MANISTEE CITY PLANNING COMMISSION

70 Maple Street, Manistee, Michigan 49660
Meeting of Thursday, March 4, 2004
7:00 p.m. - Manistee Middle School - Gym, 550 Maple Street

AGENDA

I Roll Call

II Public Hearing

1. Continuation of February 19, 2004 Public Hearing for 47 remaining signed up speakers. **(Public Comment Procedures on the Reverse Side)**

III Approval of Minutes

Planning Commission Meeting (2/5/04)

IV New Business

1.

V Unfinished Business

1. Manistee Saltworks Development Corporation - Coal Fired Power Plant
2.

VI Other Communications

1.

VII Citizen Questions, Concerns and Consideration
(Public Comment Procedures on the Reverse Side)

VIII Work/Study Session

1.

IX. Adjournment

MEMORANDUM

TO: Planning Commission Members

FROM: Denise Blakeslee
Administrative Assistant - Community Development Department

DATE: February 27, 2004

RE: March Planning Meeting

The March Planning Commission Meeting will be on Thursday, March 4, 2004 at 7:00 p.m. in the Middle School Gym, 550 Maple Street. Enclosed is an Agenda for the Meeting.

If you are unable to attend please call me at 723-2558.

:djb

Items forwarded to the City of Manistee Planning Commission at the Continuation of the Planning Commission Public Hearing/Meeting March 4, 2004 relating to the Manistee Saltworks Development Corporation

Correspondence:

Judith Cunningham, 4466 Potter Road, Bear Lake
Ed Risdon, 515 Fairview, Manistee
Alan & Susan Anderson, P.O. Box 73, Eastlake
Shirley Byrd, 2585 Benzie Hwy. Benzonia, MI
Patrick & Kimberly Culter, 1008 Buckingham, Lincoln Park
Daniel Straubel, 18300 Psutka Road, Thomsponville
Dave McIntire, Little Manistee Watershed Conservation Council, P.O. Box 52, Irons
Janet Zwiefka, 1305 E. 27th Street, Manistee
Steve and Nancy Thorp, 515 Fourth Street, Manistee
Patricia Gillis, Michigan Interfaith Climate and Energy Campaign, 26672 Elm Street Roseville
Patricia Berghoff, 16674 Starke Road, Arcadia
Mary Grover, President, League of Women Voters - Grand Traverse Area, 506 Fifth Street, Traverse City
Daniel Behring, 3695 Lakeshore Drive, Manistee
Janet Cordes, 601 Harvard Lane, Manistee
Joyce E. Delamarter, P.O. Box 133, Arcadia

Listing of Postcards received in opposition to the Northern Lights Project.

February 25, 2004

Dear City of Manistee Planning Commission:

I believe that accepting the application of the Tondu Corporation of Houston, Texas to construct a coal-burning power plant before obtaining the data from an independent impact statement was premature and gave the notion that this project was on a fast track. However, the evidence to date overwhelming points to the fact that this plant would be an environmental and economic disaster for this community. As a resident of Manistee County, I urge you to deny this permit.

The standards of the special use permit are clearly to PROTECT the health, safety, welfare and property of the residents of this community against the use that Mr. Tondu intends. Mr. Tondu of Houston, Texas wants you to believe he would never do anything to harm the people of Manistee, but his actions and the information gathered on health, safety and economic burdens to this community prove otherwise.

He kept the city in the dark about the tax status of this project; he sued our county and Filer, giving misleading evidence in an attempt to pay less taxes for TES (he threatened suits against Stronach to get his landfill); and he responded to your questions in the Environmental Assessment with vague, misleading and inadequate response

According to the Michigan Environmental Council, "Mr. Tondu's responses's to the planning commission's questions show a blatant disregard for the health of Manistee's residents and for the protection of our natural resources."

Mr. Jay Kilpatrick, the city's own consultant, argued for approval of the special use permit in a November 13, 2003 memo to the Planning Commission because "...of the substantial economic benefit and added tax base the project represents to the community." Because of recent revelations, this project seems to be of substantial economic benefit to the *City of Holland* and to Joe Tondu of Houston, Texas, who is asking for an $11 million dollar development, according to the Traverse City Record Eagle.

Tondu Corporation's own budget specifies 51 jobs, and a payroll of $2,537,000 per year. Jobs are an emotional issue for people in this area, but it is not reasonable to think that the few jobs offered by this power plant will keep young people in Manistee. They won't. These aren't the type of jobs to attract young people to a 'Cool City'. Better to have several smaller, cleaner business and light industrial jobs than this one big impact, but low employment, option.

The other economic windfall to Manistee was the 10-12 million dollars of total annual expenses (the ones that are supposed to go around within the community 7X). These include:

- payroll and payroll taxes and benefits ($3,800,000)
- the community service fee to city, townships, county and various charities- ?
- plant expenses -MDEQ emission fees - $671,000
- management expenses of travel, legal, lobbying, audits, specialized consulting and PR costs - $390,000
- plant insurance - $2,827,000
- coal line of credit - $172,000
- capital expenditures for replace, repair & maintenance of equipment - $400,000
- consumable maintenance items - $2,400,000
- escrow account to overhaul major electrical generating equipment - $1,000,000

As you can see, the vast majority of these annual expenses will not be spent in Manistee – except for trucking and landfill fees for 40-60 trucks/day to dispose of fly ash in the county landfill.

Considering the facts above, it is unreasonable to believe this plant will be a substantial economic benefit to Manistee, and much evidence to believe it will be an economic burden.

Over the last several months, the community has become educated about the serious health threats to current and future residents that this project poses. The community has also learned about the deterioration that this plant will bring to our lakes and rivers through the added mercury, lead and other emissions. Even the minimum of an additional 80 pounds of mercury would create a mercury "hot spot" 1.5 miles around the plant that in this case includes the entire city. EPA just released new evidence that 15% of pregnant women, twice as high as they had thought, have high enough levels of mercury in their blood to cause brain damage in newborn babies.

Manistee County, though not monitored for ozone and designated as non-attainment, is already receiving substantial ozone from coal plants near Chicago that move across Lake Michigan causing poor air quality in Manistee and neighboring counties. Although we have the same plume of pollution causing low air quality as Holland, because EPA provided that county with an air monitor, they would not be able to legally build the Tondu plant in their city and add more pollutio. This plant, even in compliance with all DEQ regulations would add in thousands of tons of pollutants, mercury and other toxins.

The people of this community have done their research and have weighed the 'short term' benefits in construction jobs vs. dangers to our health, our long-term economy and our environment. In canvassing neighborhoods all over the city in the past few weeks, I found that the overwhelming majority of residents – over 80%- are opposed to the Northern Lights coal-burning power plant. This issue has not divided the city; in fact, it has truly united the city, the county and the whole northern Michigan region in opposing this – Northern Blight.

The serious impact of the proposed project on this community requires serious thought. The community's health, safety, welfare and long-term economic interests must be protected at all cost. The power generated from this project will be used and will profit greatly the City of Holland, other municipalities and the Tondu Corporation of Houston, Texas. Only small change will go the citizens of Manistee while we bear the full brunt of economic losses in future opportunities, tourism, fishing and property values, health and safety hazards and environmental impacts.

Judith Cunningham
4466 Potter Road
Bear Lake, MI 49614

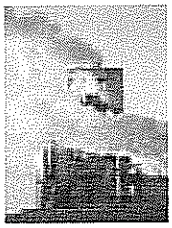
COMMUNITY DEVELOPMENT
BUILDING DEPT.
FEB 26 2008
CITY OF MANISTEE

I have a map that shows that in the Manistee zip code there are

- 27 facilities that produce and release air pollutants
- 7 facilities that have reported toxic releases
- 65 facilities that have reported hazardous waste activities
- 1 large quantity generator
- 6 small quantity generators
- 5 facilities that discharge to waters of the United States
- The U.S. EPA has Manistee Lake classified as an impaired lake. pollutants are: Mercury,PCB's,Pathogens.

PSR®
Physicians for Social Responsibility

Environment and Health Program



January 29, 2004
For Immediate Release

Contact:
Nadia Khatchadourian, 202-478-6187 or
Daniel J. Weiss, 202-478-6307

New Mercury Rule Fails to Protect Kids, Say EPA's Own Child Health Advisors

Letter to Administrator Leavitt Urges Tougher Standards for Power Plants

WASHINGTON — As the U.S. Environmental Protection Agency (EPA) prepares to formalize its proposal to establish mercury pollution limits for power plants, the EPA's respected Children's Health Protection Advisory Committee (CHPAC) sent a letter to EPA Administrator Michael Leavitt this week in an unprecedented move urging him to significantly strengthen the proposed rule to reduce the threat of mercury to children. EPA's proposed rule, expected to be published in the Federal Register on Friday, January 30, 2004, would postpone major mercury reductions from power plants until 2018 or beyond, allowing as much as 650,000 pounds of excess mercury to be released into the atmosphere. In addition, the proposed rule would remove mercury from power plants from EPA's list of hazardous (toxic) air pollutants.

The EPA's Children's Health Protection Advisory Committee (CHPAC) found that the mercury proposal "does not sufficiently protect our nation's children." The CHPAC includes doctors, nurses and other child and public health experts from academia, state agencies, industry, and the public sector, all of whom were appointed by the current administration. The letter marks the first time that the CHPAC has ever formally objected to an EPA proposed rule-making for its failure to protect children's health.

The letter adds, "While cost effectiveness is important, the priority should be to protect children's health in a timely manner."

"EPA's mercury rule ignores sound science and our children's health," said Susan West Marmagas, M.P.H., Director, Environmental & Health Programs, Physicians for Social Responsibility, and a member of the CHPAC.

"We know that mercury can damage our children's intellectual and emotional development. It is unacceptable that EPA's proposal allows power plants to pump out excess mercury for another fifteen years, contaminating our air, water, food, and our children," Marmagas noted.

Children, infants and women of child-bearing age are particularly vulnerable to mercury exposure. Mercury can harm fetal development and impair children's cognitive growth, including motor skills, learning capacity, and memory, along with other symptoms of neurological damage. Currently, about 8 percent of women of child-bearing age—literally millions of American women—have blood mercury concentrations higher than the level considered safe by the EPA. New research made public by EPA scientists this week indicates that as many as 600,000 children annually may be adversely affected.

Women and children are commonly exposed to mercury when they eat contaminated fish. Late last year the U.S. Food and Drug Administration began developing new guidelines for fish consumption indicating that children and women of child-bearing age should limit their consumption of tuna and other common

fish species as a result of unsafe mercury levels. Forty five states have so far issued 2,140 specific fish consumption advisories due to mercury contamination, a 138% increase from 1993 to 2002.

The EPA has determined that coal-fired power plants are the largest emitter of mercury in the United States, responsible for more than one-third of all industrial mercury pollution. Airborne mercury eventually deposits in water bodies and has contaminated 10.2 million acres of lakes, estuaries, and wetlands and 415,000 miles of streams, rivers, and coastline. This pollution becomes concentrated in the food chain, particularly in fish.

In addition to the proposed delay in the mercury reductions, CHPAC is also concerned about EPA's proposal to allow power plants to 'cap-and-trade' their emissions. According to CHPAC, the 'cap-and-trade' approach "may not address existing hot spots and may create new local hot spots for mercury, disproportionately impacting local communities."

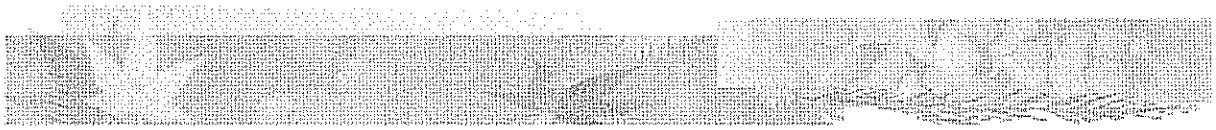
Since mercury is a toxic and accumulative pollutant, the cap-and-trade model proposed by EPA is likely to impact communities with particularly high levels of toxic mercury pollution relative to other geographic areas.

Physicians for Social Responsibility (PSR) is a leading public policy organization with nearly 30,000 members representing the medical and public health professions and concerned citizens, working together for nuclear disarmament, a healthy environment, and an end to the epidemic of gun violence.

# # #

For a copy of the CHPAC letter, please contact Nadia Khatchadourian at 202-478-6187 or nadiak@mrss.com.

Date: Wed, 18 Feb 2004 15:38:33 -0800
From: "Monica Evans" <imagine@betsievalley.net>
Reply-to: cfrd@yahoogroups.com
To: <cfrd@yahoogroups.com>
Subject: [cfrd] just in case....



.....in case some folks can't open the attactchment I sent, here's the editorial from the Record Eagle. Cheers! ~Monica

Coal-fired plant's cost measured in pollution

Residents from communities throughout northwest Michigan crowded a recent hearing in Manistee to protest plans to build a 425-megawatt coal-burning power plant on the shore of Manistee Lake.

There's good reason to worry. Toxic fallout from the innocuously named "Northern Lights" (how about Northern Blight?) plant would hurt everyone who calls the region home.

The Environ-mental Protection Agency is already threatening sanctions against northern Lake Michigan counties for failing air quality tests. That pollution is directly attributable to coal-burning power plants in Illinois and Indiana.

Siting a coal-burning plant here is a bizarre and ironic invitation to further pollute this region with large-scale emissions of sulfur dioxide, mercury, lead and nitrogen oxide, among other pollutants.

On Thursday, Manistee's planning commission will host a public hearing on developer Joe Tondu's power plant pitch. A decision isn't due that evening, but must be made within 60 days of commissioners' Feb. 5 approval of a special land use application. Planners could render a decision as soon as their March 4 meeting, city officials said.

Commissioners should reject the proposal for a number of reasons, but one above all: A coal-burning plant is too detrimental to the region's environmental and public health.

More poisons in the air and water simply aren't worth Tondu's jobs, jobs, jobs mantra. The plant supposedly would provide full-time work for more than 40 people - as well as an annual financial kickback to local governments in lieu of property taxes.

Tondu has set up the proposed plant to be part of a municipal energy provider, creating tax-exempt status for his business. Whatever local assessment Tondu pays to Manistee County and city, it's guaranteed to be a fraction of the property tax that would have to be shouldered by businesses that don't have such a plum designation.

Tondu picked the Manistee site because officials in neighboring Filer Township demanded significant environmental and financial accountability. He also fought the township and county over tax assessments, costing them hundreds of thousands of dollars in attorney fees in a tax tribunal case Tondu ultimately lost.

Tondu also would make out wonderfully on land purchase and construction deals in Manistee because a state brownfield designation again means government picks up much of his tab.

Early indications are that Manistee officials seem willing to accept Tondu's crumbs, figuring any revenue is better than none. But for a community that's touted itself as a tourist destination, fishing mecca and bedroom community, that kind of thinking seems woefully short-sighted.

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COMMENTS TO THE MANISTEE PLANNING COMMISSION ON THE PROPOSED ZONING OF A NEW 425 MW COAL-FIRED POWER PLANT, BY MICHIGAN INTERFAITH CLIMATE AND ENERGY CAMPAIGN

I represent the Michigan Interfaith Climate and Energy Campaign, a statewide group that has been in existence for five years. We are strongly opposed to the Northern Lights Project because of the many unanswered questions regarding environmental and human health. Members of the MI Interfaith Climate and Energy Campaign have formed their values based on our faith traditions. Four fundamental moral values are at stake here. These four values are shared by the National Council of Churches, the Coalition on the Environment and Jewish Life, and can also be found in the Catholic bishops' statement of June, 2001: "Let There be Light".

Value #1: Concern for the universal common good

We must work to balance individual "wants" with the majority's needs. Because pollution from power plants affects the general public, and because utilities serve most everyone, our energy policies must be measured by their effects on all members of society. The social costs of air pollution must be taken into consideration. For this reason we recommend a thorough economic, social, and environmental impacts study. We see these three as interconnected with each other, and we do not accept pitting environmental and economic considerations against each other.

Value #2: Respect for God's Creation

Jews, Christians, and Muslims share the creation story of Genesis in which "God saw all that God had made, and God found it very good." As believers, we see ourselves as creatures made in the image and likeness of a loving God, with a unique responsibility to be caretakers of the natural world. Our recent scientific discoveries about the universe have served to deepen our awe and respect for the complexity, diversity, and differentiation in Creation. Scientists and mystics have come to the same conclusions: all is one, and in original harmony. Humans can choose to destroy the Creation, or partner with God in renewing and recreating the face of the Earth. If we do not respect the natural world, we will lose not only our health, but our quality of life as well. I quote Robert F. Kennedy, Jr.:

"God talks to humans through many vectors: through each other, through organized religion, through art, literature, music, and architecture; but nowhere with such clarity and texture and grace and joy as through nature."

Our question is: what will the proposed power plant do to the integrity of the natural systems (the ecosystems) in western Michigan that are affected by the plant?

Value #3: An Option for the Poor

All energy policies should be scrutinized as to how they will affect the most vulnerable in our society, and around the world. In Proverbs, Chapter 14:31, it says "Those who withhold what is due to the poor affront their Maker; those who care for the vulnerable honor God."

When reviewing whether the new power plant should be built, our traditions tell us that those with young lungs, old lungs, diseased lungs need to be considered first. Those without health insurance, those in inner city ghettos, those without access to

air conditioning are to be given preference over those whose needs are already met. Throughout Michigan, 1.9 million children live close to dirty coal-fired power plants, which are linked not only to asthma but neonatal death and slow brain development. How will the emissions of mercury, sulfur dioxide, nitrous oxide, and carbon dioxide affect the most vulnerable among us?

Value#4: Sense of Intergenerational Obligation

In Deuteronomy, Chapter 30, it says: "I set before you, life and death, blessing and curse. Choose life, then, so that you and your descendents may live." This obligation toward our children compels us to take the long and broad view, rather than the expedient and short-term view. It calls us to go beyond cost benefit analyses and short-term profits, and think about legacies. It asks us to look for the common good in our public policy, which brings us full circle to value #1. And so we ask: What are the long-term affects of the building and operating of a coal-burning power plant? Is there another way to generate power that is less harmful to future generations?

I close with an excerpt of a statement made by Mark X. Jacobs, executive director of the Coalition on the Environment and Jewish Life. This is from testimony he gave to the Subcommittee on Transportation and Related Agencies, Committee on Appropriations of the House of Representatives on February 10, 2000.

"We stand before choices that will affect generations to come—biblical choices, between life and death, blessing and curse. Shall energy be a safe, clean, sustainable blessing? Or shall our consumption of energy be a curse, causing harm, and even death, to people and other creatures far into the future?"

Thank you for the opportunity to give comments.

Michigan Interfaith Climate and Energy

February 25, 2004

COMMUNITY DEVELOPMENT
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CITY OF MANISTEE

Mr. Ed Risdon
515 Fairview
Manistee, MI 49660

Mr. Jon R. Rose, Manistee Community Development Director
70 Maple Street
P.0. Box 358
Manistee, MI 49660

Re: Proposed Coal Burning Power Plant (Tondu)

Dear Jon:

As you know I've only been here a couple years but in this brief time I have become very fond of Manistee. The city seems to be in good hands. The books are balanced, the parks, beaches and roads well maintained. As with all cities there are problems, but they are manageable and most folks are proud to live and work here.

For several months I've listened to the debate in public forums, casual gatherings and chance encounters. Initially my concern was largely confined to perception, now it is also reality. I am deeply troubled with the potential health issues, revenue loss and legal liability the commissioning of this facility would bring to bear on Manistee.

.

No denying, there would be winners. The lakeside communities serviced by the grid would certainly benefit. Resident and non-resident company stakeholders would profit.

The big losers would be the vast majority of Manistee's present residents, their children and their children's children. Future efforts to capitalize on Manistee's great natural setting would be stalled. The luster, now present would vanish and much of what you and others have achieved tarnished. It would be a long road back to where we are today.

For your consideration have enclosed a couple of articles that recently appeared in the Detroit newspapers.

I am sure you realize the importance of this matter and will act warily. I wish you the best.

