1990

A Review and Analysis of Ontario's Municipal/Industrial Strategy for Abatement (MISA):

Going to BAT for Water Quality in Ontario.

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1. Introduction

On June 23, 1986, the Minister of the Environment Jim Bradley announced a new era in water pollution control for Ontario. The Municipal-Industrial Strategy for Abatement (MISA) was heralded as a new regulatory effort which would virtually eliminate the discharge of persistent toxic chemicals into Ontario's waterways.[1] Called Ontario's "...**most far-reaching environmental reform...**" by the Minister[2], it was welcomed by environmental groups and the public because it promised significant changes in the regulatory strategy to combat water pollution.

The opinion of the public is clear, citizens have realised that environmental problems need speedy and thorough government action. Indeed, a Decima poll in the Fall of 1989 showed that 9 out of 10 citizens living around the Great Lakes want **zero discharge of persistent toxic chemicals** in the next 10 years. Moreover, 74% of these citizens believe that industry already has the resources and capacity to achieve the zero discharge goal. As a result, any new initiative in water pollution control will have the undivided support of the public.

This report, written jointly by the **Canadian Institute for Environmental Law and Policy** and the **Pollution Probe Foundation**, is an independent review and analysis of the MISA program. Given that MISA enters its fifth year, a first overall evaluation of the program by environmental NGO groups seems more than appropriate, especially considering that Great Lakes contamination horror stories continue to be released.*

In starting this report, the introduction presents a brief overview and summary of the components within the Municipal-Industrial Strategy for Abatement. Section two examines of the international, environmental and regulatory context of why MISA came about. A detailed review of the MISA goals and activities for direct and indirect dischargers can be found in sections three and four, respectively. For both types of discharges, the relevant issues are examined by reviewing MOE's original intentions, reporting on the progress to date, evaluating this progress, and providing a report card based on our evaluations. Both sections close with recommendations for improving MISA. The decision-making process in the MISA program is analyzed in

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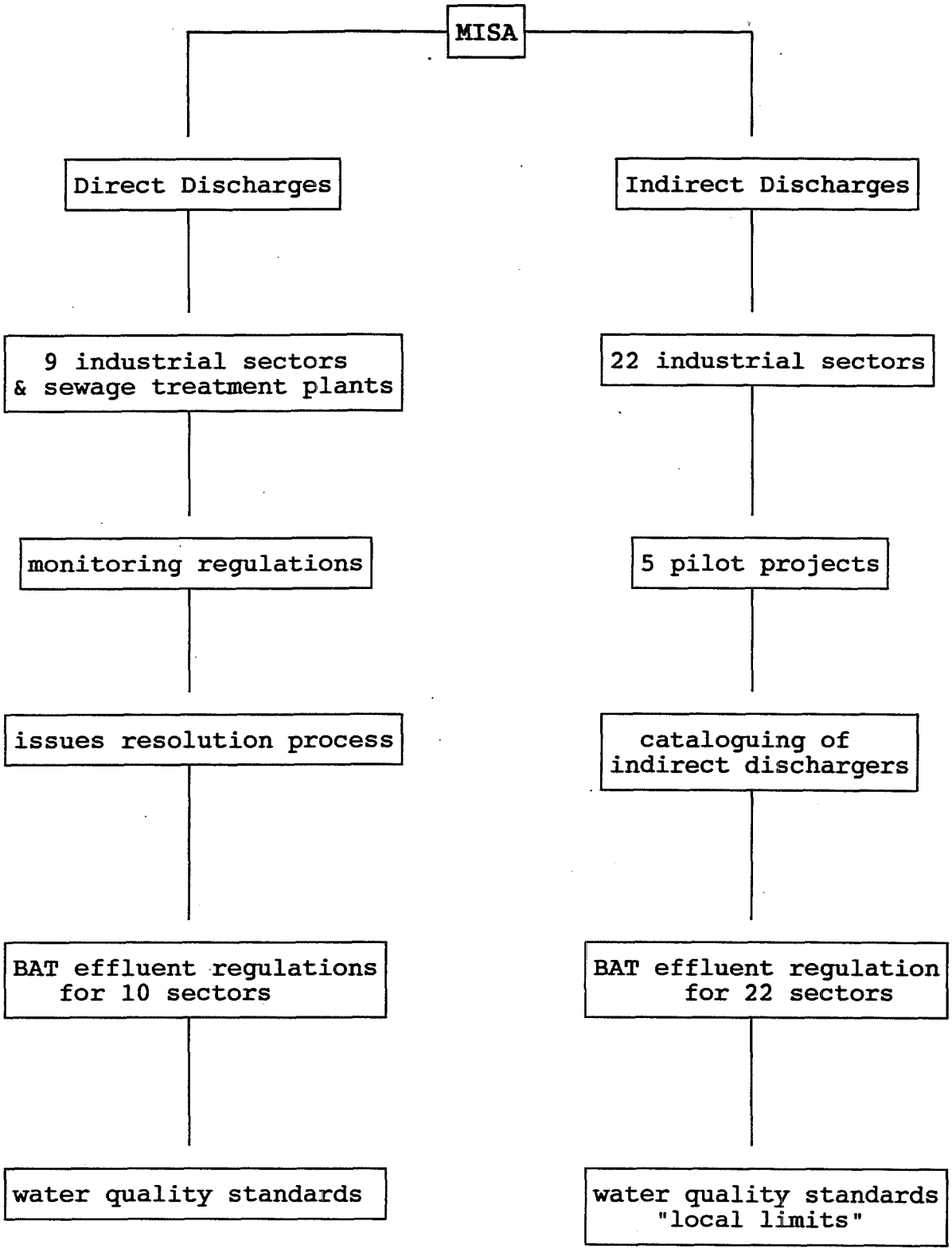
* Among them, the report Great Lakes, Great Legacy? (1990) by the **Institute for Research on Public Policy** and the **Conservation Foundation**, and the 5th Biennial Report by the **International Joint Commission** (1990).

section five. Public participation, committee structures and the MISA management structure comprise the main toxics of section five. Finally, the MISA in Retrospect section reviews MISA's allocated resources and staffing and provides a list of accomplishment. Section six closes with an overall MISA report card, an overall list of recommendations, and with a look into the 1990's.

1.1. Overview and Summary of MISA

Figure 1 below presents a graphical overview of the consecutive components of MISA.

Figure 1: Components of the MISA Program.



for indirect discharges; however, one municipality (North Bay) pulled out, leaving the Regional Municipality of Hamilton Wentworth, Gananoque, Cobourg, Thunder Bay and Ingersoll. The project are currently being carried out, with completion expected in December of 1990.

Detailed 12-months monitoring requirements will not be established for indirect dischargers, instead the municipalities must compile a **comprehensive inventory of industrial discharges** into their sewage system. This inventory is to be accomplished by site visits, sampling, questionnaires and interviews. Relevant industries must also self-monitor their effluents once the **Sewer Use Control Program** is implemented.

The MOE, in association with Environment Canada and the Municipal Engineers Association undertook a **37 sewage treatment plant (STP) pilot monitoring program** which sampled STP intake, effluent and sludges for 144 organic contaminants and 15 metals.

Best Available Technology Economically Achievable (BATEA) effluent limits will be set for 22 industrial sectors. The enforcement of these BAT standards will be primarily the responsibility of the municipality; that is, under the MISA program, the local government will be given authority to prosecute violators of the effluent standards. The MOE will also prosecute violator, but can also prosecute municipalities for not enforcing BATEA limits.

Local limits (water quality-based standards), that is limiting discharges based on the desired quality of the receiving water, will be developed after all BATEA regulations are in place. An assessment of the impacts on water quality by their effluents, must be undertaken by the municipalities. The MOE will review these assessments and decides whether or not the proposed local limits are appropriate.

QUESTION: should we put Crag's summary chart here? We could use an easy-to-read chronological chart of MISA

Direct Dischargers:

Direct dischargers release their effluents directly into rivers and lakes, and in MISA, the significant industrial dischargers are divided into **nine industrial sectors**, including electric power generation, industrial minerals, inorganic chemicals, iron and steel, metal mining and refining, metal casting, organic chemicals, petroleum refining and pulp and paper. Municipal sewage treatment plants are also considered direct dischargers.

The detailed 12-month **monitoring regulations** for each sector provide information regarding the type and amount of toxics entering Ontario waterways. Sector-specific **Joint Technical Committees** (JTCs), consisting primarily of MOE staff and industry representatives, develop these monitoring regulations through negotiations. All nine industrial monitoring regulations are currently taking place.

In the **issues resolution process** 18 important issues related to the setting of effluent limits are determined. Issues such as the exact definition of **best available technology** (BAT) and concise meaning of **virtual elimination** must be resolved before the JTCs can develop BAT effluent limits for each industrial sector. The issues resolution process has started and the MOE hopes to settle the issues by late summer or early fall of 1990.

