utilized to remove suspended solids prior to discharge. Coal pile runoff ponds may also serve as a source of water for coal pile dust suppression. Plant

wastewater likely to contain oils will be forwarded to a Plant oil/water separator for removal of these materials prior to discharge. Chemical drains in chemical storage and feed areas will be collected in local sumps and neutralized prior to discharge.

Typical wastewater discharge quality limits for water discharged to a body of water are as follows. Actual site wastewater discharge limits will be further defined through the permitting process.

pH	6 to 9
Total Suspended Solids, mg/l	30 (monthly average)
Total Suspended Solids, mg/l	100 (daily maximum)
Oil/grease, mg/l	15 (monthly average)
Oil/grease, mg/l	20 (daily maximum)

Air Emissions Limits
Anticipated air emissions limits, which will be the basis for design of the Plant, are as follows:

SO_2 lb/mmbtu	0.20 (30 day rolling average)
NO_x lb/mmbtu	0.15 (24 hour rolling average)
CO lb/mmbtu	0.15 (24 hour rolling average)
Particulate lb/mmbtu	0.04 (including backpass)
Opacity	10%

Noise Emission Limits
It is anticipated that the applied Plant noise limits will be a combination of OSHA applied near field limits for worker protection, which will generally be 85 dBA @ 3 ft, for an 8 hour exposure without the requirement for ear protection.

For far field or site boundary noise limitations, it is expected that local municipal conditions and ordinances will apply. The expected noise limitation, which will be used for the Plant design, is a Plant site boundary maximum noise condition of 65 dBA.

Ash

Ash will be removed from the bottom of the steam generator, air heater outlet hopper, dry scrubber, and baghouse. Typical and maximum ash discharge rates utilized for equipment sizing are as follows:

	Unit	Design	Maximum
Fuel		Design	Worst Case
Bottom/Fly Ash Split		20/80	+10%
Bottom Ash Flow Rate	Ton/hr	2.54	6.61
Scrubber Waste	Ton/hr	4.03	9.63
Fly Ash from Baghouse	Ton/hr	10.17	19.81
Total Fly Ash	Ton/hr	14.19	29.44

Ash density utilized for sizing of fly ash storage is 40 lb/ft^3 while the density utilized for bottom ash storage is 45 lb/ft3. Wet ash density utilized for both bottom and fly ash weight considerations is 100 lb/ft^3.

4.2 Fuel Systems

Coal will arrive in lake freighters with a minimum delivery capacity of 12,000 tons and self-unloading capability at 3000 tons per hour. The fuel yard will provide storage for 670,000 (120 days storage at full load conditions) tons of coal when stacked to 40 ft. in height with 4 to 1 side slopes. Both stacking and reclaim will be a combination of automated and manned equipment. Coal booms on the self-unloading freighters will deliver coal from ship hold to a shoreside hopper. From the receiving hopper, coal will be routed to a transfer house where it can either be routed directly to the in-Plant bunkers or deposited to the storage pile via traveling trippers to build a windrow pile. Buried reclaimers under the windrow piles will allow for an active storage capacity of 22,000 tons or 4 days at full load. Remaining tripping stations will deposit coal for pile building via track type dozers with wide blades. A separate transfer tower at the south end of the coal pile area will be used for an emergency stockout and reclaim system utilizing a telescopic chute feeding an emergency reclaim hopper. This system will allow for a 24-hour supply of coal in the event of an outage of the normal Plant supply reclaim system.

Before being sent to the day bins, coal will be routed through a crusher to size the material to 1¼ inch maximum top size conditions. From the crusher, coal will be conveyed to 4 in-Plant silos. Each silo will have the capacity to hold 1,380 tons of coal, representing in total, 24 hours of fuel requirement. From the in-Plant silos, coal will be fed into the Plant pulverizers on a metered basis via gravimetric feeders and ground to talcum powder consistency before being delivered pneumatically and blown into the boiler through the low NOx burner nozzles.

4.3 Boiler and Auxiliaries

Steam generation will be accomplished by a drum type, single reheat, pulverized coal steam generator fired on Southern Power River Basin coal. The boiler will be sized for a valves wide-open operating condition delivering 3,000,000 lb/hr of high-pressure steam at 2526 psia and 1005°F at the superheater outlet. Hot reheat

conditions from the boiler will be 646 psia and 1003°F. The boiler will also be designed for a maximum continuous rating ("MCR") consistent with a 5 percent overpressure condition with a maximum heat input of approximately 4,340 MMBtu/hr.

The boiler design will incorporate a water wall furnace, furnace and/or pendant superheater at the furnace exit, and backpass superheater, reheater, and economizer heating surface. Main steam temperature will be controlled through the use of spray water attemperation while reheat steam temperature may be controlled through gas proportioning and/or spray water attemperation. The steam generator and auxiliary systems will be designed to support a hybrid mode of sliding pressure operation.

Four coal pulverizers will be sized to maintain boiler MCR conditions with one pulverizer out of service. The fuel will be transported via the primary air to the low NOx burners.

The boiler will be provided with two 50 percent forced draft or secondary air fans for main combustion air and two 50 percent primary air fans for air supply to the pulverizers. The low NOx burner nozzles will be augmented by a SCR system. From the SCR system, the flue gas will flow through regenerative trisector air heaters. Flue gas from the air heater outlet will be forwarded to the air quality control system equipment for further emissions control.

Start-up fuel for the steam generator will be natural gas. Adequate deliverable gas is present in the Manistee area, but will require a new pipeline connection to the Plant.

4.4 Ash Handling and Disposal

Ash will be removed from the Plant from the bottom of the boiler, the air heater hopper, the dry scrubber, and the baghouse. Based upon the design fuel, ash will be split 20 percent bottom ash and 80 percent fly ash. Bottom ash will be produced at an average rate of 2.5 tons per hour with fly ash produced at a rate of 10.2 tons per hour. Ash produced from the dry scrubbing process, also considered as fly ash, will be produced at a rate of 4 tons per hour bringing the total fly ash amount to 14.2 tons per hour.

On site storage for both bottom ash and fly ash will amount to 3 days storage with separate storage provided for each. Bottom ash from the boiler will be transported via a submerged drag chain and transported to either a storage silo or a temporary form of containment that can either be loaded onto a truck via loader or other means. Fly ash will be transferred pneumatically via pipeline utilizing one of two 100 percent blowers to two fly ash storage silos. Two silos will be provided to allow for parallel truck loading of up to six, 50-yard trucks per hour. Total bottom ash and fly ash storage is expected to be in the range of 475 tons and 2120 tons respectively with total storage volumes of 20,000 ft^3 for bottom ash and 105,000 ft^3 for fly ash.

4.5 Environmental Systems

In order to achieve the expected air emissions values, the boiler air quality control system equipment will consist of a selective catalytic reduction ("SCR") system provided between the economizer and regenerative air heater after the boiler backpass, two 50 percent dry flue gas desulphurization scrubbers, and two 50 percent baghouses. The SCR system will utilize 19 percent aqueous ammonia as the reagent and will control NOx emissions to 0.15 lb/MMBtu.

For SO_2 removal, a semi-dry flue gas dryer ("DFGD") system will be provided to control SO_2 emissions to 0.2 lb/MMBtu. The DFGD system will consist of two 50 percent spray dryer absorber ("SDA") vessels which will be located upstream of a baghouse. Each SDA will inject slaked lime and atomized water into the flue gas stream via rotary atomizers. The water will lower the temperature of the flue gas stream to optimize the lime reaction with SO_2. At a minimum, one standby rotary atomizer will be provided with a removal/replacement monorail and hoist system.

Prepared lime will be delivered to the Plant Site for injection into the dry scrubbers for SO_2 emissions control. Lime will be delivered to the Plant Site via 55-ton truck or rail car and will be pneumatically conveyed to a lime storage silo sized for 3 days of storage. Average lime consumption will be at a rate of 2 tons/hr. with a maximum expected feed rate of 4.6 tons/hr. Two 100 percent pebble lime feeder units will convey the lime to two 100 percent slaking units. One lime slurry storage tank with 8 hours of capacity will feed two 100 percent capacity slurry feed pumps, which will feed the DFGD system.

For particulate control, two 50 percent capacity baghouses will be provided to control particulate emissions to 0.04 lb/mmbtu.

Provisions for future mercury control equipment will be provided in the design of the Plant. Duct length is available between the exhaust of the boiler and the dry scrubber inlet for modification as necessary and design allowances for the future reinjection of ash or the addition of other materials will be included.

Fugitive dust from the Plant will be controlled through the use of paved roads, coal pile dust suppression measures, dust collection equipment using baghouses in the coal transfer towers, coal crusher tower and, the ash storage and transfer buildings, including the truck blowdown areas.

4.6 Steam Turbine, Condenser and Auxiliaries

The steam turbine generator will be a tandem compound, 4-flow, 465 MW (nominal net output) reheat steam turbine generator designed for operation at 5 percent overpressure. The generator will be hydrogen cooled and will be sized at 550 MVA with a power factor of 0.85 and 60 Hz frequencies.

The steam turbine will exhaust to a divided water box, single flow steam surface condenser utilizing stainless steel tubes. Water from the condenser will be forwarded to the four low-pressure feedwater heaters via two 100 percent condensate pumps. The steam turbine will be designed with seven feedwater heater extractions consisting of four low pressure and two high-pressure heaters with a deaerator following the low-pressure heaters and providing suction to the boiler feed pumps. The top feedwater heater extraction will be from the cold reheat steam system. Two 50 percent steam boiler feed pumps will be provided with a 30 percent start-up/standby pump. The boiler feed pump skid will include booster pumps gear driven from the boiler feed pump turbine drive.

Condenser cooling will be provided by a 16 cell forced draft-cooling tower. The system will circulate approximately 223,000 gpm of water requiring 3,950 gpm of make-up water and creating 650 gpm of blowdown based on six cycles of concentration.

4.7 Electric Generation and Transmission

Electrical power generated from the steam turbine generator will be generated at a voltage level of 22 kV. The generated power will be stepped up to a transmission voltage of 345 kV in an on-site step-up three-phase transformer. The transformer, circuit disconnect switch and stand off structure will be located immediately east of the turbine room. The high voltage transmission system begins at a lake-crossing tower located on the west shore of Lake Manistee. The 345 kV circuit crosses Lake Manistee with a single span and proceeds directly east to interconnect with the Ludington – Keystone section of the METC/MISO 345 kV, high voltage transmission system. Interconnection to the METC/MISO system will be via a 3-breaker ring bus arrangement. The interconnection point is approximately 1.75 miles east of the east shore of Lake Manistee.

4.8 Plant Control System

The Plant control system will provide all necessary monitoring and control functions to allow the Plant to be operated safely and efficiently. Control of various systems will be implemented to best service plant operations, for interfacing manufacturer's equipment scope of supply and for overall effective integration of all plant systems. Individual control areas will be connected for monitoring and selected control within the central control room.

The primary plant control system will be a microprocessor based Distributed Control System ("DCS"). The DCS will provide both continuous and sequential control capability in one reliable integrated system. The pulverized coal steam generator and major balance of plant ("BOP") systems will be controlled directly through the DCS. Other BOP systems will be controlled from the DCS operator stations via communication connections with local dedicated PLC based control systems. Smaller local control systems will also be integrated with the DCS for selected control and alarm monitoring via hard-wired interface. DCS operator interface will be completed from CRT based stations located in a central control room area. Operators will also have access to historical trends, real-time trends, and alarm summaries from these stations.

The pulverized coal steam generator will be provided with dedicated redundant system processors in the quantity required to support the associated system I/O and programs. A minimum of two separate redundant system processors will also be provided for BOP controls allowing for distribution of redundant system component I/O. System processors will be distributed with the associated system I/O cabinet group. Each system processor pair will communicate redundantly with the DCS plant network. All DCS network connections routed through external building structures will utilize fiber optic connections to minimize the affects of electrical noise. Each DCS cabinet group will be supplied with redundant power from separate uninterruptible power supply panels.

Interface with DCS for plant control and monitoring will be via operator stations located in the central control room. Three dual screen operator stations will be provided. An operator station will be dedicated to the pulverized coal steam generator and two stations dedicated to BOP control. Although screens will be dedicated to a given function, all process graphics will be available from each operator station. A dual screen engineering station will be provided for system maintenance and configuration changes. A historical data logging station including CD writer will provide long-term data storage, retrieval, and analysis capability. Each DCS operator station, engineering station, and historical data station will communicate redundantly with the DCS communication network.

4.9 Backup and Emergency Systems

Backup and emergency power supply systems will consist of a 125V DC uninterruptible power supply system sized to support the Plant for three hours during an emergency period. It is expected that the battery size required to support this activity will be 2,800 Amp-hours. During normal and emergency operating conditions, the associated station power system will provide a reliable source of 125V DC power for critical station control and power functions. The switchyards will have their own DC battery and DC distribution systems and will not be dependent in any way on the Plant DC system. Two 100 percent battery chargers will be fed from the low voltage power system.

The Plant will also require a 120V AC station UPS system to support the DCS, remote process instruments not powered by the DCS, the continuous emissions monitoring system, programmable logic controllers, and the plant communications systems. This system will draw power from two DC sources from the 125V DC power system and will utilize two 100 percent capacity single-phase station inverters. In addition, one emergency generator sized to support safe shutdown of the Plant along with critical lighting and emergency electrical demands will be provided. This generator is expected to be sized for the supply of 500 kW of electrical power.

Arrangements will be made to purchase electricity from a third-party supplier to provide station power during Plant outages.

Estimated Project cost

5.0 PLANT EPC COST ESTIMATE

The Plant EPC cost has been estimated by Cummins & Barnard at $526 million, or about $1,239 per kW of net output capacity. This is a conceptual estimate due to the limited amount of design work completed to date. The estimate is based on the following major criteria:

- Heat balance for the design coal
- Site layout
- Electrical one-line diagrams
- I/O count
- Vendor preliminary quotes for most of the major equipment and packaged systems, including multiple quotes for some equipment.
- The Cummins & Barnard power plant database for single unit 425 MW (nominal net output) pulverized coal power plants.
- Project labor agreement

Not withstanding the limited design work, Cummins & Barnard puts the estimate accuracy in the range of plus 15% to minus 10% due to the vendor quotes and their excellent data base of current similar projects.

5.1 General Assumptions

The following items define the general assumptions used to develop the estimate:

- All costs are based on working a straight time 40 hour work week with no allowance for scheduled overtime as opposed to casual overtime which is included.
- Bulk material costs for items like concrete, reinforcing steel, structural steel, wire and cable, piping, etc. are based on current published information taken from sources like RS Means and current pricing from other projects where applicable.

- An overall labor productivity allowance has been applied to the installation man-hours to allow for site conditions and project size logistics.
- Allowances are included for contractor overheads, indirect costs, statutory taxes and insurance, temporary site facilities, consumable materials, a site laydown area, and miscellaneous site services required during construction.

5.2 Specific Assumptions

The following items define some of the major assumptions associated with specific items, systems, or areas within the estimate.

- It is assumed existing structures will be demolished as part of another project scope and that the site will be remediated as necessary prior to start of construction of the Plant. Also, the dock and associated dredging and caissons will be part of another project and are not included in this estimate.
- For purposes of this estimate, it is assumed 24" concrete filled pipe piles drilled 60 feet deep and capped with concrete will support the power block foundations. The foundation floor thickness is assumed to be 4 feet thick on average. The assumed spacing is approximately one pile for every 100 SF of foundation mat.
- The coal pile will have an impervious liner installed so that any rain runoff will not contaminate the ground water. The runoff will be collected and treated.
- Major and auxiliary piping systems have been identified and quantities developed based on historical information from similar sized power plants. Major systems pipe sizing is based on calculations for the given conditions of service.
- Piping includes fittings, valves, hangers and supports and insulation where required. The estimate assumes that large bore piping is shop fabricated and delivered as spool pieces for field erection. Small bore piping will generally be field routed by the contractor.
- Buried piping will be corrosion resistant with protection added as necessary.
- The estimate includes allowances for the necessary pipe weld testing, stress relieving, hydrostatic testing, and steam blow.
- The coal handling system is based on Cummins & Barnard historical information from similar sized power plants. It is sized based on self unloading ships delivering coal at the rate of 3,000 tons per hour. The coal pile storage allows for shipping service being interrupted during winter.
- A lime storage and handling system is included in the dry scrubber system.
- Bottom ash and fly ash systems are based on temporary silo storage for off-site disposal.

- The boiler estimate is based on the average of the vendor quotes received and includes the cost of erection.
- The turbine generator cost is based on a vendor quote and includes the boiler feedpump turbine drives.
- The circulating water system is based on a closed loop system with intake and discharge piping fabricated from reinforced concrete pipe 96" in diameter. Makeup for the circulating water and other service water will come from an intake pumphouse on Manistee Lake. Circulating water will be treated with minor amounts of chlorine to reduce biological growth in the system piping and condenser tubes.
- The estimate includes clarification and reverse osmosis water treatment with a condensate polishing system to provide demineralized water to the boiler.
- Allowances are included for all necessary electrical equipment, cabling, grounding, terminations, raceway, devices, switches, breakers, MCC's, bus duct, below ground duct banks, and transformers.
- Allowances for interior and exterior lighting are included.
- A contractors' combined contingency, profit, and risk fee reflects a moderate risk project with reasonable contract terms and liquidated damages.
- Escalation is included based on a 42 month engineering and construction schedule.
- Allowances are included for design engineering, contractor management, administration and profit. Estimated sales tax shown under Total Project Cost.
- Pricing has been obtained from vendors for the following major equipment and systems:

  Steam Generator: Babcock Power, Babcock & Wilcox, Foster Wheeler
  Turbine Generator: Mitsubishi, Ansaldo, Siemens Westinghouse
  Air Quality Control System: Babcock Power, Hamon
  Cooling Tower: Cooling Tower Depot, GEA, Hamon, Marley
  Condenser: Holtec, TEI
  Feedwater Heaters: Yuba, TEI
  Deaerator: Idreco, Kansas City Deaerator
  Boiler Feed Pump: Weir, Corrosion
  Condensate Pumps: Ruhr, Corrosion, Weir
  Circulating Water Pumps: Ruhr, Corrosion, Weir
  ID Fans: Chicago Blower, Flaktwoods
  Stack: Hamon Custodis
  Water Treatment: US Filter, ONDEO
  Fly Ash Handling: National Conveyor Co.
  Bottom Ash Handling: Ash Tech
  Mixed Bed Condensate Polishing System: US Filter

Chart 1 is a roll-up of the major components contained in the Cummins & Barnard estimate.

DIVISION OF WORK	TOTAL COST												Project Totals	%
	Procurement Major Equipment	%	Contractor Material $	%	Contractor Labor $	%	Contractor Machinery	%	Subcontractor or Other PAY $	%				
Demolition & Sitework	$0	0.0%	$158,280	0.1%	$951,418	0.5%	$1,850	0.0%	740,526	0.4%			$2,852,114	0.5%
Deep Foundations & Concrete	$0	0.0%	$3,979,833	13.6%	$7,923,464	4.2%	$11,252	7.1%	8,257,159	4.7%			$19,956,453	3.5%
Architectural & Metals	$0	0.0%	$10,324,662	35.3%	$8,383,231	4.8%	$11,043	6.7%	1,434,345	1.3%			$20,453,341	3.6%
Piping, Valves, Support, Accessories	$0	0.0%	$1,819,297	16.4%	$18,314,385	8.9%	$18,428	11.5%	1,314,818	1.0%			$24,458,189	4.3%
Mechanical Insulation & Lagging	$0	0.0%	$1,819,245	6.4%	$3,358,819	1.9%	$3,126	2.5%	6	0.0%			$23,358,174	4.0%
Materials Handling Equipment	$23,219,558	8.0%	$0		$411,346	0.2%	$1,008	0.6%	6,358,818	5.8%			$29,961,345	5.3%
Boiler Island Equipment	$63,810,788	21.9%	$0		$55,856,128	32.1%	$1,251,428	10.8%	15,583,816	12.9%			$127,201,858	22.5%
Chimney	$0	0.0%	$0		$0	0.0%	$0	0.0%	8,441,818	6.4%			$8,413,868	1.5%
DCP Mechanical Equipment	$28,344,998	10.7%	$0		$18,118,749	10.4%	$28,138	16.4%	278,869	0.2%			$68,863,747	12.4%
Electrical Equipment	$18,788,389	6.5%	$0		$467,257	0.4%	$3,284	0.0%	4	0.0%			$11,371,548	2.0%
Electrical Commodities	$0	0.0%	$3,371,978	7.1%	$3,462,257	2.2%	$41,574	0.0%	0	0.0%			$8,837,313	1.7%
Controls & Instrumentation	$1,394,389	0.0%	$130,731	0.3%	$455,459	0.3%	$2,313	0.4%	0	0.0%			$10,877,313	1.8%
Subtotal Direct Cost	$133,411,328	51.3%	$20,595,481	81.1%	$118,515,238	67.4%	$2,473,888	85.2%	$41,153,811	33.2%			$23,295,842	4.1%
Sales Tax (Not Included)	$0		$0		$0		$0		$0				$0	0.0%
Total Direct Cost	$133,411,328		$20,595,481		$118,515,238		$2,473,888		$41,153,811				$23,295,842	4.1%
Construction Indirects & Services														
- Construction Field Staff					$0	0%	0		$3,876,716	6.3%			$3,876,716	0.6%
- Construction Field Staff Expenses					$0	0%	0		$368,538	0.5%			$368,538	0.1%
- Construction Equipment					$0	0%	0		$5,163,688	6.9%			$5,163,688	1.1%
- Small Tools					$0	0%	0		$3,478,917	1.9%			$3,478,917	0.5%
- Consumable Materials & Safety Supplies					$0	0%	0		$1,318,888	2.5%			$1,318,888	0.2%
- Field Office Expense					$0	0%	0		$394,458	0.5%			$394,458	0.1%
- Temporary Facilities					$0	0%	0		$156,158	0.2%			$156,158	0.0%
- Temporary Utilities					$0	0%	0		$0	0.0%			$0	0.0%
- Support Craft & Fire Services					$379,335	0.2%	12,336	0.4%	15,588	0.0%			$394,923	0.1%
- Site Safety					$16,818,775	9.5%	489,787	15.2%	$113,358	0.1%			$17,071,345	3.2%
- Construction Permits					$477,458	0.4%	20,845	0.7%	$218,900	0.2%			$715,418	0.2%
- Construction Testing					$0	0%	0		$34,500	0.0%			$34,500	0.0%	
- Performance testing					$0	0%	0		$60,000	0.0%			$60,000	0.0%
- Pre-op Testing, Start-up					$0	0%	0		$216,658	0.2%			$216,658	0.0%
Subtotal Construction Indirects and Services	$133,411,328		$20,595,481		$134,349,783		$3,142,318		$55,363,187				$346,218,781	
Total Construction Cost									$5,744,118	4.5%			$5,744,118	1.0%
Project Indirects									$21,500,000	16.8%			$21,500,000	4.0%
- Project Management (PM, CM & Procurement)									$2,500,000	1.9%			$2,500,000	0.5%
- Power Plant Design Engineering									$18,744,118				$18,744,118	
- Start-Up and Commissioning, Testing	$0		$0		$0		$0							
Sub-Total Project Indirects									$2,359,841	1.8%			$2,359,841	0.4%
EPC Contractor Insurance & Misc Costs									$2,753,863	2.2%			$2,753,863	0.5%
- Commercial, Commissioning & First Year Spares									$2,558,137	2.0%			$2,558,137	0.5%
- LD Insurance									$1,200,000	0.9%			$1,200,000	0.2%
- Comprehensive General Liability (CGL) Insurance									$9,758,137				$9,758,137	
- Warranty Reserve	$0		$0		$0		$0		$38,582,547	30.1%			$38,582,547	7.5%
Sub-Total EPC Contractor Insurance & Misc Costs	$0		$0		$0		$0		$7,378,421	5.7%			$34,991,311	6.7%
Total EPC Contractor Project Indirect Cost	$9,218,731	6.7%	$1,781,531	8.7%	$14,789,216	8.6%			$128,184,338				$444,229,642	85.3%
- Escalation (Equip, Matls. & Labor)	$142,758,333		$21,377,374		$149,144,813		3,142,318		$7,378,421	5.7%			$31,228,947	6.1%
Sub-Total	$3,812,588	6.1%	$1,911,631	8.3%	$18,411,331	6.1%			$9,190,947	7.0%			$15,516,571	7.5%
- EPC Contractor Contingency	$11,438,853		$3,332,771		$11,933,691				$137,568,784				$491,185,161	
- EPC Contractor Profit Margin	$164,163,429		$47,615,611		$171,517,913		3,142,318						$19,733,069	
TOTAL EPC Contract Price (without Bond)														
EPC Contractor Risk Fee														
TOTAL EPC Contract Price (with Risk Fee)														
EPC Price per kW														

Chart 1 – EPC Estimate

6.0 TOTAL PROJECT COST

The components of the Total Project Cost are divided into three categories. Items whose costs are expected to be fixed through contract or have already been incurred are categorized as "Fixed at Closing." Items whose cost can be limited to a budgeted amount are categorized as a "Budget Allocation." Items that cannot be limited contractually, or are not a budget allocation are categorized as an "Estimate."

The following is a description of the items included in the Total Project Cost.

6.1 Hard Costs

Plant Construction Cost *(Fixed at Closing)* **$526,436,000**

The total EPC cost of the Plant has not yet been finalized. Cummins & Barnard have recently completed their preliminary estimate, in 2008 dollars, at $1,239/KW of net output capacity amounting to $526,436,000. This estimate is believed to be within plus 15% and minus 10% of the final incurred cost. (Source: Cummins & Barnard)

Michigan Sales and Use Taxes *(Estimate)* **$1,000,000**

Michigan Sales and Use Taxes are expected to be levied against certain equipment purchases. Much of the Plant equipment will be exempt from these taxes with the direct participation of the Joint Agencies in the purchase of the major Plant equipment. However, some purchases will be subject to these taxes and a $1,000,000 allocation has been reserved for Michigan Sales and Use Taxes. This is an approximation of the expected cost, with the final actual requirement subject to negotiation with state tax officials. (Source: Cummins & Barnard)

Administration Building *(Fixed at Closing)* **$1,500,000**

The administration building will be a separate facility built under a specific contract outside the scope of the EPC Agreement. This building will house the owner administration offices and possibly Tondu corporate offices. (Source: Tondu)

Natural Gas Interconnection *(Fixed at Closing)* **$500,000**

A gas pipeline will be installed to interconnect the Plant with the natural gas pipeline to supply start-up gas to the Plant. This pipeline, including right-of-way, is estimated to cost $500,000. (Source: Tondu)

Electrical Interconnection *(Estimate)* **$8,000,000**

A substation interconnection to the METC/MISO 345 kV system will be required. The interconnection point to the 345 kV line is approximately 1.75 miles away from the Plant. The transmission line estimate includes a $1 million contingency for tunneling under Manistee Lake if this becomes a requirement. The cost of the electrical interconnection is projected as follows.