Very truly,

Ed

Ed Risdon

large subdivision

Mercury

22 FEB 04

Tighter rules can and should go further

When one of its own advisory committees says more can be done to protect children from the risks of mercury pollution, the Environmental Protection Agency ought to listen.

"The concern . . . is that this proposed action does not go as far as is feasible to reduce mercury emission from power plants, and thereby does not sufficiently protect our nation's children," the chairman of the Children's Health Protection Advisory Committee wrote last month to EPA Administrator Michael Leavitt.

The proposed mercury rule has two flaws. First, mercury is targeted for a 70-percent reduction when many experts — and the advisory committee — believe greater mercury cleanup is technologically possible. Second, the rule sets up a national trading program that could have erratic results. "Regulation should . . . ensure that existing hot spots are reduced and no new ones are created," the committee's letter says.

The biggest remaining output of mercury comes from coal-burning power plants. Mercury released in the smoke falls back to Earth and most often gets washed into adjacent waterways, where it begins working its way into the food chain in a toxic form called methylmercury. By eating fish at the top of the food chain, people accumulate it, too.

The chief danger is the way mercury, which can damage the brain and nervous system, is passed from mother to newborn during pregnancy. Recent studies, reported by an EPA scientist last month, suggest that the risk factor is greater than previously estimated. The new studies suggest one in every six women of child-bearing age has enough mercury in her system to affect her offspring. (Previous estimates put one in 12 women in this age group at risk — which was worrisome enough.)

The children's advisory committee asked for further economic analysis after concluding the mercury rule could and should be stronger. But mercury has had plenty of analysis. The EPA should simply toughen the rule.

P.S. **CONTINUING TO PUSH** physical fitness for too-fat Michigan, Gov. Jennifer Granholm wants to add an early-morning run to the annual walk across the Mackinac Bridge on Labor Day. Will weight limits be in force for the bridge that day?

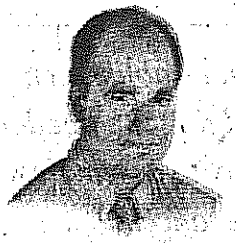
Detroit Free Press

600 W. Fort St., Detroit, Michigan 48226 An Independent

editpg@freepress.com

Det News
23 FEB 04

NOLAN FINLEY



Huge heating bills should open the door to nukes, coal and diesel

How about those heating bills this winter? Through the roof, aren't they? Paying the gas and electric tab hurts more than a slip on the February ice.

It's easy to get angry at the power companies when the bills drop through the mail slot. And they probably should get some of the blame.

But we ought to blame ourselves, too. As a nation, we've refused to make intelligent and realistic energy choices. We've operated for decades without a comprehensive energy plan and allowed the most recent attempt to enact one to get mired in special interests and partisanship.

As always, blame the politicians. They've lacked the courage to lead us where they know we should go.

Natural gas prices have exploded because we are taking the path of least resistance when it comes to energy production. But very quickly, that path is also becoming the most expensive.

The United States has placed much of its gas and oil reserves off-limits to drilling, while encouraging the use of clean-burning natural gas for electricity production.

That gets the environmentalists off the backs of the power companies, but it also is the least efficient use of natural gas. And it tightens supplies for the most efficient use — piping it directly into home furnaces.

That's why this month's gas bill is such a whopper.

The strategy is incredibly short-sighted. The nation has only a 35-year supply of available natural gas reserves.

Coal, meanwhile, is almost inexhaustible. America has roughly 250 years of coal reserves. But building a new coal-fired power plant is about as easy as starting a fire by rubbing two sticks together. You hear about it happening, but don't expect to ever see it.

The energy bill Congress can't seem to pass would make available $100 billion to develop zero-emission coal plants that could answer much of America's future energy needs.

But even super-clean coal plants are offensive to those who stubbornly cling to the illusion that renewable energy sources can keep our computers and television sets running. They'd rather spend the same amount of money to increase windmill and solar panel electricity production to 4 percent of total supply, from the current 2 percent.

If coal is a nasty word, you can't even say n-u-c-l-e-a-r — you have to spell it out.

No new nuke plants have been sited in this country since, even before the Three Mile Island melt-down in Pennsylvania in 1979. That accident was serious, but no one was killed, and claims of injuries uncertain.

The only fatality was the U.S. nuclear power industry.

Europe now gets roughly 60 percent of its electricity from nuclear plants, and in France it's nearly 100 percent. The Europeans are also switching their automotive fleet over to much higher-mileage diesel fuel, an option for fuel savings that America has been reluctant to consider.

Meanwhile, we keep dreaming our energy problems will be answered by fuel cells, cold fusion or perpetual motion machines. The real solutions, at least for the short term, are already available.

Perhaps the February heating bills will be just the whomp up side the head we need to start thinking more realistically about America's energy future.

Nolan Finley is editorial page editor of The Detroit News. Reach him at nfinley@detnews.com or (313) 222-2064.

Watch Nolan Finley at 2 p.m. Sunday on "Am I Right?" on WTVS-TV (Channel 56).

Passi

February 20, 2004

Jon Rose
Manistee City Planning Commission
550 Maple St.
Manistee, MI 49660

Dear Mr. Rose:

We would like to express our opposition to the Northern Lights Project. We feel the environmental damage to Manistee and surrounding areas exceeds the proposed benefits.

Sincerely,

Allan R. Anderson

Allan R. Anderson

Susan L. Anderson

Susan L. Anderson
PO Box 73
Eastlake, MI 49626

COMMUNITY DEVELOPMENT
BUILDING DEPT.
FEB 27 2004
CITY OF MANISTEE

B
Mrs. Shirley Byrd
2585 Benzie Hwy.
Benzonia, MI 49616-9695
231-882-0493

Manistee Planning Commission,

Please review the enclosed information. I would like this to be considered in your discussion on your vote for the coal plant. More updated information can be obtained by going to this web site. Our lakes, rivers, all water would be harmed greatly by a coal plant in this area. Our sport fishing would be gone. This report states that.

Thank you,
Shirley Byrd

COMMUNITY DEVELOPMENT
BUILDING DEPT.
FEB 27 2004
CITY OF MANISTEE

and aluminum and organic chemistry.

Biological Responses

Many studies have demonstrated that acidification can and has adversely affected aquatic biota. For example, entire lakes were experimentally acidified — two in the Experimental Lakes Area of Ontario and one in northern Wisconsin — to increase understanding of both the direct and indirect effects of acidification on aquatic communities. Changes in lake biology occurred at each pH level over a pH range of 6.1 to 4.7. Acid-sensitive species disappeared and were replaced by fewer acid-tolerant species, resulting in reduced species richness and simplification of the lake's food web. One of the most visible acidification effects was the growth of thick mats of filamentous benthic algae, which covered the shallow, littoral zone beginning when the pH dropped to 5.6. Acidification also caused fish reproductive failures and population declines, primarily as a result of increased mortality of young fish. Analyses of monitoring and survey data have confirmed fish population losses due to acidification from some surface waters in many parts of northeastern North America. For example, in the Adirondack region of New York, 15 to 19 percent of the lakes with adequate historical data appear to have lost one or more fish species as a result of acidification. The estimated number of lakes in Ontario that have either lost their sport fish populations or have residual nonreproducing populations is 226: lake trout, 119; brook trout, 43; smallmouth bass, 52; and walleye, 14. One third of the available Atlantic salmon habitat in Nova Scotia has been lost since 1950 because of acidification. This is a loss to the salmon fisheries of about 9,000 to 14,000 fish per year and is almost equal to the current annual catch.

Information on the recovery of biological communities following improvements in water quality has also become available in recent years. After experimental acidification, the pH in one lake was allowed to gradually increase from 5.0 in 1983 to 5.8 in 1988. Several biotic components recovered rapidly. The extensive mats of filamentous algae, which first appeared at pH 5.6 during acidification, disappeared at pH 5.8. Fish resumed reproduction at pHs similar to those at which reproduction ceased during acidification. Many species of insects and crustaceans that had disappeared during acidification returned.

Trends data for lakes around Sudbury, Ontario, also provide evidence of biological recovery. Reductions in emissions of SO_2, and trace metals from the Sudbury smelters during the 1970s and early 1980s have resulted in substantial improvements in water quality in many surrounding lakes. As lake pH increased and concentrations of toxic metals declined, zooplankton and phytoplankton species richness increased and some acid-sensitive species of insects and crustaceans, such as *Epischura lacustris*, reappeared. Organisms with low dispersal activity, however, such as the amphipod *Hyalella azteca*, have not yet recolonized these lakes even though pH levels have met or exceeded those required for natural populations for several years. Likewise, natural recolonization by fish is likely to be limited and slow, except where lakes are connected directly to unaffected lakes or other areas of refuge. Stocking, however, re-established a naturally reproducing population of brook trout in Joe Lake; brook trout had disappeared from Joe Lake in the late 1950s

Should Benzie County residents be concerned about Manistee coal plant?...

Continued from previous page

These are among concerns raised by Monica Evans of Honor, chair of the Traverse Group of the Sierra Club which meets weekly in Manistee.

The Sierra Club makes no bones about it. The group opposes the plans proposed by the Tondu Corporation and Manistee Saltworks Development Corporation.

The plant proposed by Joe Tondu, owner of Tondu Corp., and project petitioner through the Manistee Salt Works Development Corp., told Manistee Planning Commission members, "I was born and raised here in Manistee County. I wouldn't build anything if I thought it was going to have a negative impact on Manistee or the environment."

This would be the first coal-plant built in Michigan in a decade and the largest project Manistee has since the $65 million Harbor Village Condominiums. Built at a cost of $700 million, the plant would create about 60 jobs with a $400 million in-house annual payroll, generate another $11 million in third party services or indirect jobs and an on-site labor budget of $100 million.

Operating 24/7, the plant would produce 4.342 million BTUs an hour. This would equal 2.4 percent of Michigan's total electric generating capacity. At maximum output the plant would burn 264 tons of coal every hour, or 2.3 million tons of coal a year.

Coal would be brought in using 13 boats of a 10-month period. Twenty to 30 trips will be made daily to truck fly ash to Shorline Waste Landfill in Stronach Twp.

The plant's annual emissions output into the air of 2,666 tons of nitrogen oxide, 711 tons of particulate matter, 4,443 tons of sulfur dioxide, 60.6 tons of volatile organic compounds, 832 pounds of lead and 420 pound of mercury concerns chemist William Kracht, one of the vocal members of a grassroot organization that has been formed opposing the coal plant.

Late last month, the Bear Lake Twp. Board voted 5-0 to support the Aurora Association's position that it is premature for Manistee to issue a special land use permit for the plant.

Main points for their position were summarized by reporter Tim Richard writing for the Manistee News Advocate:

- Joe Tondu, president of the two corporations, intends to sell the plant to two consortiums of Michigan cities, and as cities, they can not be taxed by Manistee;
- As a non-consortium member, Manistee is not entitled to any of the power generated by the plant;
- Tondu is anxious for Manistee to issue a permit soon because the state Department of Environmental Quality and the federal Environmental Protection Agency are due to issue new, and possibly stricter rules this summer.

Neighboring Pleasanton Twp., which borders Benzie County, had its board vote 4-0 to oppose the City of Manistee from granting a special use permit "unit an independent economic assessment and an environmental impact statement have been completed and analyzed."

More information is on the Tondu Corp. web site, www.tonducorp.comm, and www.michigan.sierraclub.org/traverse, or www.manisteefrd.org.

United States / Canada Air Quality Agreement

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SECTION III Progress: Scientific and Technical Activities and Economic Research

In accordance with Annex 2 of the Air Quality Agreement, Canadian and American scientists have been coordinating and cooperating on acid deposition modelling, monitoring, and effects research for a number of years. Recently, the two countries expanded their cooperative efforts to include ground-level ozone and visibility impairment.

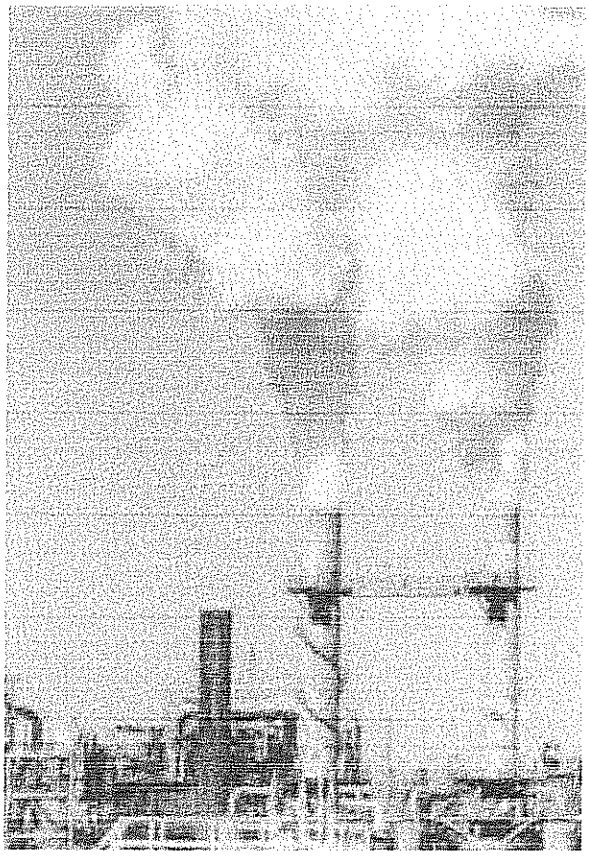
In this section (as elsewhere in the report), the terms acid rain and acid deposition are used interchangeably. "Acid rain" is a shorthand descriptor that has been used for many years and has gained widespread public recognition. The problem of acidification is more complex than the term acid rain would imply. "Acid deposition," therefore, in addition to encompassing wet deposition of acidic species, also includes dry deposition of acidic materials and atmospheric transformation and transport contributing to the impact these materials have on the environment.

EMISSION INVENTORIES

Emission inventories provide the foundation for air quality management programs. They are used to identify the major sources of air pollution, provide data for input into air quality models, and enable the tracking of control strategies. The importance of emission inventories and the accuracy of their estimates has always been a priority in Canada and the United States. Both countries have been updating and improving their estimates for the 1990 inventory using the latest information obtained from states/provinces, source measurements, and special study findings. Numerous tools also have been developed to analyze trends and forecasts of emissions. Biannual meetings are continuing, emphasizing the need to pursue and increase the level of collaboration between the two countries.

SULPHUR DIOXIDE, NITROGEN OXIDES, AND VOC EMISSIONS IN CANADA AND THE UNITED STATES FROM 1980 TO 2010

Sulphur dioxide (SO_2) and nitrogen oxides (NOx) emissions are the dominant precursors of acid rain. NOx along with volatile organic compounds (VOCs) are important contributors to the formation of ground-level ozone, which also contributes to the formation of acidic compounds in the atmosphere.



The totals for all three pollutants covered in this report were derived using methodology that has been extensively revised from the methodology used to develop previous estimates. Using the revised methodology, previous estimates have been recalculated. Regarding U.S. mobile sources, the emission estimates were revised using an updated version of the mobile source emission factor model (MOBILE 5). Enhancements include emission factors that were adjusted to account for currently used fuels, the use of nine vehicle speeds (instead of three) to obtain a more accurate model of real-life highway conditions, and the addition of late-model light-duty vehicles.

In addition, EPA's Office of Mobile sources conducted an extensive off-highway emissions VOCs data survey in 1990 that produced more accurate estimates over last year's totals. Various source categories, including solvent, fossil-fuel, steam-utility, and other point sources, were re-estimated using U.S. Department of Commerce Bureau of Economic Analysis growth factor indicators as well as the application of new control efficiencies, rule effectiveness factors, and updated emission factors.

The emission estimates for the years 1980, 1985, 1990, and 1992 and the projected emission estimates for the years 2000 and 2010 are described for each pollutant in the sections which follow. These estimates and projections of the pollutant emission levels may vary from year to year because of modelling developments. In addition, the 1990 and 1992 data reported for both Canada and the United States are preliminary. The 1980 data are included because 1980 is the base year for measuring emission reductions under the acid rain control programs in both countries.

Table 4 summarizes the 1992 emission estimates for Canada and the United States. The estimates are divided into four major categories, with the data

presented both in metric tonnes and short tons. Figures 3, 4, and 5 summarize the SO_2, NOx, and VOC emission estimates for 1980, 1985, 1990, 1992, 2000, 2005, and 2010. The data presented in these figures and Table 4 were obtained from EPA *National Air Pollution Emission Estimates, 1900-1992*, October 1993, (EPA-454/R-93-032) and from Environment Canada (Pollution Data Analysis Division).

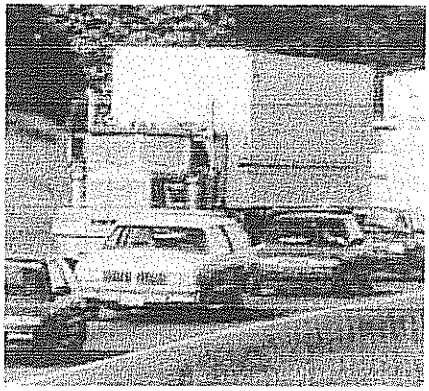
Table 4
Emission Estimates for Canada and the United States, 1992

	SO_2		NOx		VOCs	
	(million tonnes[1])	(million tons[1])	(million tonnes)	(million tons)	(million tonnes)	(million tons)
United States						
Electric Ulitilities	14.4	15.8	6.8	7.5	0.0	0.0
Industrial	4.7	5.2	4.0	4.4	10.1	11.2
Mobile	0.0	0.0	9.4	10.3	7.5	8.2
Other	1.5	1.7	0.9	0.9	3.0	3.3
Total	20.6	22.7	21.0[2]	23.1	20.6	22.7
Canada						
Electric Utilities	0.7	0.8	0.3	0.3	negligible	negligible
Industrial	1.9	2.1	0.5	0.5	0.3	0.3
Mobile	0.0	0.0	1.3	1.4	0.7	0.8
Other	0.5	0.6	0.1	0.1	1.0	1.1
Total	3.1	3.4[2]	2.2	2.3	2.0	2.2
U.S./Canadian Total	23.7	26.1	23.1[2]	25.4	22.6	24.9

[1]One ton is equal to 0.9 tonnes; 1 tonne is equal to 1.1 tons.
[2] Total is not the raw data total of enumerated items due to rounding of numbers

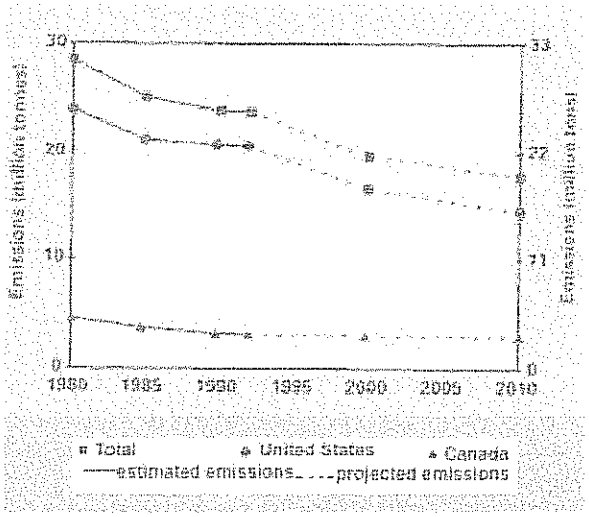
Sulphur Dioxide

The principal anthropogenic sources of SO_2, are coal and oil combustion, smelting, and a few industrial processes. As shown in Table 4, electric utilities were responsible for 70 percent of the 1992 SO_2, emissions in the United States and 23 percent in Canada, while industrial sources were responsible for 23 percent of SO_2 emissions in the United States and 61 percent of total SO_2 emissions in Canada. Canadian SO_2 emissions were approximately 13 percent of the total emissions of Canada and the United States combined in 1992; U.S. emissions were approximately 87 percent of the combined total.