Best Available Technology Economically Achievable effluent limits will be established for each industrial sector and the municipal sector. These limits are technology-based standards which reflect what is technologically possible (**"performance-oriented"**) and not ecologically necessary. Under the MISA program, BATEA standards will be reviewed, and tightened if new technology is developed, every five years. No single BATEA standard has been set, the first effluent limits regulations are expected to start in ??? for the petroleum sector.

In many cases, technology-based standards will not be stringent enough to effectively prevent the detrimental effects from toxic discharges. Thus, under the MISA program, the discharger must prepare assessments of how their effluents impact the water quality, and once reviewed by the MOE, **Water Quality Standards** (WQS) will be set. With the exception of six pilot projects, no work has been undertaken to develop water quality standards.

Indirect Dischargers:

Originally six **pilot projects** were initiated to examine the feasibility, cost and effectiveness of the proposed MISA approach

2. The MISA Context

The Ministry of the Environment initiated MISA primarily because of three reasons; first, toxic contamination of Ontario waters has caused **unacceptable environmental degradation which** continues to get worse. Second, **international agreements** obligate the Ontario government to reduce toxic discharges into the Great Lakes basin. Finally, the current regulatory scheme used to control water pollution is **completely inappropriate** to adequately protect rivers and lakes.

This section then, presents an overview of the environmental state of Ontario's waterways and explains the international obligations binding the Government of Ontario. A review of the current water pollution regulatory scheme confirms that a new water pollution control strategy was urgently necessary.

2.1. Ontario's Troubled Surface Waters

2.1.1. State of Ontario's Waters Prior to 1986

MISA was not conceived on its own- Ontario has had a long history of polluted waterways. Cholera and typhoid epidemics occurred in by the mid-1800s, due to settlement and a lack of sewage treatment (City of Toronto Report on ----- [Sarah]) Wildlife populations in close proximity to or in water have changed both in species composition and abundance, with many key species becoming extinct or extirpated from their former habitat. Nutrient loading (causing eutrophication) became of acute concern by the mid-1960s, due to excessive phosphorus loadings, especially to nearshore areas of Lake Ontario, and Lake Erie as a whole. The 1972 Great Lakes Water Quality Agreement between Canada and the United States (see 2.2) led to the imposition of controls on nutrient inputs have led to a fairly successful reversal of the eutrophication process.

By the mid-1970s, however, there was growing recognition that persistent toxic contamination was a threat to the well-being of an ecosystem. The failure of certain species to reproduce, marked deformities in many of the offspring that were able to survive, and the collapse of the commercial fisheries on the Great Lakes due partly to unacceptable levels of toxic contaminants in fish tissue (To the Last Drop, p.) were all signs of the seriousness of the threat. Many of these problems were in spite of the concentrations of these pollutants meeting "ambient water quality standards" (p. xii, GLGL).
An updated Great Lakes Water Quality Agreement (in 1978, and, again, in 1987) recognized the threat of persistent toxic

contaminants and called for the governments concerned to act.

Little was done in Ontario, however, until the discovery in 1985 of a perchloroethylene "blob" at the bottom of the St. Clair River, downstream from the heart of Canada's chemical industry at Sarnia. This "toxic blob" led to the development of a monitoring and abatement regulation (check this) for the Sarnia area. It was during this development that inadequacies in Ontario's water quality laws were fully exposed (P Seto, pers comm) (see below- 2.4 Ontario's position).

Partly in response to the above ecological disasters, in June of 1986, MISA was announced.

2.1.2. Current Condition of Ontario Waters

Since 1986, whatever progress there was in reducing loadings of toxic contaminants to Ontario's waters appears to have slowed or stopped (p. xi, GLGL). Levels of numerous chemicals continue to exceed "enforceable standards" (need def'n) in the water column and in fish tissue in Lake Ontario (LOTMP, p.76-77). Beaches are still regularly, and in some cases, permanently closed due to inadequate storm water and/or sewage treatment (GLGL). Advisories for women of child-bearing age and children against the consumption of a wide variety and sizes of fish continues for many Ontario water bodies (Guide to Eating ...1990), and persistent toxics have been and continue to be detected in human adipose tissue, breast milk, and drinking water (GLGL).

The effects of chemicals or their management on the ecosystem are still not fully known at present: (There is) still... a level of uncertainty that "remain(s) unacceptably high" (Flint, 1990, p. 3). Technologies have improved, but uncertainty also remains wrt the proper detection or identification of certain chemicals of concern (Flint. p.13). For the Great Lakes, "in many respects, environmental conditions remain unsatisfactory, and the health of the basin's inhabitants remains in jeopardy.' (GLGL, p. xxvii).

2.2. International Obligations

Because Ontario shares the Great Lakes with the United States, water quality is of international concern. Great Lakes pollution was mentioned in an international context as early as 1909, in the Boundary Waters Treaty. This Treaty created the **International Joint Commission** (IJC) to assist the Canadian and U.S. Federal Governments in carrying out the obligations of the

Treaty. In 1972, the Great Lakes Water Quality Agreement (GLWQA) was first signed and at that time, **eutrophication** (nutrient enrichment) of Lake Erie and nearshore areas was the primary focus. The 1972 Agreement established controls on nutrient loadings which reversed the eutrophication process.

The boom in the chemical industry since the second World War induced another, more serious, pollution problem in the 1970's - **toxic contamination.** The ability of persistent toxics to **bioaccumulate** in living tissue, and the early signs of the above described environmental effects, led to the re-negotiation of the 1972 Agreement and signing of a new Great Lakes Water Quality Agreement in 1978. The 1978 Agreement introduced the philosophy of **zero discharge** and the term **virtual elimination,** and required the Federal Governments to establish pollution controls for municipal and industrial sources by **December 1983.**[3] In 1987, a series of amendments were included to the 1978 Agreement reflecting, among others, concerns about non-point pollution, contaminated sediments and airborne toxic substances.

Even though the GLWQA was signed by the Federal Governments, the Province of Ontario is committed to implement the goals of the Agreement. In May of 1986, Ontario, Quebec and the eight U.S. States bordering the Great Lakes signed the Great Lakes Toxic Substances Control Agreement (TSCA). In the TSCA, the signatories committed themselves to the

> **"...Great Lakes Water Quality Agreement's aim to virtually eliminate the discharge of all toxic substances."**[4]

Furthermore, the governments of Ontario and Canada, signed the Canada - Ontario Agreement Respecting Great Lakes Water Quality (COA) in 1982. The specific purpose of this agreement is to:

> **"...to renew and strengthen co-operation between Canada and Ontario in meeting the obligations assumed by Canada under the Revised Canada - U.S.A. Agreement."**[5]

The Canada - Ontario Agreement even reiterates that:

> **"The discharge of toxic substances in toxic amounts be prohibited and the discharge of any or all persistent toxic substances be virtually eliminated."**[6]

Therefore, Ontario is clearly obliged to the Great Lakes Water Quality Agreement and its components, the important of which are described below.

2.2.1. Virtual Elimination and Zero Discharge

One of the two guiding principles of the Agreement is the philosophy of zero discharge. Article 2 of the GLWQA states that:

> "The discharge of toxic substances in toxic amounts be prohibited and the discharge of any persistent toxic substances be virtually eliminated."[7]

Furthermore, Annex 12 of the Agreement defines the philosophy by which the goal of virtual elimination of toxic substances shall be achieved:

> "The philosophy adopted for the control of inputs of persistent toxic substances shall be zero discharge."[8]

It is important to note that the philosophy of zero discharge is not an invention of environmental groups but is a commitment made by Great Lakes governments. Consequently, the MISA program must implement the concepts of zero discharge and virtual elimination.

Zero discharge means the elimination of all inputs of persistent chemicals, whether it be from direct discharges, indirect discharges such as agricultural and urban run-off, or inadvertent discharges such as from leaking landfills or reactivation of contaminated sediments. A combination of three approaches can be used to achieve zero discharge. First, treating discharges by chemical, biological or physical methods can remove certain, but not all toxics; in fact, this traditional pollution control approach is ineffective for many persistent toxic substances.

Second, the zero discharge goal must include an emphasis on the source reduction approach which focuses on eliminating toxics at their source of production. Source reduction (or pollution prevention) methods include:

* material substitution;
* use of more modern or efficient equipment;
* process modification;
* in-process recycling;

* product redesign or reformulation; and

* good housekeeping practices.

In its recent Fifth Biennial Report, the International Joint Commission supported the source reduction approach by concluding that:

> "The technology either exists - or can, with very few exceptions, be developed at some cost - to replace ... the use of persistent toxic substances."[9]

Since even source reduction methods cannot ensure the virtual elimination of all persistent toxics, a third and final approach to achieve zero discharge must be implemented. While banning chemicals from production processes may represent the least desired option, it will be a necessary choice to achieve zero discharge.* A ban will invariably imply banning certain consumer products as well. Again, the International Joint Commission supported this approach:

> "Substances for which zero discharge cannot be assured must be phased out of use as soon as possible."[10]

Therefore, the goal of zero discharge can only be achieved if MISA combines the three approaches in a thorough and effective manner.