Substation	$ 5,000,000
Transmission Line	$ 3,000,000
Total	$ 8,000,000

It is not yet known if the electrical interconnection cost can be fixed at closing through contract with a third-party contractor or if METC/MISO will require an open budget account. This is being categorized as an estimate until the method of contracting is determined. (Source: Commonwealth Associates Inc.)

Transmission System Upgrades *(Estimate)* **$2,500,000**

MISO may require the Plant to invest in transmission system upgrades. The amount required for transmission system upgrades is not known at this time, and the cost is difficult to project. This amount is arbitrary and will be adjusted after the final interconnection agreement has been reached with MISO.

Similar to the electrical interconnection costs, it is not yet known how the costs for any transmission system upgrades will be incurred and what portion will be recoverable. Until these issues are addressed, the costs are listed as an estimate. (Source: Tondu)

Site Acquisition *(Fixed at Closing)* **$4,600,000**

The Plant Site includes seven different parcels of land, the largest of which is the site currently owned by General Chemical. The Plant Site acquisition cost will be fixed by agreements for the various parcels for a total cost of $4.6 million. Two of the parcels include substantial buildings that are expected to be incorporated into the Plant facilities. (Source: Tondu)

Railroad Relocation *(Fixed at Closing)* **$500,000**

Approximately 2,000 feet of railroad track will need to be built. New railroad construction costs are estimated to be $100 per foot for a total railroad construction cost of $200,000. Grading and site preparation are estimated to cost $60,000. A large contingency allocation has been added to provide ample room for unexpected costs. (Source: Tondu and CSX Rail)

Site Work *(Fixed at Closing)* $9,500,000

All of the Plant Site preparation costs are expected to be fixed at closing. The following lists the items included in this category. (Source: Tondu and local contractors)

General Chemical Building Demolition and Cleanup	$ 700,000
Bromine Building Demolition	$ 60,000
Submarine Building Demolition	$ 15,000
Quonset Hut Demolition	$ 10,000
House Removal	$ 10,000
Salt Tanks Removal	$ 55,000
Salt Tank Storage Replacement	$ 100,000
Shoreline and Sea Wall Repair	$ 6,500,000
Salt Equipment Removal	$ 50,000
Site Preparation and Contingencies	$ 2,000,000
Total	$ 9,500,000

Rolling Stock *(Budget Allocation)* $1,600,000

The following is the estimated cost of the rolling stock to be purchased. (Source: Tondu and Cummins & Barnard)

(1) One ton flat-bed truck	$ 40,000
(1) 4 X 4 three quarter ton pickup	$ 30,000
(1) Man lift (for use inside the Plant)	$ 30,000
Coal handling equipment	$ 1,300,000
Unallocated	$ 200,000
Total	$ 1,600,000

Spare Parts *(Budget Allocation)* $3,700,000

The following is the budget for the spare parts required for the Plant. (Source: Cummins & Barnard)

Operating equipment spare parts	$ 1,500,000
Capital equipment spares	$ 2,200,000
Total	$ 3,700,000

Equipment and Supplies *(Budget Allocation)* $700,000

Certain equipment and supplies will be required including machine shop equipment, office furniture and equipment, water laboratory equipment, hand tools, etc. This budgeted item is an arbitrary allocation typical in the industry. (Source: Tondu)

Subtotal: Plant Hard Costs ($1,319/KW) $560,536,000

6.2 Soft Costs

Insurance and Bonding *(Fixed at Closing)* $7,960,000

The Project will require title insurance, liability and risk insurance, and bonding and/or efficacy insurance. The following summarizes the projected costs of these insurance policies. (Source: Manistee Abstract and Tondu)

Title insurance	$ 600,000
Liability during construction	$ 360,000
Builder's all risk insurance	$ 3,500,000
Bonding and/or efficacy insurance	$ 3,500,000
Total	$ 7,960,000

G & A Development Costs *(Fixed at Closing)* $3,000,000

The internal labor and general and administrative cost to develop the Project is projected to not exceed $3,000,000. This assumes an annual cost of $1,500,000 for two years. These development costs will be incurred by Tondu and the Joint Agencies. The amounts contributed by each party will be reimbursed at Closing subject to their long term participation in the Project. Both the annual cost and the expected time are believed to be adequate. (Source: Tondu)

General Legal Costs *(Fixed at Closing)* $500,000

Legal costs are estimated not to exceed $500,000 for contract preparation exclusive of financing legal costs. (Source: Tondu)

Environmental Permitting Costs *(Fixed at Closing)* $1,000,000

Securing the environmental permits for the Plant is estimated to require approximately $250,000 in third-party consulting costs. An additional budget of $750,000 has been reserved for a potential protracted involvement in the regulatory process. (Source: Tondu)

Preliminary Engineering and Consulting Services *(Fixed at Closing)* $1,500,000

Approximately $1,500,000 of preliminary engineering work and consulting services are projected to be completed prior to financial closing. (Source: Tondu)

Start-up Costs *(Estimate)* $2,400,000

Start-up costs include commissioning and mobilization expenses incurred prior to commercial operations. This estimate assumes the operating staff will be retained in steps beginning twelve months before the commercial operation date at a cost of six months projected labor. The first full year's labor cost including benefits is projected to be about $3,800,000 in 2008 dollars. Therefore, the start-up budget for labor is $1,900,000. An additional $500,000 has been allocated for training expenses and support costs for total start-up costs of $2,400,000.

Start-up costs also include fuel and other variable expenses incurred in operating the Plant during the start-up period. However, it is assumed these costs will be offset by revenue from the sales of test energy. (Source: Tondu)

Plant Owner's Construction Management *(Estimate)* $3,120,000

A Project Director will be retained to oversee the Plant's construction. An engineering firm will also be retained to represent the Plant owner on the Plant Site and review the various engineering aspects of the Plant during the construction period. The following summarizes the cost of this monitoring effort plus an allocation for ongoing legal, accounting, public relations, and corporate management expenses. (Source: Tondu) .

(Assumes three-year on-site period)	Annual	Total Project
Project Director	$ 240,000	$ 720,000
Accounting	$ 50,000	$ 150,000
Site Staff (3)	$ 200,000	$ 600,000
Engineering (Third Party)	$ 300,000	$ 900,000
Expeditors & Inspectors (Third Party)	$ 100,000	$ 300,000
Legal	$ 50,000	$ 150,000
Various G&A Expenses	$ 100,000	$ 300,000
Total	$ 1,040,000	$ 3,120,000

Working Capital *(Estimate)* **$8,200,000**

Working capital will be required to cover the first six weeks of the Plant's operating expenses prior to receiving the first month's income. The following budget has been established for this working capital requirement. (Source: Tondu)

One Month Debt Payment	$ 4,000,000
45 days Operation and Maintenance Cost	$ 1,200,000
One Month Fuel Costs	$ 3,000,000
Total	$ 8,200,000

The addition of one month's debt service is to provide consistency with the presentation of the Total Project Cost budget. In actual practice, working capital for debt service support will be the responsibility of each participant with the Joint Agencies and Tondu responsible for their own debt payment working capital obligations.

Development Fee **$7,000,000**

Tondu will receive a development fee of the lesser of $7,000,000 or 1% of the Total Project Costs. The portion of this fee paid by the Joint Agencies shall be equal to their pro rata participation in the Plant with the remaining portion paid by Tondu through the prepayment requirement of the Wholesale Energy Purchase Agreement.

Construction Interest *(Estimate)* **$61,500,000**

It is assumed funds for the construction will be borrowed and interest only will be paid on this debt during the construction period. Based on a 42-month construction period, a preliminary drawdown schedule, a Total Project Cost of $700,000,000, a 4% interest rate, and a 3% reinvestment rate, the construction interest is calculated to be about $61,500,000 (See Appendix C). (Source: Tondu)

Unlike other costs included in the Total Project Costs, interest and financing charges will be paid directly by the Project participants for their incurred interest and financing costs. Each party's

financing costs may vary considerably from this estimate depending on their tax status, credit rating, and willingness to accept risk.

Escalation *(Estimate)* **$1,500,000**

A budget of $1,500,000 has been established to provide for the impact of inflation at 2% per annum during the construction period for rolling stock, spare parts, equipment and supplies, electrical interconnection, Plant owner's construction management, and working capital. (Source: Tondu)

Subtotal: Plant Soft Costs ($230/KW) **$97,680,000**

SUBTOTAL OF HARD AND SOFT COSTS ($1,549/KW) **$658,216,000**

6.3 Total Project Cost Summary

Project Contingencies **$41,784,000**

An allocation of approximately 6.0% of the Total Project Cost has been reserved for any unforeseen or underestimated capital requirements, inflation or escalation and development fees. This amount is arbitrary, but is believed to be adequate to address any reasonable requirements. (Source: Tondu)

TOTAL PROJECT COST ($1,647/KW) **$700,000,000**

The following summarizes the cost categories, their percentage of the Total Project Cost exclusive of the contingencies, and the contingencies as a percentage of cost.

	Costs As a % of Subtotal Hard and Soft Costs	Cost	Contingencies As a % of Subtotal Hard and Soft Costs
Fixed At Closing	85.8%	$564,996,000	
Estimates	13.3%	$87,220,000	
Budget Allocations	0.9%	$6,000,000	
Subtotal		$658,216,000	
Contingencies		$41,784,000	6.0%
Total Project Cost		$700,000,000	

7.0 Operation and Maintenance Costs

The operation and maintenance costs for the Plant will consist of variable costs ("Variable O&M Costs") incurred when the Plant is operating and fixed costs ("Fixed O&M Costs") incurred regardless of the output of the Plant. Even though some maintenance costs are partially dependent on output, some have been included in this analysis as Fixed O&M Costs because most of their costs are incurred regardless of the Plant's output.

All of the costs were first established in 2004 dollars and then adjusted for inflation to 2008 and beyond. Inflation rates were assumed to be 2% for most costs. Certain items, such as labor and coal prices, vary from this base inflation rate. This is based on prior experience and industry expectations.

The consumption levels for various operating consumables including SCR catalyst, aqueous ammonia, and lime, and the cost of ash disposal are dependent upon the permit levels established by the EPA/DEQ for the Plant's design fuel. To a lesser extent, changes in the Air Permit levels will also impact the Plant's maintenance costs. The operation and maintenance costs used in this analysis assume the proposed Air Permit application emission levels are approved. If the EPA/DEQ requires changes in these levels, then the consumables, ash disposal costs, and maintenance costs could increase.

The following summarizes the expected operating and maintenance costs for the Plant at full load with an annual 90% Capacity Factor producing 3,351 GWhr of energy per year.

7.1 Variable O&M

Fuel
The fuel cost will be a function of three variables: the delivered per unit cost of coal, the amount of fuel per unit of energy output the Plant consumes (the "Plant Efficiency"), and the amount of time the Plant consumes fuel (the "Capacity Factor").

Per Unit Cost of Coal Delivered to the Plant Site
The per unit cost to deliver coal to the Plant Site includes: mine mouth cost of coal, rail transportation cost to the Great Lakes, transloading charge for loading coal onto lake freighters, and lake freighter shipping cost to the Plant Site. The following is the current estimate of these costs:

	2004 Dollars			2008 Dollars	
	$/Ton	$/MMBTU	Inflation Rate	$/Ton	$/MMBTU
Mine Mouth Cost of Coal	$6.25	$0.36	1%	$6.50	$0.37
Rail Costs to Chicago	$11.00	$0.63	2%	$11.91	$0.68
KCBX Transloading Cost	$2.00	$0.11	1%	$2.08	$0.12
Lake Freighter Cost	$2.50	$0.14	2%	$2.71	$0.15
Total Delivered Cost of Coal	$21.75	$1.24		$23.20	$1.32

These projections are in 2004 and 2008 dollars. Inflation for coal has been either negative or minimal during the last two decades; however, some industry observers expect coal prices to rise modestly in the future. The estimates used in this analysis assume mine mouth coal prices and the KCBX Transloading Cost will rise 1% per year. Transportation and handling costs are projected to rise at the expected average inflation rate of 2% per year. Under these assumptions, the delivered price of coal in 2008 is projected to be $1.32 per MMBtu. (Source: Tondu, MSCPA (Glen White), and KCBX)

Plant Efficiency
Plant efficiency is expressed as the amount of BTUs required to produce one kWhr of electricity. The Plant net heat rate is the amount of BTUs required to produce one kWhr available for sale to the market. The Plant is projected to consume approximately 9,544 BTUs to produce one net KWhr of electricity during its first year of commercial operations. As the Plant ages, the net heat rate is expected to degrade by 2.5% over 30 years, representing 0.0833% per year.

With an average BTU content of 8,800 BTU per lb and a total energy output of 425 MW, the Plant will require 230 tons of coal fuel per hour when operating at full load, or approximately 1.8 million tons in a normal year.

At a landed cost of coal of $1.24 per million BTUs in 2004, the cost of fuel is calculated to be $11.79/kWhr. With the assumed coal inflation rate, the cost of coal is projected to be $1.32 per million BTUs, equivalent to $12.58 per MWhr in 2008. (Source: Tondu and Cummins & Barnard)

Capacity Factor
The Capacity Factor is the amount of time the Plant is online and able to deliver its full rated capacity, and is a function of scheduled outages and forced outages. During normal years, the Plant will be scheduled for 20 to 25 days of maintenance representing approximately 5.5% to 6.9% downtime. The forced outage rate is expected to be less than 3% for a total expected downtime of approximately 9% to 10% or an annual Capacity Factor of approximately of 90%. An additional 5% downtime is expected during major maintenance years. Approximately 20 days of downtime are expected in the first year of operation to address start-up issues. Based on 425 MW (nominal net output) and a 90% Capacity Factor, the annual net electricity generation is calculated to be 3,351,000 MWhr during normal years and 3,165,000 MWhr during the initial start-up year and major maintenance years. (Source: Tondu)

Coal Handling
After the coal is unloaded at the Plant Site, heavy equipment operators will stack and compact the coal into storage piles. Coal will be reclaimed and fed into a conveyor system that delivers it to the Plant coal storage silos as needed. The equipment operators will be employees of the owner and their associated costs are included in the Fixed O&M costs with the rest of the labor. The initial capital cost of the bulldozers and

earthmovers used to move the coal is included in the Total Project Cost. Fuel, maintenance and other operating costs are variable coal handling costs and projected to be $32 per hour when the Plant is operating or $0.075 per MWhr. Assuming a 2% inflation rate, this results in a coal handling cost of $0.082 per MWhr in 2008. (Source: Tondu)

NO_x Catalyst
The SCR system will require a catalyst to operate. This catalyst needs to be replenished on a regular basis. Cummins & Barnard estimates the Plant will consume $150 per hour, or $0.35 MWhr (in 2004 dollars) of catalyst to operate the NO_x control system at full output. Inflated at 2% per year, the catalyst cost in 2008 is calculated to be $162.36 per hour or $0.38 per MWhr. (Source: Cummins & Barnard)

Aqueous Ammonia
The SCR NO_x control equipment is projected to use 1,100 pounds per hour of 19% aqueous ammonia. Quotes for 19% aqueous ammonia were received from two suppliers for approximately $115 per ton delivered to Manistee. Assuming a 2% inflation rate, the cost of ammonia delivered to Manistee in 2008 is projected to be $124.48 per ton yielding a cost of ammonia of $0.16 per MWhr. (Source: Ammonia suppliers and Cummins & Barnard)

Lime
The Plant will consume two tons of lime per hour at full load. This is a rate of 0.0048 tons per MWhr. At a 90% Capacity Factor, the consumption of lime will be 15,768 tons per year. Tondu is currently evaluating the development of a new lime production facility in Manistee, but as of today, there are only two operating sources of lime, the Carmeuse Lime Company and Huron Lime Company. The estimated cost of lime delivered to the Filer City Plant from each of these companies in 2004 is as follows:

	Lime Plant Cost	*Shipping*	*Total Lime Cost*
Carmeuse	$54.00	$18.00	$76.00
Huron	$35.00	$35.00	$79.00

The average cost of lime delivered to the Filer City Plant is currently about $77.00 per ton, or about $0.36 per MWhr. Assuming 2% inflation, this price is projected to increase to about $83.35 per ton in 2008. Under these assumptions, the cost of lime is calculated to be $0.39 per MWhr in 2008. (Source: Tondu)

Bag Replacement
The baghouse dust collection bags will need to be replaced on a regular basis. The frequency of replacement and the associated cost depends on the Plant's output. As such, the cost of bags is calculated on a cost per hour even though the actual cost is incurred on a different timeframe (e.g. quarterly, semi-annually, or annually). Cummins & Barnard estimates the cost of bags will be approximately $50 per hour or $0.12 per MWhr in 2004 dollars. Escalating this cost at 2% per year yields a projected cost of bags at $54.12 per hour or $0.13 per MWhr in 2008. (Source: Cummins & Barnard)

SO_x Credits
As part of the EPA's 1995 Acid Rain Program, new SO_x sources are required to "offset" annual SO_x emissions by purchasing allowances from parties who have excess SO_x allowances for sale. Currently, the market for SO_x allowances averages between $150 and $200 per ton of actual emissions with the future cost expected to be at the lower end of this range. With the expanding regulations expected to require more scrubbing of SO_x from the older plants, many industry observers believe the cost of SO_x credits will decline over time. For this analysis, the cost of SO_x credits was assumed to be fixed at $150 per ton. The Air Permit application proposes 0.2 lbs of SO_x emissions per million BTU of heat input. At this rate, the cost of SO_x credits is calculated to be $0.14 per MWhr. (Source: RMB Consultants & Research, Inc.)

Water Treatment Chemicals
Various chemicals will be needed to treat the Plant's makeup water. While the consumption of these chemicals depends on the output of the Plant, considerable water treatment will be needed even when the Plant is on standby. The only time water treatment chemical usage is fully variable is when the Plant is shut down completely. The cost of water treatment chemicals is estimated to be $88 per hour or $0.21 per MWhr in 2004. Assuming a 2% inflation rate, the cost of water treatment chemicals is projected to be $95.25 per hour or $0.22 per MWhr in 2008. (Source: Tondu and GE Betz)

Wastewater Treatment
Wastewater treatment costs are similar to water treatment chemicals and will be incurred even when the Plant is not producing electricity. The estimated cost of wastewater treatment in 2004 is $7 per hour, or about $0.02 per MWhr. With a 2% inflation rate, the cost is projected to increase to $7.58 per hour, or about $0.02 per MWhr in 2008. (Source: Tondu and GE Betz).

Ash Handling
Ash handling costs include the hauling and disposal of the scrubber and fly ash. The Plant is projected to generate 4 tons per hour of scrubber ash and 10 tons per hour of fly ash for a total of 14 tons per hour. This ash is expected to have a bulk density of about one-half of a ton to a cubic yard. Therefore, the Plant is projected to produce about 28 cubic yards per hour of scrubber and fly ash.

The cost to haul ash to the landfill is estimated at $1.75 per cubic yard in 2004 dollars. The current cost to dispose of ash at the Shoreline Landfill for the Filer City Plant is $5.30 per cubic yard and escalation is limited to 1% per year for the next 10 years. This analysis assumes the hauling cost will escalate at 2% per year and the disposal costs will escalate at 1% per year. The projected cost of ash hauling and disposal in 2008 using these inflation factors is calculated as follows:

	2004	*2008*
Hauling (in $/cu. yd. - 2% inflation)	$1.75	$1.89
Disposal (in $/cu. yd. - 1% inflation)	$5.30	$5.52
Ash Hauling and Disposal Costs	$7.05	$7.41

With 28 cubic yards per hour of scrubber and fly ash produced, the cost to handle this material in 2004 dollars is calculated to be $0.46 per MWhr and $0.49 per MWhr in 2008 dollars. (Source: Tondu and Donres Construction Company)

Ash Sales Income
Bottom ash is a salable product used in the manufacture of concrete and not included as a cost item. The Plant is projected to generate 2.5 tons per hour of this material. Boral Materials Technology is a purchaser of bottom ash in the Michigan market and has proposed that if the ash meets the quality requirements for concrete additive material, they would pay $6.00 per ton for ash, FOB the Plant. Escalating this price by 2% per year, the projected sales price is $6.49 per ton in 2008, yielding income to the Plant of $0.04 per MWhr. (Source: Boral Materials Technology)

Variable O & M Costs Summary
The Variable O&M Costs in 2004 and 2008 dollars are summarized as follows:

	Variable O&M Costs in 2004 Dollars	Variable O&M Costs in 2008 Dollars	% of Variable O&M Costs
	$/MWhr	$/MWhr	
Fuel	$ 11.79	$ 12.58	86.4%
Coal Handling	$ 0.08	$ 0.08	0.6%
NOx Catalyst	$ 0.35	$ 0.38	2.6%
Aqueous Ammonia	$ 0.15	$ 0.16	1.1%
Lime	$ 0.36	$ 0.39	2.7%
Bags	$ 0.12	$ 0.13	0.9%
SOx Credits	$ 0.14	$ 0.14	1.0%
Water Treatment Chemicals	$ 0.21	$ 0.22	1.5%
Wastewater Treatment	$ 0.02	$ 0.02	0.1%
Ash Handling	$ 0.46	$ 0.49	3.4%
Ash Sales Income	$ (0.04)	$ (0.04)	(0.3)%
Total	$ 13.65	$ 14.56	100.00%

7.2 Fixed O&M

Fixed O&M Costs are those costs that will be incurred even when the Plant is not running. The following is a description of the Fixed O&M Costs for the Plant.

Direct Labor **$2,800,000**

The operation and maintenance of the Plant is expected to require 51 full-time, onsite employees excluding ash and lime transportation labor. Appendix C includes a list of the expected staff requirements and their wages. The base wages for the Plant management, operations, and maintenance staff is estimated to be $2,271,000 in 2004 dollars. Certain hourly staff is expected to work overtime at a cost of 1.5 times regular pay. This overtime is calculated to be $266,000 for a total direct labor cost in 2004 dollars of $2,537,000. Assuming a 2.5% annual inflation rate, the Plant's total direct labor costs in 2008 are $2,800,000. (Source: Tondu)

Incentive compensation may be paid to the Plant employees if the Plant performs better than expected. Funding of such payments will be provided by cost savings or additional revenue from the associated productivity gains.

Indirect Labor **$1,008,000**

Indirect labor costs include insurance, employee taxes, unemployment, pension costs, and all other indirect costs associated with the management and operation and maintenance staff. These costs are estimated to be 36% of the direct labor costs. (Source: Tondu)

Community Service Payment **$400,000**

An allocation of $400,000 in 2008 dollars has been budgeted for payments to various local government bodies and charities. Certain of these funds will pay for critical governmental services needed by the Plant including fire and police support. Others will be optional and subject to the discretion of the Plant owners. (Source: Tondu)

Plant Expenses **$671,000**

Plant expenses include miscellaneous expenditures required to operate the Plant and contingencies. The largest Plant expense is the MDEQ required emission fee, which in 2004 dollars is calculated to be $181,000. All Plant expenses are expected to inflate at the general inflation rate. Assuming an inflation rate of 2%, the Plant Expenses in 2008 are calculated to be $671,000. A detailed list of the Plant expenses is included in Appendix C. (Source: Tondu)

Management Expenses **$390,000**

Management expenses include travel, legal, lobbying, audit, specialized consultants, and public relations. A detailed list of these costs is presented in Appendix C. (Source: Tondu)

Plant Insurance **$2,827,000**

Plant property and liability insurance has been estimated to cost approximately $2,612,000 in 2004 dollars. This estimate assumes insurance replacement coverage of $700 million and total business interruption coverage of $54 million for a total insured valuation of $754 million. The property insurance was calculated by assuming a rate of $0.30 per $100 of total insured valuation or $2,262,000. Liability insurance was priced at $350,000 for a $50 million limit. The total insurance cost was then inflated at the general inflation rate of 2% to $2,827,000 in 2008. (Source: Marsh & McLennan)

Coal Line of Credit **$172,000**

Coal will be stockpiled on the Plant Site during the winter months for 90 days if the coal is supplied through Chicago at the KCBX Terminal and 120 days if the coal is supplied through Lake Superior at the Superior Terminal. This analysis assumes that the coal will be supplied through Chicago. Even if the Lake Superior route is chosen, the extra inventory carrying cost should be offset by a lower cost of coal. Therefore, the maximum coal inventory cost is from the KCBX Terminal.

Ninety days of coal inventory is approximately 497,000 tons. The cost of the winter inventory can be approximated by multiplying the total inventory tons (497,000) by the average cost of coal ($20.99/ton in 2008 dollars) to yield a total coal line of credit limit of $10.4 million. Inventory coal will begin deliveries early in the summer with the full inventory on site by the first of January of each year. The inventory coal will then be consumed over the next 90 days. To accommodate this delivery and consumption schedule, it is estimated that the equivalent of the full line of credit will be drawn for approximately 5 months of each year. Assuming an interest rate of 4% per year, the annual cost of using this line of credit is projected to be $172,000. This cost will inflate at the same average rate of inflation incurred for purchasing and transporting the coal to the Plant Site. (Source: Tondu)

Capital Expenditures **$400,000**

Beginning in the second year of operations, an annual budget has been established for the Plant to replace, repair, and maintain equipment with a life expectancy greater than one year. This amount will vary over time. An allocation of $400,000 was assumed to be a reasonable estimate for the 2009 annual capital expenditures and thereafter this projection is increased by the general inflation rate. (Source: See note under Major Maintenance, below)

Annual Maintenance **$2,400,000**

Consumable maintenance items are included as a Fixed O&M Cost even though a certain amount of annual maintenance costs are dependent upon the Plant's output. This variability is, however, relatively small and only significant if the Plant were to shut down completely. In 2008, the annual maintenance costs are projected to be $2,400,000. Beyond 2008, the inflation rate is assumed to be 3%, or 1% greater than the general inflation rate of 2%. This increase in inflation provides for growth in the real cost of annual maintenance. (Source: See note under Major Maintenance, below)

Major Maintenance Escrow **$1,000,000**

The Plant is projected to require an overhaul of the major electrical generating equipment every seven years and one of the turbine sections will probably be rebuilt in four of each of the seven year periods. It is assumed funds will be escrowed until they are used. The annual contribution to this escrow account is projected to be $1,000,000 in 2008 and will escalate at the general inflation rate each year thereafter. In addition, a coal handling equipment replacement account will to be required to provide for the replacement of the major coal handling rolling stock every six years. (Source: See note, below)

Note: Tondu and Sterling Energy Operations both confirmed the adequacy of the sum of Capital Expenditures, Annual Maintenance, and Major Maintenance Escrow to cover all these expenditures.