SO_2 emissions are declining. Overall trends in emission levels from 1980 to 2010 for Canada and the United States are presented in Figure 3. In 1980, total estimated emissions of SO_2 in the two countries were 28.5 million tonnes. In 1985, total estimated emissions of SO_2 in Canada and the United States were 25.1 million tonnes. From 1980 to 1992, emissions of SO_2 in North America were estimated to decline by 4.7 million tonnes, or 16.5 percent. SO_2 emissions in the United States in 2000 and 2010 are projected to be 18.3 million tons and 16.3 million tons, respectively. The totals include emissions from banked or unused allowance credits. SO_2 emissions in Canada in 2000 and 2010 are projected to be 3.0 million and 3.1 million tonnes, respectively. Uncertainty bands on the national annual emissions estimates of SO_2 range from 5 to 10 percent; the uncertainty bands are larger for regional annual emissions estimates.

Figure 3 SO_2 Emission Estimates



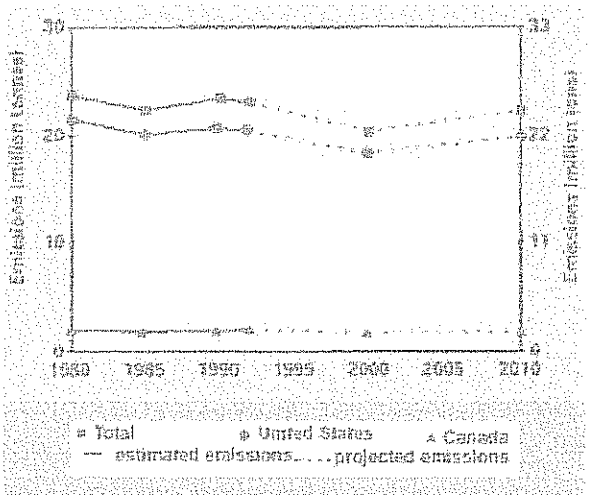
While 8.95 million SO_2 allowances are expected to be allocated by 2010, the United States' SO_2 emissions are expected to exceed the national utility cap of 8.95 million tons because utilities in Phase II are projected to use banked allowances (or credits) gained from greater emission reductions in Phase I.

Nitrogen Oxides

The principal anthropogenic source of emissions of NOx is fuel combustion, which occurs in internal combustion engines, residential and commercial

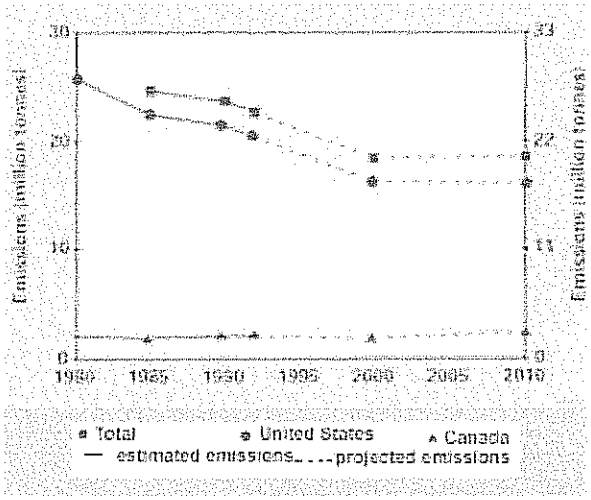
furnaces, industrial boilers, electric utility boilers and engines, and other miscellaneous equipment. As shown in Table 4, in 1992 45 percent of NOx emissions in the United States and 60 percent of emissions in Canada were produced by mobile sources. Electric utilities were responsible for 32 percent of the 1992 emissions in the United States and 14 percent in Canada. Industrial sources were responsible for 19 percent of NOx emissions in the United States and 23 percent of total NOx emissions in Canada. Canadian NOx emissions were approximately 9 percent of total emissions in the United States and Canada combined in 1992; U.S. emissions were approximately 91 percent of the combined total.

Figure 4 NOx Emission Estimates



Note: For NOx emissions, these projections incorporate mandatory CAA measures for stationary and mobile sources. The projections do not include measures that will be taken by individual states to meet the National Ambient Air Quality Standard for ground level ozone. These additional measures will act to lower future emissions.

Figure 5 VOC Emission Estimates



Note: For U.S. VOC emissions, these projections incorporate mandatory CAA measures for stationary and mobile sources. The projections do not include measures that will be taken by individual states to meet the National Ambient Air Quality Standard for ground-level ozone. These additional measures will

act to lower future emissions.

NOx emissions are expected to decline slightly by the year 2000, then rise in both countries. Figure 4 shows the overall trend for anthropogenic emissions of NOx in Canada and the United States from 1980 to 2010. In 1980, the total estimated emissions of NOx in the two countries were 23.6 million tonnes. In 1985, the total estimated emissions in Canada and the United States were 22.3 million tonnes. From 1980 to 1992, emissions of NOx in North America were estimated to decline by 0.5 million tonnes, or 2 percent. Emissions of NOx in the United States in 2000 and 2010 are projected to reach 20.2 million tons and 22.3 million tons, respectively. Emissions of NOx in Canada in 2000 and 2010 are projected to reach 2.0 million tonnes and 2.2 million tonnes, respectively. Uncertainty bands for national annual emissions of NOx are in the 10- to 15-percent range, and are larger regionally.

Volatile Organic Compounds

VOCs contribute to the formation of ground-level ozone and acidic compounds in the atmosphere. Anthropogenic emissions of VOCs come from a wide variety of sources, such as mobile sources and industrial processes (e.g., chemical manufacturing, petroleum product production, and industrial solvent use). As shown in Table 4, in 1992, 36 percent of VOC emissions in the United States and 36 percent of emissions in Canada were produced by mobile sources. Industrial sources were responsible for 49 percent of the VOC emissions in the United States and 15 percent of the total in Canada. Canadian VOC emissions were approximately 9 percent of the total emissions of the United States and Canada combined in 1992; U.S. emissions were approximately 91 percent of the combined total. There are also important natural sources of these emissions.

VOC emissions in both countries are expected to decline by the year 2000, then remain stable through the year 2010. Overall trends in VOC emission levels from 1980 to 2010 for Canada and the United States are presented in Figure 5. In 1985, the total estimated emissions of VOCs in Canada and the United States were 24.7 million tonnes. From 1985 to 1992, VOC emissions in North America were estimated to decline by 2.1 million tonnes, or 8.5 percent. Emissions of VOCs are expected to decline even further after 1992. Estimated emissions for the United States in 2000 are 17.7 million tons and in 2010 are 17.5 million tons. Emissions of VOCs in Canada in 2000 and 2010 are projected to reach 2.1 million tonnes ans 2.4 million tonnes, respectively. Uncertainty bands on anthropogenic and natural emissions of VOCs are large.

Ammonia

Natural and anthropogenic emissions of ammonia are important in the study of acidic deposition for a number of reasons: (1) ammonia is a nitrogen-containing compound and the deposition of ammonia contributes to the total loading of nitrogen in the environment; and (2) in the atmosphere, ammonia can neutralize acidic substances. This Progress Report, however, does not consider the sources, emission trends, or projected emission levels for ammonia.

Nonetheless, research on ammonia emission factors has been conducted by EPA (and certain international groups) and the Agency is currently conducting a literature search so that the latest information can be assessed. Using this information, EPA will develop a brief research plan that identifies source categories in need of more study. Additional categories of research will be based on several factors, including: (1) the limited test data available for

studying large-scale national and global ammonia emissions; (2) significant industrial process changes; and (3) controversy due to the current emissions factor or activity data.

Conclusion

An overall trend of decreasing emissions can be seen from this analysis, despite the increases in the estimated emissions for certain individual sources. For example, 1992 saw increased consumption of bituminous coal by electric utilities and industrial boilers and the decreased use of other fuels (e.g., sub-bituminous coal, oil, and gas) in the United States. The result was an estimated net decrease in SO_2 emissions. Total VOC emission estimates in the United States decreased from 1980 to 1992, due largely to changes in automotive fleets. While vehicle miles travelled rose approximately 2 percent each year, the continued replacement of older, less-efficient automobiles with newer, more-efficient ones yielded a net decrease in the emission estimates of about 10 percent. The same comparison regarding transportation sources can be made for the U.S. NOx emission estimates. An analysis of the overall trend in the Canadian emission estimates shows a decrease or flattening between 1980 to 1992. Canada has also been developing industrial and transportation pollution controls equivalent to those in the United States. The two countries have been working together to ensure emission inventory data consistency and coordination in emission trends analysis.

ATMOSPHERIC MODELLING

In Annex 2 of the Air Quality Agreement, Canada and the United States agreed to exchange information on the development and application of atmospheric models determining source-receptor relationships and transboundary transport and describing the deposition of air pollutants. This section summarizes results from linear (Lagrangian) and nonlinear (Eulerian) models and describes progress in the evaluation of Eulerian models. These models are used for a number of purposes, including analyses of different emission scenarios and the resulting change in air quality and deposition.

Model Application

Previous studies reported the impact of SO_2 emissions from a given source region on deposition in a receptor region (source-receptor relationship). Since the last Progress Report, similar studies have been conducted for nitrogen using a long-range transport sulphur/nitrogen model and 1980 base-year data. For example, the Canadian contribution to nitrogen concentrations and deposition was found to be greatest at Gander in Newfoundland (60 to 70 percent) and least at Algoma at the eastern end of Lake Superior (7 to 11 percent). Despite the model deficiencies and uncertainties, these matrices provide the first published quantitative estimates of the relative contributions of Canadian and U.S. source regions to nitrogen concentrations and deposition at several receptors in the two countries.

Scientists in Canada and the United States are exchanging information on how to use atmospheric models to anticipate future deposition patterns and how to use the predictions to improve the ability of deposition monitoring networks to detect pattern changes. Canadian and U.S. models have been used to project sulphate deposition patterns following the implementation of various phases of both countries' acid rain control programs (i.e., using the Canadian Lagrangian Long Range Transport Sulphur Model and the U.S. Eulerian Regional Acid Deposition Model [RADM]). The predicted patterns have been used to test the appropriateness of the existing networks and to

recommend changes in network design. As sulphur emission control programs are being implemented, deposition monitoring networks are continuing to fulfil the principal goals of detecting and quantifying temporal and spatial changes in deposition. The networks are being modified in accordance with the recommendations of the modelling studies.

Model Evaluation

The two countries have been cooperating in model evaluation using information from the Eulerian Model Evaluation Field Study (EMEFS). Since the last Progress Report, Phase 1 of the evaluation of the two advanced acidic deposition models —ADOM (Acid Deposition and Oxidants Model) and RADM— has been completed. This phase is primarily based on 1988 EMEFS data. Phase 2 will be based on 1990 EMEFS data as well as critical data from the 1988 period; it is to be completed in 1994. Additional cooperative efforts in the further evaluation and application of the advanced models will continue under the Air Quality Agreement.

A peer review panel has confirmed the ability of the models to represent (1) total sulphur loading of the atmosphere; (2) annual sulphur deposition (although there is some seasonal bias, with deposition being underestimated in summer and overestimated in winter); and (3) total nitrogen loading of the atmosphere. The reviewers concluded that the models could be used for developing current estimates as well as projections of annual deposition of sulphur and nitrogen.

The reviewers also concluded that, while both models were adequate for the study of large-scale and long-distance source-receptor relationships, their complexity will pose a limitation. A valuable application would be for the complex models to serve as a check on the source-receptor matrices produced by simpler but much faster Lagrangian methods. The reviewers agreed that the differences between the simple and complex models' estimates of deposition may be on the order 10 to 15 percent.

MONITORING ACTIVITIES

Coordination of Monitoring Activities

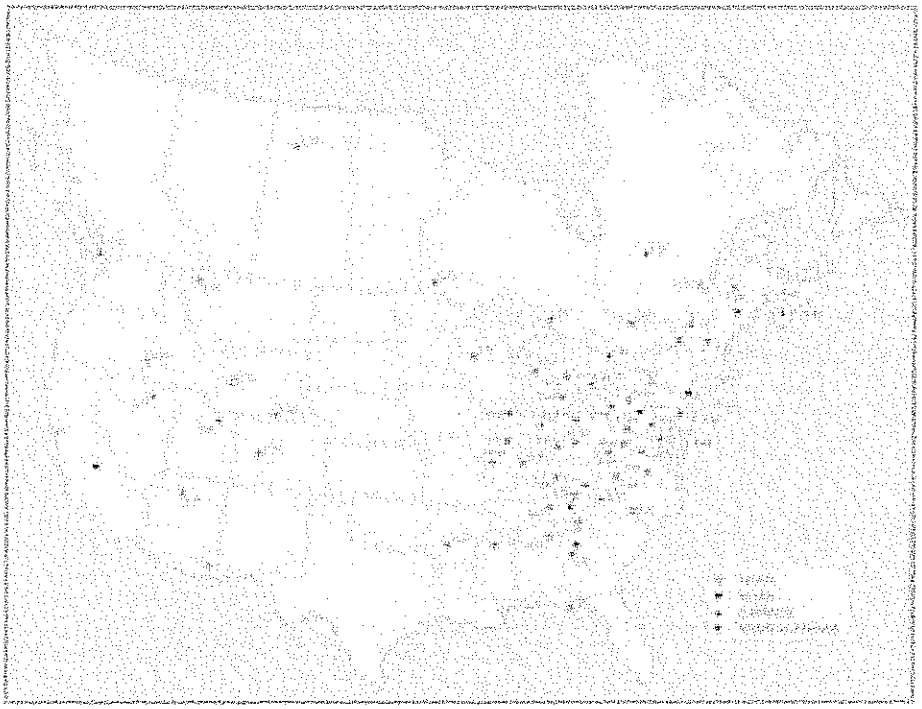
Regional Dry Deposition Estimates

Dry deposition is an important process by which acidic air pollutants are deposited to the Earth's surface. In contrast to wet deposition, dry deposition is very difficult and costly to measure and consequently there have been fewer direct measurements. Thus, rates of dry deposition fluxes in Canada and the United States are usually determined by calculating dry deposition as the product of a measured air concentration and a modelled deposition velocity. Deposition velocity is modelled as a function of surface characteristics and measured meteorological variables or climatological data.

Air concentration measurements appropriate for estimating dry deposition are taken at multiple locations in both countries. In Canada, the Canadian Air and Precipitation Monitoring Network (CAPMoN) has been providing daily concentration data of SO_2, particulate-SO_4, nitric acid (HNO_3), and particulate-NO_3 at 11 sites for up to 14 years. In the United States, the National Dry Deposition Network (NDDN) was established in 1987 and currently reports weekly averaged concentration data for SO_2, particulate-sulphate (SO_4), nitric acid (HNO_3), particulate-nitrate (NO_3), and ammonia (NH_3) for 50 sites. A map of air concentrations of SO_2 for 1991 at Canadian and U.S. sites is shown in

Figure 6. Both networks have observed a gradient in air concentrations with high values occurring closest to areas of greatest SO_2 emissions. There is very little difference between these observations and those reported in the previous Progress Report. These air concentration data, combined with land/vegetation information and hourly meteorological or climate data, give an estimate of dry deposition through an inferential model approach. Although Canadian and U.S. approaches to estimating dry deposition are similar, the differences preclude publishing a composite description of dry deposition over eastern North America at this time. To further minimize the differences, Canadian and U.S. measurement and modelling techniques are being compared.

Figure 6 Median 1991 SO_2 Air Concentrations at CAPMoN and NDDN Sites



To determine if there could be systematic differences (biases) arising from the use of different methods of sample collection and analysis, collocated NDDN and CAPMoN measurements of air concentrations of various gases have been carried out. Such differences could lead to air concentration and deposition discontinuities across the Canada-U.S. border. With the exception of SO_2, where a difference of 14 percent was noted, measured differences were found to be small.

In Canada, current investigations are focusing on the advantages and disadvantages of the various models that are available to determine an appropriate and comparable modelling framework. In the United States, recent advances in model design are being applied to the NDDN measurements. The overall goal of the work in both countries is to improve model estimates of dry deposition of all acidifying species by increasing the understanding of the processes involved in delivering gases and particles to the Earth's surface.

Estimating Total Sulphur Deposition

Total deposition is the sum of wet, dry, and droplet deposition. Work is under way to develop an effective way to combine estimates of dry deposition with wet deposition measurements that will provide comprehensive information on regional variations. Also, efforts are being made to achieve greater certainty in the characterization of spatial wet deposition fields of sulphate and nitrate in Canada and the United States. The current method employs interpolation between the sparse measurement sites, using precipitation depth measurements taken only from the acid deposition networks rather than the fuller set of observations provided by national weather services. It is expected that uncertainties in the spatial distributions will be decreased by combining interpolated precipitation chemistry fields with more detailed observed precipitation amount fields, thereby producing morehighly resolved wet deposition fields.

Significant contributions to total deposition can come from fog and cloud water droplet deposition in certain geographical locations. For example, mountain peaks in eastern North America are subject to cloud deposition that may be equivalent to or greater than deposition from precipitation. The United States collected cloud water and calculated cloud water deposition as part of the National Acid Precipitation Assessment Program (NAPAP) from 1986 through 1989. Canada also measured cloud water during this time period as part of the federal/provincial Acid Rain Research and Monitoring Program. In the United States, the Clean Air Status and Trends Network (CASTNET) is reinitiating sampling at some of the previous sites and installing new sites. In Canada, fog chemistry and sulphate deposition are currently being measured in coastal areas in the Atlantic Provinces in order to more accurately describe total sulphate deposition. The work indicates that on average the sulphate deposition from fog is almost equal to that from rain and snow in the New Brunswick Fundy Coast region.

Findings of Air Pollutant Monitoring Activities

Deposition Networks

The National Atmospheric Deposition Program/National Trends Network (NADP/NTN) is the largest wet deposition network in the United States, operating on a weekly measurement protocol with approximately 200 sites, some with data records dating from the early 1980s.

CASTNET operates wet deposition sites to supplement the NADP/NTN in areas that do not have monitoring sites, such as mountain and coastal regions. The National Oceanic and Atmospheric Administration (NOAA) recently established a daily wet deposition network, the Atmospheric Integrated Research Monitoring Network (AIRMoN). The daily sampling schedule will provide data for addressing the localized effects of emission controls to be used in source/receptor modelling. Wet deposition data from NADP/NTN, CASTNET, and the Canadian CAPMoN and provincial networks have been combined. The spatial distributions of wet sulphate and nitrate deposition in 1988, 1989, 1990, and 1991 are shown in Figures 7 to 14. Comparing 1988 data with data from 1991 shows in both years an almost total lack of areas receiving more than 30 kg wet sulphate/ha/yr. In contrast, the intervening years (1989 and 1990) show considerable larger areas as having received more than 30 kg/ha/yr, as was the case for the years prior to 1988. A direct comparison of 1988 with 1991 would not have given a realistic assessment of what had actually occurred since the last Progress Report. In all four years, the highest deposition was seen in the states of Ohio, Pennsylvania, and West Virginia (Figures 11 to 14). The highest nitrate deposition was seen in southern Canada in 1988 and in the following years in areas adjacent to the Great Lakes.

Deposition Trends

Figures 15 and 16 show the variability from 1980 to 1991 in the precipitation weighted mean concentration of sulphate and nitrate in Canada and the United States. Deposition is a reflection of both the amount of sulphate in the rainfall (concentration) and the amount of rain in any given area. Because of the greater variability in rain from year to year, trends can be more easily detected in the concentration of sulphate rather than in deposition. A significant downward trend was seen in sulphate concentration in rain at 26 to 33 U.S. NADP/NTN sites over the 1980-1991 period. A Canadian study showed that sulphate concentrations from both Canadian and U.S. sites showed significant long-term trends over the same period with reductions in concentrations being seen early in the decade and with a tendency to level off later in the decade. In contrast, while significant trends were seen for changes in the nitrate concentrations in precipitation, there was no dominant trend in terms of increase or decline.