2.2.2. The Ecosystem Approach

The second guiding principle of the GLWQA is the ecosystem approach which recognizes the interrelatedness between air, water and soil pollution problems. The ecosystem approach has two important implications. First, it recognizes that all sources of toxic contamination must be addressed and not simply those to water. Second, it suggests using the drainage basin of the Great Lakes System as the significant dividing line - not artificial political borders.

Since Ontario is bound to the Great Lakes Water Quality Agreement, MISA must incorporate the ecosystem approach in its scheme. Thus, MISA needs to incorporate a multi-media approach which addresses all sources of persistent toxic substances,

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* For example, if the use of chlorine compounds in paper production would be prohibited, dioxins and furans would not be discharged by pulp and paper mills.

irrespective of whether their initial point of entry into the ecosystem is into the air, ground or waterways. Hence, from a regulatory point of view, both point and non-point sources must be taken into account. Moreover, the ecosystem approach requires the MOE to address the overall reduction of **toxic mass loadings** into rivers and lakes. Concentration-based regulations ignore the need to reduce the total amount of toxic substances entering Ontario waterways.

Applying the ecosystem approach in a regulatory strategy also implies using **biological indicators** to identify pollution problems. Biological indicators include deaths, cancers and reproductive problems in wildlife species, and thus MISA must incorporate priority regulatory mechanisms which prevent damage to wildlife. Furthermore, MISA must set especially strict effluent standards on those sources which, by themselves or in combination with others, cause biological damage. Biological indicators must be used within MISA to evaluate whether or not effluent regulations are stringent enough.

Finally, the ecosystem approach requires Ontario to harmonize environmental standards with other jurisdictions. The efforts undertaken by the MISA program will be essentially useless if other jurisdictions sharing Ontario waters do not undertake similar actions. Thus, MISA must include a strategy to convince other jurisdictions to also virtually eliminate toxic substances entering rivers and lakes shared by Ontario.

Again, it must be emphasized that the ecosystem approach has been accepted by our Governments as the appropriate method of dealing with water pollution, and is not a 'unrealistic dream' of environmentalists.

2.2.3. Remedial Action Plans

Annex 2 of the GLWQA, ensuing from the amendments to the 1987 agreement, committed the U.S. and Canadian federal, provincial and state governments to clean-up 42 **Areas of Concern** (AoCs) around the Great Lakes. These AoCs are particularly polluted and **Remedial Act Plans** (RAPs) are presently being developed to clean them up. The three fundamental principles behind each RAP are:

* **Ecosystem Approach:** Annex 2 specifies that RAPs "...shall embody a systematic and comprehensive ecosystem approach.".[11]

* **Restoring the Ecosystem:** Remedial Action Plans are an important step "...toward restoring ... the chemical, physical and

biological integrity of the Great Lakes Basin Ecosystem."[12]

*** Virtual Elimination:** Remedial Action Plans serve as an important step "...toward [the] virtual elimination of persistent toxic substances...".[13]

As a result of the Great Lakes Water Quality Agreement, MISA must seek to achieve the goals of Remedial Action Plans. In fact, in its 5th Biennial Report, the IJC emphasized again that:

> **"...the parties give high priority to the development and implementation of RAPs,...".**[14]

Because of the serious health and pollution problems in most AoCs, and because some receiving waters are more sensitive than others, a new water pollution control program must prioritize setting effluent regulations first to these types of areas.

The GLWQA commits the Ontario government to a comprehensive clean-up of 17 Areas of Concern*, which remains the highest number of Areas of Concern for any provincial or state jurisdictions around the Great Lakes.

2.2.4. Lake Wide Management Plans

Annex 2 of the Great Lakes Water Quality Agreement also requires governments to prepare **Lake Wide Management Plans** (LWMPs) which serve...

> **"...as an important step toward virtual elimination of persistent toxic substances and toward restoring and maintaining the chemical, physical and biological integrity of the Great Lakes Ecosystem."**[15]

Lakewide Management Plans are to focus on the reduction and eventual elimination of so-called **critical pollutants**, which are designated by the two Federal Governments. Eleven critical pollutants have been identified and include

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* The Areas of Concern in or shared by Ontario include: Thunder Bay, Nipigon Bay, Jackfish Bay, Peninsula Harbour, St. Marys River, Spanish River Mouth, Penetang Bay to Sturgeon Bay, Collingwood Harbour, St. Clair River, Detroit River, Wheatley Harbour, Niagara River, Hamilton Harbour, Toronto Waterfront, Port Hope, Bay of Quinte and St. Lawrence River.

* total PCBs
* DDT and metabolites
* Dieldrin
* Toxaphene
* 2,3,7,8 - TCDD dioxin
* 2,3,7,8 - TCDF furan
* Mirex
* Mercury
* Alkylated lead
* Benzo(a)pyrene
* Hexachlorobenzene

Specifically, Lakewide Management Plans

"...shall be designed to reduce loadings of Critical Pollutants in order to restore beneficial uses."[16]

According to the Agreement, LWMPs are to define contamination problems, develop a schedule to reduce loadings, determine what loading reductions are necessary to lead to zero discharge, and evaluate remedial measures currently in place.[17]

Obviously, MISA cannot ignore such obligations under the GLQWA, and must be coordinated with LWMPs. For example, the Lake Ontario Toxics Management Plan's goal to provide drinking water and fish that are safe for unlimited consumption must be coordinated with MISA.[18] Also, the critical pollutants must be included in the MISA monitoring regulations and given special attention in the setting of effluent limits.

2.3. Ontario's Antiquated Water Regulatory System

The Municipal-Industrial Strategy for Abatement was developed not only because of environmental degradation and international obligations, but also because the water pollution control system currently employed represents a completely inappropriate practice.[19] Indeed, the Minister of the Environment, Jim Bradley stated that:

"...the system was up-to-date a decade ago, but it is inadequate now..."[20]

It should not be surprising that Jim Bradley made this statement considering the current system:

* employs primarily Certificates of Approvals, which are based

on concentrations and not loadings of discharges, ignore the majority of toxic chemicals, are negotiated secretly between the MOE and industry, and do not allow an opportunity to be reviewed by the public before being implemented.[21]

* does not include coherent or enforceable water quality standards.[22]

* does not include monitoring data such that no one knows the amount of toxics are entering Ontario waters.

* does not account for shock-loadings.[23]

* does not include provincial regulations concerning discharges to sewers.[24]

* allows discharges of persistent toxic chemicals into sewer systems.[25]

* assigns responsibility to regulate discharges into sewers to municipalities which do so on a voluntary basis.

Clearly, the current regulatory system employed by the Ontario Government is inadequate to deal with toxic substances.

In summary, the provincial government had no choice but to overhaul the water pollution control strategy because the Great Lakes continue to grow as a health threat, because of national and international commitments, and because the current regulatory system is totally inappropriate.

3. Direct Dischargers

This section deals with the proposed MISA regulations pertaining to direct dischargers. For each part of the MISA proposal, a review of the policies and an update on the progress to date is given, followed by an evaluation of both policy and update. Based on the evaluation, a report card summarizes the current state of the MISA program and the section closes with recommendations for reform.

Direct dischargers are defined as those industries which release their wastewaters directly into a river or lake. Approximately 300 direct industrial dischargers exist in Ontario[26] but in 1988 only 168 of them appeared in the direct industrial discharge inventory.[27] The 1988 wastewater releases of the 16 largest industrial dischargers in Ontario, excluding Ontario Hydro, are summarized in table x below.

Table X: Ontario's 16 Largest Direct Industrial Dischargers (excluding Ontario Hydro).[28]

Company	Location	Amount of Discharges (in cubic meters/day)
Stelco	Hamilton	868,537
Dow Chemical	Sarnia	692,290
Dofasco	Hamilton	565,327
Algoma Steel	Sault Ste. Marie	480,065
Polysar	Sarnia	328,680
CIL	Courtright	305,605
Shell	Corunna	230,190
Esso Petroleum	Sarnia	217,045
Canadian Pacific Forest Products	Thunder Bay	212,500
Dupont	Maitland	175,451
MacMillian Bloedel	Sturgeon Falls	135,948

General Motors	St. Catharines	135,760
General Chemical	Amherstburg	133,060
Kimberly Clark	Terrace Bay	120,951
INCO	Sudbury	117,671
Domtar	Cornwall	107,315

In total, these 16 industries discharge, with varying degrees of contamination, **1.8 billion cubic meters of wastewater a year** into Ontario rivers and lakes.