Total Fixed O&M 2008 Costs $12,068,000

Fixed O & M Costs Summary

The Fixed O&M Costs on a $/MWhr output basis assuming 425 MW (nominal net output) capacity are summarized for the first two years of operations as follows:

	Annual Costs 2004 ($000) Normal Year Output	Fixed O&M Costs 2008 $/MWhr	Fixed O&M Costs 2009 $/MWhr
Capacity Factor	90%	85%	90%
Annual Output (GWhr)	3,351	3,165	3,351
Direct Labor	2,537	0.88	0.86
Labor Payroll Taxes & Benefits	913	0.32	0.31
Community Services Payment	370	0.13	0.12
Plant Expenses	620	0.21	0.20
Management Expenses	360	0.12	0.12
Plant Insurance	2,612	0.89	0.86
Coal Line of Credit Interest & Fees	161	0.05	0.05
Capital Expenditures	362	0.00	0.12
Annual Maintenance	2,132	0.76	0.74
Major Maintenance Escrow	924	0.32	0.30
Total	10,992	3.69	3.68

The Annual Cost calculation is in 2008 dollars and for illustration purposes includes Capital Expenditures, which are not expected to be required in 2008.

The 2009 annual costs are adjusted upward from 2008 for inflation and include Capital Expenditures. However, the Plant is expected to have a Capacity Factor of 90% in 2009, 5% greater than its start-up year of 2008. Because the Fixed O & M Costs are spread over a larger amount of energy output, the per unit cost of the Fixed O & M decreases. This per MWhr decrease effectively offsets the inflation impacts and the inclusion of Capital Expenditures in 2009, resulting in almost equal per MWhr Fixed O & M Costs in 2008 and 2009.

7.3 O&M Summary

The total operation and maintenance cost for the Plant is summarized as follows:

	O&M Costs		
	in 2004 $	in 2008 $	in 2009 $
	Normal Year Output	1st Year	2nd Year
Capacity Factor	90%	85%	90%
Annual Output (GWhr)	3,351	3,165	3,351
	$/MWhr	$/MWhr	$/MWhr
Variable O&M Costs	$13.65	$14.56	$14.80
Fixed O&M Costs	$3.48	$3.69	$3.68
Total	$17.13	$18.25	$18.48

The operation and maintenance cost of energy produced by the Northern Lights Plant is projected to be approximately $18 in 2008 and 2009. This represents an energy cost of about $17 per MWhr in 2004 dollars.

8.0 Forecasted Financial Performance

8.1 Base Case Model

The Base Case Model is included as Appendix C and is believed to be an accurate approximation of the minimum economic performance of the Plant. The Base Case Model is based on current assumptions and will change as additional information and new projections become available. As estimates are finalized through the completion of the key contracts (e.g. the EPC Agreement and Coal Purchase Agreement), the Base Case Model will be revised. The purpose of this model is to calculate the cost of electricity to the Joint Agencies on a per kWhr basis through the first 30 years of the Plant's operating life.

The following summarizes assumptions used in the Base Case Model:

Start-up Date:	January 1, 2008 (Note: actual start-up date is expected to occur first quarter 2008. For presentation purposes, a full year is used in this model.)
Plant Capacity:	425 MW (nominal net output)
Plant Availability Rate:	85% during the initial year and major maintenance years, 90% during normal years, which are all years except the initial year and major maintenance years.
Operation & Maintenance Costs:	As described in Section 7.
General Inflation Rate:	2% per year. However, certain costs are projected to inflate at rates different than the general inflation rate, as described in Section 7.
Major Maintenance Escrow:	$1,000,000 per year adjusted annually from 2008 at the general inflation rate.
~~Property Taxes & MSBT:~~	~~None are required, however a $400,000 annual Community Services Payment is included in the O&M budget to provide a direct payment to the City of Manistee and the local area governmental bodies to support required community services that would normally be supported by property taxes.~~
Coal Btu Content:	8,800 Btu per lb.
Fuel Consumption Rate:	9,544 BTU per kWhr increasing at 0.0833% per year (2.5% degradation over 30 years)
Coal Cost:	$1.34 per MMBTU in 2008.
Lime Consumption Rate:	2 tons per hour at full load.
Lime Cost:	$83.04 per ton in 2008

Ash Production Rate:	2.5 tons per hour of bottom ash 4.0 tons per hour of scrubber ash 10.0 tons per hour of fly ash
Ash Bulk Density:	2 yards per ton.
Ash Disposal Cost:	$7.41 per yard with transportation component of $1.89 per cubic yard escalating at the general inflation rate and $5.52 per cubic yard disposal cost component escalating at 1% per year.
Total Project Cost:	$700,000,000.
Joint Agency Capacity:	250 MW
Joint Agency Bonds Amount:	$411,765,000, representing 58.8% of the Total Project Cost.
Joint Agency Bonds Long-term Interest Rate:	4.5% annual rate.
Joint Agency Bonds Maturity:	30 years.

8.2 Results

The Base Case Model calculates electricity from the Northern Lights Plant delivered to the 345 kV transmission point will cost the Joint Agencies approximately $32/MWhr in 2008.

8.3 Sensitivity Analysis

Three sensitivity analyses were performed using the Base Case Model to determine their impact on the average costs of electricity. The first analyzed the effect of increases in long-term interest rates, the second determined the impact of changes in the Total Project Cost, and the third analyzed changes in the non-fuel operating and maintenance costs. Figures 6, 7, and 8 present the results of these analyses. Figure 9 plots the cumulative impact of these sensitivities on the cost of electricity from the Best Case to Worst Case.

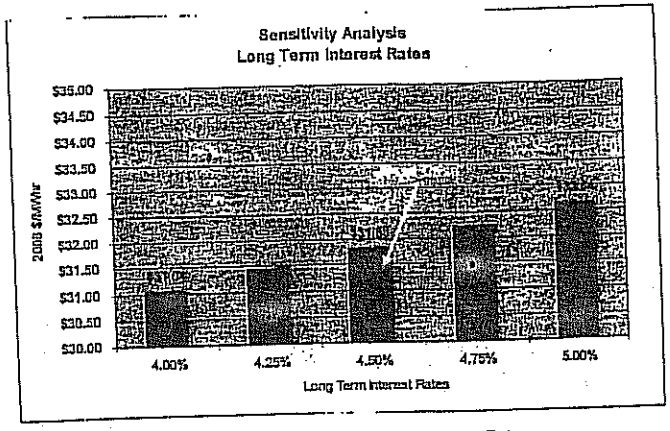


Figure 6 - Sensitivity of Power Cost to Interest Rates

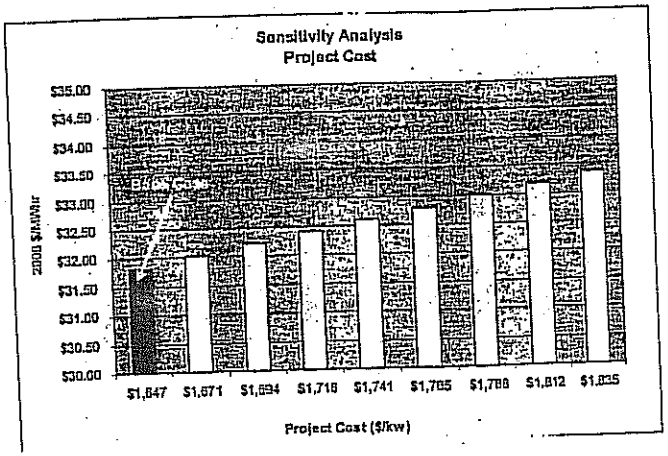


Figure 7 - Sensitivity of Power Cost to Total Project Cost

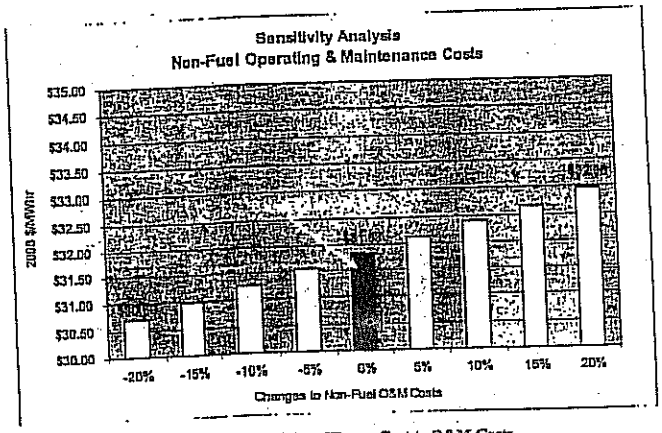


Figure 8 - Sensitivity of Power Cost to O&M Costs

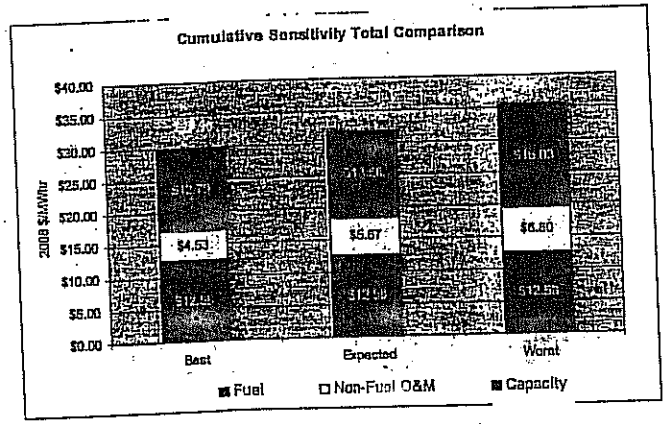


Figure 9 - Cumulative Sensitivity Analysis

9.0 RISK

9.1 General

The Northern Lights Project faces a number of risks that could have an adverse effect on the ability of the Project to perform as expected. These risks include regulatory change, fuel availability, contractual defaults, incorrect assumptions, change-in-law, equipment failure or performance below expectations, risks inherent to electrical generation, and risks specific to this Project. However, many of these risks can be mitigated through careful planning, insurance, contracts, and execution.

Planning
One of the main objectives of planning is to identify and thoroughly understand the Project's risks. Knowing the risks allows for the development of mitigation strategies to lower risks. Planning is a continuous process and incorporates changing circumstances or conditions.

Insurance
Many risks can be minimized though insurance. Financial risks caused from business interruption or catastrophic destruction of the Plant can be significantly reduced or eliminated by obtaining insurance to address these concerns.

Contracts
Many of the Project's risks are within the control of third-parties who should be willing to accept the consequences of risk within their control. A major objective of the Project's development effort will be to transfer risks to appropriate third-parties through contractual relationships.

Execution
Mitigating risk depends upon the successful execution by the people directing and implementing the effort. The experience of the development and construction management teams is the single greatest risk mitigation strategy available to any power plant project development effort. Tondu's development team working on the Northern Lights Project has successfully performed similar responsibilities on other power plant projects. This team, including several of its consultants, has worked together for over 15 years and Tondu is highly confident it can complete its responsibilities. Tondu's significant investment in the Project's development effort demonstrates its level of commitment in the ultimate success of this effort.

The following are some of the more significant risks, which any potential participant in the Project should be aware. This list is not meant to be exclusive and may not include risks that are subsequently found to be material to the economic performance of the Project. Each reader of the Report should make an independent analysis of the risks associated with this Project.

9.2 Permitting

Permitting risks are beyond the control of Tondu or the Joint Agencies. It is believed all of the required permits will be issued as needed, but it is difficult to predict what opposition could form or if the regulations could change. Tondu's approach to minimize the permitting risk is to develop a large consensus and support for the Project, including local and state level governmental support, labor unions, environmental groups, etc. To support this effort, detailed analysis on the Plant, permit requirements, site issues, etc. will be completed prior to the preparation and filing of all permits. A local public awareness program will be initiated and include public

meetings to address any issues or concerns. This proactive approach is believed to be the best method of reducing the permitting risk to the lowest level possible.

9.3 Developer

There are potential risks in working with Tondu as the Project's developer. However, it is believed these risks have been addressed and minimized to the largest degree possible. One concern is if one of Tondu's principals is unable to continue in the Project's development effort. This risk has been mitigated by the involvement of several individuals for each aspect of the development effort. No single individual will be responsible for a critical function. Each person will be supported by others and could be replaced if they cannot continue with the Project's development. Tondu has also provided sufficient funding to continue supporting Tondu's requirements associated with the development effort if Mr. Tondu is unable to continue with the Project.

Another risk is that Tondu is unable to finance the prepayment obligation of the Energy Option Agreement. Tondu will commit to the amount of energy it is able to finance before the Project financing is required and Plant construction begins. If Tondu is unable to finance the energy available under the Energy Option Agreement, then Tondu and the Joint Agencies can look for another partner or scale down the Plant to only meet the Joint Agencies requirements. This would result in an increase in the per kWhr cost of power. However, it is still believed to be considerably less expensive than the alternatives. Over the next few months, Tondu will work to obtain commitments from financial institutions for its financial requirements under the terms of the Energy Option Agreement and thereby eliminate this perceived risk.

9.4 Total Project Cost

The economics of the Project are highly dependent upon the Total Project Cost. As costs escalate, the cost of electricity to the Joint Agencies will also increase, which lowers the Project's competitive advantage. The current model assumes the Total Project Cost will be $700 million, or $1,647 per KW. This yields an initial cost of electricity to the Joint Agencies of approximately $32/MWhr.

To protect against increasing costs, many of the Project's cost risks will be assumed by third parties. Of the Total Project Cost, 86% is expected to be fixed through contract or incurred prior to the financial closing. The largest component of the Total Project Cost is the EPC cost. There are a number of options to address this risk and one of the objectives of the Phase II development effort will be to develop a strategy to mitigate EPC cost risk. In addition, substantial contingencies will be included in the Project budget to address unexpected costs increases.

9.5 Plant Technical and Operational Performance

After the Plant begins commercial operations, there will be new risks for the Joint Agencies. The EPC Agreement is expected to require the EPC Contractor to assume most of the equipment performance risks. Equipment vendor warranties will also be in place for the first year of the Plant's operation. The largest operating risk comes from mistakes by operating personnel. This risk will be mitigated through a careful selection process and extensive training before the Plant begins operations. Financial and operational procedures and ongoing training programs will also be implemented.

9.6 Financial Performance

Much of the decision to proceed with the Project is based on the projected financial performance of the Plant. In addition to operating performance, which has been addressed above, there are three areas of risk which could impact the Plant's financial performance: interest rates, inflation, and operating cost assumptions.

Actual interest and inflation rates are beyond the control of the parties. Increases in interest rates directly increase cost. Interest rates are currently at almost historic lows and represent one of the best times in history to borrow long term. It is assumed the Joint Agencies will be able to borrow capital at 4.5%.

Inflation impacts have relatively the same impact on any new project. The primary risk of inflation is if it impacts one project greater than a competing opportunity. In this regard, the Northern Lights Project is expected to have a comparative inflation advantage versus gas which historically has been subject to higher inflation rates than coal. As such, inflation is not considered to be a significant risk to this Project. Inflation is assumed to be 2% per year for most items.

If the actual operating costs are different than the numerous assumptions and calculations used in the projections, the Project will not perform as expected. The risks of incorrect assumptions or calculation mistakes are addressed through extensive review by numerous parties, both internal and external. Tondu, the Joint Agencies, and qualified third-party consultants will independently review these assumptions.

9.7 Summary

Even though there are risks associated with the development, construction, and operation of the Northern Lights Plant, the risks will be minimized by careful planning, insurance, contracts, and execution. These risks will be addressed by including major company participants, utilizing standardized equipment and proven technology, requiring performance guarantees and equipment warranties, maintaining adequate insurance, and having a clear transfer of risks through various Project agreements. Because of these protective measures, Tondu believes the likelihood of an event occurring that will have a material impact on the forecasted financial performance of the Project will be minimal.

10.0 PHASE II DEVELOPMENT PLAN

If the Joint Agencies elect to continue with Phase II of the Northern Lights Project development, a project consulting agreement (the "Project Consulting Agreement") will be completed between the Joint Agencies and Tondu. This agreement will establish how the parties will work together to complete the remaining Project development tasks. The following is a brief discussion of how this effort is expected to be managed, controlled, and implemented.

10.1 Management

The Phase II development effort will be directed and controlled through a management committee (the "Management Committee"). The Management Committee will be composed of representatives from MPPA and MSCPA with each party will have an equal vote in the decisions of the Management Committee. The individuals and teams responsible for conducting the various development tasks will report to the Management Committee. The Management Committee will be responsible for approving all aspects of the Project's development effort including budgets and Project agreement terms.

10.2 Permitting

The permits for the Plant shall be applied for by Tondu or its designee and assigned to the Joint Agencies at the close of the construction financing for the Plant (the "Closing"). In Phase II, each permit or governmental approval required for the Project will be listed along with the source for the permit, the responsible entity for acquiring the permit, and the length of time expected between application and acquisition. For permits that trigger public involvement, a strategy will be defined and responsibilities delineated for coordinating the interaction with the public. Although it is not an anticipated requirement, it will be determined if any baseline monitoring or sampling may be prudent prior to operations and if so, then implemented. Appendix B contains a list of the required permits identified to date.

10.3 Preliminary Engineering

Phase I incorporated the conceptual engineering necessary to define the Project in sufficient scope and detail to provide confidence in the technical and economic feasibility of the Project. Phase II will require more specific preliminary engineering to better define the Project scope of work, prepare a request for proposals, and perform the proposal evaluation.

A Plant Site geotechnical study and topographical analysis will be performed. All Plant Site demolition and preparation work will be defined and bids solicited. Additional work will also be done to further optimize the Plant Site layout and Plant arrangement.

10.4 EPC Agreement

During Phase II, an EPC negotiating team (the "EPC Negotiating Team") will be formed with Tondu, MPPA, and MSCPA representatives. The purpose of this team will be to develop a strategy for identifying the EPC Contractor and completing the EPC Agreement. In determining this strategy, the objective will be to obtain the highest value Plant, which is not necessarily the lowest cost, with due consideration given to the most cost-effective way of controlling all the risks inherent to such a Project.

10.5 Coal Purchase Agreement

During Phase II, a coal negotiating team (the "Coal Negotiating Team") will be formed with Tondu, MPPA, and MSCPA representatives. The purpose of this team will be to develop a strategy for purchasing and delivering the coal to the Plant. The Coal Negotiating Team will report to the Management Committee and recommend a coal acquisition strategy for its approval.

10.6 Support Agreements

Other Project agreements, e.g. lime purchase, lime hauling, ash disposal, ash hauling, etc. (the "Support Agreements") may be required before Closing can occur. Tondu, at the direction and prior approval of the Management Committee, shall select the various service providers and negotiate these agreements.

10.7 Plant Site Acquisition

Tondu will grant to the Joint Agencies an option on the Plant Site at incurred cost. At Closing, the Joint Agencies shall purchase the Plant Site.

10.8 Project Financing

Tondu, MPPA, and MSCPA shall be responsible for arranging and paying the cost associated with their respective Project financing requirements. Each party shall designate an individual to represent their interest in directing the preparation of the financing documentation. Tondu shall be responsible for coordinating the Closing among the parties. The Joint Agencies are expected to issue bonds backed by commitments from the Participating Municipals to purchase capacity in the Plant. The amount of these bonds will be based on the Participating Municipals' commitment to purchase capacity in the Plant. The terms and conditions of this debt will be determined between the Joint Agencies and their funding sources. Financing for the remaining portion of the Total Project Cost will be provided at Closing by selling the Plant's Reserve Capacity to Tondu under the terms of the Wholesale Energy Purchase Agreement. Under the terms of thisagreement, Tondu will pay the Joint Agencies a prepayment fee equal to the cost of the Project not funded by the Joint Agencies' bonds.

10.9 Project Construction Management

After the Closing, a construction management team (the "Construction Management Team") will be formed to manage the EPC Agreement and monitor every aspect of the Project from the Joint Agencies' perspective. This team will be led by Mr. James Ford of Tondu and include consulting engineer support, representatives from the Joint Agencies and other third-party specialists in addition to several full-time personnel. The Construction Management Team will have a prior approved budget and report to the Management Committee. The team will also be responsible for generating all the necessary periodic reports for the Joint Agencies and Project lenders.

10.10 Start-Up and Operations

At the direction of the Management Committee, the Construction Management Team will prepare an employee hiring and training plan (the "Employee Hiring and Training Plan"). This plan will set forth how the Plant's management, operation, and maintenance employees will be identified, hired, and trained. It is expected that a third-party consulting firm will be contracted to assist in the preparation and implementation of this plan. When the Plan is completed, it will be presented to the Management Committee for approval. The Construction Management Team will coordinate with the Joint Agencies the hiring and training of the Plant employees according to the Employee Hiring and Training Plan. After the Plant employees have successfully completed their training program, they will, under the supervision of the EPC Contractor, start-up and complete the performance testing of the Plant.

The Plant will be operated and maintained by the Joint Agencies. The Reserve Capacity energy will be sold to Tondu under the terms of the Wholesale Energy Purchase Agreement for a term of 30 years. At the end of this period, the Reserve Capacity will be released back to the Joint Agencies for their use.

11.0 PROJECT SCHEDULE

The key remaining development tasks are securing the required environmental permits, and verifying and fixing the Total Project Cost. It is difficult to predict when the environmental permits will be issued. The Air Permit was filed on September 10, 2003 and may take nine to twelve months to be issued. Current estimates indicate the Air Permit will be issued in the summer of 2004. From the date the Air Permit is issued, it will take approximately four to six additional months to complete the Project financing and begin construction. Depending on how much preconstruction work is completed prior to financing, the construction period could take up to 42 months to complete with commercial operation beginning in the first quarter of 2008. The Project Schedule will be updated as additional information and new projections become available and will be subject to review by the Management Committee. The current projected development schedule is provided in Appendix D.

Appendix A
Tondu Resumes

KEY PERSONNEL OF TONDU CORPORATION

R. J. Tondu
President

Mr. Tondu is the President and sole shareholder of Tondu Corporation. He is primarily responsible for identifying new business opportunities, marketing, and coordinating the various project development efforts. Mr. Tondu began his career at Getty Oil Company where he worked as a staff geologist for three years. During this period, he was responsible for monitoring oil and gas development drilling activities throughout the Texas Gulf Coast. In 1978, Mr. Tondu created the predecessor company to Tondu Corporation and began actively developing oil and gas exploration and development ventures. This involved identifying and leasing drilling prospects, raising investment capital, and managing the drilling and production of oil and gas wells.

In early 1982, Mr. Tondu sold the oil and gas leasehold interest of the company and expanded into industrial project development. Mr. Tondu identified the independent power business in 1984 as a new emerging industry and focused the company's activities on this new industry. Mr. Tondu was responsible for identifying the Filer City and Williams Lake Projects, assembling the respective project development teams, and formulating many of the development strategies that led to their success.

During the development of the Filer City Plant, Mr. Tondu led the negotiations for the key contracts and was instrumental in organizing the political lobbying effort in the state of Michigan resulting in the enactment of Public Act 81. This law created much of the legal framework that supported the development of the independent power plant business in the state of Michigan. Mr. Tondu led the negotiations for the power purchase agreement for the Williams Lake Project.

Mr. Tondu received a B.S. in geology from Grand Valley State University in Allendale, Michigan and a M.A. in geology from the University of Texas at Austin.

Beverly Z. Baker
Managing Partner

Ms. Baker is a Managing Partner who joined Tondu Corporation in 1988. Ms. Baker is responsible for the organization and implementation of Tondu Corporation's financing activities and the coordination of project documentation. As a Managing Partner, Ms. Baker participates in the equity ownership of Tondu Corporation's projects. Ms. Baker was responsible for preparing lender presentations, negotiating the financing, reviewing the loan documentation, and organizing the closings with the equity providers and lenders for both the senior and subordinated debt financings for the Filer City and Williams Lake Projects. Ms. Baker also participated in all aspects of the development effort for the Williams Lake Project.

Ms. Baker came to Tondu Corporation with over eleven years of business experience, primarily in the finance area. Prior to working with Tondu Corporation, Ms. Baker restructured $100 million of debt for an individual and his privately held investment companies that owned real estate, oil and gas reserves, hotels, and miscellaneous assets. She was responsible for selling numerous assets and was the company's primary banking liaison. Prior to this position, Ms. Baker worked for First City National Bank for five years and left the organization as a Vice President and Group Manager in their Special Loan Division. While at First City National Bank, she was responsible for managing complex credits and multiple bank groups, which included companies with debt in excess of $1 billion. Ms. Baker completed a management-training program at the bank and was initially involved in lending to the oil and gas industry. Upon graduation from college, Ms. Baker worked for Michigan Wisconsin Pipeline Company in various capacities.

Ms. Baker received a B.B.A. in finance from the University of Texas at Austin and a M.B.A. from the University of Houston.

James A. Ford
Managing Partner

Mr. Ford is a Managing Partner who joined Tondu Corporation in January 1990. Mr. Ford is responsible for directing the engineering, construction, and operation and maintenance activities of Tondu Corporation's projects. As a Managing Partner, Mr. Ford participates in the equity ownership of Tondu Corporation's projects. Mr. Ford was responsible for developing the engineering and design scope and negotiating the engineering construction contract for the Williams Lake Project. Mr. Ford also negotiated the fuel transportation agreement and coordinated the environmental permitting, independent engineer's review and procurement of the insurance and bonding requirements. As Project Director during the construction of the Williams Lake Project, Mr. Ford managed the construction and created the plant's operation and maintenance organization.