Between 1980 and 1985, the total SO_2 emissions in eastern North America decreased by about 15 percent, after which they remained approximately constant. NOx emissions, on the other hand, showed no strong downward trend and exhibited only slight annual variations (i.e., of less than 5 percent) around the mean from 1980 through 1991. In general, changes in SO_2 emissions are reflected in changes in sulphate concentrations in precipitation. Nevertheless, the ecological response is often a reflection of both the amount and the concentration (deposition) and trends in deposition needed to be investigated. For the period studied, changes in deposition are seen to reflect the changing emission patterns. A statistically significant relationship exists between the SO_2 emissions over eastern Canada and United States and the sulphate concentration trends averaged over all sites in the same area. When sulphate wet deposition is integrated across all of eastern North America and compared with the integrated SO_2 emissions over the same area, a close correlation exists between sulphate deposition and emissions initially showing both emissions and deposition declining (Figure 17 on page 32). However, due to the uncertainty in the data, trends in the latter half of the decade are not obvious. The normalized integrated nitrate deposition showed no upward or downward trend over the decade consistent with the normalized NOx emissions. Continued monitoring and analysis is needed to quantify the link between reduced SO_2 emissions and subsequent reduced wet sulphate deposition.

EFFECTS RESEARCH AND MONITORING

Aquatic Ecosystems Trends

Reduction in North American SO2 emissions is expected to reduce acidic deposition and result in beneficial changes in the chemistry and biology of lakes and streams that have been adversely impacted by acidic deposition. Some emission reductions have occurred since the 1980s. Assessment of chemical trends observed in surface waters during this period provides a qualitative indication of the response complexity, a verification of whether ecosystems do in fact respond positively, and a baseline for evaluating future changes.

Canada

The 1983-1991 chemical records from 111 lakes or streams in southeastern Canada were evaluated to identify increasing or decreasing trends that were statistically significant at a 95 percent confidence level.

Figure 7 1988 Wet SO_4 Deposition Sea Salt Corrected (kg/ha/yr)

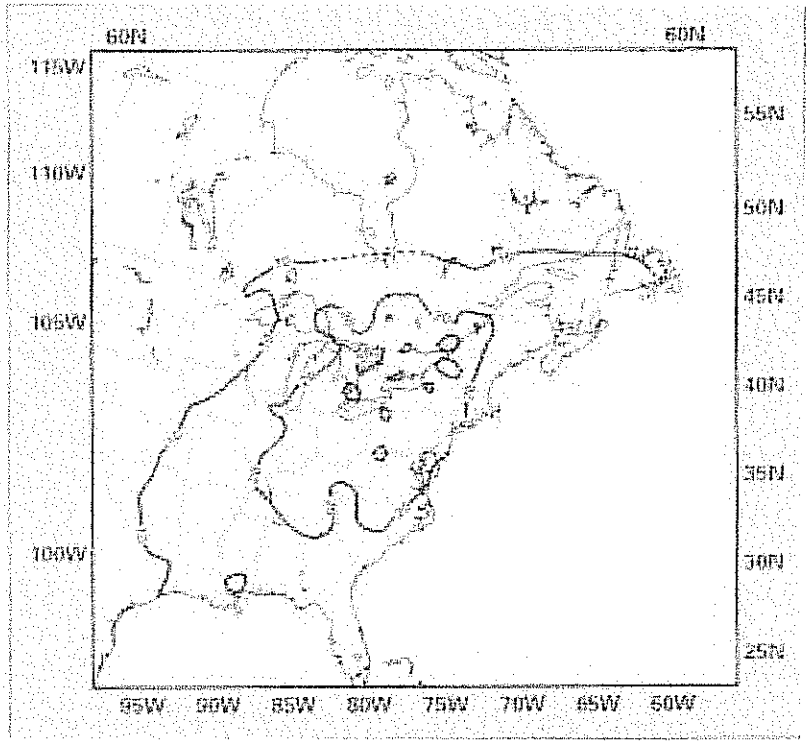


Figure 8 1989 Wet SO_4 Deposition Sea Salt Corrected (kg/ha/yr)

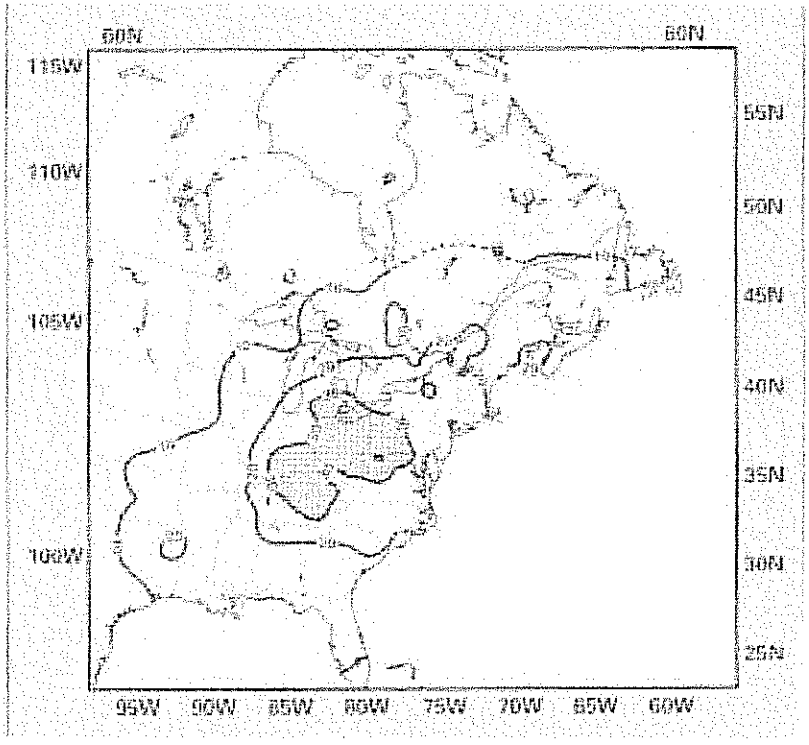


Figure 9 1990 Wet SO_4 Deposition Sea Salt Corrected (kg/ha/yr)

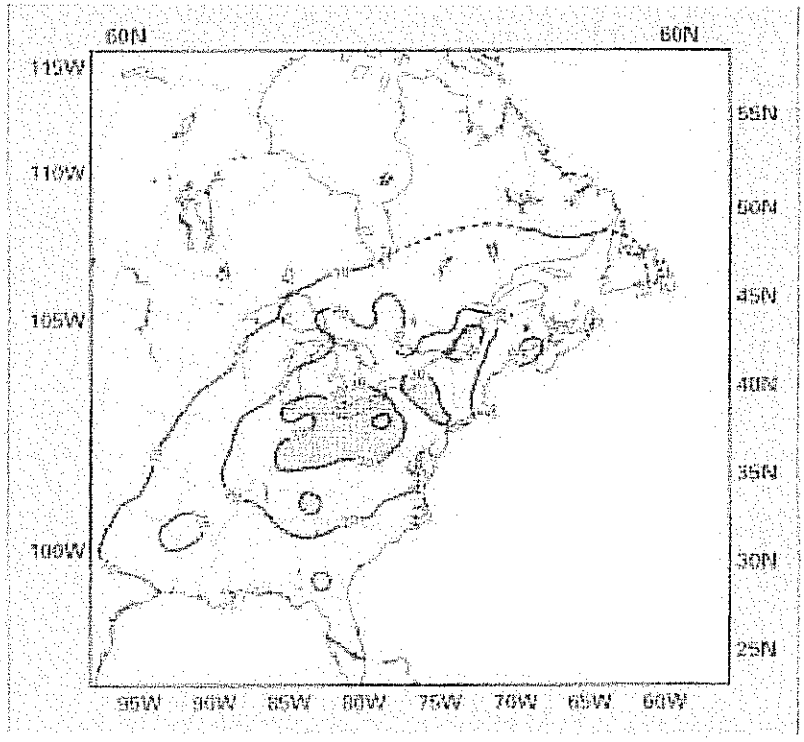


Figure 10 1991 Wet SO_4 Deposition Sea Salt Corrected (kg/ha/yr)

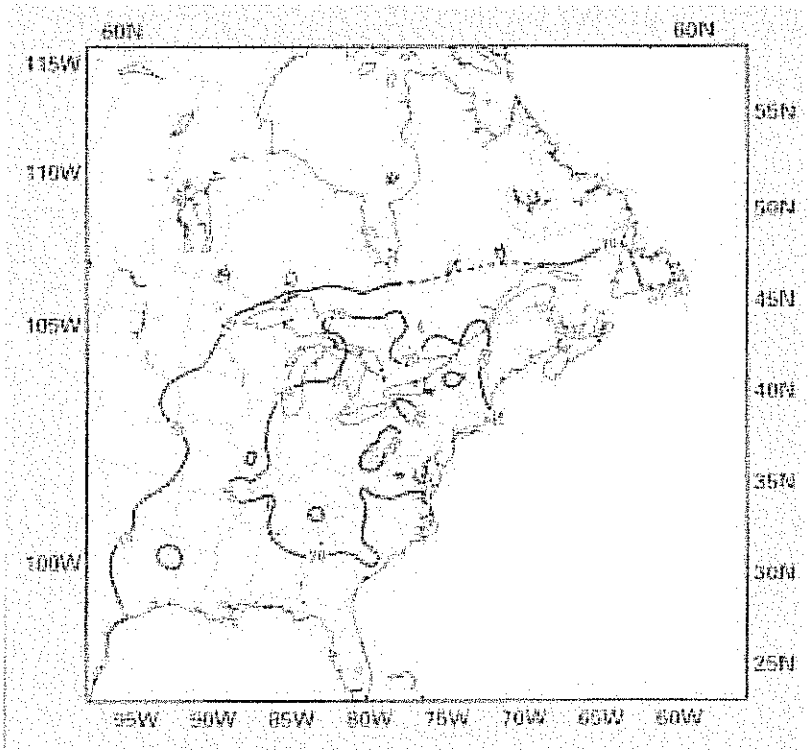


Figure 11 1988 Wet NO_3 Deposition (kg/ha/yr)

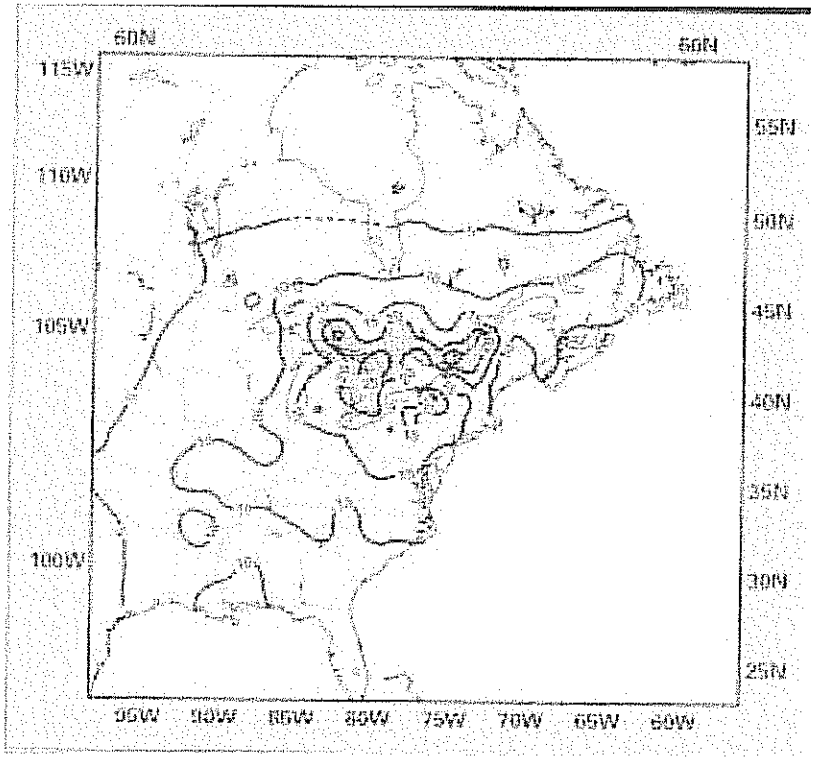


Figure 12 1989 Wet NO_3 Deposition (kg/ha/yr)

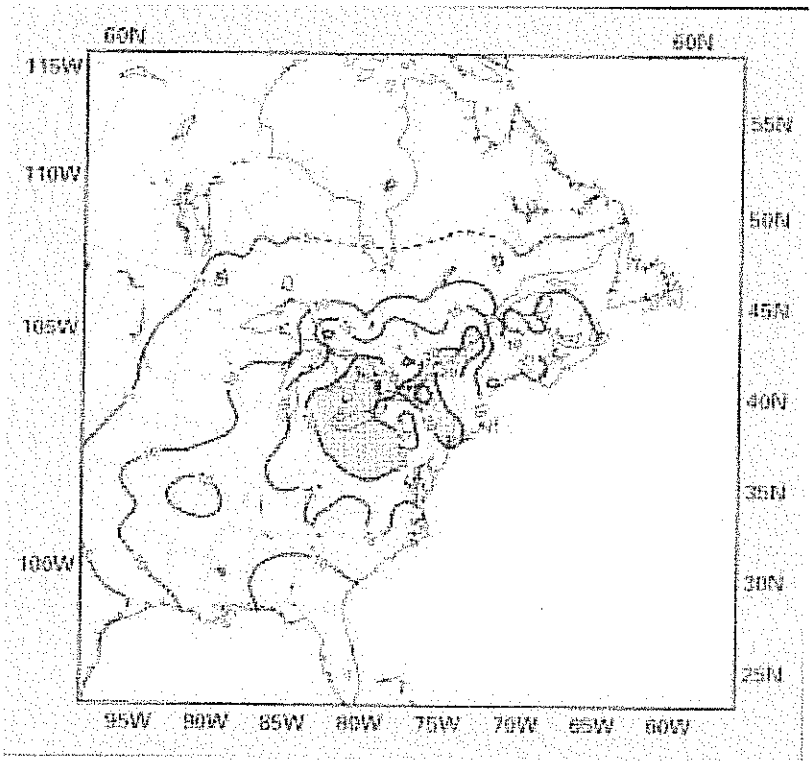


Figure 13 1990 Wet NO_3 Deposition (kg/ha/yr)

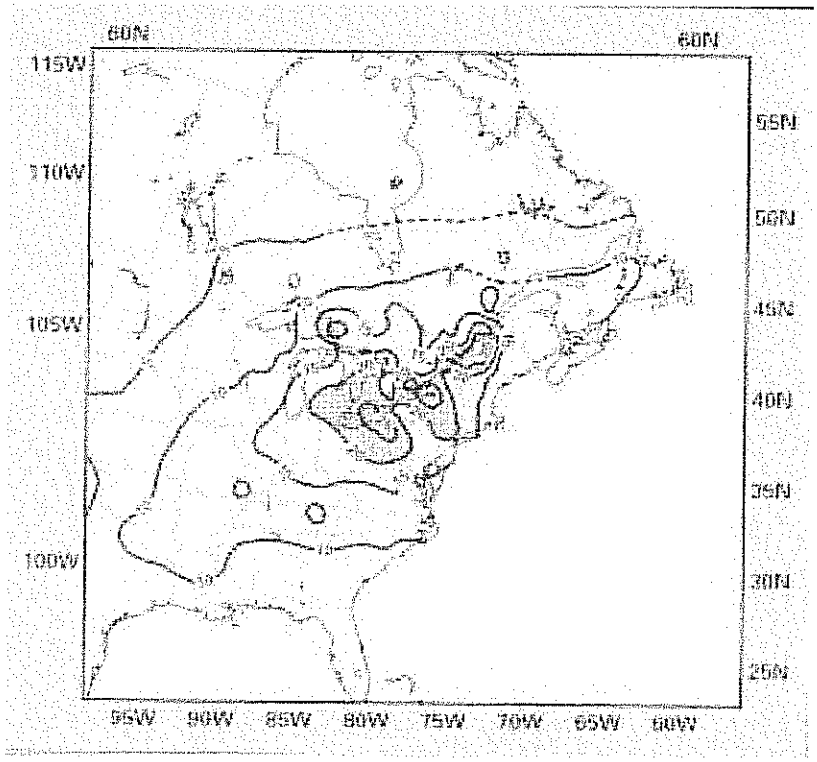


Figure 14 1991 Wet NO_3 Deposition (kg/ha/yr)

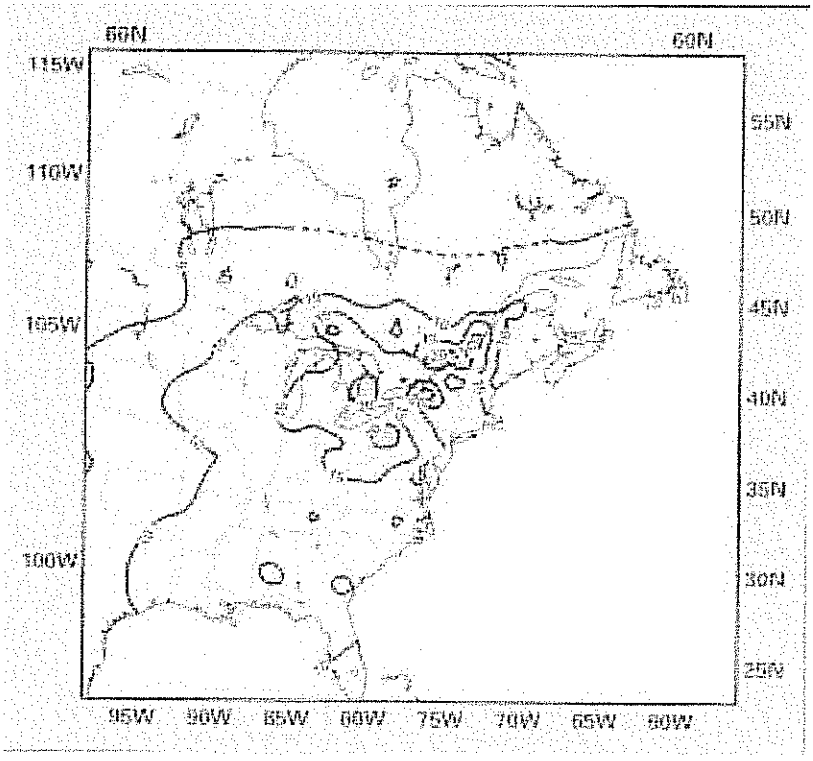
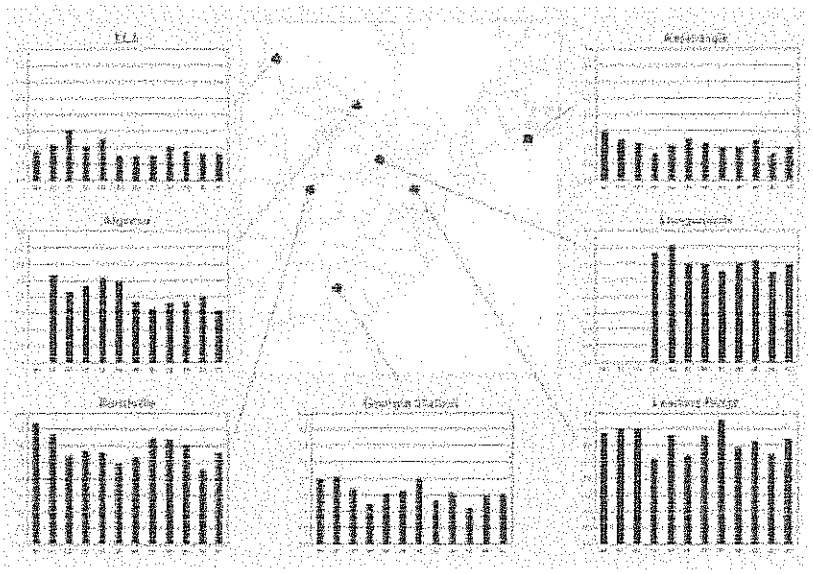
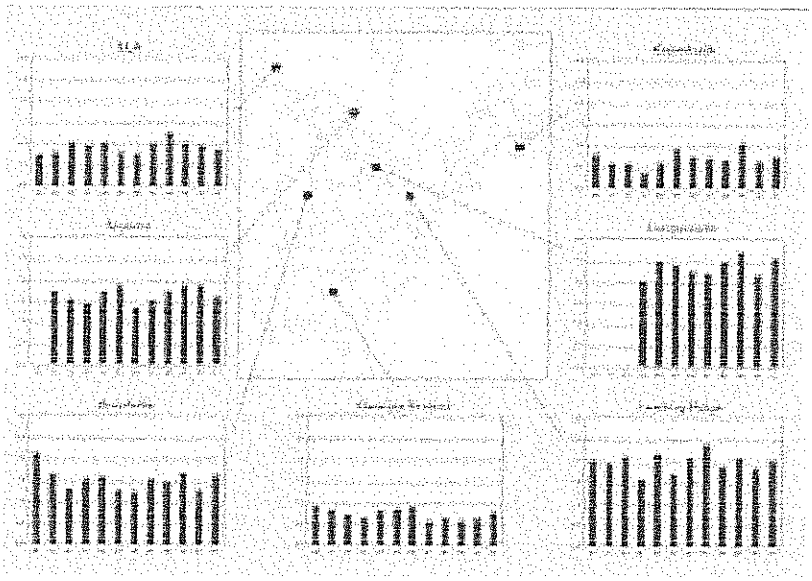


Figure 15 Precipitation Weighted Mean $SO_4^=$ Concentration, Sea Salt Corrected (mg/l)



Considering all 111 sites together, 31 percent (mostly in Nova Scotia and Newfoundland, a few in Ontario) are recovering. These sites show an increasing pH and/or acid neutralizing capacity (ANC) trends (regardless of the sulphate trend). Lakes within the Sudbury region of Ontario have also been recovering throughout the 1980s in response to emission reductions from local sources. If these lakes had been included in the statistical analysis, a greater proportion of Ontario's waters would have been classified in the recovering group. Forty-one percent of the sites showed no trend in pH or ANC and no change in sulphate concentration (i.e., from 1983 to 1991, their acidification status was stable). Thirteen percent (mostly in Nova Scotia and Newfoundland) exhibited stable pH and/or ANC but significantly increasing sulphate. If sulphate continues to increase at these sites and the present compensatory mechanisms fail, these waters might eventually acidify. Fifteen percent of the waters (mostly in Ontario and Quebec) are continuing to acidify (declining pH and/or ANC) despite having stable or declining sulphate levels. Some of the water chemistry trends recognized by this analysis differ from those identified by earlier studies that used a different timeframe. In southwestern New Brunswick, 18 percent of 40 headwater lakes sampled in 1993 had negative ANC compared with 3 percent with negative ANC for the same lakes in 1986. This is to be expected, given the short monitoring period for which records are presently available for evaluation (i.e., short relative to the response times of many catchment processes). Moreover, the results show that the regional responses of waters to reductions in SO_2 emissions are not straightforward. Only high-quality, long-term monitoring records will reliably quantify the chemical and biological responses to SO_2 control.