3.1. Overview of the 1986 MISA Proposal

The 1986 White Paper, entitled A Policy and Program Statement of the Government of Ontario on Controlling Municipal and Industrial Discharges into Surface Waters, announced the MISA program and stated that:

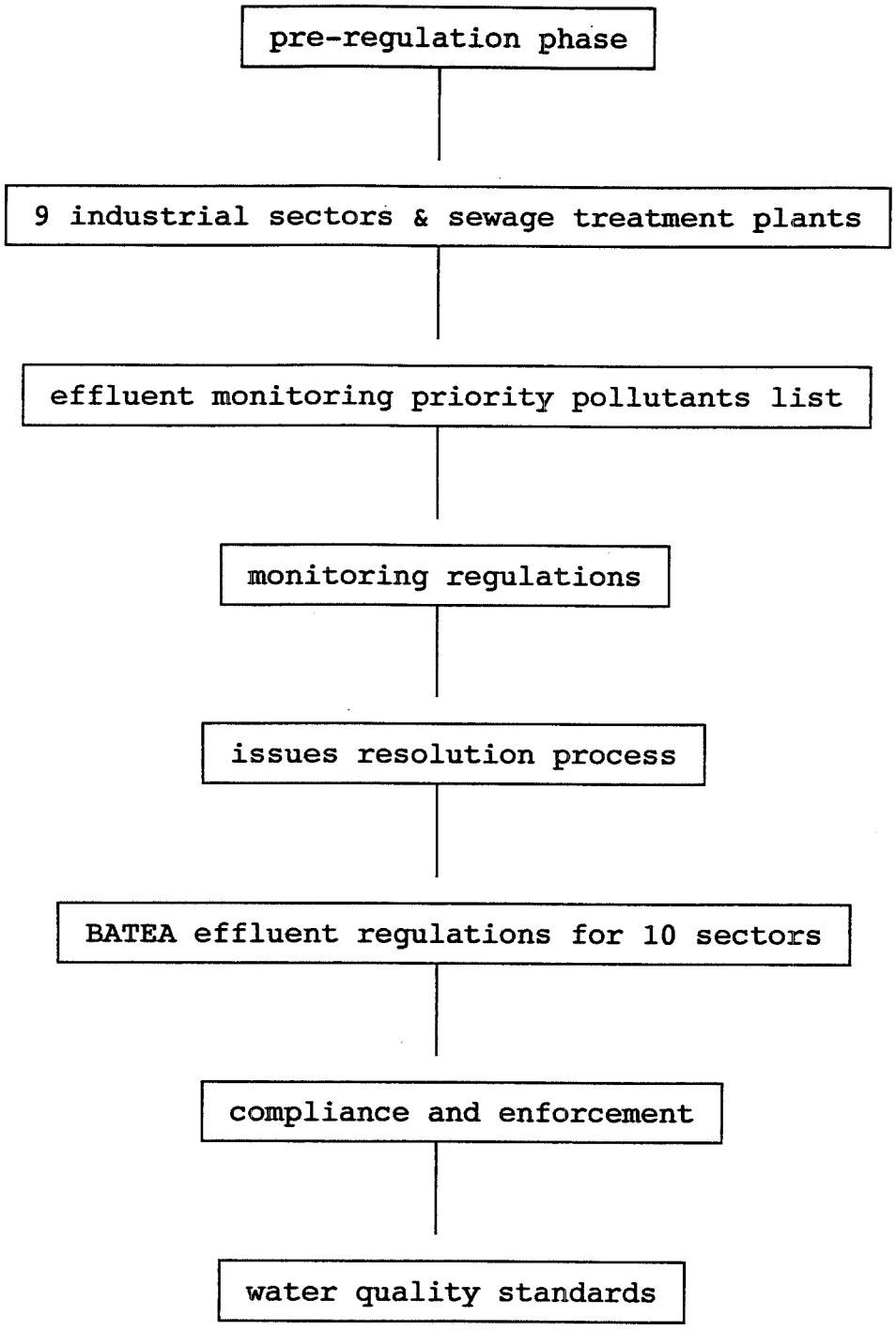
> **"MISA's ultimate goal is the virtual elimination of toxic discharges in municipal and industrial discharges into waterways."**[29]

To achieve this goal, the MOE identified five key components in its MISA program:[30]

1. **pre-regulation consultation** with industries, municipalities, and the public to reach the optimum program;
2. a comprehensive **data base of toxic contaminants** in discharges;
3. setting **effluent limits** for each industrial and municipal sector with the best available technology economically achievable (**BATEA**);
4. setting effluent limits for each receiving water body based on a **water-quality approach**; and
5. **abatement and enforcement** mechanisms.

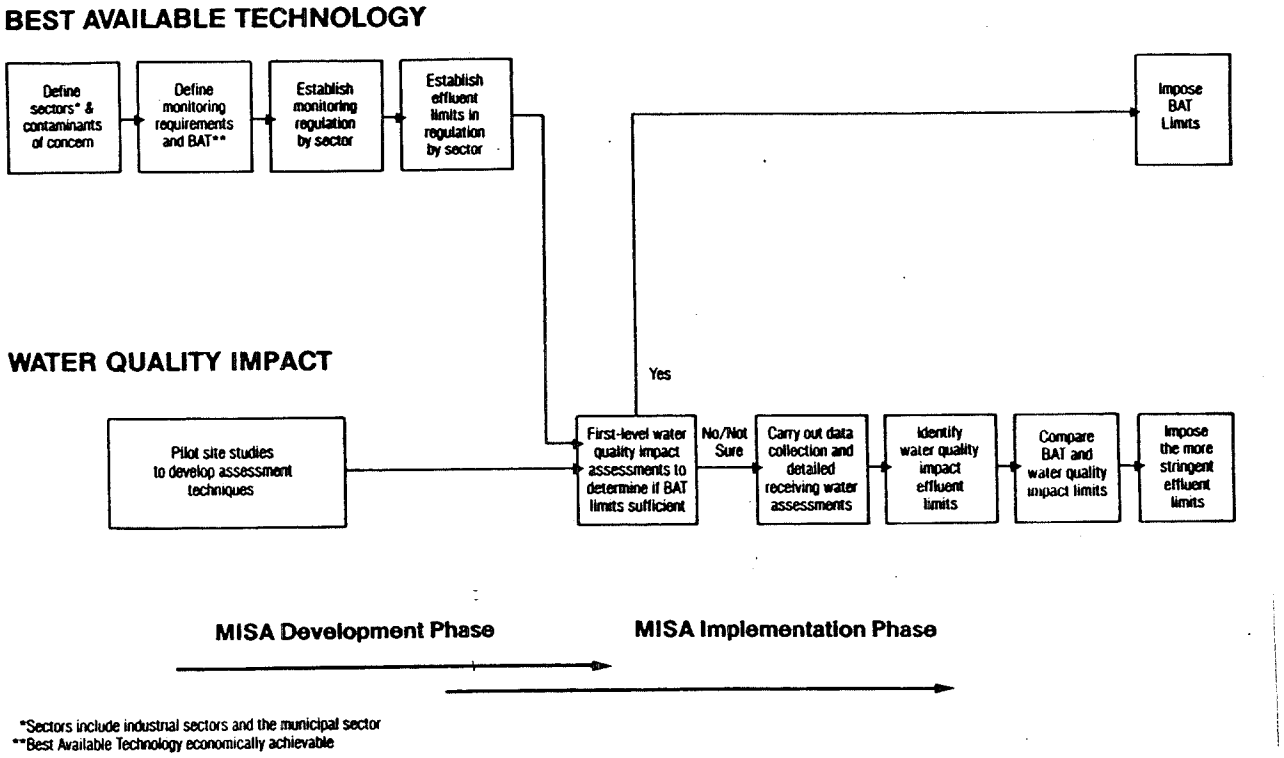
Dissected into its practical components, the MISA program for direct discharges can be graphically summarized as follows:

Figure X: Chronological Overview of the MISA Components for Direct Discharges.



The establishment of the so-called **two track approach** - setting effluent limits based on Best Available Technology (BAT) before setting **more stringent** limits based on water-quality - originated from the U.S.. Figure X shows the visual overview of this two-track approach according to the 1986 MISA proposal.

Figure X: Two Approaches for Setting Effluent Limits.



3.2. Pre-regulation Phase

- Kai Millard should comment on this section especially, re: other pre-regulation activities.

3.2.1. Industrial Sectors

In order to categorize effluent types from Ontario's industrial operations, the MOE divided industries into **minor and major** industrial sectors. The major sectors comprise 200 of Ontario's 300 direct dischargers and originally encompassed eight, now nine, industrial sectors and the municipal sector (sewage treatment plants):[31]

* electric power generation
* industrial minerals
* inorganic chemicals
* iron and steel
* metal casting
* metal mining & refining
* organic chemicals
* petroleum refining
* pulp and paper
* sewage treatment plants

The remaining 100 dischargers in the minor sectors will be regulated a later point.[32]

3.2.2. The Effluent Monitoring List

The MOE established an overall list of pollutants which represents those chemicals that have been or are potentially present in Ontario municipal and industrial discharges. From this list, known as the **Effluent Monitoring Priority Pollutants List** (EMPPL), each sector monitors certain industry-specific contaminants. To be included in EMPPL, a pollutant undergoes a hazard assessment based on the chemical's

* environmental persistence;
* potential to bioaccumulate;
* acute and sub-lethal toxicity to biological organisms; and
* its potential to exist in effluents discharged to water.[33]

The pollutant list will be, and has been already, updated frequently and the MOE initiated a federal-provincial advisory committee (the **Priority Substance Advisory Committee**) advising the Minister on the addition or deletion of chemicals as new information becomes available.[34] When the EMPPL list is updated, the additional pollutants must be incorporated into the monitoring regulations to determine whether or not, and at what levels, they are present in industrial and STP effluents. The current edition of the Effluent Monitoring Priority Pollutants List can be found in Appendix 1.