Mr. Ford has over twenty-five years experience in all phases of engineering, construction, development, operations and management of major projects. Prior to joining Tondu Corporation, Mr. Ford was Chief Operating Officer for California Agri-Power Company and responsible for the operation and maintenance of four agri-waste fueled power plants. During the mid 1980s, Mr. Ford was a business development manager for Fluor Daniel, Inc. In this capacity, Mr. Ford was responsible for developing non-utility power generating projects throughout the United States. These projects ranged in size from 10MW to 300 MW and were fueled by gas, coal, oil, waste-coal, agri-waste, municipal waste and biomass. While at Fluor Daniel, Mr. Ford managed the technical team for Tondu Corporation's Filer City Plant and represented Fluor Daniel in the negotiations for the EPC contract.

Mr. Ford received a B.S. in engineering from the University of Missouri and a M.B.A. from the University of Tennessee.

Matthew J. Smith
Marketing Director

Mr. Smith joined Tondu Corporation in 1999. He is the Marketing Director, and is responsible for investigating investment opportunities, networking, and general marketing for Tondu Corporation. Mr. Smith evaluates investments generated by other investors, developers, or venture capitalists by conducting due diligence and generating financial models. He also performs due diligence on start-up projects where Tondu Corporation takes the lead developer role.

Most of Mr. Smith's experience has been in finance and marketing. He spent three years at Wells Fargo Bank in their Houston commercial Banking Group as a Business Development Officer. He was responsible for marketing to the Houston area, calling on companies with revenues up to $500 million. In an office of 17 corporate banking officers, Mr. Smith was solely responsible for over 80% of the office's growth. Prior to joining Tondu Corporation, he held the position of Sales Manager for Gleaby-Marks Leasing, a national fleet leasing company based in Houston. Mr. Smith oversaw the management and growth of a $40 million leased asset portfolio.

He holds a M.B.A. from Southern Methodist University as well as a B.S. in marketing from Trinity University.

Cheryl V. Longuet
Executive Assistant

Ms. Longuet joined Tondu Corporation in September 1994 as an Executive Assistant. Her responsibilities include corporate accounting and cash management as well as the daily operation of the office. In addition, she provides ongoing support to the Partners and Associates of Tondu Corporation. She insures that documents, schedules and itineraries are planned and provided in a timely manner. She coordinates receipt and distribution of needed information and correspondence between internal personnel and outside entities. Ms. Longuet has worked within the administrative and office management field for the past twenty-five years and has a B.S. in education from Louisiana State University.

Jim A. Tondu
Business Development

Mr. Tondu joined Tondu Corporation in 2003 and is in charge of business development activities in Michigan. His responsibilities include acquiring real estate properties for the Northern Lights Project, overseeing the site demolition, requesting proposals, and monitoring the BEAs. He is a liaison for the local community and will be part of the on-site management staff for the Northern Lights Project. Mr. Tondu manages the redevelopment and environmental remediation of the Manistee Drop Forge and General Chemical properties.

Mr. Tondu has over 24 years of construction experience and has successfully managed many challenging projects. He has been involved in the design and managing the construction of many types of jobs including country clubs, office buildings, hotels, and public schools. He has worked with Daverman & Associates, WBDC/Beta Design Group, Dan Vos Construction and the Erhardt Construction Company.

Mr. Tondu received an Associates Degree in Architecture from Ferris State University.

Meagan Bobler-Kempf
Public Affairs Consultant

Ms. Kemp has worked with Tondu Corporation since 2001 and her responsibilities include public relations in the Manistee area, providing representation at Township and County Board meetings, and being a liaison with the press, elected officials, local residents and business people.

Ms. Kempf has worked as a community development consultant for six years, providing services to local and tribal governments, corporations, non-profits, and private developers. Areas of expertise include public relations, brownfield redevelopment, grant writing and administration, survey research, along with housing, industrial and economic development.

Appendix B
Required Permits

1. Air Permit – Agency review time estimated 9 months minimum

2. Stormwater Construction Permit
   - Obtain Soil Erosion & Stream Sedimentation permit from Manistee County Planning Department. – Local agency review time estimate – 1 month after submittal of complete package.
   - Review Permit-by-Rule (Rule 2190 of Part 31 of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended [Act 451])
   - Submit a Notice of Coverage application along with necessary attachments and $125. (This NPDES storm water permit program requires that the soil erosion control measures be under the supervision and control of a certified storm water operator, and that weekly inspections be completed and documented.) – Estimated processing time upon receipt of complete application – 1 month

3. FAA Stack Permit

4. High Voltage Transmission Lake Crossing Permit

5. Special Use Permit - A Special Use Permit modification will be needed from the City of Manistee Planning Commission. This Permit is expected to require only one meeting of the Planning Commission and should be completed in 2005.

6. NPDES Industrial Stormwater Permit – Following completion of the plant, it is necessary to obtain coverage for Michigan's Industrial Storm Water Permit Program. To obtain coverage, a Notice of Intent must be filed with the MDEQ. To obtain coverage, the plant must develop and implement a storm water pollution prevention plan (SWPPP). Once a completed plan is submitted, DEQ processing time is approximately 1-month

7. Process and sanitary wastewater. It is our understanding that the Plant's process and sanitary wastewater will be sent to the City of Manistee wastewater treatment Plant for disposal. Unless there is something usual in the process water, it is unlikely there would be an industrial pre-treatment permit required.

8. Cooling water. Permits will be required for both the water intake and the water that will be discharged directly to Manistee Lake will require a NPDES permit. The permit must be in place before any discharge can begin. – following receipt of a complete application the estimated agency review and public comment period are typically 6 to 9 months

9. Inland Lakes and Streams – MDEQ / Corps of Engineers permit for the dock and seawall reconstruction. Required for any construction, dredging, or filling of any part of a lake or streambed.
   - All activities involving dredge or fill of bottomlands, construction, enlargement, extension, removal, or placement of structures on bottomlands are subject to permitting.
   - Submission Requirements include a completed application form with vicinity map, cross-sectional diagrams, and fee to the Geological and Land Management Division of the MDEQ (copies of the application are provided to the U.S. Army Corps of Engineers, and public notices are sent to the Michigan Department of Community Health, Soil Conservation Service District, County Clerk's office, and other affected divisions and agencies for comment).
   - Procedures – Once approved, the permits are normally valid for 1 year, but may be extended; upon completion of the Project, a final inspection may be made by the MDEQ to certify that applicant has complied with the permit requirements.

10. Pollution Incident Prevention Plan (PIPP) – According to the revised (December 2001) Part 5 Rules of Part 31 of Act 451, a person who uses and/or stores oil, salt (in either solid or liquid form – including sodium, potassium, calcium, and magnesium chlorides) polluting materials included on the significantly expanded list of substances in the Part 5 Rules above threshold management quantities must prepare a PIPP plan to help ensure storage of oil and hazardous materials does not result in an unauthorized release to the environment.

    The plan must be in place at the time a new facility has polluting materials in volumes/weight that meet or exceed the Threshold Management Quantities. PIPPs and Integrated plans are required to be kept at the facility for inspection by MDEQ. Within 30 days of completing or updating the PIPP a written notification of completion or update and certification the facility is in compliance with the Part 5 rules must be submitted to the MDEQ district office – Water Division. In addition, within 30 days of completing the PIPP the local emergency planning committee and local health department must be notified the plan has been prepared.

11. Emergency Response Plan required for "planning facilities" that have an extremely hazardous substance (EHS) on-site in an amount at or above the threshold planning quantity (EPA's list of EHSs in Appendix A of 40 CFR Part 355). This list includes storage of anhydrous ammonia in quantities greater than 10,000 pounds.

12. Spill Prevention Control and Countermeasure Plan (SPCC) – persons who use or store oil in individual above ground storage containers larger than 660 gallons or whose total storage of oil in above ground containers in exceeds 1320 gallons, are required to develop and SPCC plan (40 CFR 112). The total oil volume calculations must also include oil contained within equipment. This may be combined into an integrated PIPP/SPCC plan.

Appendix C
Base Case Model

Appendix D
Development Schedule

NORTHERN LIGHTS PROJECT
INDEPENDENT ENGINEERING REVIEW OF PHASE I PROJECT DEVELOPMENT ACTIVITIES

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This report has been prepared for the use of the client for the specific purposes identified in the report. The conclusions, observations and recommendations contained herein attributed to R. W. Beck, Inc. (R. W. Beck) constitute the opinions of R. W. Beck. To the extent that statements, information and opinions provided by the client or others have been used in the preparation of this report, R. W. Beck has relied upon the same to be accurate, and for which no assurances are intended and no representations or warranties are made. R. W. Beck makes no certification and gives no assurances except as explicitly set forth in this report.

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Section 2
CONCEPTUAL PLANT DESIGN

For a more detailed description of the Project's conceptual design, the reader should refer to the Feasibility Study prepared by Cummins & Barnard dated August 29, 2003 (the "C&B Feasibility Study"). The purpose of this section of our report is to comment on the conceptual design as proposed by Cummins & Barnard and to restate only those features of the design that we believe are important enough to be restated.

2.1 Project Site

R. W. Beck visited the proposed Project Site on July 16, 2003. The 50 acre site includes the existing site of the General Chemical Company facilities (most of which will be demolished) and six other smaller parcels. According to Tondu, options for all parcels have been executed except two of the smaller ones not critical to the Project. Flood plains have not been identified on any of the drawings we have reviewed. However, Tondu states in the Phase I Report that the site is well drained with water level approximately eight feet below surface grade. This is consistent with our observations during our site visit.

The 425 MW coal-fired power plant proposed by Tondu appears to be a good utilization of the proposed 50 acre site. In addition, the layout proposed by Cummins & Barnard for arranging all plant equipment on the site appears to be well thought out.

2.2 Power Plant Design Basis

The Project intends to use Southern Powder River Basin coal from Wyoming. The anticipated fuel spec for this coal is as follows (expressed in percent by weight as received):

	Maximum	Design	Minimum
Total Carbon	54	52	48
Moisture	31	26	25
Oxygen	13.8	11.2	10.6
Ash	8.7	5.5	3.8
Hydrogen	4.1	3.6	3.1
Nitrogen	.98	.75	.43
Sulfur	.65	.30	.12
Chloride	.05	.02	0.0

	Maximum	Design	Minimum
Higher Heating Value (Btu/lb)	9100	8600	8239
Mercury (PPM)	.14	.09	.05
#SO_2 /MMBtu	1.52	.68	.33

This low sulfur, sub-bituminous coal allows the Project to incorporate dry scrubbers to remove sulfur rather than the more expensive, higher maintenance wet scrubbers that are needed for high sulfur eastern coals.

The Cummins & Barnard Feasibility Study also includes design ambient conditions and a design make-up water analysis. Total average make-up water withdrawn from the lake is expected to be approximately 4500 gpm assuming five cycles of concentration in the cooling tower.

The air emissions limits proposed by Tondu in the Project's air permit application currently under review by the MDEQ are as follows:

- SO_2 0.20 lbs/MMBtu (30-day rolling average)
  3,555 tons/yr
  70% removal
- NO_x: 0.15 lbs/MMBtu (24-hour rolling average)
  2,666 tons/yr
- CO: 0.15 lbs/MMBtu (24-hour rolling average)
  2666 tons/yr
- VOC: 0.06 lbs/ton of coal (0.0034 lbs/MMbtu)
  61 tons/yr
- PM10: 0.04 lbs/MMBtu
  711 tons/yr
- Opacity: 10%
- Mercury Removal: no additional equipment proposed

We have not communicated with the regulatory agencies to determine their reaction to these proposed emission limits.

Noise emissions are assumed to be 65 dBA at the site boundary and 85 dBA at three feet for an eight hour exposure.

Limits for wastewater discharged by the Project are expected to be:

- pH: 6 to 9
- Total Suspended Solids: 30 mg/l (monthly average)
  100 mg/l (daily average)
- Oil/grease: 15 mg/l (monthly average)
  20 mg/l (daily average)

Cummins & Barnard based their estimates for the cost of equipment foundations on two existing geotech studies performed on behalf of the current owner of the site (General Chemical Company).

The redundancy criteria used by Cummins & Barnard to establish the capacity of major equipment (pumps, fans, pulverizers, etc.) is reasonable and consistent with current industry practice.

The design basis specified in the Cummins & Barnard Feasibility Study is sufficiently thorough and complete for establishing the conceptual plant design and cost estimate needed at this early stage of Project development.

2.3 Power Plant Conceptual Design

The steam turbine cycle proposed for the Project is a conventional, subcritical, reheat (2400psia/1000F/1000F) cycle with seven stages of feedwater heating. A conventional wet cooling tower heat rejection system is proposed with make-up water coming from Lake Manistee.

A conventional, balanced-draft, pulverized-coal (PC) fired boiler is proposed. Dry scrubbers are proposed for flue gas desulferization which is appropriate for low-sulfur, Powder River Basin coal. Selective catalytic reduction (SCR) with ammonia injection is proposed to control NO_x to 0.15 lbs/MMBtu.

The conceptual design of the Project as proposed by Cummins & Barnard is reasonable and consistent with industry practice.

2.4 Interconnection Facilities

Net Power generated by the Project will be stepped up to 345 kV and transmitted via a 1.8 mile, overhead, line east to interconnect between the Ludington-Keystone leg of the METC/MISO 345 kV transmission grid. The Project may ultimately decide an underground crossing of Lake Manistee is preferred depending on the results of discussions with regulatory and local government officials.

The interconnection facilities, as proposed by Tondu in its Phase I Report, have not yet been finalized but are sufficiently complete to provide a reasonable cost estimate at this early stage of Project development.

2.5 Fuel, Reagent and Water Usage

The Project will use approximately 240 tons/hr (1.9 million tons/yr) of Southern Powder River Basin in Wyoming. Coal transport is described in Section 3.3 of Tondu's Phase I Report. Coal will be delivered to the Project Site via self-unloading Lake Freighters each with a capacity of 12,000 to 14,000 tons. According to Tondu, the shipping season for freighters operating out of the KCBX Terminal in Chicago is March 15 to January 15 (closed 60 days) on average and for freighters using the Superior Terminal is April 1 through December 1 (closed 120 days). Thus, on-site coal storage capacity will be designed for 120 days of full-load coal consumption or approximately 690,000 tons of coal. Coal is reclaimed, crushed to 1.25 inch maximum size, conveyed to four day bins (with a total capacity sufficient to operate the plant at full load for 24 hours), fed to plant pulverizers and pneumatically blown into the boiler through low-NO_x burners.

Based on a coal sulfur content of 0.5% and a $CaCO_3$ content in line of 93%, approximately two tons per hour (15,700 tons/yr) of lime will be consumed at full load operation. Lime will be shipped to the site in enclosed trucks.

At full load operation, the Project will generate approximately 2.5 tons/hr of bottom ash, 4 tons/hr of scrubber ash, and 10 tons/hr of fly ash. Tondu assumes the scrubber ash and fly ash will be taken to a local landfill approximately five miles from the site while the bottom ash will be sold for $6/ton as a concrete additive.

The Project will require 4500 gpm of make-up water from Manistee Lake while operating at full load and will generate 775 gpm of wastewater to be treated and discharged to the City of Manistee's wastewater discharge plant.

3.1 Construction and Development Costs

The Total Project Cost estimated by Tondu is provided below, expressed in escalated dollars (escalated from 2003 to the date expenditures are estimated to occur) in order to result in early 2008 commercial operation date.

Construction Costs	$ x 10^6	
Power plant (inside the fence)	$ 511.1	$1203/kW
Substation	5.0	
Power interconnection	3.0	
Transmission system upgrades	2.5	
Natural gas interconnection	0.5	
Site acquisition	4.6	
Shoreline and sea wall repair	6.5	
Misc. site work	3.0	
Rolling stock	1.6	
Misc. equipment and supplies	0.7	
Spare parts	3.7	
Admin building	1.5	
Railroad relocation	0.5	
Michigan sales tax	1.0	
TOTAL Construction Costs	$545.2	($1283/kW)
Soft (indirect) Costs		
Insurance and bonding	$ 8.0	
Development costs	3.0	
Legal costs	0.5	
Environmental permitting	1.0	
Preliminary engineering	1.5	
Start-up (O&M labor) costs	2.4	
Owner's admin during construction	3.1	

Soft (Indirect) Costs (con't)	$ x 10^6	
Working capital		
▪ Debt (one month)	4.0	
▪ Fuel (one month)	1.2	
▪ O&M costs (45 days)	3.0	
Interest during construction (IDC)	61.0 (1)	
Escalation of misc. costs	1.5	
Owner's contingency and development fee	64.6	
Total Soft Costs	$154.8	($364/kW)
Total Project Cost	$700.0	($1647/kW)
Total Project Cost w/o IDC	$639.0	($1503/kW)

(1) Interest during construction as estimated by Tondu; this has been adjusted for MPPA- specific finance requirements and circumstances below

The cost estimate for the power plant equipment alone ("inside the fence") was developed by Cummins and Barnard as reported in their Feasibility Study dated August 29, 2003. This estimate is based on vendor price quotes for major equipment and includes EPC contractor's insurance, cost escalation, profit margin, and contingency. This estimate does not include an EPC contractor's risk fee which is typically in the vicinity of 5 percent of the EPC contract price and covers the risk to which the EPC contractor is exposed for providing a turnkey wrap around the power plant that lenders will require to finance the Project on a non-recourse basis. Cummins and Barnard will add this EPC risk fee to the total power plant cost in their final feasibility study. However, we believe that the contingency amount included in the Project Cost estimate is sufficient to cover the addition of this EPC risk fee assuming typical amounts for such an item.

Tondu provided estimates for the remaining line items in the above table. Interconnection costs for power and natural gas are lower than most projects of this size with which we are familiar. However, those costs vary significantly from project to project depending on location and site-specific elements. Tondu's cost estimate for the Project's power interconnection cost was developed by Commonwealth Associates as reported in a study of interconnection options dated May 30, 2003. Two options were considered: an underground crossing of the lake which costed out at $4.0 million and an overhead crossing of the lake estimated at $3.2 million. At this time, Tondu believes it is reasonable to assume an overhead line will be acceptable given the zoning and land use around the lake. Since the incremental cost of having to cross under the lake is low compared to the Total Project Cost, this uncertainty does not represent a significant cost overrun risk to the Project.

Transmission system upgrades beyond the interconnection of the Project with the transmission grid have been estimated by Tondu at $2.5 million. This estimate is lower than most other similar projects with which we are familiar, and could be

considerably higher. MPPA should investigate this issue in more detail and pursue interconnection and deliverability study requests in order to better determine the magnitude of the ultimate costs of interconnection and delivery.

The owner's contingency and development fee of $64.6 million represents approximately 9.2 percent of the Total Project Cost, including Tondu's initial estimate of interest during construction, or approximately 10 percent of the Total Project Cost excluding interest during construction. According to Tondu, its expected development fee will be paid from unexpended funds only after the plant begins commercial operation. The magnitude, timing and conditions of the final development fee may still be subject to negotiation. Thus, the full $64.6 million can be considered a contingency from the lender's perspective at this stage of Project development. At financial closing, lenders typically require an owner's contingency of approximately 5 percent of the Total Project Cost which leaves approximately $30 million to cover the EPC contractor's risk fee and other costs that are currently unaccounted for at this early stage of the development process. This should provide a reasonable level of additional contingency sufficient to satisfy funding requirements, as long as 100 percent of any development fees is available for use as a contingency fund until the Project begins commercial operation, and the design basis of the Project does not materially change.

Therefore, for the purpose of developing the Project's Base Case Pro Forma, we believe a Total Project Cost, exclusive of interest during construction, of approximately $640 million ($1505/kW of net capability) is reasonable as long as all development fees are available for contingency funds until the Project begins commercial operation. This observation is contingent upon the final design of the Project being representative of the conceptual design reflected in the Cummins and Barnard Report, and not adversely affected by modifications for items such as more stringent pollution control requirements. It is also contingent on the final costs of transmission system upgrades beyond the interconnection of the Project with the transmission grid being at or below the current estimate of $2.5 million, which could easily be exceeded.

3.2 Financing and Debt Issuance Costs

Tondu's initial estimate for interest during construction was based on a 42-month construction period, an interest rate of 4 percent, and a reinvestment rate of 3 percent. We have adjusted these estimates for circumstances related to MPPA's issuance of tax-exempt debt for its share of the Project, based on recent information and estimates provided by Morgan Stanley.

Total finance requirements for MPPA's tax-exempt portion of the Project were developed based on the following assumptions:

1. A 42-month capitalized interest period, based on a 41 month construction period and financial closing one month prior to the start of construction.
2. Issuance of tax-exempt premium bonds at an average interest rate of 4.80 %.

3. Reinvestment rate on unexpended proceeds of 2.00 percent, and a 42-month construction drawdown schedule as projected by Tondu.
4. Issuance costs equal to 2.00 percent of total bond proceeds.
5. P&I insurance costs equal to 1.45 percent of total bond proceeds.
6. Debt service reserve fund surety bond premium equal to 0.20 percent of total bond proceeds.
7. A 30-year amortization period.

On the basis of these assumptions, the following uses of funds were developed for MPPA's 250 MW share of the Project:

Uses of Funds	$ x 10⁶
Construction Costs	$ 377.1
Interest During Construction	76.5
Cost of Issuance	9.1
P&I Insurance	6.6
Debt Reserve Surety Premium	0.9
MPPA Development Cost Reimbursement	0.5
Investment Income	(14.7)
Total Bond Proceeds	$ 456.0
Annual Debt Service Payment	$ 29.0

On the basis of these assumptions, the total debt-related cost of the Project to MPPA is estimated to be approximately $1825 per kW of net capability, with an annual debt service expense of approximately $116 per kW of net capability.

3.3 Potential Environmental Costs

As discussed more fully in Section 6 of this Report, we have reviewed the impact of adding a control system for the removal of mercury in the event that such a system is required. The mercury regulations are still in a state of flux and as such there is no clear definition as to the emission levels that must be achieved. However, based on adding a carbon injection system to the facility, we suggest that a planning level estimate of $2.5 - $3.0 million of associated capital costs can be expected. We have included this possibility as a sensitivity case in our Projected Operating Results based on an additional capital requirement of $3.0 million in the total Project cost.

It should be noted that presently, there are no full-scale carbon injection systems in operation on commercial coal-fired power plants with which we are familiar. The ultimate equipment requirements and capital costs associated with mercury removal requirements could potentially be higher than the above estimate.

Section 4
PROJECT IMPLEMENTATION SCHEDULE

The project development schedule in Appendix D to Tondu's Phase I Report estimates the following major development milestones.

Milestone	Estimated Date
Submit Air Permit Application	9/03
Approve Draft Air Permit	2/1/04
Approve Final Air Permit	5/26/04
Execute Interconnection Agreement	6/1/04
Financial Closing	8/2/04
Execute EPC Agreement	8/30/04

Typically for a large, coal-fired power plant like the Project we would expect the air permit application and approval process to be on the critical path of the development schedule. Tondu's estimate in Section 11.0 of its report is that the Final Air Permit will be issued within nine to 12 months of the application being submitted to the MDEQ, which occurred on September 10, 2003. This estimate would indicate an approval date for the Final Air Permit some time in the July to September, 2004 time frame.

Normally we would agree that a nine to 12 month duration to obtain an approved Final Air Permit would be a reasonable estimate for this Project. However, the permit application and review process has not progressed far enough along for us to know or project with any certainty how long the total process might take, and we have not reviewed the results of any air modeling. Also, the regulatory environment is uncertain, and additional inputs and data will likely be required. For example, the uncertainty surrounding how state and federal environmental regulatory agencies will ultimately limit mercury emissions from new coal-fired plants, and specifically how the MDEQ will limit mercury emissions from the Project, make it very difficult to predict a date when the Final Air Permit will be approved. In addition, since the Project's air permit application proposed a mercury removal of just 25% using conventional flue gas cleaning equipment, the negotiating process to arrive at a limit acceptable to both the MDEQ and the Project might extend the air permit approval date even further.

Since we have not communicated with anyone from the MDEQ about this Project, it is very difficult for R. W. Beck to estimate a specific date for receipt of a final air

permit. However, we would not be surprised if such a date extended beyond the 12 month duration (September, 2004).

Cummins & Barnard estimates a 41 month EPC duration from the date the Project achieves financial closing to the date the Project passes all required performance testing and achieves commercial operation. This estimate is contingent upon the EPC contractor receiving a Limited Notice to Proceed three months prior to financial closing to begin detailed design and procurement of major equipment on the EPC critical path schedule. This 41 month schedule is also contingent upon the majority of required site demolition and preparation work being complete prior to the issuance of Final Notice to Proceed to the EPC Contractor. This estimate for EPC duration is reasonable and consistent with other similar projects with which we are familiar, but contingent, of course, upon no force majeure or other events that would extend or delay the EPC schedule.

We therefore conclude that the construction schedule estimated by Cummins & Barnard is realistic. Provided the final air permit is received by September, 2004, and the remaining stages of Project development proceed in a timely fashion according to the schedule provided in the Cummins & Barnard Report relative to the scheduled receipt of a final Air Permit, the commercial operation date of the Project should be able to occur prior to the peak summer season in 2008.

5.1 Net Plant Capacity and Heat Rate

The estimates for average annual net plant capacity and heat rate used in the Base Case Projected Operating Results provided in Appendix C to Tondu's Phase I Report dated 9/2/03 are 425 MW and 9,544 Btu/kWh on a higher heating value (HHV) basis. At this stage of the Project, there are no EPC contractor guarantees for net plant capacity and heat rate. However, according to an e-mail received from Cummins & Barnard, their conceptual plant design and associated cost estimate are based on a conservative sizing of the boiler island to make sure the plant would not be boiler-limited. That is, the boiler island is sized to support the Project's steam turbine operating at valves wide open (VWO), 5% over pressure, with an additional allowance of 2% on heat input to the boiler to account for future steam turbine degradation. This is a reasonable boiler sizing criteria for a conceptual plant design. An explanation of this sizing criteria will be added to Cummins & Barnard's Final Feasibility Study.