Figure 16 Precipitation Weighted Mean NO_3 Concentration (mg/l)



United States

About 80 low-ANC lakes and streams have been monitored in the northeastern and upper midwestern United States since the early 1980s as part of EPA's Long-Term Monitoring Program. Trends in surface water chemistry were calculated for each site through 1989.

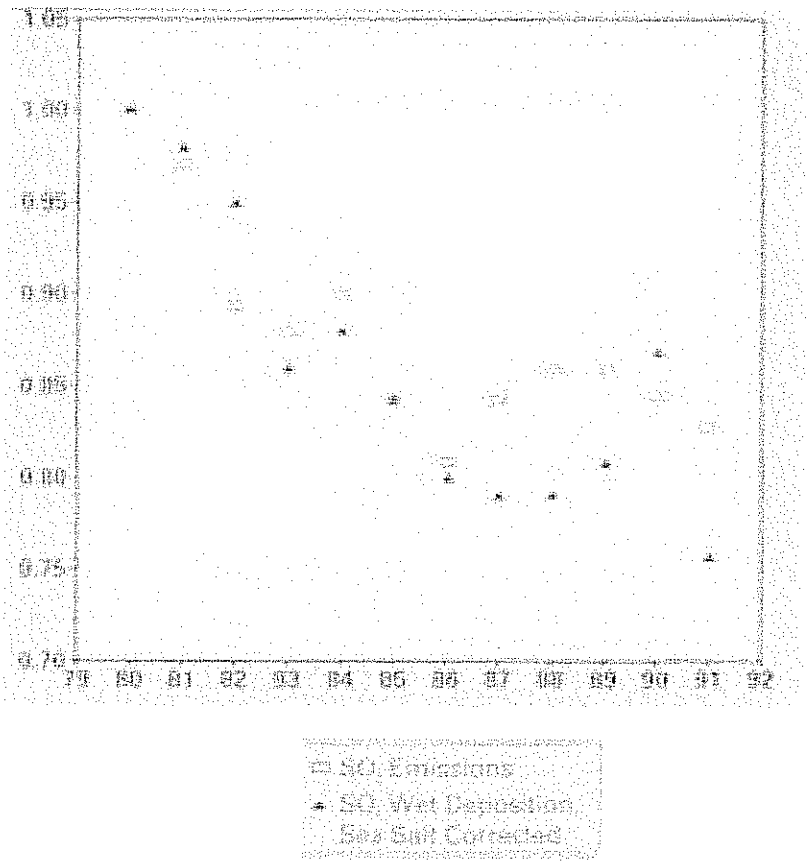
Surface waters monitored during the 1980s are generally representative of low ANC systems in these regions, but they were not selected as a statistically representative sample of lakes and streams. Regional trends monitoring began in 1991 in the Northeast and in 1993 in the Mid-Appalachians to evaluate changes in regional surface water chemistry in response to the emission reductions mandated by the 1990 CAA Amendments. Data from current regional monitoring studies will be available for future reports.

Sulphate concentrations declined in 50 of 53 waters monitored in the northeastern United States. Thirty-four sites (64 percent) had a statistically significant decrease in sulphate (at a 90 percent level of confidence), whereas none had a significant increase in sulphate. Given that sulphate deposition declined in the late 1970s and early 1980s, but has remained relatively constant since then, these results suggest a time lag between decreased deposition and decreases in surface water sulphate. Soils that have historically become saturated with sulphate, due to high sulphate deposition, are now gradually losing sulphate.

In contrast, nitrate concentrations, increased during the period of record in all 24 of the lakes and streams monitored in two Northeast subregions: the Adirondack and Catskill Mountains of New York. Fourteen of these waters (58 percent) had a statistically significant increase in nitrate, while none had a significant decrease. Similar increases in nitrate did not occur in lakes in Vermont and Maine. Increases in nitrate in Adirondack and Catskill waters occurred even though no pattern is evident in trends in nitrate deposition (Figure 18). Current theories suggest that watersheds in the Adirondacks and Catskills may be moving toward nitrogen saturation. This is due to historically high nitrate deposition and a natural predisposition to nitrogen saturation (because of high soil nitrogen content and the presence of mature forests).

Figure 17 Normalized Annual SO2, Emissions and Sulphate Wet

Deposition, Sea Salt Corrected, Over Eastern North America



Time series showing the annual emissions and annual deposition over eastern North America from 1980 to 1991. All values are normalized to 1980 as unity.

Trends in ANC, pH, and base cations in Northeast surface waters were not nearly as consistent as those for sulphate and nitrate; both increases and decreases occurred with no strong regional pattern. In the Adirondacks, 13 of 16 lakes (81 percent) had decreased ANC, but only 5 (31 percent) had a statistically significant decrease in ANC. In contrast, in New York's Catskills and in Maine and Vermont, 28 of 37 waters (76 percent) increased in ANC; nine sites (24 percent) had a significant increase in ANC. ANC, pH, and base cations are probably affected by several interacting factors, including decreased sulphate deposition and increased nitrate leaching in some areas (which may offset the benefits of declining sulphate), as well as shifts in base cation deposition, aluminum, and organic chemistry.

Long-term monitoring data are also available for 28 lakes in the Upper Midwest. There is some indication of a regional decrease in surface water sulphate during the period of record (16 lakes have decreased, 12 have increased, but all 8 of the statistically significant trends were decreases). Lakes had no measurable changes in nitrate, and there was no consistent pattern in pH, ANC, or base cation trends. Many of the lakes monitored in the Upper Midwest are seepage lakes (with no tributary streams), which receive water directly from precipitation and ground water. Such lakes tend to have long water-turnover times, and thus longer response times. In addition, drought conditions in much of the Upper Midwest during the 1980s complicated interpretation of lake responses to changes in sulphate deposition

and aluminum and organic chemistry.

Biological Responses

Many studies have demonstrated that acidification can and has adversely affected aquatic biota. For example, entire lakes were experimentally acidified — two in the Experimental Lakes Area of Ontario and one in northern Wisconsin — to increase understanding of both the direct and indirect effects of acidification on aquatic communities. Changes in lake biology occurred at each pH level over a pH range of 6.1 to 4.7. Acid-sensitive species disappeared and were replaced by fewer acid-tolerant species, resulting in reduced species richness and simplification of the lake's food web. One of the most visible acidification effects was the growth of thick mats of filamentous benthic algae, which covered the shallow, littoral zone beginning when the pH dropped to 5.6. Acidification also caused fish reproductive failures and population declines, primarily as a result of increased mortality of young fish. Analyses of monitoring and survey data have confirmed fish population losses due to acidification from some surface waters in many parts of northeastern North America. For example, in the Adirondack region of New York, 16 to 19 percent of the lakes with adequate historical data appear to have lost one or more fish species as a result of acidification. The estimated number of lakes in Ontario that have either lost their sport fish populations or have residual nonreproducing populations is 228: lake trout, 119; brook trout, 43; smallmouth bass, 52; and walleye, 14. One third of the available Atlantic salmon habitat in Nova Scotia has been lost since 1950 because of acidification. This is a loss to the salmon fisheries of about 9,000 to 14,000 fish per year and is almost equal to the current annual catch.

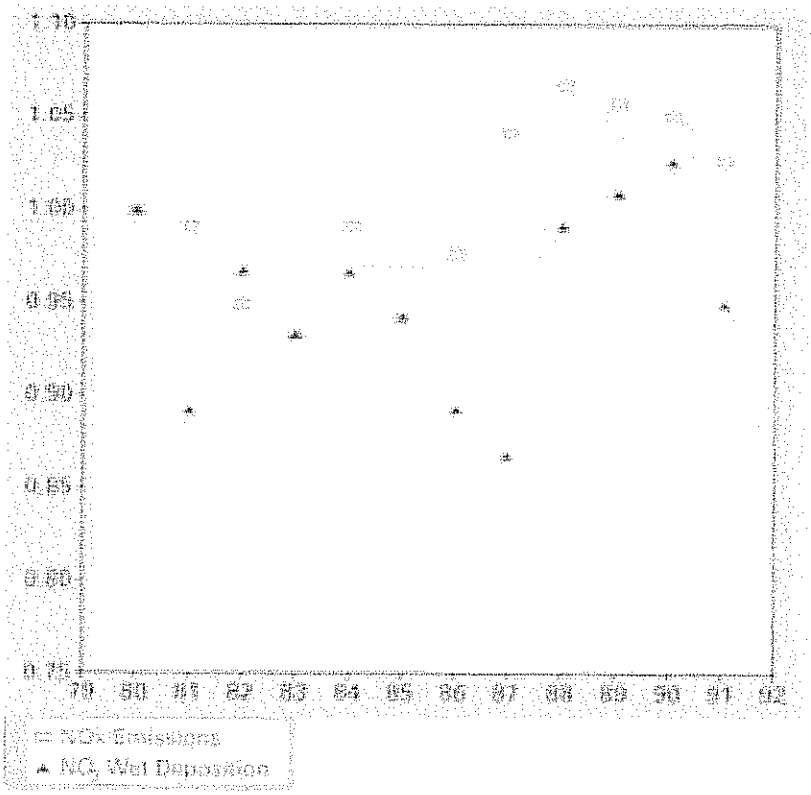
Information on the recovery of biological communities following improvements in water quality has also become available in recent years. After experimental acidification, the pH in one lake was allowed to gradually increase from 5.0 in 1983 to 5.8 in 1988. Several biotic components recovered rapidly. The extensive mats of filamentous algae, which first appeared at pH 5.6 during acidification, disappeared at pH 5.8. Fish resumed reproduction at pHs similar to those at which reproduction ceased during acidification. Many species of insects and crustaceans that had disappeared during acidification returned.

Trends data for lakes around Sudbury, Ontario, also provide evidence of biological recovery. Reductions in emissions of SO_2, and trace metals from the Sudbury smelters during the 1970s and early 1980s have resulted in substantial improvements in water quality in many surrounding lakes. As lake pH increased and concentrations of toxic metals declined, zooplankton and phytoplankton species richness increased and some acid-sensitive species of insects and crustaceans, such as *Epischura lacustris*, reappeared. Organisms with low dispersal activity, however, such as the amphipod *Hyalella azteca*, have not yet recolonized these lakes even though pH levels have met or exceeded those required for natural populations for several years. Likewise, natural recolonization by fish is likely to be limited and slow, except where lakes are connected directly to unaffected lakes or other areas of refuge. Stocking, however, re-established a naturally reproducing population of brook trout in Joe Lake; brook trout had disappeared from Joe Lake in the late 1950s to early 1960s. Whitepine and Nelson lakes near Sudbury supported remnant populations of large, old lake trout, which resumed reproduction when pH increased to 5.6. Thus, results from these studies suggest that many biological populations will recover or can be re-established relatively rapidly (in less than a decade) when acidification is reversed.

Historical Lake Acidification in North America

Evaluation of the fossil remains of aquatic organisms buried in lake sediments can provide indirect evidence of past lake chemistry since certain species tolerate only a limited range of conditions. Recent studies show that lakes with low base cations and ANC are the most likely to have experienced acidification due to acidic deposition, whereas lakes with historically higher pH levels have exhibited little change or even become more alkaline. For example, in a comprehensive study of this type conducted in 1991, 80 percent of a target population of Adirondack lakes with present-day pH $\leq$ 5.2 have undergone large declines in pH and ANC and concomitant increases in aluminum, but only 30 to 45 percent of lakes with current pH between 5.2 and 6.0 were so affected. Similarly, all lakes in the Sudbury area of central Ontario that presently have pH $\leq$ 6.0 show evidence of extensive past acidification, whereas those with current pH between 6.0 and 7.0 have changed little from their historical pH levels.

Figure 18 Normalized Annual NOx Emissions and Nitrate Wet Deposition Over Eastern North America



Time series showing the annual emissions and annual deposition over eastern North America from 1980 to 1991. All values are normalized to 1980 as unity.

Quebec Lake Survey

Between 1986 and 1990, the chemistry of 1,253 Quebec lakes within the 10 to 2,000 hectare(ha) size class and south of 51°N was measured. At the same time, fish surveys were completed on 253 lakes from the 20 to 200 ha size class. The lakes chosen for the chemical sampling were statistically representative of the lake population within the size class, with the lakes covered by the fish survey being a subset.

Results of the chemical survey show that 19 percent of the lakes (or 6,150 of the total population of 31,800 lakes in the size class) have pH $\leq$ 5.5, and 52 percent (16,500 lakes) have pH $\leq$ 6.0. These low pH lakes are located mostly south and east of Noranda, north of Quebec City, and in northeastern Quebec. Sulphuric acid (H_2SO_4) introduced through the atmosphere is mainly responsible for the acidity of lakes in southwestern Quebec, while the acidity of northeastern lakes is due mainly to natural organic acids. Hence, chemical recovery of acidic lakes following emission reductions will occur primarily in southwestern Quebec.

Fish surveys conducted in the southwestern regions where H_2SO_4 is of greatest importance showed that the number of species present decreases with decreasing pH: from 100 percent of all 32 identified species at pH = 6.0, to 72 percent at pH = 5.5, to 28 percent at pH = 5.0, and to 0 percent at pH = 4.5. At pH $\leq$ 5.0, fish reproduction is limited and younger age classes are often absent.

Implementation of control measures at the Noranda smelter in 1989 has resulted in a decrease of more than 60 percent in SO_2 emissions compared with 1980. Compared with 1982 levels, 1991 sulphate concentrations in lakes near the smelter have decreased by >50 percent, and lakes >200 km away have decreased 0 to 20 percent. There was no change in ANC during this time period, however. Although the decrease in sulphate is encouraging, findings indicated that repetition of the lake survey in the mid-1990s will be needed to verify an attendant improvement in the acidity status of these lakes.

Episodic Response Project

Aquatic ecosystems can be adversely affected not only by chronic acidification, but also by short-term (episodic) decreases in pH that occur during snowmelt and rainstorms. EPA conducted an Episodic Response Project (ERP) in 1993 that studied the effects of episodic acidification on fish in 13 streams in the Adirondack and Catskill Mountains in New York and the Northern Appalachian Plateau in Pennsylvania.

ERP results clearly demonstrate that episodic acidification can have long-term adverse effects on fish populations. Streams with suitable chemistry during low flow, but low pH and high aluminum levels during high flow, had substantially lower numbers and biomass (weight) of brook trout than were found in non-acidic streams. Streams having acidic episodes showed significant mortality of fish. Some free-living brook trout avoided exposure to stressful chemical conditions during episodes by moving downstream or into areas with higher pH and lower aluminum. This movement of fish only partially mitigated the adverse effects of episodic acidification, however, and was not sufficient to sustain fish biomass at levels that would be expected in the absence of acidic episodes. These findings indicate that stream assessments based solely on chemical measurements during low flow conditions will not accurately predict the status of fish communities in small streams.

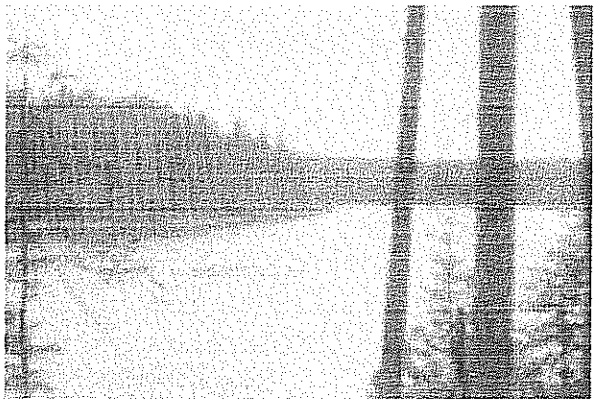
Atmospheric deposition of sulphate and nitrate contributed significantly to the occurrence of acidic episodes, with low pH and high aluminum levels, in the ERP streams. In addition, naturally occurring organic acid from decomposing vegetation also commonly contributed to episodic pH depressions. Sulphate and nitrate pulses, however, augment these natural processes to create episodes with lower pH and higher aluminum concentrations than would occur from natural processes alone. Yet even in streams with high enough background or base flow concentrations of sulphate and nitrate to cause natural pH depression, episodic atmospheric deposition still causes a

significant additional depression of the pH. This effect is noted even though the apparent stream concentrations of sulphate and nitrate remain relatively constant during the episode.

Nitrogen Deposition and Water Acidification

While SO_2 emissions have declined throughout North America, NOx emissions have remained fairly constant. Existing levels (or increases) of nitrogen deposition over the long term could eventually undermine the ecological benefits derived from the SO_2 control programs.

The most important technical question concerning nitrogen-based ecosystem acidification is the mobility of nitrogen. When nitrogen contributes to acidification, the nitrogen deposition in excess of that immobilized for the nutrition of terrestrial and aquatic biomass is leached into ground and surface waters as nitrate. This situation implies a change in the "normal" functioning of the nitrogen cycle from a virtually closed internal cycle to an essentially open cycle where excess nitrogen is leached — a state commonly referred to as nitrogen saturation. The development of nitrogen saturation involves a complex interaction of processes in a watershed's nitrogen cycle, not just an increase in atmospheric input. Increasing or chronically high nitrate concentrations in runoff waters or alteration of characteristic seasonal patterns indicate that a watershed may be at or progressing toward nitrogen saturation and nitrogen-based surface water acidification. In addition to concerns about acidification, there are concerns that high nitrate concentrations may possibly contribute to eutrophication (increase in input of nutrients leading to a growth in algae) in estuarine areas and near coastal waters. High nitrate concentrations alone are believed unlikely to cause freshwater eutrophication.