3.2.3. Evaluation of the Pre-Regulation Phase

It was meaningful that the MOE categorized and prioritized the major industrial dischargers, otherwise much effort would

have been wasted on dealing with minor sources while major industries would continue to pollute. However, it remains questionable why sewage treatment plants are considered and categorized as direct dischargers. STPs are not sources of persistent toxic chemicals, the sources are industrial, commercial and household hazardous wastes. Thus, there is little information to be gained by monitoring STPs for toxics and also causes unnecessary delays.* As a result, effluent regulations for STPs should not include toxic substances, and can encompass only the original purpose of STPs - dealing with human wastes.

The MOE has released another White Paper in 1988, Controlling Industrial Discharges to Sewers, which deals specifically with industries discharging into sewers; however, it is important to realize that STPs are considered direct dischargers and thus have to fullfil similar requirements as the other direct dischargers.

With the exception of uranium, one important group of chemicals not included in the EMPPL list are radioactive substances. Indeed, the MISA draft monitoring regulation for the electric power generating sector specifically exempts radioactive emissions, including those from Ontario Hydro's nuclear power stations. The MOE justifies this exemption by arguing that

> "To pursue inclusion of radionuclide monitoring in the regulation would require extensive negotiations [with the federal Atomic Energy Control Board (AECB)] due to the problem of regulatory jurisdiction. This would not be in the interest of the MISA program..."[35]

MOE staff acknowledged that they have not obtained legal opinions on the jurisdiction question, although Ontario signed the Great Lakes Toxic Substances Control Agreement (TSCA) and the Canada - Ontario Agreement on Great Lakes Water Quality (COA) which specify that federal and provincial agencies should work together in the virtual elimination of persistent toxic chemicals.[36]

The exemption of radioactive discharges continues despite the following evidence:

* Radioactive materials produced in and emitted by nuclear power plants (eg.: tritium, Strontium^{90}, Cesium^{137} and Carbon^{14}) are invariably carcinogenic, mutagenic and acutely

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* MAC submission (Jan.31, 1989):extensive monitoring of STPs would cost between 26 and 85 million dollars.

lethal, usually in tiny amounts. Many exhibit a high degree of environmental persistence and/or bioaccumulation.

* The nuclear industry and its regulators have never used BAT or BATEA in controlling emissions of radioactive materials into the environment. Indeed, a 1984 draft by Environment Canada, Environmental Code of Practice, called for tightening limits on one class of radio-toxins by a staggering **300,000-fold based on BAT!**

* Recent evidence on radiation and human health indicates that the basis for today's federal emissions regulation is no longer valid. The December 1989 report BEIR-5 by the U.S. National Research Council estimates that a population exposed to "low levels" of radioactive pollutants would experience **3-14 times as many fatal (and non-fatal) cancers** as previously estimated (and as the AECB assumes).

* Because of a recent change in calculation methodology, radioactive emission limits into water are **increasing by a factor of ten.**[37] So far, only Darlington has been calculated the "new" way, and as a result, it is permitted to emit more radioactive pollution (into Lake Ontario) than all of Ontario Hydro's other nuclear power stations combined.[38] And the other limits will soon be raised as well! One of the problems with the calculations, especially with Darlington, is the fixation with concentrations not total loadings.

* Actual emissions of radio-toxins from Ontario Hydro's plants may be small in weight but are **very large in toxicity.** For example, in 1987 the Pickering reactors emitted 57,537 Curries* of radioactive tritium into Lake Ontario. The lethal dose at which 50 percent of humans will die is between 2 and 20 Curries, while the "average cancer dose" would be in the 3-30 Curries range!

Considering this evidence, the MOE can no longer maintain that MISA will virtually eliminate the discharge of persistent toxic chemicals into Ontario waters. Radioactive substances such as tritium, Strontium^{90} and Cesium^{137} emitted by nuclear power plants are persistent toxics associated with a range of serious environmental and human health effects.

3.3. Monitoring Regulations

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* A Currie is a measure of radioactivity. CHECK!!

The almost universal lack of information about the amount of toxic discharges entering Ontario waters is simply incomprehensible. Ontario's 20 million citizens are threatened by a toxic brew in their waters and no-one in government knows who discharged what, how much, and when. The information to be gained by a provincial monitoring effort must be geared towards supplying the needs for setting effective effluent regulations. Thus, it is important to prevent obtaining information for its own sake.

3.3.1. The 1986 Proposal and Intentions

The MOE recognized the large information gap and initiated an extensive twelve months monitoring program for each industrial sector. Industries have to monitor for specific chemicals from the EMPPL list and conduct acute toxicity tests for their effluents.*

According to the 1986 proposal, the information gathered through monitoring will be used to:[39]

* measure pollutant loadings and variations over time;
* relate known environmental degradation to specific pollution sources; and
* act as the trigger for abatement and enforcement.

Even though industries are required to monitor their own discharges during the twelve months, the MOE believes it can ensure a high degree of accuracy with this self-monitoring principle in four ways:[40]

1. require the discharger to follow established sampling procedures, flow measurement procedures and laboratory procedures;
2. require a quality-assurance and quality-control program by the discharger's laboratory to be checked by the Ministry laboratory;
3. conduct random audit sampling to be tested by MOE laboratories; and
4. conduct random on-site inspections.

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* The acute toxicity tests determine how lethal the effluent is to rainbow trout and Daphina spp..

Each monitoring regulation will specify sampling locations and procedures, procedures for data submission, and actions in cases of non-compliance.

3.3.2. Progress to Date

Designing and implementing the monitoring regulations has been seriously delayed as Table x shows.

Table X: Planned and Actual Starting Dates of Monitoring Regulations.[41]

Industrial Sector	Planned Date of Commencement	Actual Date of Commencement
electric power generation	June 1988	June 1990
industrial minerals	June 1988	
inorganic chemicals	June 1988	December 1989
iron and steel	June 1988	November 1989
metal casting	June 1988	May 1990
metal mining and refining	June 1988	February 1990
organic chemicals	June 1988	October 1989
petroleum refining	June 1988	December 1988
pulp and paper	June 1988	January 1990
sewage treat-ment plants	Dec. 1988	"being revised"

Note: Seven plants of the 29 inorganic chemical plants started monitoring in February 1990.

On average, the monitoring regulations appeared (8 for 143 = 18) months later than originally planned.

3.3.3. Evaluation of the Monitoring Regulations

The serious delay in designing and implementing the monitoring regulations is disturbing. During the development of the monitoring program, toxic discharges have continued at steady levels, and have even increased for certain pollutants as Figures x to x show.

Figure X: Average Annual Loadings of Phenolics from four Ontario Iron and Steel Plants (in tonnes/year).[42]