Cummins & Barnard assumed a gross turbine generator output of 465 MW. According to a heat balance included in the Feasibility Study run at VWO, rated pressure, 70 F, 60% relative humidity, and using design coal, the plant would perform as follows:

Gross output	451,033 kW
Auxiliary power	27,936 kW (6.2% of gross)
Net power	423,097 kW
Net plant heat rate	9,544 Btu/kWh (HHV)

The primary purpose of this heat balance calculation was to calculate net station heat rate. Thus, it is not important that the plant is not generating 425 MW net as modeled in the Base Case Projected Operating Results since the plant design and cost estimate are based on a 465 MW gross steam turbine output. However, what is important is the estimate for auxiliary power consumption and the net station heat rate. The estimate for auxiliary power of 6.2% of gross output appears low for a PC-fired power plant. The net plant heat rate (NPHR) calculation of 9544 Btu/kWh (HHV) appears reasonable for this power cycle and boiler (assuming the auxiliary power assumption is reasonable) for the "best-expected" value of NPHR while the steam turbine is operated at full load in the new and clean condition. However, for the purpose of

modeling plant performance in the Base Case Pro Forma, we recommend increasing NPHR to 10,000 Btu/kWh (HHV) to account for the following:

- the difference between expected and guaranteed NPHR (Base Case Projected Operating Results done for Project lenders are typically based on guaranteed performance, not expected performance)
- the average annual performance degradation of the steam turbine
- additional fuel consumed during start-up and part-load operation

Also, if the estimate for the "guaranteed" auxiliary power consumption increases, the NPHR estimate will need to be increased accordingly.

5.2 Project Availability and Capacity Factor

The Base Case Pro Forma contained in Tondu's Phase I Report dated September 2, 2003 estimates the Project's capacity factor to be 85% in the first year, 90% in all "Normal Years" and 85% in "Major Maintenance Years". R. W. Beck has not evaluated how the Project will be ultimately dispatched and utilized by MPPA or the other Project participants. However, the redundancy criteria used by Cummins & Barnard to establish the capacity of major auxiliary equipment is reasonable and consistent with current industry practice, and if the Project is base-loaded whenever available, these estimates for plant availability capacity factor are reasonable and should be achievable provided the Project is properly designed, constructed and operated.

5.3 Fuel Costs

Southern Powder River Basin coal will be the design fuel for the Project. Based on Tondu's fuel procurement plans, fuel will be delivered by rail over one of two possible routes, to either the Chicago or Duluth terminal, and further transported to the Project via lake freighters. Because of the availability to multiple fuel providers, two alternate rail paths from the source to the Great Lakes, multiple shipping providers, and the resulting competitive environment for fuel supply and delivery, the availability and pricing of fuel for the Project are expected to be adequate for its intended purpose.

Fuel consumption has been based on a capacity factor as described above, a heat rate of 10,000 Btu/kWh, and a heating value of the coal of 8,800 Btu/lb of coal. Western PRB coal will be supplied to the Project via rail to the Chicago KCBX Terminal. From there the coal will be transloaded to lake freighters and then delivered to the Plant Site. Tondu has estimated the Mine Mouth cost of the coal to be $6.25/ton in 2004 dollars, escalating at 1% annually based on industry trends.

Transportation and handling costs are expected to rise with inflation at 2.5% and include estimates for 2004 of $11/ton rail transport to the KCBX Terminal, $2/ton for transloading, and $2.5/ton for Great Lakes shipping to the Plant. Under these assumptions, the delivered price of coal in 2008 is projected by Tondu to be $23.60 per ton in 2008, or $1.34 per MMBtu, based on discussions with fuel production and

transportation providers, and on experience at the neighboring Filer City facility. These estimates appear reasonable and comparable to other similar projects with which we are familiar.

Additional variable coal handling costs consisting of fuel, maintenance and other operating costs associated with Plant Site coal handling are projected by Tondu to be $37/hr in 2004 dollars.

5.4 Non-Fuel Operations and Maintenance Costs

Tondu developed the following projections for operating and maintenance costs as reported in the Phase I Report dated September 2, 2003:

Production-Related O&M Costs	Annual O&M Cost (2008 $ x 10^3)
■ Variable O&M	
On-site coal handling	$570
NO_x catalyst replacement	1273
Ammonia	503
Lime	1306
Baghouse bags	436
SO_2 allowances	469
NO_x allowances (1)	0
Water treatment chemicals	300
Wastewater treatment	67
Ash Handling and disposal	1642
Ash sales	(134)
Subtotal	$6432
■ Fixed O&M	
Direct labor	2698
Indirect labor	1100
Plant expenses	671
Capital expenditures	400
Annual maintenance	2100
Major maintenance escrow	900
Subtotal	$8067
■ Total Production-Related O&M Costs in 2008	

Annual cost	$14,499/yr
Unit cost	$4.30/MWh
Owner-Related O&M Costs	
Community service payment	$400
Property taxes	0
Admin and management expenses	325
Insurance	2827
Coal line of credit	172
Transmission fee	0
Wheeling fee	0
Operator's fee	0
Subtotal	$3724
Total O&M Costs	$18,223/yr
	$5.44/MWh

1) According to Tondu, the Project is located outside the boundary subject to the EPA SIP Call and Section 126 requirements, thus not requiring the project to provide allowances to cover its NOx emissions

The estimate for total production-related O&M costs of $14.5 million/yr in 2008 (or $4.30/MWh) is low compared to similar coal-fired power plants with which R. W. Beck is familiar. For the purpose of modeling the Project's Projected Operating Results, we recommend adding 20 percent to the Production-Related O&M Costs. In the development of our Base Case Projected Operating Results Model, we have simply increased all production-related O&M costs by this recommended 20 percent rather than allocate the increased dollar amount to specific categories.

Owner-related O&M costs are project specific and therefore cannot generally be compared to other projects. R. W. Beck is not qualified to comment on the estimates for property taxes or insurance. However, the estimate for annual insurance costs was provided to Tondu by Marsh & McLennan, a specialist in this field.

Annual property tax payments, or payments in lieu of property taxes, could increase the annual operating expenses of the Project considerably. According to Tondu, its attorney believes the way the Project will be structural will allow the Project to avoid local property taxes entirely, although a $400,000 per year Community Service Payment has been assumed in the development of the Base Case Projected Operating Results. We cannot comment on this issue, but suggest that MPPA investigate this matter further, and seek to obtain a written opinion from legal counsel on this matter as soon as possible. Every $1 million in property taxes or payments in lieu of property taxes imposed on the Project will increase the busbar cost of the Project by approximately $0.30 per MWh, or just under 1 percent in 2008 dollars.

5.5 Transmission Expenses

We have not investigated any transmission system upgrades or wheeling expenses applicable for the delivery of Project capacity and energy to any of the Project participants, nor have we been provided with any studies conducted by the ultimate transmission providers for power and energy delivery to the Project participants. MPPA should investigate this issue separately to better determine the actual delivered costs of Project power.

5.6 Potential Environmental Costs

As discussed more fully in Section 6 of this Report, we have reviewed the impact of adding a control system for the removal of mercury in the event that such a system is required. The mercury regulations are still in a state of flux and as such there is no clear definition as to the emission levels that must be achieved. However, based on adding a carbon injection system to the facility, we suggest that a planning level estimate of an additional $1.2 million in annual O&M costs be included in the Project's annual operations and maintenance expenses. We have included this possibility as a sensitivity case in our Projected Operating Results.

It should be noted that presently, there are no full-scale carbon injection systems in operation on commercial coal-fired power plants with which we are familiar. The ultimate equipment requirements and operations and maintenance costs associated with mercury removal requirements could potentially be higher than the above estimate.

5.7 Financing and Debt Issuance Costs

Total finance requirements for MPPA's tax-exempt portion of the Project were developed based on the following assumptions:

1. A 42-month capitalized interest period, based on a 41 month construction period and financial closing one month prior to the start of construction.
2. Issuance of tax-exempt premium bonds at an average interest rate of 4.80 percent.
3. Reinvestment rate on unexpended proceeds of 2.00 percent, and a 42-month construction drawdown schedule as projected by Tondu.
4. Issuance costs equal to 2.00 percent of total bond proceeds.
5. P&I insurance costs equal to 1.45 percent of total bond proceeds.
6. Debt service reserve fund surety bond premium equal to 0.20 percent of total bond proceeds.
7. A 30-year amortization period.

On the basis of these assumptions, the following uses of funds were developed for MPPA's 250 MW share of the Project:

	$ x 10^6
Construction Costs	$ 377.1
Interest During Construction	76.5
Cost of Issuance	9.1
P&I Insurance	6.6
Debt Reserve Surety Premium	0.9
MPPA Development Cost Reimbursement	0.5
Investment Income	(14.7)
Total Bond Proceeds	$ 456.0
Annual Debt Service Payment	$ 29.0

The total debt-related cost of the Project to MPPA is estimated to be approximately $1825 per kW of net capability, with an annual debt service expense of approximately $116 per kW of net capability.

It should be noted that these financing requirements and interest rates were provided to us by Morgan Stanley, and represent their determination of today's market environment, interest rates and finance structure (including insurance and reserve fund requirements) applicable to MPPA. The ultimate interest rates and finance requirements could be considerably different once MPPA actually would be in a position to fund its share of the Project. MPPA should investigate this matter in more detail with its appropriate financial advisors.

5.8 Base Case Projected Operating Results

Based on the projected operation of the Project and operating and maintenance cost information provided by Tondu, we have estimated the projected busbar cost of power from the Project including capital costs. On the basis of the studies, analyses, and review of the Project and the assumptions set forth in this Report, we are of the opinion that, for the Base Case Projected Operating Results, the projected 2008 fixed operating costs from the Project will be approximately $36.1 per kW-year and 2008 variable costs will be approximately $15.4 per MWh. Annual debt service is projected to be approximately $29 million for a total power cost of $35.8 per MWh in 2008, and $35.2 per MWh in 2009. The projected busbar cost of power for the term of the Projected Operating Results is presented in Exhibit 5-1 for the entire Plant capability. Debt-related Charges are reflective of MPPA's (including MSCPA) portion of the Project only.

5.9 Sensitivity Cases

Due to uncertainties necessarily inherent in relying on assumptions and projections, it should be anticipated that certain circumstances and events may differ from those assumed and described herein and that such circumstances may affect the results of our Base Case Projected Operating Results. In order to demonstrate the impact of certain circumstances on the Base Case Projected Operating Results, a number of sensitivity analyses were developed. It should be noted that other examples could have been considered, and those presented here are not intended to reflect the full extent of possible impacts on the Facility. The sensitivities are not presented in any particular order with regard to the likelihood of any case actually occurring. In addition, no assurance can be given that all relevant sensitivities have been presented, that the level of each sensitivity is the appropriate level for testing purposes, or that only one (rather than a combination of more than one) of such variations or sensitivities could impact the Facility in the future.

These sensitivity analyses present the Projected Operating Results assuming, respectively, that: (a) the fuel commodity cost will be 25 percent higher than that assumed in the Base Case; (b) the average annual availability and annual capacity factor will be 5 percent lower than that assumed in the Base Case; (c) a mercury control system is required in the initial Plant design, incorporating additional capital and operating costs above those included in the Base Case; (d) the average annual heat rate achieved by the Facility will be approximately 5 percent higher than that assumed in the Base Case; (e) all non-fuel and non-fuel-transportation operating expenses will be 10 percent higher than those assumed in the Base Case; (f) the general rate of inflation is increased to 5.0 percent per year; and (g) the tax-exempt bond interest rate is increased to 5.8 percent (this sensitivity is also indicative of an approximate 12 percent increase in Project construction cost).

A summary of the busbar Power Supply Costs for the Base Case Projected Operating Results and each sensitivity case is presented in the following table, and are shown in detail in the following Exhibits 5-2 through 5-8.

Projected Busbar Power Supply Costs

		Sensitivity Cases						
		A	B	C	D	E	F	G
Year Ending Dec 31,	Base Case	Increased Fuel Price	Reduced Availability	Mercury Controls Added	Increased Heat Rate	Increased Operating Expenses	Increased Inflation	Increased Interest Rate
2008	35.8	36.8	37.1	36.3	36.6	36.5	37.3	37.7
2009	35.2	36.1	36.3	35.7	35.9	35.8	37.1	36.9
2010	35.6	36.6	36.7	36.1	36.4	36.3	38.0	37.4
2011	36.1	37.0	37.2	36.6	36.9	36.8	39.0	37.8
2012	36.6	37.5	37.7	37.1	37.4	37.3	40.1	38.3
2017	39.1	40.1	40.3	39.7	40.0	39.9	46.1	40.9
2022	42.0	43.1	43.2	42.6	43.0	42.9	53.8	43.7
2027	45.3	46.4	46.5	46.0	46.3	46.3	63.5	47.0
2032	50.3	51.4	51.8	51.1	51.5	51.5	77.7	52.1

Section 6
ENVIRONMENTAL CONSIDERATIONS

We have reviewed the Permit to Install Application for One (1) 425 MW, Coal Fired Utility Power Plant, Northern Lights Project, Draft August 4, 2003. The application includes information on the boiler characteristics, applicable regulations, Best Available Control Technology Evaluation ("BACT"), emission levels proposed by Tondu, and brief sections on additional impact analysis and proposed monitoring/recordkeeping/reporting requirements.

We note that the key section of air quality impact analysis was not completed at the time of the draft report and as such was not included in the application. The air quality analysis is based on air quality modeling and is intended to identify compliance with a number of ambient air quality standards.

Our approach to reviewing the application focused on whether the applicant has proposed technologies and emission limits comparable to recent similar projects to assure that project costs include likely technologies to be required. We did not review the application from the viewpoint of whether it incorporates information on each and every issue the regulators might raise. It is typical and customary for regulatory agencies to request additional information as the application is being reviewed by them. We anticipate that this will be the case with this application.

The project as defined by the applicant generally includes the types of technologies that are likely to be mandated by the MDEQ. A dry scrubber-baghouse combination is proposed for the control of sulfur dioxide ("SO_2") and a Selective Catalytic Reduction ("SCR") system is proposed for the control of nitrogen oxides ("NO_x") emissions. Low-NO_x burners are also proposed in combination with the SCR for the control of NO_x. A system for the control of mercury is not proposed since the regulations are still in development.

Also, a system for the removal of aerosol pollutants, primarily sulfuric acid mist, is not included in the proposal. Certain recently permitted projects have included a wet electrostatic precipitator to control sulfuric acid mist emissions. Given the fact that the project will utilize low sulfur Wyoming fuel, it is reasonable to expect, but not certain, that a wet electrostatic precipitator will not be required. This is contingent upon the air quality modeling not demonstrating any issues or concerns with meeting ambient air quality standards and particularly not impairing visibility in sensitive receptor areas.

The project proponent proposed an emission limit of 0.15 lb/MMBtu for NO_x and 0.2 lb/MMBtu for SO_2. While these limits meet the New Source Performance Standards, other projects recently permitted have been subjected to lower emission limits. Emission limits at or below 0.1 lb/MMBtu have been imposed on projects. As long as the project keeps flexibility in their planning relative to design and addresses

somewhat potentially higher capital and O&M costs associated with lower emission limits, such lower limits can be achieved in practice. It is typical for a project to propose higher permit limits in the permit application than what actually is included in the final permit issued. In essence, it becomes a negotiation between the project proponent and the regulatory agency.

We have also reviewed the impact of adding a control system for the removal of mercury in the event that such a system is required. The mercury regulations are still in a state of flux and as such there is no clear definition as to the emission levels that must be achieved. However, based on adding a carbon injection system to the facility, a planning level estimate of $2.5 - $3.0 million of capital cost and $1.2 million annual operations and maintenance costs may be prudent to be included in the cost sensitivity evaluations, which we have done in Section 5 of this Report. It should be noted that presently, there are no full-scale carbon injection systems in operation on commercial coal-fired power plants with which we are familiar. . The ultimate equipment requirements and capital costs associated with mercury removal requirements could potentially be higher than the above estimate.

In reviewing the information included in the application on ammonia usage for the SCR and waste disposal needs associated with the dry scrubber, we find that the usage rate of ammonia and the tonnage of scrubber wastes to be disposed of may be somewhat underestimated. We estimate an ammonia use rate of approximately 400 lb/hour vs. a 210 lb/hr estimate in the application. However, in the Project Pro Forma projections, ammonia usage was increased, and the total estimated costs for ammonia are considered reasonable for the projected emissions levels in the permit application.

In addition, we estimate approximately 36,000 lb/hour of fly ash and scrubber wastes vs. a 28,683 lb/hour estimate in the permit application.

In summary, based on our review of the application, we find that:

1. The project has incorporated the key technologies of an SCR along with low-NO_x burners for the control of NO_x emissions.
2. The project has incorporated a dry scrubber-baghouse combination for the control of SO_2 emissions.
3. The proposed limits for NO_x and SO_2 in the application are higher than other similar projects recently permitted. Should lower limits be set forth in the permit, the capital and operations and maintenance costs could be higher than presently contemplated. We believe that the adjustments made to the Project's total operations and maintenance costs in the Base Case Projected Operating Results have accommodated this observation for increased operating costs, but not for any potential increases in capital cost.
4. Waste disposal needs for the project may be underestimated in terms of O&M costs. We believe that the adjustments made to the Project's total annual operations and maintenance costs in the Base Case Projected Operating Results have accommodated this observation.
5. The air quality modeling analysis for the project has not been completed as of the date of this Report. This analysis is a critical part of the permit application

and the permitting process. Emission limits and control requirements may be impacted as a result of the analysis, and as mentioned, initial capital and annual operations and maintenance costs could increase.

6. Should a mercury control system be required in the future, an estimate of $2.5 million of capital costs and $1.2 million per year additional operations and maintenance costs is prudent to anticipate for an activated carbon injection system.

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PROJECT SUPPORT AND OPPOSITION

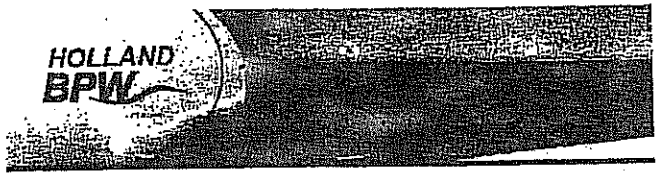
According to Tondu, the Project has been viewed favorably by local government officials primarily since it utilizes what would soon become a vacant lot once the General Chemical Company closes its doors. In addition, the introduction of additional jobs to the local economy is a favorable impact.

According to Tondu's attorney, the current ownership structure will not require the Project to pay property taxes. However, Tondu has included in its operating budget a $400,000 annual "community support payment" which is more than twice as much as General Chemical has been paying in property taxes. Tondu does not intend to discuss this issue with the local government officials until the MPPA and MSCPA have finalized their agreement with Tondu.

Neighbors have expressed concern about ash disposal truck traffic but Tondu thinks that a workable solution can be found. The Native American community asked about the impact on fishing in Manistee Lake and Tondu's response has been that the quality of water in the lake should improve since runoff that is now flowing into the lake will be collected and treated according to state regulatory requirements.

To date, neither the regional nor the national environmental groups have opposed the Project. However, typically, these groups don't get involved until the air permit application is released for public comment.

We recommend MPPA and MSCPA closely monitor both support for and opposition to the Project as the Project develops.



Holland Board of Public Works

James De Young Plant

CFB Boiler/Steam Turbine Expansion

C&B Project 4540.00
May 30th, 2003

CUMMINS & BARNARD, INC.
CONSULTING ENGINEERS / SINCE 1932

EXECUTIVE SUMMARY

The James DeYoung (JDY) Plant is located in Holland, Michigan at the far eastern end of Lake Macatawa. Units 1 & 2 are decommissioned. Units 3, 4, and 5 currently produce just over 60 MW. In previous correspondence, C&B looked at repowering these units with a new CFB steam generator and a topping turbine. That concept is not part of this study.

This study considers a base case of installing a new CFB steam generator, condensing steam turbine generator, mechanical draft cooling tower, and other required balance of plant and environmental equipment to generate a net 60 MW of new power. An optional case for sizing the steam generator to provide enough steam to run the existing Unit 3 steam turbine generator in addition to a new 60 MW net steam turbine generator was also considered.

There are also two side options included herein: one to include an investigation of the feasibility for a deep water intake system, and the second to investigate burning municipal wastewater sewage sludge cake, chipped wood, or chipped tires to the quantities available in the City of Holland constraints.

Space Requirements of New Plant

The base and option cases will fit within the existing site. The existing Units 1 and 2 steam turbine area has adequate room to fit the new steam turbine generator, condenser, and associated equipment and skids. The CFB steam generator and associated equipment would use the Units 1, 2 and 3 boiler areas. The boiler from Unit 3 would be removed in order to optimize the site arrangement. The south wall would be extended to make room for the necessary auxiliary equipment.

The baghouse, ID fans, and stack would extend west from the existing boiler building with room for a new ash storage silo, water storage tank, and continuous emissions monitoring equipment. Fuel handling would use the existing coal conveyor and coal pile area. If a new conveyor and fuel pile are required, there is adequate space available on the site.

A new, 7000 square foot, one story building to house administration will be located at the current switchyard location on the east side of the plant. The existing plant building will be extended to accommodate turbine pull space for the new steam turbine generator. Space for a new maintenance shop with turbine lay down space will also be incorporated into this building addition. The existing crane rails will also be extended from the existing building into the new maintenance shop addition. The new high voltage switching will be placed with the rest of the plant's switchyard at the corner of Pine and Third.

Project Capital Cost Estimate

The approach used to estimate the total cost of the project, not including operating and maintenance costs, was to solicit budget quotations for a CFB steam generator and steam turbine generator based on performance specifications. The balance of plant equipment was estimated based on phone quotations and past experience. Labor was estimated based on assumed merit

shop participation. The constructed cost of the project is $95,390,00 plus soft costs for a total installed, financed cost of $99,190,000. Installation costs are based on retrofit of an existing plant and typical problems/costs that are encountered on such a project have been incorporated into the estimate.

Performance of New Plant

Plant net heat rates were calculated based on the boiler vendor supplied information with high sulfur coal. They are shown in Table 1 below.

Table 1. Plant Net Heat Rates with High Sulfur Coal

	100 % Load		60 % Load	
Plant Net Heat Rate BTU/kWh (HHV)	Average Ambient	Summer Ambient	Average Ambient	Summer Ambient
Base Case	10,740	10,815	11,048	11,173
Option Case	11,349	11,415	11,209	11,334

Plant net heat rates were also calculated for low sulfur fuels for only 100% loads with average ambient conditions. They are shown in Table 2.

Table 2. Plant Net Heat Rates of Low Sulfur coal vs. High Sulfur Coal

	100 % Load, Average Ambient Conditions	
Plant Net Heat Rate BTU/kWh (HHV)	High Sulfur Coal	Low Sulfur Coal
Base Case	10,741	10,662
Option Case	11,349	11,267

The heat rates improved slightly for the lower sulfur coal due to less limestone consumption, which results in slightly better boiler performance.

Cost of Generation

The estimated variable cost of generation for the base case has been calculated to be $25.95/MWhr on high sulfur coal and $19.53/MWhr on low sulfur coal. The total cost of generation for the base case is $43.88/MWhr on high sulfur coal and $37.45/MWhr on low sulfur coal.

Sludge

The ability of the CFB boiler to burn sludge from the City of Holland Waste Water Treatment Plant was reviewed by C&B. An analysis of the sludge regarding carbon content and heating value could not be obtained, however, C&B used some information from past experience as a basis for a portion of the review.

All of the boiler suppliers indicated that for the amount of sludge proposed to be burned, roughly 10 tons per day, the boiler sizing would not be affected. The additional project costs associated with burning the fuel is the addition of the sludge storage silo and any necessary pumping equipment and dispersion equipment. Tire and wood chips would be fed directly onto the coal belt feeders.

Due to the small amount of sludge being introduced into the boiler, roughly 10 tons per day, no negative emission issues are expected. The tire and wood chips being limited to no more than 10% of the total heat input would likewise have no negative emission issues.

Deep Water Intake

Lake Macatawa is fed from a river that provides little flow in the summer months. The result is a lake that has limited ability to flush itself compared to its use and size. It has been thought that pumping fresh water from Lake Michigan through the JDY Plant's circulating water system and back into Lake Macatawa would improve the water quality of the lake.

As a basis for a cost estimate, C&B determined the amount of water to be pumped would be 65,000 gpm and would be delivered with two 100% capacity, 2000 hp circulating water pumps.

The suction and discharge piping would be buried. The suction piping would extend roughly 3000 feet into Lake Michigan to avoid ice ridges and would be installed deep enough to gain protection of the Lake Michigan ice formations in the winter. The 29,000 feet of discharge piping would be buried in the bottom of Lake Macatawa up to a new pump house intake at the JDY plant.

Installing a deep water intake system to supply water for steam condensing and to help flush Lake Macatawa, will cost between $30,000,000 and $45,000,000.

Recommendations

C&B recommends that the City of Holland commission a preliminary engineering effort to further define the project. The scope of the preliminary engineering effort includes at a minimum:

- Finalizing the heat cycle of the proposed plant.
- Completing 30% of the engineering design of the proposed plant in support of the estimate.
- Performing an electrical interconnection study for the high voltage system.
- Performing a study of the re-use of existing foundations.
- Selecting the design fuels for the CFB boiler including definition of future alternate fuels such as waste water treatment sludge, wood chips, and tire chips.
- Preliminary engineering required to incorporate the snow melt system into the new cycle.
- Soliciting bids and selecting a CFB boiler and steam turbine supplier.

- Preparing a final budget for the project.
- Starting the environmental permitting process.

The above tasks will be critical to execution of the project, the approval process, and permitting. Further, completing engineering to the 30% level will better define the cost and substantially reduce the probability of cost exceedence.

November 7, 2003

Mr. David G. Koster
Power Resources Director
Holland Board of Public Works
64 Pine Avenue
Holland, Michigan 49423

Dear Mr. Koster:

Subject: Limited Review of CFB Unit Installation

Introduction

The Holland Board of Public Works ("Holland") is reviewing options regarding the acquisition of additional baseload power supply resources to serve the City's increasing demand and energy requirements. R. W. Beck, Inc. was retained by Holland to assist in defining assumptions necessary to develop planning-level power supply cost estimates, reviewing assumptions, costs and prices of resource options developed by others, and reviewing in-house work products developed for the evaluation of various options.

One option under consideration is the addition of a 60 to 70 MW net circulating fluidized bed ("CFB") boiler to the James De Young Power Plant (the "Project"). Holland retained Cummins and Barnard, Inc. ("Cummins & Barnard"), to develop a conceptual plant design, capital cost estimate and construction schedule for the Project. The results of Cummins & Barnard's work to date are summarized in their Report dated May 30, 2003. The scope of our limited review was to analyze the cost and schedule projected in the Cummins & Barnard report for consistency with other similar projects and industry trends and to develop reasonable assumptions for comparison of the Project to other options. It should be emphasized that Beck did not conduct a detailed or independent review of the Project or any of its specific elements, as would be normally recommended before a final decision is made to implement the development and construction of the Project. Rather, we made certain adjustments to the Cummins & Barnard results to bring the assumptions more in line with other similar developments, and summarized key observations of Project implementation issues that we believe would warrant further review should Holland decide to proceed with the Project.