Lake survey data from eastern Canada and data from long-term monitoring projects in the 1980s and 1990s in the United States confirm that there are watersheds in both countries that are likely retaining less nitrogen than they did in the past. Nitrate can be a major contributor to episodic acidification, particularly during spring snowmelt when biological uptake of nitrogen is minimal. Increasing trends in nitrate have been observed in some lakes and streams in the Adirondack and Catskill Mountains of New York, the Mid-Appalachian region, Ontario, and Quebec. These locations also receive some of the highest levels of nitrogen deposition. Although the link between saturation and deposition must still be considered circumstantial, preliminary model analyses suggest that high levels of nitrogen deposition can reduce the time required for watersheds to reach nitrogen saturation. Future aquatic research and monitoring would be necessary to better quantify which ecosystems are becoming saturated and why, and to determine deposition levels at which nitrogen saturation occurs.

Forest/Soils Studies

Research has shown that acidic deposition directly affects tree foliage and soil chemistry and that it has contributed to the decline of high-elevation spruce forests in the eastern United States. Acidic deposition is suspected as a contributing factor in the increased dieback and decline in birch forests in eastern Canada. Monitoring of forests, research on ameliorating symptoms, and studies on forest productivity continue in both countries.

Forest health in both countries has been assessed by comparing the crown condition, mortality, and growth rates using various monitoring systems. Methods and results varied. All systems showed that changes in crown condition and mortality reflected the combined effects of insects, diseases, and air pollution. Growth rates in one monitoring system studied were found to correlate with levels of pollutant deposition on soils where nutrients were limited.

A number of Canadian and U.S. networks have been established to monitor forest health by assessing damage to forests caused by acid deposition. Results to date indicate that there is no large scale decline in the health of Canadian and U.S. forests that can be directly attributed to acidic deposition.

Joint Studies — North American Maple Project

This monitoring program was established in 1988 by Canada and the United States in response to reports of widespread decline in sugar maples. The program measures the condition of tree crowns in managed (sugar bush) and unmanaged (non-sugar bush) stands. Results from 1988 to 1992 show that over 90 percent of the trees sampled were healthy, and mortality rates were normal. The condition of sugar maples in sugar bushes was not significantly different from that of sugar maples in unmanaged stands, nor was tree condition affected by different zones of deposition. Changes in tree condition were caused by natural factors, specifically drought and insects. The monitoring system tracked these events and the data show that trees recovered from these stresses after two to three years. Other Canadian and

U.S. networks designed to monitor forest health have looked for damage to forests caused by acid deposition.

Canada — National Networks

In 1984, Forestry Canada's Acid Rain National Early Warning System (ARNEWS) was established to monitor forest health. ARNEWS is designed to detect forest damage by assessing a common set of measurements from permanent sample plots, supplemented by additional surveys.

U.S.-State Networks — Forest Health Monitoring

The U.S. Forest Health Monitoring (FHM) Program is a cooperative effort between federal and state resource agencies to collect, analyze, and report on the health of all forested lands in the United States. The program has three objectives: (1) detection monitoring; (2) evaluation monitoring; and (3) intensive site ecosystem monitoring. Over 1,000 plots in 14 states have been studied and results through 1992 do not show any extensive unexplained forest or tree decline. The system is sensitive enough to have detected the effects of known pests, such as American beech bark disease and hemlock looper.

U.S.-State Networks — Hardwood Tree Health Survey

The State of Vermont first conducted a statewide survey of hardwood tree health in 1986, reporting that 22 percent of the upper canopy hardwood trees had ≥10 percent crown dieback, and 2.9 percent of the standing hardwood trees were dead. By 1991, the percent of upper canopy hardwood trees with ≥10 percent dieback had declined to 14 percent. Nearly 25 percent of the trees that had ≥10 percent dieback in 1986 were dead by 1991 (5.5 percent of the standing hardwood trees). The study concluded that the health of surviving trees had improved from 1986 to 1991 because of decreased insect populations and increased precipitation since 1986.

Responses to Air Pollution Studies

Canada — White Birch Decline

Severe foliage browning and premature leaf-fall in southeastern New Brunswick in the mid-1980s have resulted in serious deterioration and mortality of white birch. The damage was not caused by insects or diseases, but occurred in areas with a high frequency of summer fog that has been measured below pH 3.0. The sensitivity of birch was confirmed by clonal transplant tests. Since 1989, there has been a reduction in foliage browning and a regreening of surviving trees. The improvement in the condition of surviving trees since 1989 is correlated with a reduction in the frequency of fog, indicating a cause-and-effect relationship between damage and acid fog. A similar condition may be developing in the Wawa area of Ontario.

Canada — Ontario Maple

Observations of maple decline have been monitored by health surveys focusing on visual symptoms. In addition, the Ontario Ministry of the Environment and Energy has also examined the growth rates of maples throughout the province. Dendrochronological (tree ring growth) data have showed that sustained reduction in growth has occurred concurrently with increasing pollution levels. Growth reductions were in proportion to the wet

sulphate and nitrate deposition being received by each study site. Reductions of forest health were greater on soils with poor buffering capacity. Tree growth, however, was also affected by climatic stresses and outbreaks of defoliating pests.

United States — Red Spruce Decline

Unexplained increases in mortality of high-elevation red spruce in the eastern United States were reported in the early 1980s. At the time, examination of the climate, pest history, and stand dynamics did not explain the change in spruce condition. Research begun in the later part of the 1980s has, to date, indicated that winter injury to spruce foliage is clearly associated with growth damage and mortality to trees. Both laboratory and field evidence indicated that increased levels of acidic deposition associated with cloud water increased the susceptibility of red spruce foliage to winter injury. Aluminum interference with plant nutrient uptake and increased levels of cation leaching from nutrient-poor ecosystems were documented in some ecosystems. The level of acidic deposition in these ecosystems is consistent with the level required to cause damage.

Canada — Critical Loads for Forest Soils

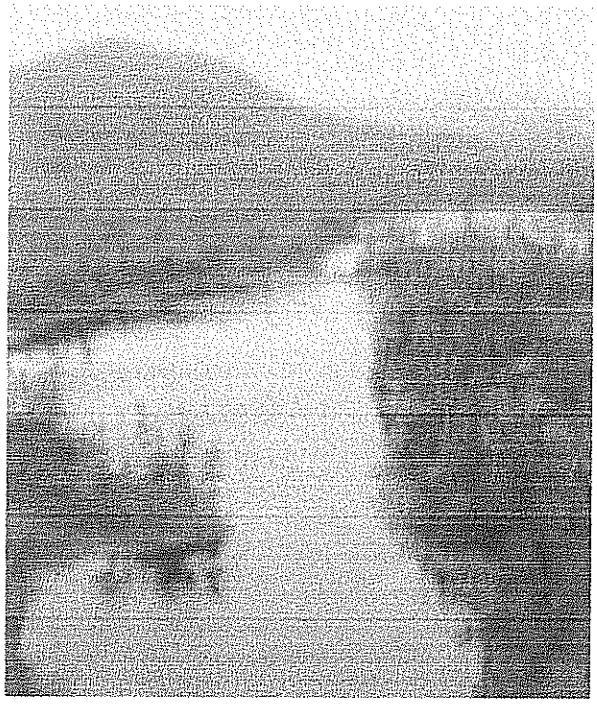
Canada is developing critical loads for forests using a dynamic model to predict chemical and physical biomass (weight) changes in upland forests as a result of acid sulphate/nitrate loading. The term critical load refers to a quantitative estimate of the maximum exposure to a pollutant that a soil can sustain without significant damage. The model forecasts long-term reductions in site productivity at current levels of pollution. The model will be used to estimate critical loadings for Canadian forests. Numerical estimates are expected to be available for public discussion by the end of 1995.

Canada — Remediation Studies

One hypothesis concerning the reason for forest decline is that tree nutrition is impaired by acid deposition, which leaches base cations, principally potassium, calcium, and magnesium. Consequently, during the period 1988 to 1991, fertilization treatments for restoration of soil cation levels were applied to several sites in Ontario and Quebec with declining forests. Generally, declining trees showed a greater response than healthy trees, but the response to the fertilizer treatments varied among sites and among declining and healthy trees. This indicates that the causes of decline and the response to fertilizers were specific to individual sites. Thus, there would appear to be little benefit in fertilizing extensive areas to avoid damage from air pollutants.

Canada-United States — Effects of Nitrogen Deposition

Continued deposition of nitrogen will increase the amount of nitrogen in forest ecosystems and, depending on the nature of the soil, will increase the capacity for nitrification and the movement of nitrogen to surface water. Vegetation growth can be expected to increase where nitrogen is limiting and where deposition does not interfere with nutrient uptake and/or introduce additional stresses. Continued nitrogen deposition will affect mycorrhizae (fungi), insects, pathogens, and wildlife. Research on nutrient cycling is continuing in both countries to assess long-term impacts of increased nitrogen deposition on soils and vegetation.



Visibility

Annex 1, Section 4 of the Canada-United States Agreement on Air Quality recognizes that the prevention of significant air quality deterioration and the protection of visibility are important to both countries. This annex requires the United States to apply Part C of Title 1 of the U.S. Clean Air Act to sources that would cause significant transboundary air pollution. The annex requires Canada, by January 1995, to develop and implement means of preventing significant air quality deterioration and protecting visibility comparable to those called for in the U.S. legislation. Since the last Progress Report, several areas of research have been initiated in Canada to meet this obligation.

Canadian Airport Visibility Data

A technique has been developed in Canada to extend the range for capturing airport visibility data. The new approach enables the development of visibility estimates at distances greater than 24 km (15 miles). Maps of the visibility across Canada by season and by year give a historical record of median visibility in Canada since 1951. This will serve as the baseline against which visibility changes in the future will be determined. Efforts are under way to merge the historical visibility data sets in Canada and the United States.

Visibility Reduction Testing

Environment Canada has been testing techniques by which visibility reduction can be linked to the aerosol types that scatter and absorb light. During the 1992 Egbert Aerosol Study, measurements were made of particle size. These in situ measurements were made at the same time and place as light scattering measurements. The results are being used to determine the amount of particle growth attributable to humidity, aerosol scattering and absorption properties, and a radiation balance for the scattering process.

Monitoring Aerosols

In addition to the above studies, routine sampling of visibility-reducing aerosols was initiated in Glacier/Waterton Lakes International Park by Canada and the United States. One sampling site is now operating on the Canadian side at Waterton, Alberta, and one on the United States side in Glacier National Park.

In British Columbia, a significant effort to understand visibility reduction in the lower Fraser Valley (near Vancouver, B.C.) is under way. The Pacific '93 field experiment was expanded to include aerosol movement in this region. In addition, the Province of British Columbia, in cooperation with the regional offices of Environment Canada and the University of British Columbia, are analyzing data from 10 Interagency Monitoring of Protected Visual Environments (IMPROVE) sampling stations located in the lower Fraser Valley. While the intensive phase of this measurement program lasted only for the summer of 1993, an ongoing program of monitoring in the valley involving in situ and optical sampling will be carried on in the future.

Modelling Visibility Changes

In the past, simple sulphate dispersion and transformation models were used to estimate ambient sulphate concentrations that influence visibility. Water vapour, however, also has been found to contribute significantly to light extinction. Thus, computations of visibility degradation need to consider the availability of water vapour simultaneously with the amount of sulphate. More complex models have been developed to produce new estimates of visibility degradation attributable to sulphate aerosols in Canada and the eastern United States. These new models combine relative humidity predictions from meteorological models with data from the chemistry and transport models to more accurately predict the amount of light extinction (a measure of visibility reduction).

U.S. estimates of the current visibility degradation in the East (using a perceptible measure of degradation, termed deciview) and future visibility degradation, assuming full implementation of Canadian and U.S. control programs, have been calculated. This assessment indicated that a noticeable improvement in visibility should occur across the eastern United States (Figure 19) for the 1985 base year, with most of the change occurring in the warm seasons.

Materials

While joint effects research is not currently being conducted concerning the degradation of materials due to acid rain, both countries participate in a United Nations-ECE Cooperative Programme entitled "Effects on Materials Including Historic and Cultural Monuments." The following presents an overview of the main findings after four years of an exposure program that started in 1987.

As expected, for all materials exposed, great differences in the corrosion rates have been measured, and the observed degradation is more severe at polluted sites than at rural sites with background pollution. For some materials, like carbon, steel, or nickel, the effects of pollutants are obvious after the first year; for other materials like copper or paints, the effects appear only after four years. For most materials, SO_2 has the strongest corrosive effect. Wet deposition expressed as rain acidity or conductivity has a corrosive effect on certain materials, which, in general, is less severe than the effect of dry deposition.

The dominant effect of SO_2 is evident for zinc, which is commonly used to coat steel to reduce corrosion. Sheltered and unsheltered copper (e.g., shed roofs,

decorative items) also have a high corrosion rate during the first year at rural sites. At polluted sites, corrosion increases after the first year due to the formation of a rough and porous layer that accelerates the corrosion. Sheltered and unsheltered cast bronze (commonly used for statues) are less sensitive to humidity than copper.

The analysis performed so far has shown that SO_2 significantly contributes to the degradation of unsheltered sandstone and limestone materials, commonly used in buildings and monuments. The damaging effects of acid rain on wood panels with alkyd paint and those panels with primer and acrylate paint are not yet well understood.

Materials (e.g., nickel, copper, and tin) react differently to SO_2. SO_2 appears to corrode nickel extensively. While the evaluation of copper and tin is not yet completed, it appears that SO_2 does not have the same strong corrosive effect on tin as it does on many other materials. The amount of copper corrosion seems to be related to the conductivity (e.g., higher SO_2 concentration) of rain.

Figure 19 MODELLED IMPROVEMENT IN VISIBILITY FOR THE AVERAGE DAY. 1985-2010 (Improvement is expressed in terms of deciviews)

These results, obtained for plain flat samples, show clearly that pollutants, particularly SO_2, enhance the degradation of building materials exposed to the atmosphere. In northern climates, materials already incur heavy degradation due to, for instance, extreme temperatures, many freeze-thaw cycles in winter, and considerable humidity in summer. The further degradation causes evident damage in cities like Montreal, where even newer bronze statues have evidence of the typical stages of degradation (e.g., streaked brown, black, blue-green surfaces resulting from the combined action of acid deposition, de-icing salts, corrosive dust). Older limestone buildings are either washed by acid rain and lose their details or they retain most of the deposited pollutants in protected areas and then form a crust of gypsum that forms scales and then flakes off the surfaces. Some recently constructed metallic structures embedded in cement have corroded to the point of splitting the concrete.

As confirmed by the results of the ECE Cooperative Programme, even at low deposition loads all materials are subject to degradation due to the pollutants. Materials in Canada might be more susceptible to pollutant degradation because the complex interaction of pollutants with harsh climactic elements causes faster degradation than in locations with more favourable climates but identical pollution levels.

Human Health

The major new finding since the issuance of the 1992 Progress Report is that long-term ambient exposures to acid aerosols have been linked to a decrease in lung function in children. In addition, significant progress has been made on methods to measure acid aerosols and on elucidating possible mechanisms involved in health effects. New research initiatives on the effects of ozone-acid mixtures have uncovered complex relationships suggestive of a possible synergism.

Preliminary results of a five-year study of 24 North American cities, designed specifically to determine the health risk posed by long-term exposure to ambient acidic aerosols, have recently been published. The study included administering a questionnaire and lung function tests to more than 10,000 children between the ages of 8 and 12. In each community, acid aerosol monitoring was performed for one year. The results of the study indicate a strong statistical association between decreased lung function and long-term exposure to ambient acidic aerosols. The annual mean strong acidity in cities ranged from 0.5 to 52 nanomoles/m^3. Previous studies have suggested possible adverse health effects due to long-term exposures of airborne acidity, but they had not measured ambient acidity directly. The independent effects of ozone were also assessed, and they were found to be small. These data provide further evidence that airborne particulate matter, specifically acidic particles, have a detrimental effect on normal lung function, growth, and development.

Human clinical studies have examined the short-term effects of acidic aerosol exposures and have generally focused on asthmatics as a sensitive population. These studies suggest that asthmatics may be more sensitive to short-term high-acid aerosol exposures. Further work is in progress to determine the extent of this association.

Although the effects of H_2SO_4 on clearance of particulates from the lung has been recognized, new studies in animals have expanded the knowledge base by showing that H_2SO_4 inhibits the ability of lung defence cells to kill bacteria; a significant problem in people with chronic bronchitis is lung infection. Earlier animal studies gave rise to a hypothesis that acidic aerosols may cause chronic bronchitis if exposures are sufficiently high for extended durations. Data from the 24-city study indicate significant differences in acute bronchitis between high- and low-acid communities. Also H_2SO_4 alters the biochemistry of mucus. This constellation of effects is poorly understood at present, but represents an area of concern.

New research has illustrated the importance of acid aerosol composition and the number of particles, in addition to the mass of hydrogen ion. Acid sulphate aerosols in the ambient air are a mixture of H_2SO_4 and ammonium bisulphate ($NH_4(H)SO_4$). Several studies in humans and animals have shown that H_2SO_4 is more potent, but the reasons are only now becoming understood. Even at equivalent hydrogen ion (H^+) concentrations, H_2SO_4 was more potent than $NH_4(H)SO_4$. Other studies using guinea pigs showed that responses were dependent on both number concentration and mass concentration of H_2SO_4.

These interdependencies may be responsible for some of the anomalies within the acidic aerosol database; they indicate that monitoring to predict effects needs to encompass more than mass of H^+. Knowledge of exact causative factors associated with the aeroso could be important to the development of effective control strategies.

Interactions of ozone and H_2SO_4 were studied in 1993 as part of the development of a revised *U.S. Ozone Criteria Pollutant Support Document*. The results show that the interaction is dependent on the exact nature of the exposure and the endpoint. Even when one endpoint is examined, both antagonism and synergism have been observed, depending on the concentrations of ozone and H_2SO_4. In addition, ultra-fine H_2SO_4 caused more effects than fine H_2SO_4 in mixtures with ozone.

Acidic aerosols are a subfraction of ambient total suspended particulate matter. Recent ambient air monitoring data from a number of studies have demonstrated that acidic aerosols are concentrated in the fine (< 2.5 µm) and ultra-fine (< 0.1µm) fractions (µm=micrometre). Because of their size, these aerosols are more likely to enter the respiratory system and bypass many of the body's natural defence mechanisms.

Significant progress has been made in characterizing personal exposures to particulate matter, including acidic aerosols. This information will be important in developing exposure estimates and assessing risks resulting from ambient acidic aerosol concentrations.

In summary, many of the new findings raise important questions concerning the potential health risk posed by ambient airborne acidity. The data confirm the potential for ambient acidic aerosols to affect lung health in children and for important interactions between acidic aerosols and other ambient pollutants to adversely impact on human health. The impact of and regulatory issues related to acidic aerosols will be considered under the technical/peer reviews for ambient particulate matter in standard/guideline setting by the respective agencies in both countries.

QUALITY ASSURANCE

A variety of activities are being carried out to ensure that the data collected under both countries' programs are comparable and have credibility. For example, routine laboratory comparison studies are being conducted to ensure that the data produced for terrestrial, atmospheric, and aquatic programs are comparable. For the terrestrial program, six studies have been completed, and they show continual improvement in the laboratory measurement process. The most recent study included 23 laboratories analyzing plant tissues for metals and nutrients.

Similarly, three comparisons are being carried out annually to support the atmospheric and aquatic programs. Laboratories are requested to analyze about 25 different constituents in 10 different water samples. These test samples include natural rainwaters and soft surface waters collected from Canadian and U.S. acid rain watersheds. Thirty-three studies have been completed since December 1982, with over 130 Canadian and U.S. laboratories participating in the studies. The results of these studies are maintained on a database and are available for further analysis.

In other activities, sampling equipment has been co-located to compare Canadian and U.S. measurement techniques. At Egbert, Ontario, almost two years of CAPMoN and NDDN measurements are available. Median values

associated with all measurements collected from the fourth quarter of 1990 to the third quarter of 1992 are listed in Table 5. The NDDN and CAPMoN differences are very small (less than or equal to the precision determined for collocated sites within NDDN) for sulphate, ammonium, and total nitrate. Larger differences are noted for SO_2.