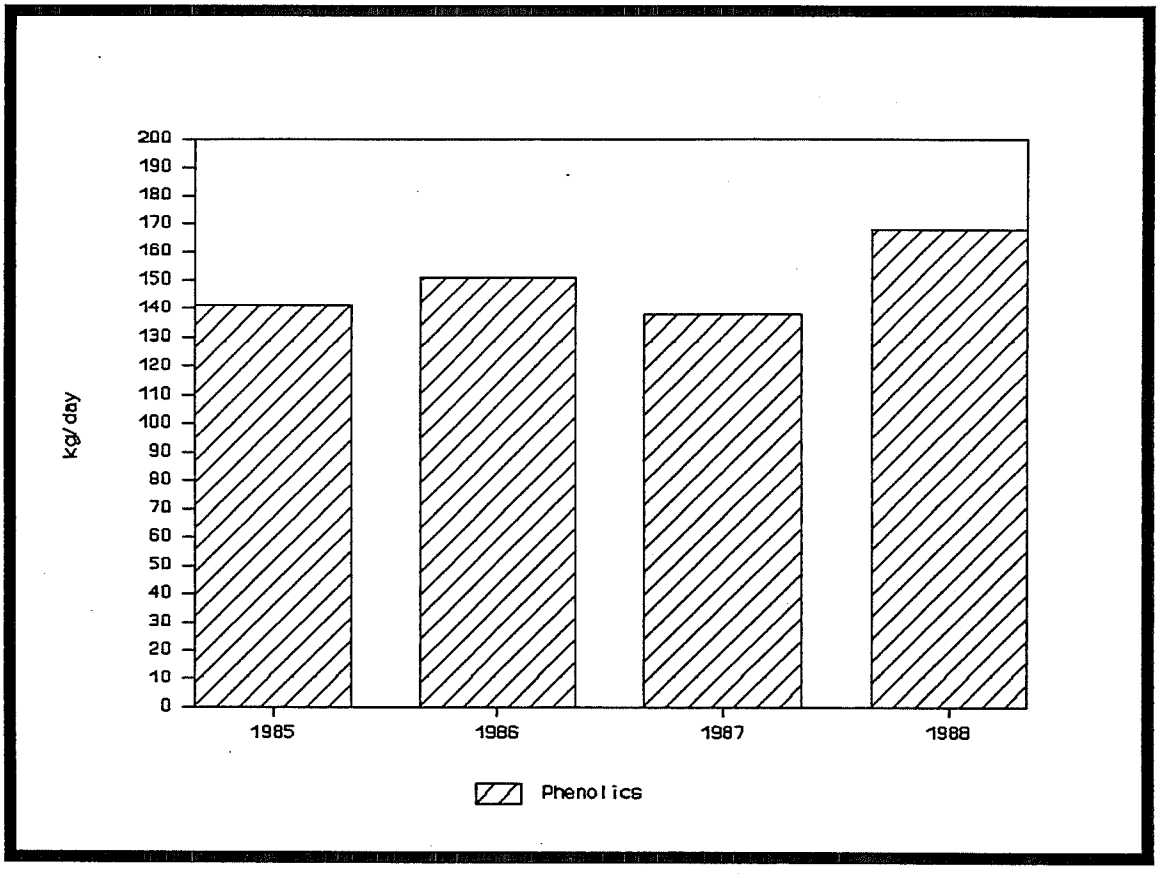


Figure X: Average Annual Loadings for Ammonia from four Ontario Iron and Steel Plants (in tonnes per year).[43]

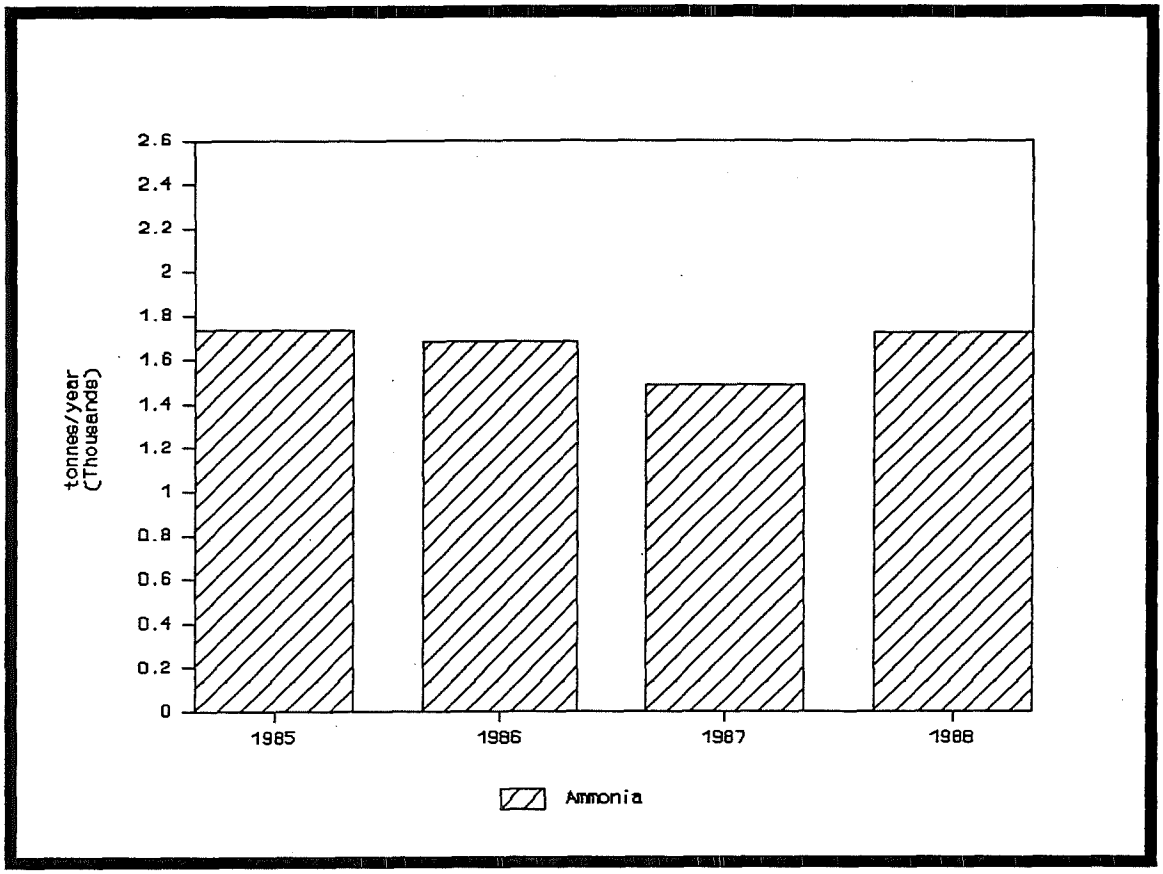
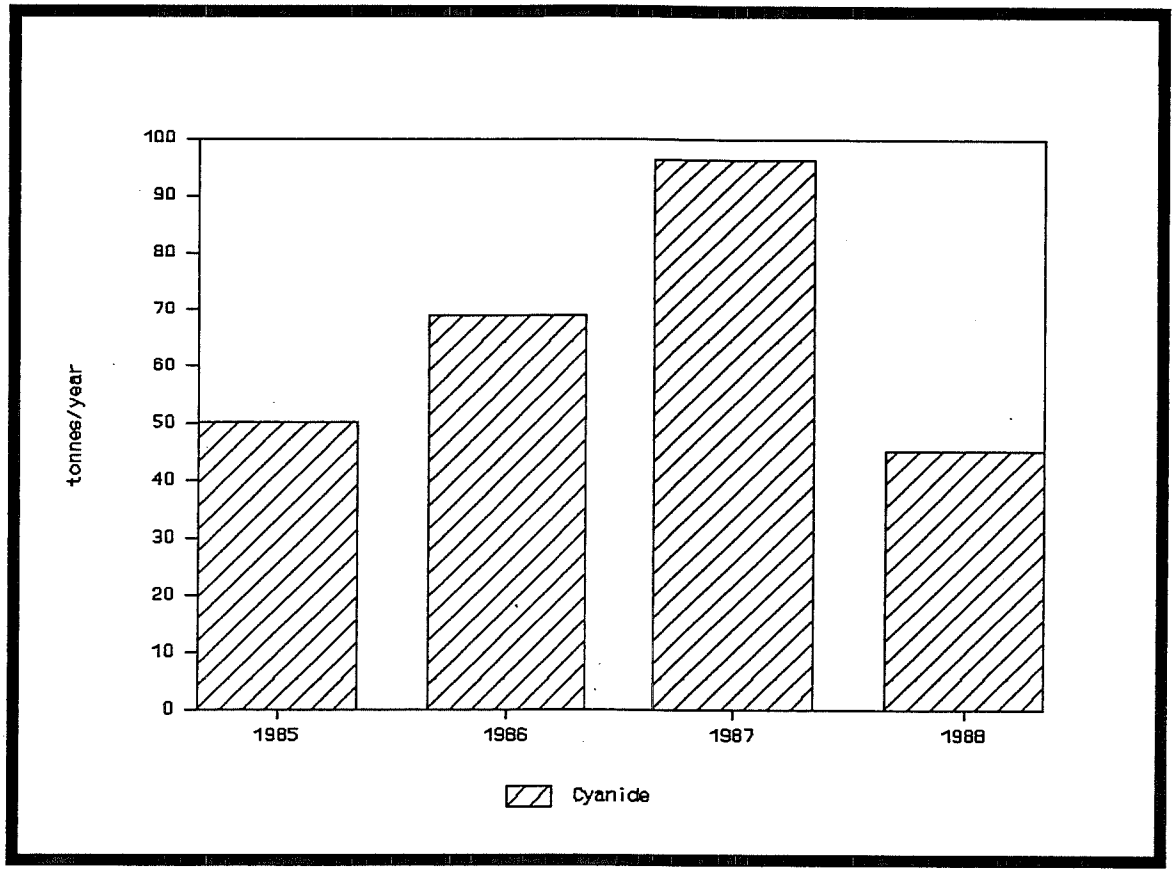


Figure X: Average Annual Loadings of Cyanide from four Ontario Iron and Steel Plants (in tonnes per year).[44]



Clearly, no significant decrease in toxic discharges has occurred since MISA has been announced.