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Conceptual Project Design

For a more detailed description of the Project's conceptual design, the reader should refer to the Cummins & Barnard Report. The purpose of this report is to comment on the conceptual design as proposed by Cummins & Barnard and to restate only those features of the design that we believe are important enough to be restated.

The Project under review consists of the installation of a new 70 MW CFB steam generator, 60 MW steam turbine, cooling tower and necessary auxiliary equipment, and using the excess steam capability to operate the existing 10 MW steam turbine from Unit 3. The Project would be added to the space currently occupied by the retired Units 1 and 2, and the space currently occupied by the boiler of Unit 3, all of which would be removed. The existing plant building would be extended to accommodate the new equipment. R. W. Beck visited the De Young Plant in May, 2003, and reviewed the location and discussed the Project with plant personnel. We believe the Project will fit in the identified space, although space will likely be tight, and construction may be impacted by the limited area and necessary modifications to the Plant to accommodate the space and operational requirements of the Project. We are uncertain what affect these elements will have on Project cost and operation.

The Project would likely utilize low sulfur western bituminous coal from Colorado, as recommended by Cummins and Barnard, of similar quality to what is now being blended with Midwest coal for use in the existing units. Heat content is approximately 11,500 Btu/lb and sulfur content is approximately 0.50 percent. The existing fuel handling system would be either modified or replaced with a new system necessary to handle the roughly doubling of fuel handling capability over current operations. The Project will use approximately 25-30 tons per hour of fuel and 9-10 tons per hour of limestone. Fuel delivery would be the same as current western fuel sources.

Based on discussions with Holland personnel, it was agreed that the results of the Cummins & Barnard study would be adjusted for the purpose of our review to incorporate a larger 70 MW steam turbine and forgo utilization of the existing Unit 3 turbine, for economic and enhanced performance benefits.

A selective non-catalytic reduction system and a baghouse would be included on the CFB boiler for emissions control and partial mercury removal. Because of the CFB boiler design, limestone is injected into the boiler, thereby precluding the need for a scrubber for SO_2 removal. Proposed emissions limits are 0.20 lbs/MMBtu for SO_2 and

0.10 lb/MMBtu for NO_x and CO. No specific additional equipment is proposed for mercury removal. We have not communicated with the regulatory agencies to determine their reaction to these proposed emission limits.

The design basis specified in the Cummins & Barnard Report appears sufficiently thorough and complete for establishing the conceptual plant design and cost estimate needed at this early stage of Project development.

Estimated Project Costs

The Total Project Cost estimated by Cummins & Barnard was $95,390,000, in present day dollars. This estimate was based on a number of vendor quotes and bids for the major Project equipment, and was based on a traditional engineering and contracting methodology that has been used by Holland in the construction of past power generation projects. We have assumed that this approach would be adopted by Holland should the Project be implemented. An EPC approach to Project construction would "likely add 10-15 percent to the current estimate" according to Cummins & Barnard.

The Cummins & Barnard Project cost estimate excluded interest during construction and any financing fees, and we understand, also excluded various owners costs related to personnel, development expenses, start-up operations, etc. The estimate is also based on a contingency level that, according to Cummins & Barnard, is sufficient to provide a 20 percent probability that the estimate would not be exceeded by 10 percent. Further engineering efforts would be necessary to refine the estimate to a more precise level.

Because of the uncertainties and concerns regarding existing unit demolition, the tight space availability at the De Young Plant, and general concerns about installations of small units at existing locations, we have adjusted the Cummins & Barnard estimate to increase the Project contingency level by 5 percent of total Project costs (approximately $5.5 million), which we believe is a more reasonable for Holland's intended purpose at this stage of Project development.

We further adjusted the base Cummins & Barnard cost estimate noted above to account for the addition of the following cost items:

1. $3.5 million for spare parts and project management and development expenses (as estimated by Cummins & Barnard).
2. $2.5 million for the increased steam turbine size from 60 to 70 MW, as noted above.
3. $.5 million for added contingency for the increase fuel storage and handling systems necessary.
4. Approximately $7.5 million in escalation to bring the revised cost estimate to in-service date dollars.
5. Approximately $2.5 million for items such as initial fuel and reactant supply, and Holland's projected costs for legal and insurance requirements, project management and other outside advisors.

On the basis of these adjustments, we suggest a revised Project capital cost of around $117 million ($1,675 per kW) would be more realistic as an input assumption to Holland's analysis of resource alternatives. It should be noted that because of the early nature of Project development, the very limited number of comparable installations, and the uncertainty involved with the eventual design and construction methodology selected, demolition and disposal requirements and the relatively limited space, this estimate could easily increase by a considerable amount.

Our initial reaction to this revised cost estimate is that it appears reasonable, but again, there are limited comparable installations on which to base this judgment, and given the specific requirements at the De Young site, could eventually be higher. Additional engineering efforts would be necessary to refine this observation.

Estimated Project Financing Costs

We developed an estimate of total Project finance costs to Holland, based on recent information provided by Morgan Stanley relative to the Northern Lights financing by MPPA. Total finance requirements for Holland's tax-exempt financing of the Project were developed based on the following assumptions:

1. A 36-month capitalized interest period.
2. Issuance of tax-exempt premium bonds at an average interest rate of 4.75 %.

3. Reinvestment rate on unexpended proceeds of 2.00 percent.
4. Issuance costs equal to 2.00 percent of total bond proceeds.
5. P&I insurance costs equal to 1.45 percent of total bond proceeds.
6. Debt service reserve fund bond premium equal to 0.20 percent of bond proceeds.
7. A 30-year amortization period.

On the basis of these assumptions, the following uses of funds were developed for the Project:

Uses of Funds	$Millions
Construction Costs	$ 117.0
Interest During Construction	19.1
Cost of Issuance	2.7
P&I Insurance	2.0
Debt Reserve Surety Premium	0.2
Investment Income	(4.0)
Total Bond Proceeds	$ 137.0
Annual Debt Service Payment	$ 8.7

On the basis of these assumptions, the total debt-related cost of the Project is estimated to be approximately $1960 per kW of net capability, with an annual debt service expense of approximately $125 per kW of net capability. Holland's actual costs of financing may be different than those assumed herein, and should be investigated in more detail with its financial advisor should the Project move forward.

Estimated Project Operations and Maintenance Costs

Fuel Costs

Cummins & Barnard estimated a total delivered fuel cost of $38.14 per ton, or $1.66 per million Btu in 2006 dollars, based presumably on current fuel costs for the existing western fuel source used at the De Young Plant. We believe this estimate is reasonable for planning purposes. Based on a projected heat rate of 10,700 Btu/kWh, which also appears reasonable for planning purposes, a projected fuel cost of approximately $17.75 per MWh in 2006 can be expected.

Non-Fuel Operations and Maintenance Costs

Cummins & Barnard projected an increase in incremental labor costs of $480,000 in 2006 dollars, consisting of one additional fuel handler, 4 additional operators, and 1 additional maintenance technician. Because of the retirement of Unit 3 and the replacement of capacity from the Unit, this estimate appears reasonable, since existing staff can be shared with the Project, but Holland should verified that the revised De Young staff levels are adequate to accomplish the combined plant operations at expected levels, particularly with regard to fuel handling and maintenance work.

Cummins & Barnard estimated a total fixed operations and maintenance expense, in 2006 dollars, of $1.35 million, or $19.30 per kW, including the incremental labor force addition mentioned above. This estimate included provisions for labor, insurance, boiler and turbine maintenance, and other minor maintenance. They also estimated a total variable operations and maintenance expense of $.8 million in 2006, incorporating provisions for limestone, ash disposal, ammonia and chemicals. In all, the average 2006 incremental operations and maintenance cost estimate for the Project equates to approximately $4.00 per MWh at a full load capacity factor.

The estimated average operations and maintenance cost if very low compared to other similar coal-fired power plants with which R. W. Beck is familiar, although we qualify this observation by noting there are limited projects of similar size and configuration on which to compare. Specifically, limestone costs of $166,000 in 2008 seem very low.

For the purpose of modeling the Project's Projected Operating Results, we recommend adding the following operations and maintenance costs to the Cummins & Barnard estimates to account for the uncertainties associated with the Project:

1. $100,000 in additional fuel handling equipment.
2. $280,000 in annual capital expenditures (.25 percent of capital cost)
3. $50,000 in miscellaneous administrative and owner costs.
4. $250,000 in additional coal handling variable expenses ($1 per ton).
5. $760,000 in SO_2 and NO_x allowance costs (excluded in Cummins & Barnard estimates).
6. $250,000 in miscellaneous variable operating expenses (i.e. limestone) and to account for increased output and revisions to capacity factor assumptions.

The revised operations and maintenance costs we suggest serve as the basis for Holland's economic comparisons are thus $27.50 per kW in fixed expenses, and $3.5 per MWh in variable expenses, for an average O&M cost of approximately $7.00 per MWh in 2006 dollars.

Average Project Busbar Energy Cost

Based on the above adjustments to the Cummins & Barnard estimates, and the assumed financing costs and term, we estimate the average busbar cost of power and energy from the Project will be approximately $41.00 to $42.00 per MWh at a full load annual capacity factor of 88 to 89 percent, in 2007 dollars.

PROJECT IMPLEMENTATION SCHEDULE

Cummins & Barnard projected an overall time frame of between 24 and 28 months for construction from the time that full notice to proceed is given by Holland until the Project could be placed in commercial operational. This appears optimistic, but could be accomplished under ideal development and permitting conditions and ideal construction unaffected by winter weather conditions.

Assuming the prompt application for an air permit and receipt of the permit within 9 – 12 months of the application, we suggest that commercial operation of the Project could realistically occur no sooner than the summer season of 2007. Normally we would agree that a 9- to 12-month duration to obtain an approved final air permit would be a reasonable estimate for this Project. However, development of a permit application has

not begun, and any delays in starting this process would delay the commercial operation date accordingly.

Observations and Conclusions

Based on our limited review of the Cummins & Barnard Report and our site visits, we would offer the following observations on the Project's technical requirements and economic projections:

1. The Project layout and design basis appears reasonable for establishing a conceptual design and cost estimate at this early stage of Project development.
2. Asbestos removal and disposal issues were not considered in the Cummins & Barnard Report, and have not been addressed in our review. Holland reports these items will be necessary at some point in the future regardless of the Project being developed and recommended not to specifically charge the Project for such items.
3. Demolition and removal requirements for Units 1 and 2, and Unit 3 boiler have been estimated at just under $1 million. This estimate should be verified, as removal requirements could be considerable. However, no revenues for scrap sales were considered, which could help mitigate this concern.
4. We believe the Project will fit in the identified space, although space will likely be tight, and construction may be impacted by the limited area. Relocation of existing facilities in the demolition areas and the impacts of construction on existing plant operations may be considerable and result in added costs to the Project.
5. A visual inspection of available space for increased coal storage and handling indicates there is likely enough space for the Project, although the site may be stressed with the much larger coal pile needed for the Project. We have added additional operating costs for this likelihood.
6. Water issues have not been reviewed, and we understand that existing plant operations are sometimes limited in summer months. The removal of Unit 3 and addition of cooling towers should not adversely contribute to the current water limitations, but additional review on this issue would be warranted. Additional

costs for a new water intake from Lake Michigan, if needed for reliable operation of the Project, would make the Project cost prohibitive.

7. Additional controls for mercury removal may be required, and higher operating expenses may result from these controls and possibly more stringent emission limits that might be imposed, all of which could impact Project cost accordingly.

8. Because of the uncertainties and concerns regarding existing unit demolition, the tight space availability at the De Young Plant, and general concerns about installations of small units at existing locations, we have adjusted the Cummins & Barnard estimates accordingly for planning purposes to $117 million. This revised cost estimate appears reasonable, but there are limited comparable installations on which to base this judgment, and given the specific requirements and space constraints at the De Young site, could eventually be higher.

9. The total operations and maintenance cost estimates prepared for the Project appear to be low, and we recommended using the adjusted amounts for planning and comparative purposes.

10. The anticipated construction duration appears optimistic, but could be accomplished under prompt and ideal development and permitting conditions and ideal construction unaffected by winter weather conditions.

11. Costs associated with disruptions in the operation of the other De Young units have not been considered in the overall Project cost.

Many of these observations could have a negative impact on the projected costs of power and energy from the Project to Holland. More detailed engineering will be necessary to better define these uncertainties.

Sincerely,
R. W. BECK, Inc.

Richard M. Soderholm, P. E.
Principal and Senior Director

HOLLAND
Load Forecast

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This report has been prepared at the request of and for the use of the Holland Board of Public Works. The conclusions, observations and recommendations contained herein constitute only the opinions of R. W. Beck, Inc. To the extent that statements, information and opinions provided by others have been used in the preparation of this report, R. W. Beck, Inc. has relied upon the same to be accurate, and for which no assurances are intended and no representations or warranties are made. R. W. Beck, Inc. makes no certification and gives no assurances except as explicitly set forth in this report.

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HOLLAND

SUMMARY

The load forecast for Holland was prepared using historical utility, economic, demographic, and weather data series. The relationships among these series were examined using econometric and time series techniques.

ENERGY

Energy sales have grown at an average annual rate of 6.7% from 1981-2002 and at 4.4% during 1998-2002. The following table shows historical and projected values for energy sales and energy requirements. For both series, actual values are listed for 1998-2002. The forecast values are based upon normal weather conditions.

Forecast energy requirements were determined from retail sales plus an adjustment for unmetered and unaccounted energy (losses). Losses are projected at 2.6% of energy requirements and have ranged from 0.9% to 6.2% over the period 1990-2002.

			Energy Requirements	Annual %	Energy Sales (MWh)	Annual %		Peak Demand (MW)	Annual %	
		FISCAL YEAR	(MWh)	Change	(MWh)	Change	Losses	(MW)	Change	Load Factor
Historical	Actual	1998	941,328	5.4%	894,018	6.0%	5.0%	195.0	6.6%	55.1%
		1999	1,012,987	7.6%	950,573	6.3%	6.2%	204.2	4.7%	56.6%
		2000	1,075,940	6.2%	1,037,535	9.1%	3.6%	214.3	5.0%	57.3%
		2001	1,102,803	2.5%	1,093,152	5.4%	0.9%	221.0	3.1%	57.0%
		2002	1,092,351	-1.0%	1,063,830	-2.7%	2.6%	231.0	4.5%	54.0%
Projected	Weather Normal	2003	1,132,042	3.6%	1,102,465	3.6%	2.6%	239.8	-0.1%	55.0%
		2004	1,169,627	3.3%	1,139,098	3.3%	2.6%	238.4	3.3%	56.0%
		2005	1,218,077	4.1%	1,186,273	4.1%	2.6%	248.3	4.1%	56.0%
		2006	1,265,473	3.9%	1,232,431	3.9%	2.6%	258.0	3.9%	56.0%
		2007	1,313,224	3.8%	1,278,936	3.8%	2.6%	267.7	3.8%	56.0%
		2008	1,361,216	3.7%	1,325,674	3.7%	2.6%	277.5	3.7%	56.0%
		2009	1,409,380	3.5%	1,372,570	3.5%	2.6%	287.3	3.5%	56.0%
		2010	1,457,519	3.4%	1,419,463	3.4%	2.6%	297.1	3.4%	56.0%
		2011	1,505,837	3.3%	1,466,619	3.3%	2.6%	307.0	3.3%	56.0%
		2012	1,554,122	3.2%	1,513,544	3.2%	2.6%	316.8	3.2%	56.0%
		2013	1,602,378	3.1%	1,560,540	3.1%	2.6%	326.6	3.1%	56.0%
		2014	1,650,340	3.0%	1,607,250	3.0%	2.6%	336.4	3.0%	56.0%
		2015	1,698,016	2.9%	1,653,682	2.9%	2.6%	346.1	2.9%	56.0%
		2016	1,745,358	2.8%	1,699,787	2.8%	2.6%	355.8	2.8%	56.0%
		2017	1,792,228	2.7%	1,745,433	2.7%	2.6%	365.3	2.7%	56.0%
		2018	1,838,595	2.6%	1,790,589	2.6%	2.6%	374.8	2.6%	56.0%
		2019	1,884,396	2.5%	1,835,184	2.5%	2.6%	384.1	2.5%	56.0%
		2020	1,929,895	2.4%	1,879,447	2.4%	2.6%	393.4	2.4%	56.0%

PEAK DEMAND

The preceding table also shows historical and projected system peak demands, as well as the annual load factor. Again, values shown for 1998-2002 are historical annual peaks; remaining values are projected, weather-normalized annual peaks. The system peaks were projected on the basis of a load factor approach. System load factors are projected to be relatively stable.

COMPARISON WITH PRIOR REPORTS

The values determined in this load forecast were compared with the most recent prior projections, made by Burns and McDonnell ("B&M") in their *Integrated Resource Planning Study* (1996; updated 1998). In general, the current projection is higher than that prepared in 1998. For example, the current projection for total energy requirements is about 7½ % greater than their projection in 2005. The current projection also grows at a faster rate than the B&M forecast. For example, between 2005 and 2010, the B&M forecast for total energy requirements grows by 15%, while the current projection grows by 20%. Finally, the general trend in the projected energy growth rate is similar between the B&M projection and the current study, with both showing a decline in the growth rate as the future unfolds.

At the customer class level, the comparison reveals interesting details. For example, while initially higher, the current projection of energy sales for the residential class grows at nearly the same rate as the B&M forecast. This implies that the primary difference in the forecast growth rates lies in the commercial and industrial customer classes. An examination of the equations used to project the energy demands for these two customer classes reveals that the main difference appears to be the functional form used in each case. In the B&M study, a linear form was chosen; in the current study, a logarithmic form was selected. While it is possible that the functional form choice impacted the resulting growth rates, it is more likely that either an underlying change in the economic projections or the observed history from 1998-2002 are the root causes for the differences observed.

ENERGY SALES BY CUSTOMER CLASS

RESIDENTIAL

Residential energy sales were projected on the basis of an analysis that examined economic, demographic, and weather conditions over the period 1979-2002. Economic conditions were modeled through the use of county real income per household, an economic series calculated by taking the real income received by county households divided by the county's number of households. Demographic conditions were modeled through the use of the number of residential customers receiving service each month. Electricity prices were modeled through the use of average revenue per kWh. Weather

conditions were modeled through the use of two series that summarize the daily changes in temperature: heating and cooling degree-days.

The number of residential customers was projected on the basis of an analysis comparing historical residential customer growth with the growth of the county's population. For additional information regarding the projection of explanatory variables, please refer to the section entitled "Explanatory Variables."

The equation used to project residential energy sales is shown below:

$$kWh_t = (\beta_0 + \beta_1 YPHH_t + \beta_2 RPrice_t + \beta_3 CDD_t + \beta_4 (CDD_t/t) + \beta_5 HDD_t) * RCus_t$$

where:

kWh	=	Residential Energy sales
YPHH	=	County Income per Household (Constant Dollars)
RPrice	=	Residential Electricity Price (Constant Dollars)
RCus	=	Number of Residential Customers
CDD	=	Cooling Degree Days
HDD	=	Heating Degree Days
t	=	Annual Index

For technical (econometric) detail on this (and other) equations, please refer to the Technical Appendix section of this Report.

Commercial and Industrial

Commercial energy sales were combined with industrial energy sales for projection purposes, primarily due to the recent reclassification of commercial and industrial accounts. As the primary driving forces that affect commercial and industrial customers are similar, this approach should be satisfactory until a longer history under the new classification system is available. From the combined projected total of commercial and industrial energy sales, commercial energy sales were projected on the basis of the recent relative percentage of energy sales made to the commercial class. This ratio (50%) was maintained throughout the forecast horizon. Excluding this combination with industrial energy sales, commercial energy sales were projected on a basis comparable to that used for the Residential class.

The number of commercial and industrial customers (combined) was projected on the basis of the projected number of households. (This formulation was superior to those based on employment data.) Other explanatory variables were projected as discussed in the section "Explanatory Variables." The equations used to project commercial energy sales are shown below:

$$ZkWh_t = \beta_0 * YPHH_t^{\beta_1} * (CCus_t + ICUS_t)$$

$$kWh_t = 0.5 * ZkWh_t$$

where:

ZkWh	=	Commercial + Industrial Energy sales
kWh	=	Commercial Energy sales
YPHH	=	County Income per Household (Constant Dollars)
CCus	=	Number of Commercial Customers
ICus	=	Number of Industrial Customers
t	=	Annual Index

Other (Street Lighting)

Other energy sales (primarily Street Lighting) were projected on a basis comparable to that used for the Residential class. The equation used to project city-use energy sales is shown below:

$$kWh_t = \beta_0 + \beta_1 PY_t$$

where:

kWh	=	Other Energy sales
PY	=	County Personal Income (Constant Dollars)
t	=	Annual Index

EXPLANATORY VARIABLES

Seven externally gathered data series were examined as a part of our analysis. Five of these were *county-level* data series:

- population,
- households,
- total employment,
- manufacturing employment, and
- personal income (in constant dollars).

In addition, two weather-related data series were obtained from the nearby NOAA weather station in Grand Rapids[1]: heating degree-days, and cooling degree-days.

County population is projected to increase at the rate of about 1.5% per annum over the period 2003-2020. Number of households expands slightly more rapidly at about 1.7%. Total county employment also grows at about the same rate as households, increasing by from 2.0% to 1.2% per year over this same time period. Manufacturing employment grows by about ¼ % point less per year in

[1] A separate analysis was made to compare the weather data from Holland and Grand Rapids. Using several recent years of monthly data, the analysis suggested that Grand Rapids is a suitable proxy for Holland for our purposes.

comparison to total employment. Finally, county income (in constant dollars) is projected to increase at the rate of about 2.5% per annum.

The rates just described were derived from an extensive economic modeling system developed and maintained by Woods & Poole Inc., a private economic forecasting firm. Their forecast of county-level series is based upon a regional, "export-based" forecasting methodology that is consistent with certain national totals. For example, they forecast US gross domestic product (GDP) growth at an average annual rate of about 2.2% (in constant dollars) over the period of our load forecast.

Electricity prices (adjusted for inflation) were projected to increase by about ½ % point per year throughout the forecast horizon.

Heating and cooling degree-days were projected at average (normal) monthly values. Weather conditions can have a major impact on any individual year's results, and can particularly affect growth rates measured from unadjusted historical data.

CONCLUSIONS

A load forecast is based on historical data and assumptions about the future values of explanatory variables. But besides the numerical values that are a result of the process, what else has been learned about the relationship between Holland's energy sales and the environment in which these sales occur? This section will attempt to summarize some of the more general results of the analyses that may be useful to management.

- The primary driver of additional electric load growth is demography. Or, put in slightly different terms, the main reason why electric loads will grow (or not grow) in the future lies in the numbers of customers served, residential, commercial and industrial.

  In the residential sector, about 80% of the projected load growth is related to the projected growth in the number of residential customers. Thus, while residential customers are increasing their use of electricity, growth in electrical use per-customer is not the main source of growth.

  In the commercial sector, about 65% of the projected load growth is related to projected growth in the number of customers. Therefore, commercial growth is likewise tied to increases in the numbers of customers served, although usage per-customer plays a larger role in this customer classification.

  In the industrial sector, by assumption, growth in electrical use is related entirely to increases from existing customers.

- For every 1% the economy grows (or does not grow), the demand for electricity will grow (or not grow) by slightly less than 1%. So, for example, if the economy has a relatively poor year and grows by only 1% instead of the normally expected (projected) 2.5%, electricity demand in Holland will be reduced by about 1% to 1.5% from what would have been expected (projected). Similarly, when the economy recovers, demand for electricity can be expected to increase at a faster rate.

- While important for month-to-month swings in electricity demand, annual weather conditions change energy sales by less than 2%. Most of this change is concentrated in the residential customer class (which changes by a much larger percentage). The impact of weather on peak demand is greater, as weather affects both the underlying energy base and the load factor. Weather variations can easily swing the annual peak demand by 10% or more.

Finally, when comparing the load forecast to actual results, it should be remembered that the equations are not perfect. Even if the economy and the weather (and all the other implicit assumptions) are realized in the future, actual values for energy sales and peak demand will tend to fluctuate around the projected values due to the random behavior of factors not included in the equation. As a rule of thumb (and given the accuracy of these particular load forecasting equations), if the forecast is in error by more than 4% (after compensating for weather abnormalities) in the same "direction" (+/–) for three (3) consecutive years, then either the underlying demographic and economic assumptions have not been realized or the load forecast equations are in error (and should be revised). And, of course, if any substantial (≥ 1 MW) new loads are added or lost from a single source, the load forecast should be revised accordingly. Econometric techniques are not well-suited to capture such large changes that are unrelated to any underlying causal factors.

TECHNICAL APPENDIX

The following econometric information is provided for those readers desiring additional detail regarding the nature of the equations used to in the projections described in this Report.

RESIDENTIAL ENERGY

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.286267	1.129515	4.680121	0.0002
RPRICE	-0.022590	0.006654	-3.394980	0.0032
PY96/HH	0.017417	0.012523	1.390862	0.1812
HDD	0.000185	4.69E-05	3.946521	0.0009
CDD	0.004559	0.001517	3.006326	0.0076
CDD*(1/I)	-0.310502	0.121759	-2.550145	0.0201

Adjusted R-squared 0.972
S.E. of regression 0.091 (MWh/Cus)
F-statistic 162.0
Durbin-Watson 2.394
Price Elasticity[2] -0.24
Income[3] Elasticity. +0.20

COMMERCIAL AND INDUSTRIAL ENERGY

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.874367	0.974558	1.923300	0.0704
LOG(PY96/POP)	1.058304	0.302488	3.498659	0.0026
AR(1)	0.738603	0.134021	5.511100	0.0000

Adjusted R-squared 0.974
S.E. of regression 0.032 (%)
F-statistic 376.6
Durbin-Watson 2.218
Income[4] Elasticity +1.06

[2] Calculated at the mean of both dependent and independent variables.
[3] Income per household
[4] Income per capita

OTHER ENERGY SALES

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1350.472	314.3263	4.296403	0.0005
PY96	0.321040	0.055772	5.756314	0.0000
DUM98	567.7691	47.64098	11.91766	0.0000
AR(1)	0.790520	0.143771	5.498471	0.0000

Adjusted R-squared 0.979
S.E. of regression 60.33 (MWh)
F-statistic 313.7
Durbin-Watson stat 1.649
Income Elasticity. +0.49

GLOSSARY AND EXPLANATION OF TERMS

Adjusted R^2 The percentage of variation in the independent variable that has been "explained" by the equation (as a whole). Values closer to one are desirable. The "adjusted" refers to the adjustment made to compensate for the addition of explanatory variables in the equation.