An expansion of this activity is now under way. Wet deposition sampling equipment was installed at Scotia Range, Pennsylvania, during the first quarter of 1993. This site was selected because it will permit comparison of all three major wet deposition networks in North America. Precipitation samples are collected according to network-specific schedules (NADPN/NTN and NDDN are weekly and CAPMoN is daily) and analyzed by the network laboratories. There is no sample splitting among laboratories. This effort represents the best chance for assessing overall network comparability, since it covers both field and laboratory operations.

Table 5 Comparison of Canadian CAPMoN and U.S. NDDN Filterpack Measurement of Acidifying Air Pollutants (micrograms per cubic metre)

Egbert, Ontario	Sulfate ($\mu g/m^3$)	Nitrate ($\mu g/m^3$)	Ammonium ($\mu g/m^3$)	Nitric Acid ($\mu g/m^3$)	Sulphur Dioxide ($\mu g/m^3$)	Total Nitrate ($\mu g/m^3$)
Mean NDDN[1]	3.93	2.39	1.73	1.34	5.90	3.78
Mean CAPoN[2]	3.92	2.31	1.75	1.39	6.60	3.70
Median AD	0.14	0.26	0.08	0.13	0.73	0.24
Median APD	3.94	14.77	6.05	12.75	14.74	5.62

[1] NDDN: National Dry Deposition Network (United States)
[2] CAPMoN: Canadian Air and Precipitation Monitoring Network

Note: Average value over the time period, running from fourth quarter 1990 through third quarter 1992. Concentrations in ($\mu g/m^3$) at 273° kelvin, using median values for absolute difference (AD) and absolute percent difference (APD).

CONTROL TECHNOLOGIES

Canada

Work in Canada is ongoing to develop, demonstrate, and deploy technologies to reduce emissions of SO_2 and NOx. This work involves many government agencies at both the federal and provincial levels and major industrial partners such as metals companies and electric utilities. For example, at several Canadian smelters, intensive industrial research has led the way to major modernization programs that feature advanced techniques for milling, beneficiation, smelting, and capturing SO_2 as a useful by-product. At power plants, new technologies — such as fluidized-bed combustion (FBC) and limestone injection into furnaces, and activation of unreacted calcium (LIFAC) — result in large volumes of solid wastes; Environment Canada has conducted extensive studies to characterize and assess pollution control requirements for these wastes. In order to mitigate or eliminate the adverse environmental effects associated with such residues, Environment Canada

has published a report called *Interim Recommended Practices for the Management of Solid Residues from Circulating Fluidized Bed Combustion (CFBC).*

Environment Canada also published *Environmental Codes of Practice for Steam Electric Power Generation-Operations Phase and Environmental Codes of Practice for Steam Electric Power Generation-Decommissioning Phase.* These are the fourth and fifth in a series of five documents developed for steam electric power plants. These documents are intended to show that adverse environmental impacts associated with the operation of electric generating stations can be mitigated.

Additionally, Environment Canada has collaborated with the Canadian Electrical Association, utilities, and industries on varied projects including combining technology to reduce NOx emissions with flue gas desulphurization wet scrubber technology to reduce SO_2 emissions, identifying additives that enhance the formation of larger gypsum crystals in SO_2 scrubbers, and investigating NOx formation in power plant plumes. Similarly, the Canadian Coal Gasification R&D Committee is studying integrated coal gasification combined cycle (ICGCC) as a clean coal technology option for Canada. Environment Canada is also working with Nova Scotia Power on pilot scale testing of conventional selective catalytic reduction (SCR) of NOx in a high-sulphur content Canadian coal.

Government-industry sponsored research programs on a range of SO_2 and NOx emission control technologies applicable to Canadian sources are continuing. In many cases, these programs draw directly on developments or industry experience in the United States and other countries.

United States

Considerable progress has been made in the development of control technologies. In the United States, the Clean Coal Technology (CCT) Program will fund almost $7 billion in projects over the course of the decade. The power-generating and pollution-control technologies developed in this government-business research and development program are initiatives aimed at emission reductions and cost and operation efficiencies. The initiative, lead by the U.S. Department of Energy, is intended to demonstrate the utility and merit of new coal-burning processes in a series of full-scale commercial facilities.

The CCT Program continues to place emphasis on mitigation of acid rain precursor emissions. This focus is consistent with the *U.S. and Canadian Special Envoys Report on Acid Rain*, the source of the original 1986 recommendation for a multi-billion dollar clean-coal demonstration program.

All five competitive solicitations under the CCT Program have been completed. There are currently 45 active projects in the CCT Program. Three projects have been completed, 21 are in operation, and 16 projects are in the design phase or under construction. The remaining five projects are in negotiation. Of the 45 projects selected under the first three CCT solicitations, almost all will have had sufficient operating time by the year 2000 to be offered commercially. Once the projects are completed, both sponsors and participants will use information and experience gained to promote and market the technologies in commercial applications. Total project costs through the five solicitations under the program amount to approximately $6.9 billion, with the average industry cost share being 66 percent.

Achievements to date (by market category) under the Clean Coal Technology Program are summarized below:

- *Advanced power generation systems.* Development of a commercial replication of the atmospheric circulating fluidized-bed combustion (ACFB) technology at 100 megawatt (MW) scale was a direct result of demonstrating the technology under the program at the Colorado-Ute Electric Association Nucla Station between 1988 and 1991. At the time of demonstration it was the largest ACFB plant at 110 MW. While ACFB was finding its way into the marketplace, operations began under the program on the first U.S. application of pressurized fluidized-bubbling-bed combustion (PFBC) at utility scale (70 MW). Approximately three years of pioneering work led to the establishment of a sound database. As work on the PFBC unit nears completion, construction of a circulating bed version is set to get under way so that this alternate approach also can be evaluated. Seven different approaches to integrated gasification combined cycle, an inherently efficient and clean technology, are in various stages leading to full-scale system integration and analysis. The projects in place cover a broad spectrum of gasifier types, coals, sorbents, diluents, oxygenates, and operating conditions. To further expand the technology options being explored, selections under round 5 include an indirect coal-fired cycle, a second generation PFBC, a coal-fired diesel, and an integrated gasification fuel cell.
- *Environmental control systems.* Two advanced flue gas desulphurization technologies in operation have been routinely achieving over 95 percent SO_2 capture and producing wallboard-grade gypsum. Several combined SO_2/NOx control systems are in operation and exceeding design goals. One of these systems is achieving 96-percent SO_2 reduction and 94 percent NOx reduction while producing 93 percent pure sulphuric acid and no solid waste. Six NOx control options covering the full range of boiler types are in the later stages of scale up. Three of these systems have been adopted for commercial use by the host utility. At least one commercial sale to an operation other than the host utility has been realized for one of the technologies. As emissions reductions are realized over the next 15 years, opportunities to use other technologies as they become available will increase.
- *Coal process for clean fuels.* These technologies are characterized by production of high-energy density solid, stable compliance fuels and production of coal-derived liquids that can be used as chemical or transportation fuel feedstocks. Both the Rosebud Syncoal coal upgrading project and the ENCOAL mild gasification project are producing products at the target capacity of 1,000 tons per day. Testing of the solid and liquid products by potential users is in progress.
- *Industrial applications.* This category encompasses the steel industry, cement industry, and industrial boiler applications. Dealing with coke oven emissions is the key concern of the steel industry. An early effort under the program to control coke oven gas emissions was slowed by an unrelated shutdown of the coke ovens. Another effort to substitute coal for at least 40 percent of the coke has proceeded to construction. A third project aimed at eliminating the need for coke is in negotiation. Complete success was realized for a coal-fired cement kiln application that may have broader application in the paper production and municipal waste incineration areas. Cement kiln waste was used to achieve 90 percent SO_2 reduction, produce fertilizer, convert the kiln waste to cement feedstocks, and eliminate all waste streams. Cement, municipal waste, and paper production plants in the United States and abroad are actively considering adoption of this technology.

Finally, Canada and the United States continue to hold an annual meeting on control technologies under a bilateral Memorandum of Understanding. Status reports on their respective CCT programs are given at the annual meeting.

MARKET-BASED MECHANISMS

Canada

Canada's acid rain program has substantially achieved the SO_2 emissions reductions required under the Canada-U.S. Air Quality Agreement. However, discussions are under way between the federal government and several provinces on the feasibility of applying economic instruments as a cost-effective way of achieving emissions reductions.

United States

The Acid Rain Program under the 1990 Clean Air Act (CAA) Amendments represents the largest use of market-based mechanisms to achieve environmental protection in the world. Innovative market-based approaches, some in combination with traditional command-and-control approaches, are believed to reduce the overall costs of compliance and stimulate innovation in pollution reduction methods. The market-based emissions allowance system under the Acid Rain Program has been estimated to reduce costs of compliance. The reductions are considered significant given that costs of compliance with Phase I of the Acid Rain Program have been projected to increase from $1 billion in 1997 and $1.3 billion in 2000 to $2.1 billion in 2005. In 2010 costs are expected to reach $2.2 billion for SO_2 compliance. The potential cost savings from a market-based system range from 25 to 50 percent. Over 326,000 emission allowances were sold during public auctions in March of 1993 and 1994; also, more than a dozen two-party and brokered trades have been reported involving the sale of over 1 million allowances valued at about $200 million. Further trading and additional private auctions are expected to occur now that EPA's Allowance Tracking System is in place.

There are numerous other examples beyond the U.S. Acid Rain Program of innovative market incentive programs aimed at achieving pollution reductions under the CAA Amendments. One example is EPA's Cash for Clunkers Program, which by encouraging fleet turnover promotes the removal from service of older vehicles that tend to be more polluting. Vehicles can be sold to program sponsors, which can include participating state and local governments or industries such as power companies, petroleum refineries, and steel mills. Vehicle owners are encouraged to participate in the program by the opportunity to avoid high maintenance bills that older vehicles tend to incur. Since newer models meet more stringent emission limits, drivers can put their profits toward purchases of new cars and still net important emissions reductions.

By retiring older "dirty" vehicles, sponsors earn emissions credits to offset their own emissions requirements or to sell to other companies. EPA guidelines establish methods to calculate credits and to ensure that the program removes dirty in-use vehicles from the nation's roads, rather than from the nation's junk yards.

Some states, including Massachusetts and California, have established initiatives in the area of market incentives for air pollution reductions. In each case, the goal is to ensure pollution reduction while providing for flexibility and financial incentives to stimulate innovation and technological advancement. Massachusetts recently unveiled a statewide emissions banking and trading

program allowing companies that reduce air pollution below regulatory requirements to trade or sell the additional reductions to companies that need those credits to build or expand their own operations in the state. Under the CAA Amendments, any new source of air pollution, such as a factory, must find offsetting pollution reductions amounting to 120 percent of what is expected to be emitted.

Finally, California's South Coast Air Quality Management District (AQMD) has developed an emissions trading program called the Regional Clean Air Initiatives Market (RECLAIM) for the Los Angeles area. The program would set annual emissions limits for over 450 major NOx emitting sources and approximately 40 major SO_2 emitting sources in Los Angeles, Orange, Riverside, and San Bernardino counties, the air basin suffering the worst air pollution in the United States. The limits on NOx and SO_2 would decrease each year to curb the area companies' emissions by 80 percent and 65 percent respectively by 2003. Companies would choose their own cost-effective compliance plans, and those companies reducing emissions beyond their annual limits could sell pollution credits to others. AQMD expects that the costs of meeting the goal would be about half that of regular smog control. Approximately 400 businesses would save an estimated $93 million a year.

ASSESSMENT OF THE COSTS, BENEFITS, AND EFFECTIVENESS OF CLEAN AIR CONTROLS

Canada

Canada has achieved its required SO_2 emissions reductions by relying on a mix of regulations, voluntary approaches, and public education, with each province determining its own cost-effective mix depending on the nature of the SO_2 sources in its jurisdiction. This approach has resulted in about a 40 percent reduction in SO_2 emissions from 1980 levels.

However, scientists are predicting that parts of Canada will still be acidified after the year 2000. As a result, Canada is now developing a new National Strategy on Acid Rain for the post 2000 period to protect acid-sensitive areas. An economic analysis of the various measures to reduce SO_2 emissions will be central to the development of the new strategy.

United States

Numerous efforts are under way to evaluate the costs, benefits, and effectiveness of the Acid Rain Program in the United States. Research efforts in the 1980s created baselines in various areas, particularly acid rain impact areas, with which to track and compare data following implementation of the CAA Amendments. The Acid Rain Program, in particular, benefits from years of research that can be used to compare current and future data. Furthermore, because the Acid Rain Program is one of the first attempts at environmental protection using a market-based approach, it lends itself to analysis of the effectiveness of market-based approaches compared with traditional command-and-control approaches.

Under the directive of several different sections of the CAA Amendments, assessment and evaluation of the Acid Rain Program are planned and are currently under way. Section 812 of the Amendments requires EPA to assess the costs and benefits of the entire CAA. The assessment requirement is both retrospective (1970-1990) and prospective (in terms of projections regarding expected costs, benefits, and other effects of compliance pursuant to the act). Since acid rain legislation was new to the act upon passage of the 1990

Amendments, the Section 812 analysis is particularly relevant to the Acid Rain Program, and numerous efforts to assess and forecast the costs and benefits of the Acid Rain Program have been initiated.

Evaluation of the Acid Rain Program also will be addressed under Section 901 of the CAA Amendments. Under this requirement, the National Acid Precipitation Assessment Program (NAPAP) will issue a report to the Congress in 1996 and every four years thereafter on costs, benefits, and effectiveness of Title IV. The Acid Deposition Standard Study, under Appendix B, Section 404, of the CAA Amendments, will also provide insight to the environmental effectiveness and costs of the Acid Rain Program.

Furthermore, efforts to effectively track and evaluate the environmental impact of the Acid Rain Program (e.g., deposition of acidic compounds and surface water chemistry) are ongoing. Finally, regarding Title II (mobile sources) of the CAA Amendments, EPA is required to make a determination by the end of 1999 on the need to further reduce NOx emissions from vehicles with more stringent emission standards.

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The Green Lane™, Environment Canada's World Wide Web site
Last updated: 2002-11-08
Last reviewed: 2002-08-15
Important Notices
URL of this page:
http://www.ec.gc.ca/pdb/can_us/qual/1994/english/section03_e.html

February 26, 2004

To whomever it may concern:

I am writing concerning the proposed Coal Powered Plant to be placed on the shores of Manistee Lake.

I live in Southern Michigan but have owned a vacation spot in Manistee County for many years. My family and I spend up to 2 months out of the year in Manistee County when you total up the weekends, family vacations and fishing excursions throughout the year. I have planned for years to retire to Manistee County when the time comes.

First and foremost I fear that, if approved, this plant will jeopardize the health of my family and I with the emissions from the plant. Without question this plant will put mercury into the air that has adverse affects on the nervous system and breathing.

Secondly, the emissions will harm fish and wild life. The mercury in the air will have to settle eventually which will put it on the ground and in the waters. Once the mercury settles on the ground it will work it's way into the ground water and streams. Once the wild life and fish are infected it will take decades to clean up. The mercury in the waters, and fish, will not only impact Manistee County but other states as well since many of the steelhead planted and salmon around the country are taken from the weir on the Little Manistee river.

If the plant is approved I, and I'm confident many other families, will have to take their tourism dollars else where to ensure the health of our families. I encourage you to say no to this plant in Manistee County.

Respectfully,

Patrick & Kimberly Culter

Patrick and Kimberly Culter
1008 Buckingham
Lincoln Park, MI 48146

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Manistee Planning Commission
70 Maple Street
Manistee, MI 49660

February 26, 2004

Commissioners,

As a resident of Springdale Township, I wish to express my opposition to the construction of the coal-burning power plant proposed by Tondu Corporation. Those of us who live in the county will be prime recipients of the air pollution that will result from burning of coal. I have many family members in Manistee and surrounding counties whose health is very important to me. And there will be no benefits for us in terms of cheaper power or economic development. Also, at the public meeting I attended last week, Mr. Tondu did not mention how many dollars the city and county of Manistee will lose through decrease in tourism as a result of the plant. I believe the loss will be significant. I have begun to enjoy Manistee as a pleasant place to visit and shop, but I believe I and others will enjoy it less and less often if the plant is built.

One point that Mr. Tondu made was that the state Department of Environmental Quality has strict rules that must be enforced. That is laughable. The department is so woefully underfunded that it can consistently enforce many of the laws for which it is responsible.

I'm asking you to follow your own master plan and block the building of this power plant. We should be developing alternative sources of energy, not turning the clock back to 1986.

Even though I'm not a resident of the city of Manistee, your decision will have impacts upon my family and me.

Sincerely,

Daniel Straubel

Daniel Straubel
18300 Psutka Road
Thompsonville, MI 49683

Little Manistee Watershed Conservation Council
P.O. BOX 52
Irons, MI 49644

COMMUNITY DEVELOPMENT
BUILDING DEPT.
MAR 1 2004
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February 27,2004

Dear Manistee City Planning Commission,

Thank you for the opportunity to sit in on the public hearing regarding the Tondu Corp. of Houston Texas special use permit to build another coal burning electrical plant in the City of Manistee.

Unfortunately there was no time for my presentation. With this letter, I want to share our continued concerns.

This was the second meeting for public in put. The first meeting was pretty much taken up with Tondu Corporation's marketing power point presentation. Because the majority of the public was not able to speak, this second meeting was scheduled.

Every issue has pros and cons. The unfortunate part is that all of the Manistee City Planning commissioners were present at the first meeting to hear The Tondu Corporation's incomplete presentation and a good portion, (4 members) were not in attendance at yesterday's meeting. Had they been there, they could have heard the rest of the testimony form other experts who are in opposition to the proposal. When it comes to an important issue like this, one can only form an opinion as to why they were not interested in the whole story. I certainly have formed my opinion as to why they're absences were not explained.

It was also interesting to hear that a person claimed to represent Governor Jennifer Granholm's office and state that Governor Granholm was in favor of this proposal to build the coal burning plant. I'm glad that someone pointed out that this was not factual.

The support for this plant came from a few construction tradesmen, boilermakers and steelworkers. Although on occasion it is nice to work close to home, I know many folks in this profession and the nature of their job is to travel throughout Michigan and other states to follow the construction. This is how their union has it set up.

What the absent commissioners missed, was the qualified testimony form experts in the medical field along with PHD professionals, chemists and experts who deal with medical situations, Environmental pollution and toxicity.

Tondu Corporation knows the health hazards related to a plant of this nature. This is why they are proposing a tall 400' foot smoke stack to distribute the toxic waste further away from Manistee.

The normal wind currents will take this pollution inland to the east. Here it will settle on the vast Big Manistee, Little Manistee, Pere Marquete, Pine and Sauble river watersheds. After polluting these rivers, marshes and wet lands along with in land lakes, the pollutants will flow through the rivers, right back to Manistee and Ludington.

You commissioners have a big decision to make. I hope that those of you who were either unable to attend the second meeting or decided it was not important to hear the public opinion on this

matter, can find a way to be informed on all comments. Everyone of your votes count the same and each and everyone of you need to be fully informed.

When making your decision on this Special Use Permit, please realize your decision effects many more people than just those living in Manistee. Michigan residents, sportspeople and tourism will suffer if this plant is allowed to be constructed.

Please consider the "overwhelming" public opposition when casting your votes.

Sincerely
Dave McIntire

President LMWCC

cc. Manistee City Council, Manistee County Commissioners, Fred Lapoint, Dave Barber, Governor Granholm, Senator McManus, Representative David Palsrock, Tom Rozich MDNR Gregg Gouday MDEQ

1305 E. 27th Street
Manistee, Michigan

Mr. Jon Rose
Manistee Planning Commission

Dear Mr. Rose:

I am writing this to try and influence your decision(and the planning commission) to allow the special use permit to the Tondu Corp. of Houston, Texas.

I am 65 years old, born and raised in Manistee and I love this town very much. No other can in my eyes compare to our revitalized lovely Victorian Port City or the great and friendly residents.

However, I am concerned about the health aspects of allowing this plant to build here. Not only for myself but for you and future generations of Manisteans to come.