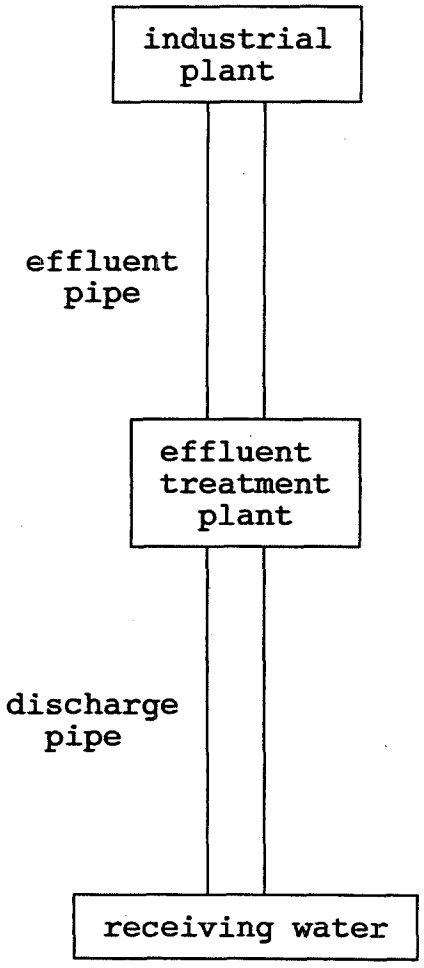
MISA management provides three reasons in defense of the delay. First, a lot of information had to be processed to arrive at an effective monitoring program.[45] Second, high MISA staff-turnover necessitated re-training of personnel, and third, only two out of three available positions within the MISA program can be filled with qualified professionals.[46] While there is no doubt that these factors <u>can</u> cause serious delays, they should have been considered and acted upon either before announcing the MISA program or as soon as it became apparent that time schedules were not being met. Obviously, there is a need to retain and hire more qualified staff which can be easily achieved by a concentrated political will. The time schedule promised in the

1986 MISA White Paper depicted the provincial government as an environmental knight against water pollution, but it appears that making promises remains a big part of MISA.

- add MAcLAren's comments.

Ignoring their serious delay, the monitoring regulations generally fullfil their intentions, however, several concerns have surfaced. Most importantly, the selection of the principal sampling location, at which pollutants are monitored, raises some questions. Figure X shows a schematic diagram of the two possible sampling locations for a typical industrial operation: at the discharge pipe or at the effluent pipe.

Figure x: Two possible Sampling Locations for a Typical Industrial Operation.



Industry has successfully argued that sampling should occur at the discharge pipe and not at the effluent pipe. However, this will have important implications during the setting of BATEA effluent limits because the effluent controls will now focus more on applying best available treatment technology and not on applying source reduction methods. Eliminating toxic substances at their source of production has always proven to be more effective and economical than treating them*, and if industry would be required to sample the effluent pipe, they would be forced to consider source reduction technologies over treatment methods.

- add Suboch latest comments.

The authors briefly examined monitoring regulations for the each industrial sector and found some disturbing evidence in certain sectors.

Pulp and Paper:

The effectiveness of the pulp and paper monitoring regulation has been impeded by the unwillingness of some industries to consider the regulations early enough.[47] While some companies acted ahead of time to prepare for the monitoring regulations, others did not act or fully co-operate with the MOE until the regulations became law. As a result, the ideal sequence of (1) identifying the sources, (2) identifying the discharge points and sampler locations, and (3) for each sampler, identifying the parameters per discharge, was not undertaken for those mills that refused to participate early enough.[48] The MISA Information Data Entry System (MIDES), by which the monitoring data is electronically summarized and submitted to the MOE, requires a great deal of specific information for the discharge sources. Much of this information was not available from the non-collaborating mills until the month before monitoring started, and five months after the regulations were promulgated.

Furthermore, some pulp and paper mills changed their number of discharge pipes several times. Just as the MOE could establish the sampling locations and parameters to be sampled at each location, some mills reduced their number of discharge pipes by combining two or three pipes into one. Consequently, the sampling locations and parameters had to be revised to reflect

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* Pull 3 or 4 important documents from the literature review.

the new situation and the MISA office needed to change the electronic software (MIDES) several times. Furthermore, MISA staff now have to check all the monitoring data from Ontario's 29 pulp and paper mills manually to ensure the mills have monitored correctly.[49] Consequently, **the availability of monitoring data has been delayed.**

In an unrelated matter, the pulp and paper industry (and iron and steel sector) refused to accept the MOE's claim that more accurate flow measurement devise would be needed.[50] Since the MISA staff required accurate flow measurements to calculate **mass loadings**, the MOE hired and paid for a consultant to clear the issue.[51] Based on the consultant's report, it was decided that 1/3 of the plants in the two sectors should install more accurate flow measurement instruments.[52]

Petroleum Refining:

This industrial sector was the first to monitor their effluents and consequently is the only sector for which a six months monitoring data report is available. The Canadian Institute for Environmental Policy has determined the mass loadings for three toxics - phenol, chromium and benzene - discharged by petroleum refineries based on the six month data. The results are summarized in Table X.

Table X: Mass Loadings of Benzene, Phenol and Chromium from all Ontario Petroleum Refineries.[53]

chemical	total loadings (kg/year)
benzene	261
chromium	3,766
phenol	33.9

- Suboch recommended that we look at JTC's minutes to see shift in focus!!

Electric Power Generation:

As mentioned earlier, radioactive substances such as tritium, Strontium^{90}, Cesium^{137} and Carbon^{14} are expressively exempt from the Ontario Hydro monitoring regulation even though

these radionuclides are toxic, persistent and produced by nuclear power plants.

All fossil fuel and nuclear-power plants are monitored, while six out of a total of 68 hydraulic power stations are monitored.[54]

Metal Casting:

Originally, 16 plants were classified as direct metal casting dischargers, however, before the monitoring regulations were promulgated, three companies suspiciously discontinued to be direct dischargers. The three companies - Magalloy in Stratford, Bowmanville Foundary in Bowmanville, and Crowe Foundary in Cambridge - claim to have started a closed-loop system, recycling and reusing their wastewaters.[55] It appears though that these corporations decided to hook-up to the sewer system, but they claim the discharges into sewers consist of sanitary and air-compressor wastewaters only.[56]

Finally, the **MISA Advisory Committee** (MAC) commissioned a study to evaluate and compare the monitoring regulations. The study outlined the differences between the nine regulations and the differences between the draft and legal regulations, and concluded the following:[57]

* Some sector's monitoring requirements are written more clearly, and variation will ultimately affect quality of data.

* Some loopholes exist in mineral industry sector: **leachate and secondary streams may not be accounted during monitoring** but may contribute a significant amount to contaminant discharges.

* With regard to schedule interpretation, MISA **uses inconsistent effluent stream codes and designations** which impede interpretation of schedules. Also, the MISA statistical software cannot accommodate unique stream codes.

* The most serious concern relates to the use of language: the meaning of certain words and terms is open to several interpretations, and need to be clarified.

* Overall, the monitoring regulations **serve their intended functions** of specifying requirements pertinent to each sector.

In summary, while the monitoring program under MISA will fill a significant information gap, it has been seriously delayed and features a number of practical flaws.

3.4. BATEA Effluent Regulations

A technology-based standard is an effluent limit based on the assumed performance of a defined technology to control the discharge of specified pollutants. Hence, technology based standards, as the name suggests, are based on the availability and feasibility of technology to control pollution, and not on the ecological need of a receiving water body.

3.4.1. The 1986 Proposal and Intentions

The process of arriving at BATEA standards was summarized in the 1986 White Paper as follows:[58]

1. Review existing treatment technologies and their compliance with existing regulations.

2. Review U.S. EPA documents for their definition of best available technology in controlling toxics; review technology used in Ontario and other Canadian provinces, including research and demonstration projects.

3. Establish performance levels (in mg/l and in kg/day) for each technology in terms of removal efficiencies of contaminants.

4. Calculate up-to-date estimated costs of different technologies.

5. Choose effluent limits on the basis of potential environmental impact, costs, or relationships to other toxics.

6. Define the best available technology and its abatement performance based on treatment-efficiency and cost.

7. Define best management practices for each sector.

8. Include input and review by municipalities and industries of above steps.

9. Specify details of information to be submitted by each industry to identify effluent requirements.

10. Choose effluent limits in terms of performance only. The industries and municipalities may choose the means to achieve the effluent limits.

The BATEA standards, applied uniformly across each sector at the same time, will be reviewed every five years. Effluent limits will be implemented to individual plant operations through site-specific **Certificates of Approval** which replace other control documents if their terms are fulfilled.[59] Except for special circumstances, the MOE does not allow "negotiations" of Certificates of Approvals, as is currently the practice.[60] The Certificate will consist of two parts: (1) **"capital works approval"**, prescribing the capital works, and (2) **"special terms and conditions"**, which will prescribe operating practices, effluent limits, monitoring requirements for the purposes of compliance and other related requirements.[61] The MOE anticipates that all Certificates of Approvals for a given plant will be consolidated into a single Certificate.[62]

3.4.2. Progress to Date

No effluent limits have been set at the time of writing this report; the delay in starting the monitoring program has stalled the process of arriving at effluent regulations. Table x shows the date by which all industrial sectors were supposed to be regulated according to the 1986 White Paper compared to the most recently available revised dates.

Table x: Planned and Revised Starting Dates for Effluent Regulations.[63]

Industrial Sector	Planned Date of Commencement	Revised Date of Commencement
electric power generation	June 1989	
industrial minerals	June 1989	
inorganic chemicals	June 1989	
iron and steel	June 1989	

metal casting	June 1989	
metal mining and refining	June 1989	
organic chemicals	June 1989	
petroleum refining	June 1989	
pulp and paper	June 1989	
sewage treatment plants	Nov. 1989	

The revised starting-date for implementing effluent limits is by no-means certain, further delays are undoubtedly possible.