AR(1) An explanatory variable based on the residual (error) of the equation. This term takes into account a relationship between these residuals to enhance the projection. Useful as short-term corrections.

Coefficient A numerical value of the estimated relationship between that variable and the independent variable based on historical observations, and holding all the other variables in the equation constant.

Durbin-Watson The DW statistic attempts to measure the amount of serial correlation in the error term. That is, the DW tries to provide information about whether the error made in period 5 is somehow related to the error made in period 4. Under optimal circumstances, the DW value should be 2.0, although values from 1.5 to 2.5 are generally acceptable.

Elasticity A summary measure that expresses the quantitative relationship between an explanatory variable and the independent variable in percentage terms. The elasticity measures the percentage change that will occur in the independent variable given a 1% change in the explanatory variable.

F-statistic A measure similar to R^2, but unbounded. Thus, larger values are desirable (without limit).

Prob The probability value calculated from the t-statistic, provides an estimate of the chance that the coefficient could, in fact, be zero. Probability values under 5% (0.05) are generally held to be statistically significant.

S.E. of regression — The standard error of the regression is a measure of the uncertainty of the equation as-a-whole in explaining the independent variable. Similar to R^2, this statistic measures the equation as a whole, as compared to standard errors for individual coefficients that measure uncertainty with respect to only that variable. Standard errors of regression are very useful in examining the overall explanatory power and uncertainty in a regression.

Std. Error — A numerical value of the uncertainty in the estimated coefficient. The Std.Error essentially quantifies the amount of "wobble" in the estimated relationship. Higher Std.Error implies greater "wobble".

t-Statistic — A calculated value determined by taking the estimated coefficient and dividing by the Std.Error. t-Statistics are used to examine the statistical significance of the estimated coefficient. A t-Statistic greater than 2 (in absolute value) usually signifies a statistically significant relationship. Note that statistical significance does not imply that this variable is an important determinant of the independent variable, but rather that the relationship (small or large) that has been estimated is probably not simply due to chance.

Variable — The data series used to "explain" the independent variable.

TABLES & GRAPHS

The following pages contain the historical and projected values related to the load forecast, including both dependent variables (e.g. residential energy sales) and independent variables (e.g. county population).

While the graphs and tables "speak for themselves," a cautionary note is warranted. In some cases, a distinct discontinuity or "jump" from the last historical value to the first projected value may be evident. There are two primary reasons this may occur. First, the historical data are "actual," while the projected data are "weather-normalized." Therefore, to the extent that the last historical year (2002) was abnormal (severe or mild), the projected series will exhibit an adjustment to normal weather conditions. Second, the estimated historical relationships do not "fit" the data perfectly. In moving to the first projected value (2003), the equation removes any discrepancy. Thus, any error contained in the equation's estimate for 2002 will show up in the forecast as a "jump" to the 2003 value.

Further complicating the analysis of short-term projections is the fact that the projections are expressed on the basis of fiscal years, which end June 30. Thus, even 2003 is partially comprised of actual as opposed to projected weather data.

The combination of these factors can result in a discontinuity or "jump" from the historical 2002 value to the projected 2003 value. And, because it is a combination of factors, a direct explanation may not be readily apparent. In most cases, this effect should be minimal, as the equations generally "fit" the historical data well, and annual weather-normalization of energy sales is typically only a few percentage points.

§

Holland

Fiscal Year-ending	RMWH	RCUS	RPrice
1979	70,086	11,788	79.5
1980	69,498	11,995	78.7
1981	71,934	12,495	79.4
1982	73,570	12,939	88.4
1983	74,487	13,106	86.0
1984	81,250	13,403	81.1
1985	82,520	13,715	77.4
1986	84,361	13,825	76.0
1987	89,493	14,341	72.9
1988	97,092	14,884	68.8
1989	103,691	15,282	65.6
1990	105,554	15,977	64.0
1991	109,044	16,578	64.0
1992	114,749	16,817	66.0
1993	109,246	17,070	66.0
1994	118,003	17,230	66.6
1995	119,193	17,497	65.2
1996	132,799	18,024	63.5
1997	131,103	19,162	62.8
1998	134,781	19,622	62.2
1999	143,929	20,077	61.0
2000	149,951	20,985	59.7
2001	153,121	21,141	58.0
[redacted]			
2004	159,334	21,677	59.8
2005	165,597	22,449	60.1
2006	169,564	22,907	60.4
2007	173,537	23,383	60.7
2008	177,507	23,817	61.0
2009	181,495	24,271	61.3
2010	185,431	24,716	61.6
2011	189,388	25,163	61.9
2012	193,335	25,607	62.2
2013	197,316	26,054	62.5
2014	201,257	26,492	62.9
2015	205,144	26,922	63.2
2016	209,045	27,352	63.5
2017	212,898	27,773	63.8
2018	216,702	28,184	64.1
2019	220,448	28,585	64.4
2020	224,097	28,972	64.8

RMWH... Residential energy sales (MWh)
RCus... Number of residential customers
RPrice...Average revenue per kWh (1996 mills)

Holland

Fiscal Year-ending	CMWH	CCUS	IMWH	ICUS
1979	#N/A	#N/A	#N/A	#N/A
1980	#N/A	1,594	#N/A	205
1981	36,258	1,740	164,566	205
1982	34,501	1,759	176,558	206
1983	37,638	1,860	199,206	110
1984	42,263	1,956	224,810	110
1985	41,907	1,982	250,144	109
1986	44,302	2,023	279,426	111
1987	46,528	2,117	312,912	116
1988	51,568	2,255	344,221	117
1989	60,130	2,446	388,156	114
1990	65,399	2,715	408,249	106
1991	73,116	2,839	415,570	106
1992	74,353	2,903	435,391	106
1993	79,031	2,985	448,161	106
1994	84,874	3,047	490,763	105
1995	85,737	3,137	637,136	101
1996	86,981	3,234	588,987	101
1997	87,093	3,392	622,573	102
1998	89,339	3,475	666,691	100
1999	100,383	3,539	702,880	99
2000	115,600	4,184	768,528	134
2001	458,743	4,231	477,826	134
2002	[illegible]	[illegible]	[illegible]	[illegible]
2003	[illegible]	[illegible]	[illegible]	[illegible]
2004	488,047	4,473	488,047	138
2005	508,482	4,586	508,482	137
2006	529,550	4,704	529,550	136
2007	550,787	4,825	550,787	139
2008	572,141	4,948	572,141	140
2009	593,585	5,070	593,585	141
2010	615,011	5,193	615,011	141
2011	636,529	5,316	636,529	142
2012	658,034	5,440	658,034	142
2013	679,508	5,562	679,508	143
2014	700,863	5,682	700,863	143
2015	722,096	5,801	722,096	143
2016	743,163	5,919	743,163	142
2017	764,025	6,034	764,025	142
2018	784,665	6,146	784,665	141
2019	805,060	6,254	805,060	141
2020	825,324	6,362	825,324	140

CMWH, IMWH... Commercial (industrial) energy sales (MWh)
CCus, ICus... Number of commercial (industrial) customers

Holland

Fiscal Year-ending	OMWH	OCUS	TOTMWH	REQMWH	LOSSES	PEAK	LF
1979	#N/A	#N/A	#N/A	282,457	#N/A	57.0	56.6%
1980	#N/A	31	#N/A	283,867	#N/A	60.2	53.6%
1981	2,466	32	275,216	298,160	7.7%	65.8	51.7%
1982	2,488	36	294,123	315,666	6.8%	66.0	54.6%
1983	2,509	36	304,848	329,708	7.5%	72.0	52.3%
1984	2,457	36	350,789	378,960	8.9%	76.5	56.3%
1985	2,481	36	377,052	403,312	6.5%	82.4	55.9%
1986	2,488	37	410,575	424,731	3.3%	86.6	56.0%
1987	2,511	26	451,444	480,200	6.0%	98.8	55.8%
1988	2,612	26	495,490	524,666	5.6%	107.8	55.8%
1989	2,639	26	552,816	582,983	5.2%	119.1	55.9%
1990	2,705	27	581,907	613,956	5.2%	119.1	58.8%
1991	2,727	27	600,457	636,023	5.6%	128.2	57.5%
1992	2,759	27	627,252	656,832	4.5%	133.9	56.0%
1993	2,794	27	639,232	680,829	6.1%	131.8	59.0%
1994	2,790	27	696,421	732,262	4.9%	151.1	55.3%
1995	2,860	26	744,926	786,049	5.2%	164.4	54.6%
1996	2,929	26	813,686	864,189	5.8%	179.0	55.1%
1997	3,100	26	843,869	892,768	5.5%	183.0	55.7%
1998	3,827	26	894,618	941,326	5.0%	195.0	55.1%
1999	3,381	26	950,573	1,012,987	6.2%	204.2	56.6%
2000	3,457	26	1,037,535	1,075,940	3.8%	214.3	57.3%
2001	3,463	26	1,093,152	1,102,883	0.9%	221.0	57.0%
2002	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2003	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2004	3,661	26	1,139,088	1,169,627	2.6%	238.4	56.0%
2005	3,712	26	1,186,273	1,218,077	2.6%	248.3	56.0%
2006	3,767	26	1,232,431	1,265,473	2.6%	258.0	56.0%
2007	3,824	26	1,278,936	1,313,224	2.6%	267.7	56.0%
2008	3,884	26	1,325,674	1,361,215	2.6%	277.5	56.0%
2009	3,946	26	1,372,570	1,409,369	2.6%	287.3	56.0%
2010	4,010	26	1,419,463	1,457,519	2.6%	297.1	56.0%
2011	4,075	26	1,466,519	1,505,637	2.6%	307.0	56.0%
2012	4,141	26	1,513,544	1,554,122	2.6%	316.8	56.0%
2013	4,208	26	1,560,540	1,602,378	2.6%	326.6	56.0%
2014	4,277	26	1,607,259	1,650,349	2.6%	336.4	56.0%
2015	4,346	26	1,653,682	1,698,018	2.6%	346.1	56.0%
2016	4,416	26	1,699,787	1,746,358	2.6%	355.8	56.0%
2017	4,486	26	1,745,433	1,792,228	2.6%	365.3	56.0%
2018	4,557	26	1,790,589	1,838,595	2.6%	374.8	56.0%
2019	4,629	26	1,835,194	1,884,396	2.6%	384.1	56.0%
2020	4,701	26	1,879,447	1,929,835	2.6%	393.4	56.0%

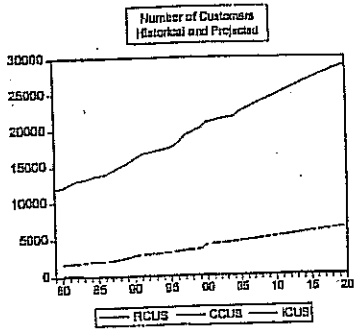
OMWH, OCus... "Other" energy sales (MWh), Number of "other" customers
TOTMWh, REQMWh... Total Energy sales, Total Energy Requirements (MWh)
Losses, Peak, LF... Energy Losses (%), Annual Peak (MW), System Load Factor (%)

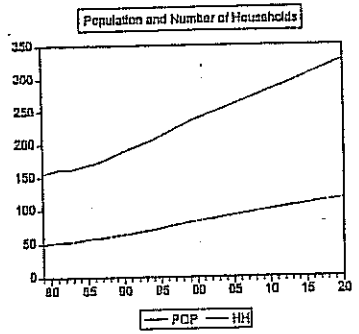
Holland

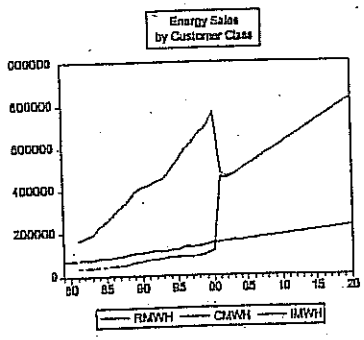
CALENDAR YEAR DATA

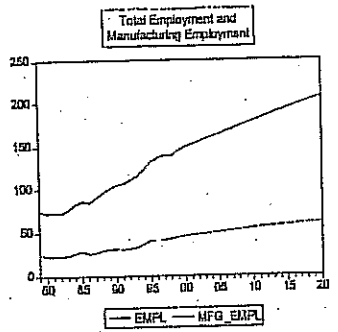
Fiscal Year-ending	Grand Rapids HDD	CDD	Ottawa County Economic Data POP	EMPL	MFG EMPL	PY96	HH	PCEd
1979	7,350	578	154.5	74.5	25.0	2810	49.1	49.8
1980	6,580	575	156.2	71.5	22.5	2712	50.5	55.2
1981	6,837	682	161.4	72.8	23.3	2753	51.8	60.1
1982	7,110	620	161.6	72.1	22.5	2735	52.3	63.5
1983	6,205	631	162.4	75.8	23.6	2857	52.6	66.2
1984	7,118	828	165.1	82.5	28.6	3189	54.3	68.6
1985	6,508	631	168.0	85.9	28.7	3329	55.9	71.0
1986	6,839	515	170.6	88.6	25.7	3408	57.0	72.7
1987	6,300	732	174.5	89.2	27.0	3613	58.3	75.5
1988	6,877	738	179.4	95.5	29.4	3860	60.0	78.4
1989	7,003	733	183.8	100.9	31.8	4104	61.4	81.9
1990	6,608	682	189.2	104.0	30.9	4199	62.9	85.6
1991	6,117	803	193.8	105.9	30.5	4174	64.6	88.9
1992	6,678	598	196.0	109.3	31.8	4447	66.6	91.8
1993	7,000	333	202.2	114.1	33.1	4681	67.9	93.8
1994	7,404	682	206.8	122.3	36.7	4928	69.6	95.7
1995	6,363	548	212.4	131.1	40.4	5138	71.9	97.9
1996	7,520	764	218.2	135.7	40.8	5389	74.4	100.0
1997	7,082	551	223.9	138.9	41.0	5643	76.5	101.9
1998	8,090	562	229.4	137.9	42.2	5940	78.7	103.0
1999	6,085	790	234.9	144.0	44.1	6120	80.7	104.7
2000	6,111	625	239.6	146.6	45.4	6251	82.2	107.4
2001	6,837	509	243.9	151.7	46.3	6440	83.9	109.8
2002	6,896	613	248.3	156.3	47.5	6630	85.6	112.4
2003	6,896	613	252.6	158.4	48.2	6822	87.3	113.9
2004	6,896	613	256.8	160.9	49.0	7015	89.2	115.5
2005	6,896	613	261.1	164.0	49.9	7214	90.9	118.2
2006	6,896	613	265.4	167.1	50.7	7415	92.7	121.1
2007	6,896	613	269.7	170.1	51.6	7618	94.4	124.2
2008	6,896	613	274.0	173.1	52.4	7824	96.1	127.7
2009	6,896	613	278.3	176.1	53.2	8031	97.8	131.5
2010	6,896	613	282.6	179.1	54.0	8241	99.5	135.6
2011	6,896	613	287.0	182.1	54.8	8453	101.2	139.8
2012	6,896	613	291.4	184.9	55.5	8667	103.0	144.0
2013	6,896	613	295.9	187.8	56.3	8882	104.6	148.5
2014	6,896	613	300.3	190.6	57.0	9100	106.3	153.2
2015	6,896	613	304.9	193.4	57.7	9319	107.9	158.1
2016	6,896	613	309.4	196.1	58.3	9539	109.5	163.1
2017	6,896	613	314.0	198.8	59.0	9761	111.1	168.4
2018	6,896	613	318.6	201.4	59.6	9985	112.6	173.8
2019	6,896	613	323.1	204.0	60.2	10210	114.1	179.3
2020	6,896	613	327.7	206.5	60.8	10438	115.6	185.1

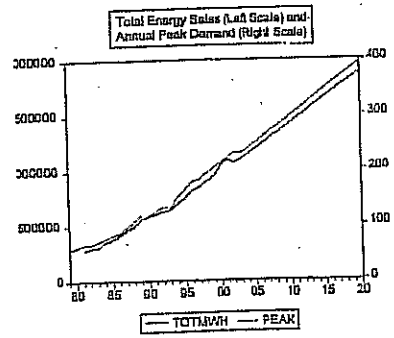
HDD, CDD... Heating (Cooling) Degree days
POP, HH... Population (000), Number of Households (000)
Empl, MfgEmpl... Total Employment (000); Manufacturing Employment (000)
PY96, PCEd... Personal Income (1996$M); PCE deflator (price index series)

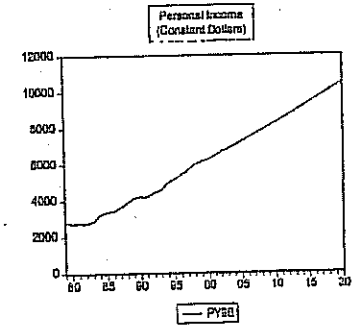












November 6, 2003

Mr. David G. Koster
Power Resources Director
Holland Board of Public Works
64 Pine Avenue
Holland, Michigan 49423

Dear Mr. Koster:

Subject: Economic Comparison of Baseload Resource Options

Introduction

The Holland Board of Public Works ("Holland") is reviewing options regarding the acquisition of additional baseload power supply resources to serve the City's increasing demand and energy requirements. R. W. Beck was retained by Holland to assist in defining assumptions necessary to develop planning-level power supply cost estimates, reviewing assumptions, costs and prices of resource options developed by others, and reviewing in-house work products developed for the evaluation of various options.

R. W. Beck and Holland staff jointly developed an economic comparison of Holland's potential ownership participation in the following baseload power plant options: a 60 MW entitlement in the Northern Lights Power Project ("NLPP"); a 100 MW entitlement in NLPP; and the installation of a 70 MW Circulating Fluidized Bed ("CFB") unit at the James DeYoung Plant. The results of our independent engineering assessment of each of these proposed plant developments have been documented and delivered to Holland in separate reports.

Methodology and Assumptions

The methodology used to compare the economics of the three baseload options was developed by Holland and reviewed by Beck, and consisted of a projection of net income to Holland over a defined time period using the following methodology and assumptions:

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1. Holland's most recent load forecast was used as a basis for future demand and energy requirements, increased to incorporate a 15 percent reserve requirement on all non-firm resources.

2. A simulated economic dispatch model was developed for each of the three baseload options to project the annual energy production and associated variable and fuel-related costs associated with participation in each of the three options, in conjunction with all current Holland generating assets. The projected in-service dates for the NLPP and CFB option were 2008 and 2007, respectively. In all cases, we assumed that Unit 3 of the DeYoung Plant would be retired after 2007.

3. Capital, debt and operations and maintenance costs for the three options were based on the economic and finance estimates prepared independently for each project and reported on in other reports. Interest and investment rates, interest during construction calculations, amortization period, and all assumed finance costs and fees were consistent (as a percentage of projected indebtedness) for each plant and were provided by Morgan Stanley. The resulting estimated total debt requirements to Holland were $183 million for the 100 MW NLPP option, $110 million for the 60 MW NNLP option, and $137 million for the CFB option.

4. Under the 100 MW NLPP option, no additional resources were added to the Holland system. Under the 60 MW NLPP and 70 MW CFB options, we assumed a new 40 MW combustion turbine would be added internally to the Holland system in 2013 to provide for adequate capacity margins in future years, based on the assumption that no more than around 10-12 percent of Holland's future peak load would be satisfied by uncertain market purchases. Beyond 2013, no additional resources were added to the Holland system, indicating total reliance on market purchases for deficit capacity levels over the long-term future under all cases. It is probable that Holland would acquire or add other types of generating resources to its system after 2015, based on resulting load growth and regional market conditions, which will likely improve the net income projections for these future years from those projected herein.

5. For all options, remaining operating, maintenance and other costs common to the Holland system were included, such as network transmission access charges, depreciation (based on a 30-year basis) and interest expenses for existing facilities, and projected costs for existing unit labor, operations and maintenance,

facilities and vehicles, and administrative and office expenses, based on initial estimates provided by Holland. Estimates of future investment income were also included, based on projections provided by Holland.

6. Transmission access charges were consistent for all options, based on network service and existing rates and Holland entitlements. It is possible that the NLPP options could incur additional congestion charges for delivery to Holland based on current system configurations, but we have assumed that system upgrades necessary to relieve most congestion will be made as a condition for NLPP development, and such charges will be for the most part mitigated.

7. No credits were considered for the possible sales of periodic excess capacity into the marketplace, although such a sensitivity scenario was investigated for each of the three options. It was determined that while periodic excess capacity could exist, the revenues from such sales would be relatively minimal, and would not substantively affect the relative comparison of the three options. The 100 MW NLPP option would provide the greatest level of excess capacity, and consideration of excess sales would benefit the economics of this option more than the other two.

8. The following assumptions were utilized for interest and escalation rates under the Base Case net income projections, based on recent trends and the assumptions utilized in the review of the various resource alternatives:

General Inflation – 2.5%	Coal - 1.5%
Fixed O&M – 2.0%	Variable O&M – 2.5%
Gas – 2.5%	Market Prices – 2.0%
Debt Interest Rate – 4.75%	Holland Labor – 3.8%

9. An annual contribution to the City of 3 percent of all electric revenues was also included as a Holland expense for all options.

10. For the new resource options, annual interest payments on associated debt, assuming a 30-year amortization period, and depreciation based on a 30-year rate were included as expenses in the determination of annual net income.

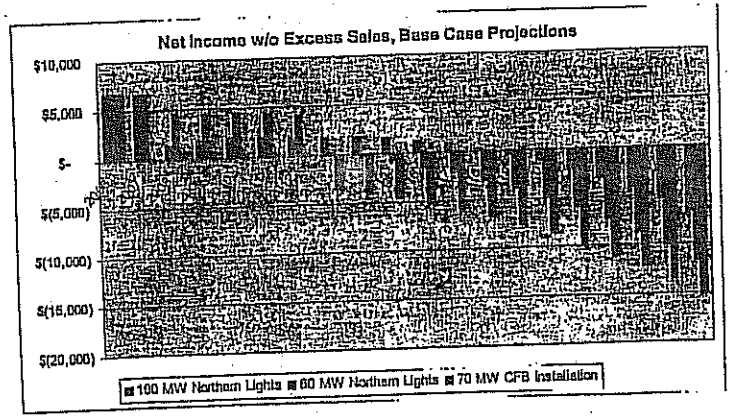
11. Holland's current average retail of $57.6 per MWh for its aggregate customer base was held constant for future years to determine projected net income from retail electric sales into the future.

12. Resulting net income projections were calculated as the difference in anticipated retail sales income, assuming no increases in current rates, less the aggregate annual expenses for the operation of the Holland system, including depreciation and interest expenses for all current and future assets, operations and maintenance costs all current and future resources, network transmission access charges, existing unit labor, operations and maintenance, facilities and vehicles, and administrative and office expenses, interest income, and the aforementioned annual contribution to the City.

Results - Base Case Net Income Projections

The results of this analysis under the Base Case escalation and interest rate assumptions are shown on the following figure for the three options over a twenty-year period of 2006 through 2025.

Holland Board of Public Works
Baseload Resource Options Analysis



The resulting cumulative net present values of the projected income streams from the three resource options, based on a discount rate equal to the assumed interest rate, are:

100 MW Northern Lights Option	$14.4 million
60 MW Northern Lights Option	$ 2.4 million
70 MW CFB Option	$ (45.2) million

Sensitivity Analysis

Because of the inherent uncertainties involved in projecting future commodity prices and interest rates, a number of sensitivity analyses were conducted on each of the three power supply options, representing changes in key pricing variables over time. We analyzed the following sensitivity cases for each power supply option:

1. High Coal Escalation – assumes a 1 percent increase in the Base Case coal escalation rate assumption to 2.5 percent.

2. Low Coal Escalation – assumes a .5 percent decrease in the Base Case coal escalation rate assumption to 1.0 percent.

3. High Interest Rate – assumes a 1 percent increase in the Base Case interest rate assumption to 5.75 percent. Note this case also represents an approximate 15 percent increase in resource debt costs.

4. Low Interest Rate - assumes a 1 percent decrease in the Base Case interest rate assumption to 3.75 percent. Note this case also represents an approximate 15 percent decrease in resource debt costs.

5. Increased Load Growth Rate – assumes a 4 percent per year increase in load requirements over an average growth rate of approximately 3 percent in the Base Case.

6. Reduced Load Growth Rate – assumes a 2 percent per year increase in load requirements over an average growth rate of approximately 3 percent in the Base Case.

7. High Inflation Rate - assumes a 1 percent increase in the assumed escalation rates for general inflation, natural gas, Holland labor, fixed and variable operations and maintenance costs and market energy prices over the rates assumed in the Base Case.

8. Low Inflation Rate - assumes a 1 percent decrease in the assumed escalation rates for general inflation, natural gas, Holland labor, fixed and variable operations and maintenance costs and market energy prices over the rates assumed in the Base Case.

The following table shows a summary of the projected net present value of net incomes for the three resource options under the Base Case and the various sensitivity cases we investigated.