I have never had allergies in my life until the Tondu plant was built in Filer City. Now I have continuous sinus and breathing problems.

When the snow is gone and I have to sweep by the entries to my home and the porch I will again have at least 1/8 to ¼ cup of fine black dust every 2 or 3 days and I cringe at the thought that I and others are breathing this in every day!! Besides that the black film that collects on our house needs to be power washed every fall and spring.

I am hoping that this is not a cut and dried done deal with the committee and that if this permit is granted you will be selling our health and yours for an amount of a few million dollars per year that the Tondu Corp. will pay as a fee. I understand that they will not be a taxpaying entity since they will be classed as a utility . The jobs created for the long haul will be minimal, although I know that Manistee needs jobs, but not at this expense.

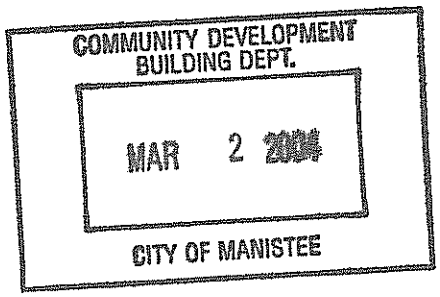
One of your very first concerns as the committee is to pay much attention to the health aspect of the citizens of Manistee and surrounding communities.

Please consider very carefully what a one time decision will wreak on our town and it's people. I know that I am just a small peon in the process but I urge you to vote NO.

If that 400 foot stack is built, when the wind blows those of us in the higher elevations of the county will get the full brunt of the discharges. They are trying to tell us that this won't affect us, but look what we have to put up with already and if they are going to burn coal (I don't care if it is East or West) along with the tires we will be paying for this dearly down the road, as we are already.

I thank you for taking the time to read this and for considering my views.

Sincerely,
Janet L. Zwiefka



Feb 27, 2004

Dear Planning Commission,

My wife and I have been seasonal residents of Manistee since 2002. We intend to move to Manistee in the next year and become year-round residents. Our two young daughters will be enrolled in the public school system.

We are concerned about the power plant project and urge you to deny a special use permit. As the chair of the Ann Arbor City Planning Commission, I can appreciate the complexity of your decision process. I believe the health issues alone though are sufficient reason to exercise your authority and not allow this project to go forward.

We think Manistee has a tourism and outdoor recreation future. It will be a

prosperous and clean future with the inevitable seasonal cycles. Our natural resources and historic assets are the base to build on. Industry is losing its grip here and in the state. Its a natural and not-to-be-feared evolution and we should plan for it, not resist it.

Thank you for your consideration

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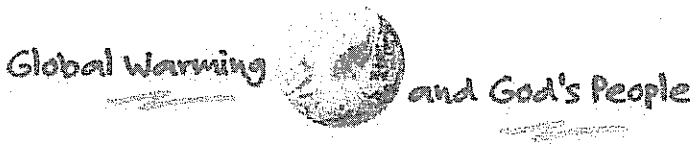
Steve and Nancy Troy
(THORP)
515 Fourth St
Manistee



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COMMENTS TO THE MANISTEE PLANNING COMMISSION ON THE PROPOSED ZONING OF A NEW 425 MW COAL-FIRED POWER PLANT, BY MICHIGAN INTERFAITH CLIMATE AND ENERGY CAMPAIGN

My name is Patricia Gillis. I represent the Michigan Interfaith Climate and Energy Campaign, a national group that has been in existence for five years in Michigan. We are strongly opposed to the Northern Lights Project because of the many unanswered questions regarding environmental and human health. Members of the Michigan Interfaith Climate and Energy Campaign have formed their values based on our faith traditions. Four fundamental moral values are at stake here. These four values are shared by our member groups: the National Council of Churches, the Coalition on the Environment and Jewish Life, and can also be found in the Catholic bishops' statement of June, 2001: "Let There be Light".

Value #1: Concern for the universal common good

We must work to balance individual "wants" with the majority's needs. Because pollution from power plants affects the general public, and because utilities serve most everyone, our energy policies must be measured by their effects on all members of society. The social costs of air pollution must be taken into consideration. For this reason we recommend a thorough economic, social, and environmental impacts study. We see these three as interconnected with each other, and we do not accept pitting environmental and economic considerations against each other.

Value #2: Respect for God's Creation

Jews, Christians, and Muslims share the creation story of Genesis in which "God saw all that God had made, and God found it very good." As believers, we see ourselves as creatures made in the image and likeness of a loving God, with a unique responsibility to be caretakers of the natural world. Our recent scientific discoveries about the universe have served to deepen our awe and respect for the complexity, diversity, and differentiation in Creation. Scientists and mystics have come to the same conclusions: all is one, and in original harmony. Humans can choose to destroy the Creation, or partner with God in renewing and recreating the face of the Earth. If we do not respect the natural world, we will lose not only our health, but our quality of life as well. I quote Robert F. Kennedy, Jr.:

"God talks to humans through many vectors: through each other, through organized religion, through art, literature, music, and architecture; but nowhere with such clarity and texture and grace and joy as through nature."

Our question is: what will the proposed power plant do to the integrity of the natural systems (the ecosystems) in western Michigan that are effected by the plant?

Value #3: An Option for the Poor

All energy policies should be scrutinized as to how they will affect the most vulnerable in our society, and around the world. In Proverbs, Chapter 14:31, it says "Those who withhold what is due to the poor affront their Maker; those who care for the vulnerable honor God."

When reviewing whether the new power plant should be built, our traditions tell us that those with young lungs, old lungs, diseased lungs need to be considered first. Those without health insurance, those in inner city ghettos, those without access to air conditioning are to be given preference over those whose needs are already met. Throughout Michigan, 1.9 million children live close to dirty coal-fired power plants, which are linked not only to asthma but neonatal death and slow brain development. How will the emissions of mercury, sulphur dioxide, nitrous oxide, and carbon dioxide effect the most vulnerable among us?

Value#4: Sense of Intergenerational Obligation

In Deuteronomy, Chapter 30, it says: "I set before you, life and death, blessing and curse. Choose life, then, so that you and your descendents may live." This obligation toward our children compels us to take the long and broad view, rather than the expedient and short-term view. It calls us to go beyond cost benefit analyses and short-term profits, and think about legacies. It asks us to look for the common good in our public policy, which brings us full circle to value #1. And so we ask: What are the longterm effects of the building and operating of a coal-burning power plant? Is there another way to generate power that is less harmful to future generations?

I close with an excerpt of a statement made by Mark X. Jacobs, executive director of the Coalition on the Environment and Jewish Life. This is from testimony he gave to the Subcommittee on Transportation and Related Agencies, Committee on Appropriations of the House of Representatives on February 10, 2000.

"We stand before choices that will affect generations to come—biblical choices, between life and death, blessing and curse. Shall energy be a safe, clean, sustainable blessing? Or shall our consumption of energy be a curse, causing harm, and even death, to people and other creatures far into the future?"

Thank you for the opportunity to give comments.

c/o Voices for Earth Justice
26672 Elm Street
Roseville MI 48066

March 1, 2004
City of Manistee Planning Commissioners

Good morning -
I am a year-round resident of Arcadia on the shore of Lake Michigan and Arcadia Lake in Arcadia Township of Manistee County. I am your neighbor in the greater sense of a community neighbor to the City of Manistee.

I became somewhat knowledgeable about "GROUNDWATER" a few years ago when the Kellogg Foundation of Battle Creek, Michigan offered interested citizens an opportunity to become better informed about GROUNDWATER in Michigan . There is a great need for EACH ONE OF US to do anything that can be done to protect our groundwater from contamination.

* Groundwater is the water below the surface of the top layer of earth
* Groundwater can travel miles below the surface of the earth
* Groundwater moves by underground pressure as well as gravity
* Groundwater can carry dissolved and un-dissolved contaminants as it travels underground
* Sand, gravel or clay do not automatically filter contaminants from groundwater
* Groundwater can become contaminated by direct discharge onto the ground
* Groundwater can become contaminated thru direct discharge into adjacent water
* Contaminants discharged into our atmosphere can also enter water that becomes groundwater
* The source of water from community and individual wells is groundwater
* The majority of northern Michigan residents get their drinking water from wells
* When groundwater is contaminated - our drinking water is contaminated

You, as a City of Manistee Planning Commissioner, have already received much precise, reliable, detailed data from knowledgeable citizens at your public hearings. Many citizens that spoke have been experts in their fields regarding the effects of hazardous pollutants including known carcinogens that would be released from this proposed plant.

YOU - as a member of the City of Manistee Planning Commission, YOU MUST NOT APPROVE the Special Use Permit that will allow the proposed Tondu plant to be built. You must do everything within your power to help protect the groundwater for the Health, Safety and Welfare of your immediate community as well as the greater Manistee County community which includes Arcadia Township where I live. GROUNDWATER KNOWS NO BOUNDARIES.

Respectfully,

Patricia Berghoff

Patricia Berghoff
16674 Starke Road
Arcadia, MI 49613

COMMUNITY DEVELOPMENT
BUILDING DEPT.
MAR 2 2004
CITY OF MANISTEE

Fax

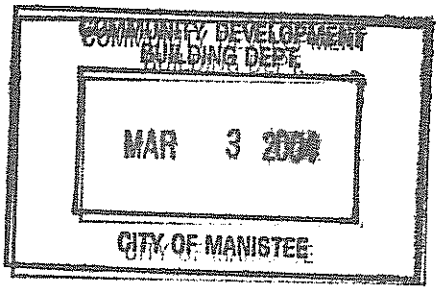
To: **MANISTEE PLANNING COMMISSION**
City of Manistee

Fax number: 231-723-1546

Date: March 2, 2004

Number of pages: 2

From:



Mary M. Grover
President, League of Women Voters – Grand Traverse Area
506 Fifth Street **Phone 231-933-4112**
Traverse City, MI 49684 **Email: mmgrover@charter.net**

Message

Please accept the letter of the League of Women Voters of the Grand Traverse Area, faxed herewith, and include it as part of the public record in the matter of the special use permit application of the Manistee Saltworks Development Corporation.

Thank you.

Mary M. Grover

Mary M. Grover
President, LWV-GTA

506 Fifth Street
Traverse City, MI 49684

Phone 231-933-4112
Email: mmgrover@charter.net

March 3, 2004

Manistee Planning Commission
City of Manistee
P.O. Box 358
Manistee, MI 49660

Re: **The Northern Lights Coal-Fired Power Plant**

The League of Women Voters of the Grand Traverse Area encompasses a five-county region in northwestern lower Michigan: Antrim, Benzie, Grand Traverse, Kalkaska and Leelanau Counties. In environmental matters, pollutants ignore these governmental boundaries. In a very real sense, we all live down stream; in matters of air quality, it can be said we all live down wind.

It has long been the League's position to support the preservation of the physical, chemical and biological integrity of the ecosystem that sustains us. We support the maximum protections of public health and the environment, and we encourage others to do so, as well. Our goal, and the goal of public policy-makers, should be to prevent ecological degradation, to reduce and control pollutants before they go down the sewer, up the chimney or into the landfill.

Policy-makers must weigh the importance of a few jobs, the short-term benefits of cheaper power for some, and the long-term costs of airborne mercury, greenhouse gasses, and carbon-dioxide emissions for all of us. We ask that the Manistee Planning Commission and the State Department of Environmental Quality deny the applications of the Manistee Saltworks Development Corporation for the permits that would enable the Northern Lights project to proceed.

Sincerely,

Mary M. Grover
President
LWV-GTA

Mailed and faxed to 231-723-1546

Copy to: Anne Magoun, President
League of Women Voters of Michigan

Mary M. Grover
President, LWV-GTA

506 Fifth Street
Traverse City, MI 49684

Phone 231-933-4112
Email: mmgrover@charter.net

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Sincerely,

Mary M. Grover
President
LWV-GTA

Mailed and faxed to 231-723-1546

Copy to: Anne Magoun, President
League of Women Voters of Michigan

COMMUNITY DEVELOPMENT
BUILDING DEPT.
MAR 4 2004
CITY OF MANISTEE

3695 Lakeshore Drive
Manistee, MI 49660

COMMUNITY DEVELOPMENT
BUILDING DEPT.
MAR 3 2004
CITY OF MANISTEE

February 28, 2004

Mr. Jon Rose
City/Community Development Director
C/O Manistee Planning Commission
City Hall
70 Maple Street
Manistee, MI 49660

Dear Mr. Rose:

Today I received the enclosed letter from Region V of the U.S. EPA. After there was some concern about the accuracy of the reporting information on mercury from the TES Filer plant, I wrote to the Director of Region V. The answer is enclosed. Please distribute this to the Planning Commission as the copies of the Forms R provided by the EPA appear not to be correct.

The enclosed letter explains that "the error was a result of a mistake in the facility's report to EPA." While the letter does not indicate what the estimated emissions were from the plant for 2000 and 2001 and 2002, the letter from the EPA states that the new estimate reported is similar to the estimate that the EPA derived for 1999 mercury emissions, which at that time was 2.3 pounds. I believe the commission should be aware of this information.

The new learning for me, is that there appears to be no accurate monitoring of mercury as there is no requirement to control it. The estimates are derived from a formula that plants use to come up with the estimate.

This information should be used to correct previous statements I have provided which were based on the information provided by the TES Filer superintendent to the EPA.

Thank you for your attention to this.

Sincerely,

Daniel W. Behring

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:

AT-18J

FEB 26 2004

Daniel H. Behring
3695 Lakeshore Drive
Manistee, Michigan 49660

Dear Dr. Behring:

Thank you for your letter of February 13, 2004, to Regional Administrator Thomas V. Skinner, regarding mercury emissions from Tondu Corporation's TES Filer Cogeneration Plant in Filer, Michigan. This facility made incorrect calculations of mercury emissions in a report to the Toxics Release Inventory database. The facility has subsequently corrected this information. The news article that you refer to in your letter incorrectly states that the information was incorrect because of an error by the Environmental Protection Agency (EPA). In fact, company representatives have confirmed that the error was a result of a mistake in the facility's report to EPA.

The new, corrected, estimate of mercury emissions that the company has reported is similar to the estimate that the EPA derived for 1999 mercury emissions from this facility, based on facility fuel use reported by the facility. EPA estimated that 1999 mercury emissions were 2.3 pounds in 1999. This information is available on EPA's web site at http://www.epa.gov/ttn/atw/combust/utiltox/pltxplt3.pdf.

I appreciate the opportunity to be of service and trust the information provided is helpful. You may contact Alexis Cain of my staff at (312) 886-7018, if you need additional information.

Sincerely yours,

Stephen Rothblatt, Director
Air and Radiation Division

Recycled/Recyclable-Printed with Vegetable Oil Based Inks on 100% Recycled Paper (40% Postconsumer)

601 Harvard Lane
Manistee, MI 49660

Feb. 29, 2004

Dear Planning Committee Members,

I am writing to implore you to oppose the Special Use Permit. This is not in the interest of the Health, Safety, and Welfare of our community.

Thank you for your help,

Janet W. Cordes

COMMUNITY DEVELOPMENT
BUILDING DEPT.

MAR 3 2004

CITY OF MANISTEE

March 2, 2004

COMMUNITY DEVELOPMENT
BUILDING DEPT.
MAR 4 2004
CITY OF MANISTEE

John Rose
Manistee Planning Commission
P.O. Box 358
Manistee, Michigan 49660

TO: The Manistee County Planning Commission

ATT: Mr. Rose,

I am a resident of Arcadia Twp. and unable to attend the Thursday evening meeting in Manistee. I am writing concerning the coal burning power plant proposed for Manistee. I find it hard to believe that this project is even being considered.

There is so much information available that confirms the danger of coal burning plants to the environment and to the quality of life that we all cherish. The issue of jobs is an important one for Manistee County but not at the risk of our beautiful forests, lakes, rivers, and every resident's health and well-being.

I do not understand why the Governor is remaining neutral on this topic in light of the fact that she is on record as being committed to eliminating polluting sources of Mercury -a dangerous neurotoxin contained in coal- in Michigan by 2020.

I will send this message on to her as well. Sincerely,

Joyce E. Delamarter

Joyce E. Delamarter
PO Box 133
Arcadia, MI 49613

Postcards Received in Opposition to the Northern Lights coal-fired power plant

Postcards are on File at City Hall, Community Development Department

Green or Gold Postcard #1 reads

To the Manistee Planning Commission: I live in Manistee, and I am opposed to the Northern Lights coal-fired power plant. I urge the Planning Commission to turn down the application for a Special Use Permit for the facility.

Received 2/27/04 (0 postcards)

Received 3/1/04 (0 postcards)

Received 3/2/04 (0 postcards)

Received 3/3/04 (3 postcards)

Karen Lewis, 324 Second Avenue, Manistee

(Unsigned, no address) " Air, Land & Water Pollution - Knows no Boundaries, Please explore renewable energy and conservation Technologies!" (Crossed out Manistee and wrote Benzonia in printed message)

James A. Clements (no address) "I Believe you have been given false information from Tondu - there's no way we'll realize new jobs or tax revenue justifying the pollution passing over my house! Thank You. (Crossed out Manistee and wrote Eastlake in printed message)

Received 3/4/04 (0 postcards)

Postcards Received in Opposition to the Northern Lights coal-fired power plant

Postcards are on File at City Hall, Community Development Department

Yellow or White Postcard #2 reads

To the Manistee Planning Commission: I am opposed to the Northern Lights coal-fired power plant. I urge the Planning Commission to turn down the application for a Special Use Permit for the facility.

Received 2/27/04 (2 postcards)

Linda Anderson, 1409 Manistee Street, Manistee
Bruce Jankowski, 708 Ramsdell Street, Manistee

Received 3/1/04 (8 postcards)

The Chases, 576 Michigan Avenue, Frankfort
Bill Howson, 3474 Potter Road, Bear Lake
Ken Bauman, 1405 Manistee Street, Manistee
Carol (Susie) Bauman, 1405 Manistee Street, Manistee
George Kaminski, 21125 Valencourt, Copemish
Anne Kaminski, 21125 Valencourt Road, Copemish
Ed Novak, (no address) "Why is this not coming to a County vote? We all breath the same dirty air? Lets keep it as clean as we can?"
Mr. & Mrs. A. McWatt, 730 Harbor Drive, Manistee "Where have the absent Commissioners been during the last two public hearings? How can they assess the commentary if they are not in attendance? Have they already made up their minds?

Received 3/2/04 (9 postcards)

John Helze, 516 Maple Street, Manistee
Sara Helze, 516 Maple Street, Manistee
Chuck Reed, 4573 Main Street, Onekama
(Unreadable signature) (no address)
Mary Reed, 4573 Main Street, Onekama
Anne Howson, 3474 Potter Road, Bear Lake
Candy Dancz, 300 W. Kott Road, Manistee
Robert Hayes, 316 W. Kott Road, Manistee
Catherine Eubanks, 1295 Greenwich, Manistee "I urge you to turn down this application, It takes courage to do that, but you will gain the respect and gratitude of many if you do."

(Continued)

Received 3/3/04 (5 postcards)

Jane Gunia (no address)
Robert Guina (no address)
Jack & Trish Buchanan (no address)
Phyllis Hayes, 316 W. Kott Road, Manistee
Colleen Tucker, 3501 Madison Road, Manistee "It is not worth the few jobs it would bring. It is a BAD ideal."

Received 3/4/04 (9 postcards)

Monty Klein (no address)
Monica Klein (no address) "Coal Kills"
Maegan Miller (no address) "Youth says NO to coal!"
Ashley Nowak (no address)
Kevin Bauman, 1405 Manistee Street, Manistee
(unable to read signature) (no address)
Jason Traviss (no address)
Jim Barnes, Frankfort "I grew up in Middletown, Ohio a steel town with a coal plant. Everyday (almost) we had this film of dust on the top of our cars from acid rain. Two of my high school classmates had cancer in their early 20's. Breast and Testicular Cancer. Thank for your consideration."
Linda Anderson, 1409 Manistee Street, Manistee "Based on your current Zoning Ordinance that clearly states that a permitted project cannot create a dangerous element or condition tot he public. I feel you must turn down Tondu's application for a Special Use Permit. Thank you."