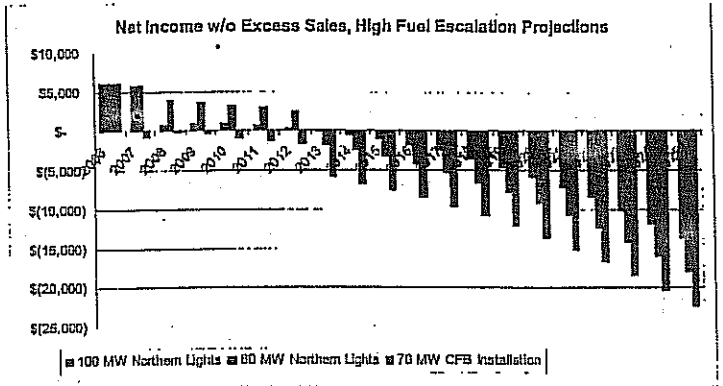
Holland Board of Public Works
Baseload Resource Options Sensitivity Analyses
Net Present Value of Net Income – 2006 – 2025 ($000)

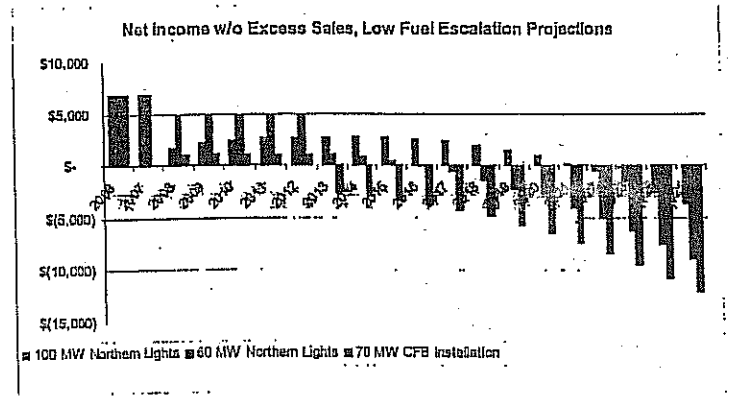
	100 MW NLPP	80 MW NLPP	70 MW CFB
Base Case	$ 14,390	$ 2,364	$ (45,203)
High Fuel Escalation	$ (18,233)	$ (28,927)	$ (80,462)
Low Fuel Escalation	$ 29,244	$ 16,588	$ (29,163)
High Interest Rate	$ (7,916)	$ (9,821)	$ (58,170)
Low Interest Rate	$ 39,849	$ 16,266	$ (32,083)
Increased Load Growth	$ 33,577	$ 20,899	$ (26,229)
Reduced Load Growth	$ (33,342)	$ (12,499)	$ (61,441)
High Inflation	$ (44,834)	$ (72,925)	$ (117,132)
Low Inflation	$ 101,790	$ 102,464	$ 52,774
Average	$ 12,725	$ 3,823	$ (44,121)

The results of the projected annual net incomes to Holland under each of these sensitivity cases are shown graphically on the following pages for higher and lower assumptions relating to coal prices, interest rates, load growth and inflation, respectively.

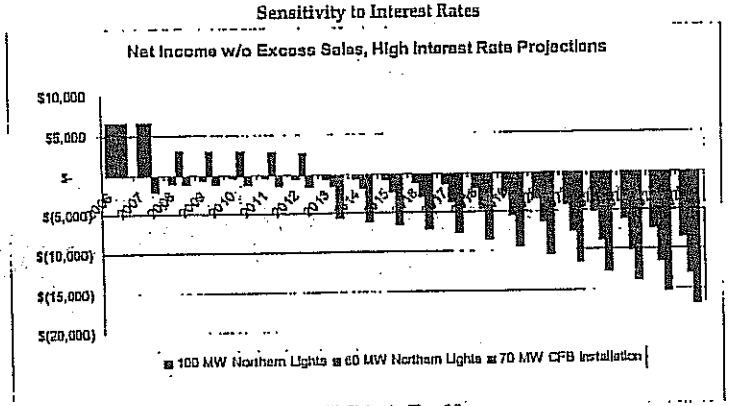
It is our understanding that Holland staff will be preparing further analyses that will identify required retail rate increases necessary to maintain adequate levels of net income to Holland for the Base Case assumptions with each resource option, and possibly under various sensitivity cases.

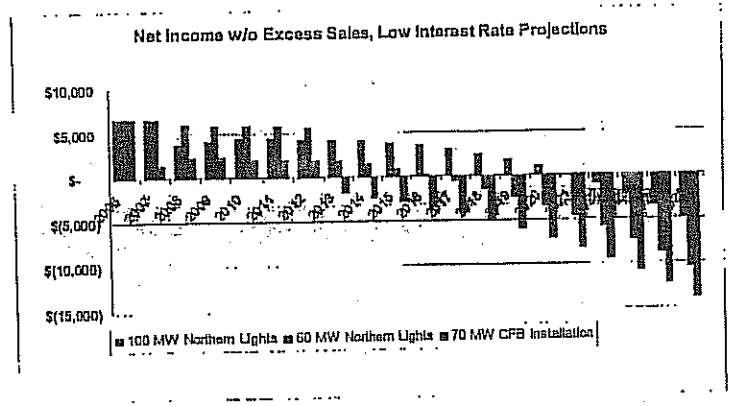
Holland Board of Public Works
Baseload Resource Options Analysis
Sensitivity to Coal Escalation Rates





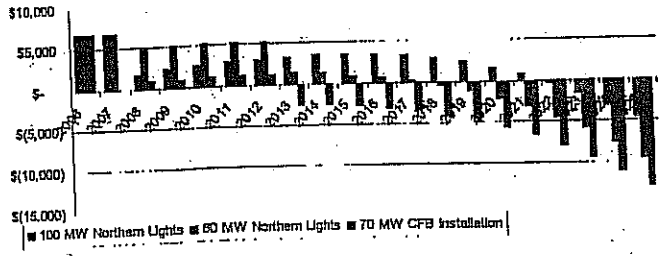
Holland Board of Public Works
Baseload Resource Options Analysis
Sensitivity to Interest Rates



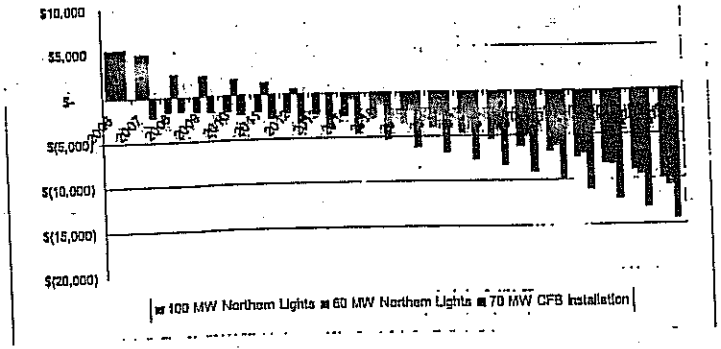


Holland Board of Public Works
Baseload Resource Options Analysis
Sensitivity to Load Growth

Net Income w/o Excess Sales, Increased Load Growth Projections

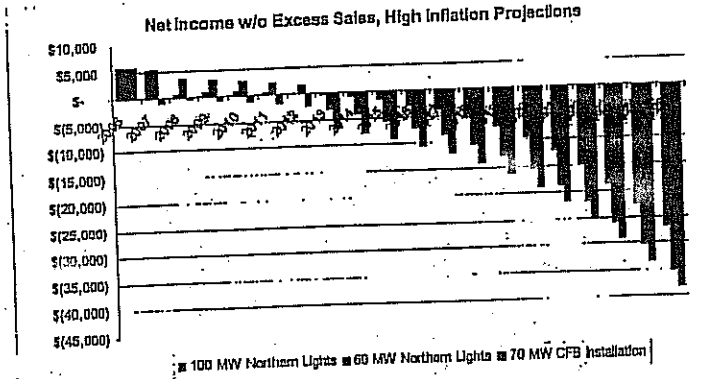


Net Income w/o Excess Sales, Reduced Load-Growth Projections

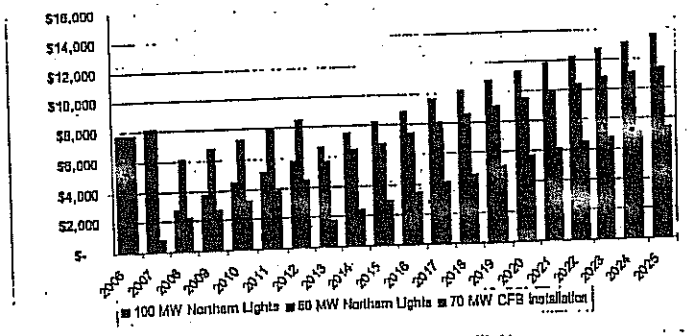


Holland Board of Public Works
Baseload Resource Options Analysis
Sensitivity to Escalation Rates

Net Income w/o Excess Sales, High Inflation Projections



Net Income w/o Excess Sales, Low Inflation Projections



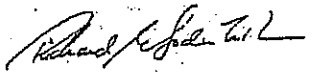
Conclusions

The methodology developed by Holland and expanded upon through our joint efforts represents a reasonable means of comparing the effects on net income of Holland's potential participation in the three baseload resource alternatives identified for further study. It also provides a reasonable indication of future retail rate increases required to maintain adequate levels of net income.

Under the Base Case assumptions for interest rates, load growth and future commodity prices, Holland's participation in the 100 MW of the NLPP appears to provide Holland with the greatest level of net income well into the future with retail rates remaining stable at today's levels. The economics of this alternative would be further enhanced if the levels of excess capacity on the Holland system projected to be available during the first five years of NLPP operation could be marketed off-system at profits. This option appears most beneficial under all sensitivity cases.

Under the other options, net income is reduced primarily due to the lower capacity levels, which will require increased dependence on market energy purchases and the earlier addition of more new generating capacity to the Holland system, assuming Base Case load growth. The smaller resource alternatives will require the highest levels of retail rate increases in order to maintain positive income at adequate levels. A lesser amount of capacity entitlement from the NLPP appears more beneficial in early years of operation, assuming no net revenues from excess capacity sales, but the early benefits of such a lesser amount erode as the need for additional generating capacity becomes apparent around the 2013 time frame.

Sincerely,
R. W. BECK, Inc.



Richard M. Soderholm, P. E.
Principal and Senior Director

Testimony prepared by
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Submitted February 5, 2004 to the
Manistee City Planning Commission

Good evening. My name is Tanya Cabala. I am the Associate Director of the Lake Michigan Federation, a 34-year old nonprofit environmental organization with offices in Chicago, Illinois and Grand Haven, Michigan. The Lake Michigan Federation was founded to spur citizen action to protect Lake Michigan. On behalf of the Federation and its one thousand members, I submit this written testimony which pertains to a decision regarding a special use permit for the "Northern Lights" coal fired power plant proposed for Manistee Lake's shoreline.

Introduction. As one of the region's oldest and most respected environmental organizations, the Federation works diligently to assemble important research and provide it to decision-makers, offer educational programs to citizens, and promote on the ground protection for the largest lake entirely within America's borders – our Big Lake – Lake Michigan. As such, our programs focus on key issues that directly affect the health of the lake and its inhabitants. One of the pressing issues confronting residents of this region is the impact of power generation, and in particular, the impact of coal fired plants on people, wildlife, the environment, and Lake Michigan.

At the Federation, we understand that the decision facing the Manistee Planning Commission is an especially critical one in these uncertain economic times and the prospect of new jobs is tempting. Because of that, I encourage planning commission members to examine all of the information brought forward tonight with an eye toward not only what makes sense right now, but also for the long-term. This decision will have far-reaching implications, well beyond this city and Manistee County. What takes place in communities, like Manistee, situated on the Lake Michigan shoreline, has a strong effect on the lake and its overall health.

I am here tonight to convey our opposition to the proposal and explain the justification for our position. I am presenting our testimony in three parts: 1) impacts to human health and associated costs, 2) impacts to fish and wildlife, and 3) impacts to property values and tourism.

Health Impacts and Associated Costs: Coal Plants Threaten Public Health

Coal plants pose a number of health threats to humans, most importantly those related to emissions to the air such as nitrogen oxide, sulfur dioxide, and mercury, which occurs naturally in coal and is released during its combustion. Sulfur dioxide is a leading source of fine particulate pollution (soot) and nitrogen oxides are a main ingredient of smog. Smog causes respiratory problems for children, the elderly, and people with asthma, and reduces the productivity of agricultural crops. Both sulfur dioxide and nitrogen oxide contribute to acid rain. A 2003 Harvard School of Public Health study found that nine coal fired plants in Illinois caused an estimated 300 premature deaths each year, as well as 14,000 asthma attacks, 2,600 emergency room visits, and 500,000 cases of upper respiratory disease. Per capita health risks were greater closer to the power plants and decreased with distance.

While pollution abatement technology reduces health effects, even plants in compliance with current emissions standards cause substantial health impacts. Studies of power plants in the Boston, Massachusetts and Washington, D.C. areas by the same Harvard researchers found substantial health impacts associated with compliant operation. In particular, the studies estimated the number of premature deaths associated with particulate matter alone to range from one to 25 deaths annually. In addition, the plants caused tens of thousands of asthma attacks, upper respiratory disease, chronic bronchitis, and hospital and emergency room visits each year. Based on the cost of treating the diseases, the value of lost worker productivity, and the value of a human life of about $6 million, the annual economic cost associated with an individual power plant ranged from $6 million to $160 million depending on the characteristics of the particular plant.

Mercury emissions from coal fired plants are also a health concern – and particularly in the Great Lakes region. According to a June 2000 report by the National Academy of Sciences, coal fired power plants are the country's single largest source of mercury pollution. Mercury is not easily broken down and is transported easily through the atmosphere. Once in the air, mercury can change into a gas and fall out in rain or snow or attach to dust particles. When in rivers and lakes, bacteria can transform it into methylmercury, the harmful form of the metal that fish and, in turn, people and other predators accumulate in their tissues. Mercury is highly toxic in trace amounts: it only takes 1/70 of a teaspoon of mercury to contaminate a 25-acre lake. Locally, an experiment on Little Rock Lake in Wisconsin found that only 1 gram of mercury was required to contaminate all the fish in the lake (Weiner, JG., and W.F. Fitzgerald, C.J. Watras and R.G. Rada, 1990. Partitioning and bioavailability of mercury in an experimentally acidified Wisconsin lake. Environmental Toxicology and Chemistry, Vol. 9, pp. 909-918).

The effects of mercury exposure are well known and not to be taken lightly. The most serious risk to humans is posed by the eating of mercury contaminated fish. Adults who have been exposed to too much methylmercury might begin to experience trembling hands and numbness or tingling in their lips, tongues, fingers or toes. These effects can

begin long after the exposure occurred. At higher exposures, walking could be affected, as well as vision, speech and hearing. In sufficient quantities, methylmercury can be fatal.

The greatest risk, however, is for fetuses and young children because their nervous systems are still developing. They are four or five times more sensitive to mercury than adults. Unborn children can be seriously affected even though the methylmercury causes no symptoms in their mothers. Damage occurring before birth or in infancy can cause a child to be late in beginning to walk and talk and may cause lifelong learning problems. In particular, pregnant women and young children are most at risk. The National Academy of Sciences, an independent group of scientists advising Congress, estimates that 60,000 children born each year in the United States might encounter neurological and learning problems because their mothers had eaten large amounts of mercury-contaminated fish and seafood during pregnancy.

Mercury is already a problem in Lake Michigan. According to the U.S. Environmental Protection Agency, 3,031 pounds of mercury are emitted each year to Lake Michigan, and 86 percent of that comes from direct atmospheric deposition. (EPA 2000b) This high rate of deposition translates into rainwater with mercury levels as high as 42 times the U.S. EPA's human health standards, with a one-year average of 12 times the acceptable level (NWF 1999b). Because of this, all of the states around Lake Michigan have issued fish consumption advisories restricting the eating of certain fish due to mercury contamination. Further, both the states of Wisconsin and Michigan have statewide advisories on all their inland lakes due to elevated mercury levels in fish. We know that local sources of mercury, such as a new coal plant on Manistee Lake, will add to this problem, because the majority of airborne mercury deposition is thought to be from local or regional sources (NESCAUM 1998).

Impacts to Fish and Wildlife: Will Manistee Remain the "Fishing Capitol of the Midwest?"

More mercury in the air means more mercury in fish. A Mercury Study Report to Congress in 1997 by the U.S. EPA indicates direct links between local mercury emissions and high levels of mercury in fish. Although there is some evidence to show that mercury contamination can interfere with the reproduction of fish (Walleye reproduction may be impaired by the fish's exposure to mercury, (reported by J.G. Wiener and D.J. Spry in "Toxicological Significance of Mercury in Freshwater Fish," published by Lewis Publishers), the most important problem with fish contaminated with mercury is that they will be eaten by humans and wildlife, such as birds and animals.

Loons, eagles, otters, mink, kingfishers and ospreys naturally eat large quantities of fish. Because these predators rely on speed and coordination to obtain food, mercury may be particularly damaging to them. Studies indicate that methymercury affects wildlife in numerous ways, including adult survival rates, reproduction, behavior, and cell development. With a diet that consists almost entirely of fish, loons are extremely valuable indicators of the health of our environment and the threat that elevated mercury poses. One study finds that Minnesota loons are accumulating so much mercury that it

may be affecting their ability to reproduce, (reported by K.L. Ensor, D.D. Helwig and L.C. Wemmer in "Mercury and Lead in Minnesota Common Loons," published by the MPCA Water Quality Division in 1992). In addition to loons, mercury poses a risk to other wildlife species that live in aquatic habitats or prey on fish, including mink, otter, Belted Kingfishers and Bald Eagles.

Property Value and Tourism Impacts: Smokestacks Vs. Small Town Natural Beauty

Interest in living in Manistee County is on the rise, with the county in the top third of Michigan counties for growth, according to the U.S. Census. How would a new coal plant affect that trend? There are no direct studies of how the new plant might affect the overall growth of Manistee. There are, however, existing estimates of the economic impact of coal fired power plants on property values. Those studies that relate to property values look at the perceptions of residents who live near the plants and the problems they associate with living in close proximity to the plants that might negatively influence whether a person would want to live in a certain area or neighborhood and what they would be willing to pay to live there. It is the perceptions of residents that ultimately affect property values. A power plant's effect on prices of residential property represents the actual amount that homeowners and renters feel they have to be compensated – in reduced housing costs – to live near a power plant. It represents their value for all of the perceived negative impacts associated with living near a plant, which could include noise, dust, nuisance, health, increased traffic, and odors.

There are a number of studies that link property values to proximity to power plants. One of the more recent studies uses data from 76 sites from around the country and concluded that coal fired plants reduced average property values by $45.13 per year per facility within a 1,000 square mile area (Clark and Nieves 1994). This report suggests that the proposed Northern Lights plant will significantly reduce property values within a sizeable region. It is important to note that $45.13 per year does not seem at first glance to be a significant drop in property values. It is the long-term, cumulative loss of property tax base, however, that will ultimately have an impact on the community.

More significant, perhaps, is the likely impact of the plant on area tourism, an industry that makes a substantial contribution to the local economy. Tourism is a big part of the economic picture for Manistee and its surrounding areas. Manistee's new tourism focus is evident in promotions of the area, for example, the Downtown Development Authority's Web site: "*Manistee, is now as it was over 150 years ago, a place with old fashioned hometown values - a community dependent on its natural resources, the waterfront, the forests, beaches, the rivers and inland lakes.*" A 1998 tourism profile of Manistee County shows the estimated direct expenditures related to tourism as around $75 million annually – a sizable figure that could well be threatened by new smokestack development.

Because of the impacts of power plants on mercury levels in sport fish and on visibility, the proposed power plant could have a disproportionately large affect on outdoor-related

Whether it is a pipeline into the water or a smokestack in the air, the issue is the same: tourism in Manistee is tied to its natural resources – the river, Lake Michigan beaches, forests, and scenic vistas. The decision to contest the pipeline signified a revolutionary and positive change by community leaders. That commitment is being challenged by the Northern Lights proposal and short-term thinking. We urge community leaders to stay the course and protect people, fish and wildlife, and the economy. Say no to a new coal plant and yes to a future of exciting developments that enhance Manistee, not diminish it.

tourism in the Manistee area. Charter fishing and wildlife viewing are important components of local tourism and both would be negatively affected by increased concerns about mercury contamination and reduced visibility.

The primary cost to tourism would likely be future economic development opportunities that would be lost as a result of the decision. For example, if Manistee decides to allow the construction of the coal plant on Manistee Lake, what are the costs of losing out on other developments in the city and county because of what is permitted on the property? Obviously, it is difficult to put a dollar figure to that cost, but it could be very high if new condo developments, restaurants, outdoor recreation retail stores, hotels, and marinas decline to locate in Manistee because of a perceived disamenity such as the coal plant. One example to consider is Bay Harbor in northern Michigan. A cement factory that had once employed hundreds of area workers was originally on the site and closed its doors in the early 1980s, leaving an abandoned waterfront property. Local officials did not think "once an industrial site, always an industrial site." Instead, they helped to bring a residential and commercial development to the site that now generates millions of dollars in revenue, employs several hundred area workers, and brings in thousands of out of state visitors. There is most certainly the potential that Manistee could host such a development or numerous similar developments, but the question remains – how would allowing a new coal plant on Manistee Lake affect future decisions by developers to locate in this area?

Conclusion

Protection of the Great Lakes and Lake Michigan, America's largest lake, is becoming an increasingly high priority for those who live in and around them. More now than ever, the lakes are acknowledged as the natural base of the region's economic engine, by providing the necessary elements for important industrial, commercial, recreational and tourist activity. The lakes also offer a very special quality of life to those who live in their coastal communities. This belief is evident in the new Great Lakes Cities Initiative, spearheaded by Mayor Daley of Chicago, which states on its Web site: "Mayors in the Great Lakes basin have a direct interest and stake in the sustainability of the Great Lakes. As the world's largest freshwater resource and an international treasure, the Great Lakes are essential to the continued vitality of the cities, townships, villages and counties along the shores and in the surrounding watershed. Not protecting, improving, and preserving the Great Lakes could jeopardize public and environmental health as well as the economic prosperity of all Great Lakes communities." Cities in West Michigan are recognizing this also – newspaper headlines have newly elected Mayor Steve Warmington of Muskegon welcoming the advent of a new alternative energy research facility on the city's waterfront, with the statement, "Hello fuel cells, goodbye foundries."

Manistee has come a long way from its industrial history and is becoming an increasingly attractive tourism destination as well as a community that offers a special quality of life for permanent residents. This new approach was apparent in the city's opposition to relocation of PCA's discharge pipeline to the river as detrimental to its tourism efforts.

Mark Sanford
260 East Piney Rd.
Manistee, MI 49660

February 4, 2004

Manistee City Planning Commission
P.O. Box 358
Manistee, MI 49660

Dear Commissioners:

I am a Limited Licensed Psychologist and a Licensed Professional Counselor practicing within the state of Michigan since 1989. In the course of these fifteen years I have worked with many individuals who applied for or received S. S. I. payments from the Social Security Administration. I am writing this letter as a private citizen.

Related to this I have noted that the proposed Northern Lights project is being promoted as an enterprise that may produce and attract jobs to the area.

I am concerned that the impression that this project may create and attract jobs to this area may not take into account all aspects of this proposed project. In fact, I note in many sources that coal burning plants regardless of how "clean" release mercury into the atmosphere and then into the water and earth and thus into our food sources.

A fact sheet on the National Wildlife Federation website states: "when ingested by pregnant women, methylmercury is absorbed and travels to the developing fetus affecting the development of the brain and the nervous system. Infants are also exposed to methylmercury from their mothers through breast milk. Exposures at these early stages of development are the most dangerous, and can result in delays in walking, talking and fine motor skills. Mercury exposure is also implicated as a cause of many other health problems such as attention deficit disorders, autism and mental retardation." (www.nwf.org)

I also note on the website of the Social Security Administration (ssa.gov) (Table 8 – attached) that mental retardation is listed as the leading diagnostic group for children receiving SSI payments. These children account for 32.8 percent of the total children receiving S.S. I. payments for that given year.

It is also important to note that this particular diagnosis is frequently not one from which a person recovers as he/she gets older. It is a lifelong condition. These children frequently continue to receive SSI benefits for their entire lives, thus not becoming a part of the work force.

I think this is information that merits attention by the Commission because if the proposed coal burning plant increases the number of people in our area with mental retardation as well as other health related problems we may wind up with added costs to pay unemployment and SSI benefits instead of an increase in jobs.

Respectfully submitted,

Mark A. Sanford

Table 8.— Number and percentage distribution of children receiving federally administered SSI payments, by age and diagnostic group, December 2000

Diagnostic group	Total	Age			
		Under 3	3–5	6–12	13–17
	Number				
Total	843,000	66,050	103,110	385,890	287,950
Total with diagnosis	796,330	61,180	95,090	364,700	275,360
Infectious and parasitic diseases	2,900	170	440	1,670	620
Neoplasms	8,680	700	1,750	4,040	2,190
Endocrine, nutritional, and metabolic	6,220	830	1,040	2,520	1,830
Mental disorders:					
Schizophrenia	4,280	0	20	1,390	2,870
Other psychiatric	232,690	4,820	27,080	122,070	78,720
Mental retardation	261,200	1,900	13,440	118,970	126,890
Diseases of the—					
Nervous system and sense organs	93,140	5,860	14,730	44,910	27,640
Circulatory system	4,140	940	1,040	1,540	620
Respiratory system	24,090	3,620	6,180	10,160	3,930
Digestive system	3,470	1,160	780	1,040	490
Genitourinary system	2,380	240	320	1,030	790
Musculoskeletal system and connective tissues	7,830	410	1,010	3,290	3,120
Congenital anomalies	42,160	10,170	9,540	16,130	6,320
Injury and poisoning	4,530	450	570	1,900	1,610
Other	98,620	29,710	17,150	34,040	17,720
	Percent				
Total with diagnosis	100.0	100.0	100.0	100.0	100.0
Infectious and parasitic diseases	.4	.3	.5	.5	.2
Neoplasms	1.1	1.1	1.8	1.1	.8
Endocrine, nutritional, and metabolic	.8	1.4	1.1	.7	.7
Mental disorders:					
Schizophrenia	.5	.0	.0	.4	1.0
Other psychiatric	29.2	7.9	28.5	33.5	28.6
Mental retardation	32.8	3.1	14.1	32.6	46.1
Diseases of the—					
Nervous system and sense organs	11.7	9.6	15.5	12.3	10.0
Circulatory system	.5	1.5	1.1	.4	.2
Respiratory system	3.0	6.2	6.5	2.8	1.4
Digestive system	.4	1.9	.8	.3	.2
Genitourinary system	.3	.4	.3	.3	.3
Musculoskeletal system and connective tissues	1.0	.7	1.1	.9	1.1
Congenital anomalies	5.3	16.6	10.0	4.4	2.3
Injury and poisoning	.6	.7	.6	.5	.6
Other	12.4	48.6	18.0	9.3	6.4

"Air pollution remains a significant concern with **coal-fired generating facilities**, even though contemporary plants that burn low sulfur coal are far less a threat than older plants. Nevertheless, such facilities **should not** be sited near planned or existing residential areas, and special care should be taken to avoiding areas that already have a significant air pollution problem."

Erin Kilpatrick, Planner
Williams & Works, Inc.
Grand Rapids, MI
Planning & Zoning News
November 2002