3.4.3. The Issues Resolution Process

Sometime in 1989, the MOE concluded that it was necessary to develop a process which would decide on issues generic to all sectors. The purpose of this Issues Resolution Process is to ensure consistency between the effluent regulations for the ten sectors. The MOE identified 18 generic issues and the key ones include:*

* definition of virtual elimination
* definition of toxicity
* definition of best available technology
* definition of economically achievable
* determination of the limit setting procedures

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* The remaining issues are: statistical analysis of effluent monitoring data; QA/QC for monitoring data; net loadings; selection of parameters for limits; flow measurement accuracy under limits; form of limits; listing/de-listing of pollutants; periodic review of effluent limits regulation; stormwater and waste disposal site effluent; by-passes and emergency overflows; and reporting to the public.

* definition of compliance

* definition of best management practise

The MOE plans to release a report outlining its position, and that of industry, for each of the 18 issues during the Summer of 1990. At this time, it is unclear as to how the Issues Resolution Process interrelates with the development of the first effluent limit regulations, which is for the petroleum refining sector.

3.4.4. Evaluation of the BATEA Regulations

Since no effluent limits based on BATEA have been set, a detailed evaluation cannot take place. However, a number of aspects can be analyzed including the approach chosen to set effluent limits by - Best Available Technology Economically Achievable.

Technology-based standards have been criticized on a number of grounds.* First, there is the question of whether BAT standards actually encourage technological innovation. While periodic review may demand that limits be reviewed, in the absence of any technology forcing mechanism, there is little motivation for industry to improve beyond attaining the particular limits. There will be no incentive for industry to develop new technologies, quite opposite, **industry tends to promote the status quo.**[64] More importantly, BAT standards put the onus on governmental agencies to assess current control technologies in order to define the technological standard. Considering the delay with the amount of information necessary to arrive at the monitoring regulations, further delays in developing BATEAs are inevitable. In the U.S., arriving at what is an appropriate BAT for an industrial process and defining what is economically achievable has caused long debates and a 100 page definition of Best Available Technology.[65] By focusing on technology-based standards, **MISA is necessarily a resource intensive and time-consuming process.**

A consequential flaw in MISA's approach to establishing BAT concerns choosing effluent limits **"in terms of performance only"**. Absolutely no reference is made that source reduction technologies will be made a priority for industry. However,

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* See B.A. Ackerman and R.B. Stewart. Reforming Environmental Law, in Stanford Law Review, Vol. 37, May 1985, pages 1333 to 1365, for a useful review of BAT regulation system and its shortcomings in the U.S..

countless case-studies and surveys have indicated that preventing the production of toxic substances is more economical and efficient than end-of-pipe treatment methods. Just to mention one example, following a concentrated source reduction effort, the County of Ventura, California reduced 70% of toxic industrial wastes in two years. [REFERENCE] If government action and industry innovation would have combined forces early in the MISA program, more toxic chemicals could have been reduced than so far.

The failure to address shock loadings is another omission with the proposed BAT approach. Shock loadings occur when industry discharges large amounts of toxics in a short time. While their monthly BAT effluent limit may not have been exceeded, shock loadings can cause significant ecological damage.

* BAT in U.S. for STP is sewage treatment - predicts same for Ontario. Most Ontario STPs meet this standard.[66]

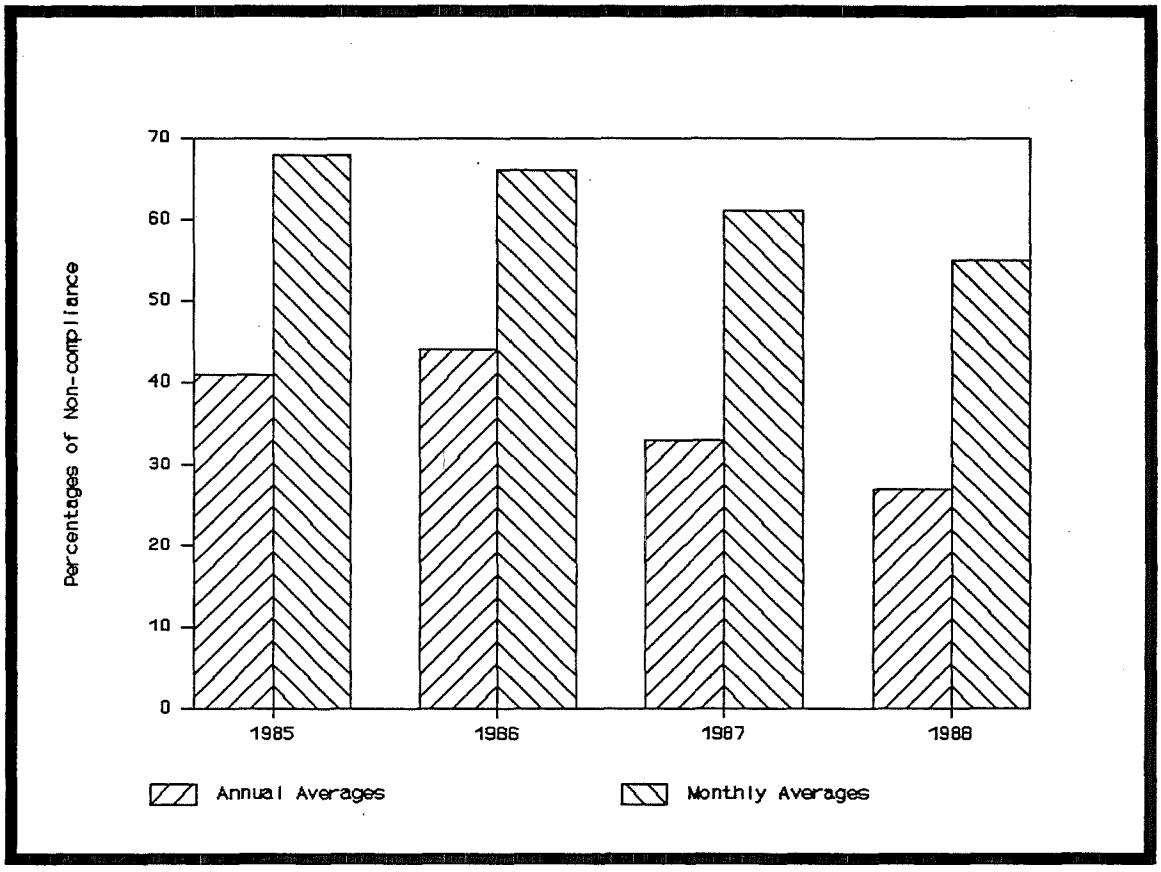
A final comment on the proposed BATEA regulations concerns their implementation tool - Certificates of Approvals. Approvals may not be appropriate in MISA's philosophy of zero discharge because they ...

HELP... SEE also IRP paper, page 5, Probe 1986, CELA/CLERF 1986.

3.5. Compliance and Enforcement

Once BAT discharge limits are set, a procedure to ensure industry compliance, backed up with an appropriate enforcement system, must be considered. Establishing discharge limits is only useful if they are appropriately enforced, and violations properly punished. Since limit-setting standards have yet to be developed, the compliance and enforcement record cannot be examined. Nonetheless, the MISA program features a strategy to deal with these important aspects and this strategy can be commented on. It is important to indicate that industrial compliance records in the past four years have marginally improved but are still quite high as Figure X shows.

Figure X: Non-Compliance Percentages by Direct Industrial Dischargers (1985 - 1988).[67]



To be effective, a new provincial water pollution control program must achieve a better compliance record than the current one. Therefore, MISA must present and develop a stringent and forceful enforcement program for direct industrial dischargers.

3.5.1. The 1986 Proposal and Intentions

The enforcement procedures included in two existing Ontario Acts, the Ontario Water Resources Act and the Environmental Protection Act, will be utilized in the MISA program.

- Get copy of MOE enforcement policy entitled Uniform Enforcement Policy; this policy is being renewed and has entered the approval

stage; will be released before July (Julian Wieder, IEB, 440-3506, June 12)

The **"self-monitoring"** principle will apply to all MISA sectors - dischargers monitor their own effluents to verify whether or not the BAT effluent limits are met. The MOE expects to become aware of any violations in one of three ways:

* the discharger will notify the Ministry;

* a review of submitted data by Ministry staff; and

* random, "surprise" effluent sampling by MOE staff.

Following a **violation of a BATEA standard**, the MOE plans to evaluate the severity and frequency of the violation(s), actual and anticipated environmental damage, and the environmental history of the discharger before penalties are considered.[68] For minor or infrequent violations, the MOE will send notifications to the discharger requesting to explain the violation and remedy the problem.[69] For other types of violations, the MOE may consider using **legally binding Control Orders***, specifying abatement actions if non-compliance occurs frequently.

Compliance to the proposed Effluent Limit Regulations is not limited to discharge limits but also includes:[70]

* reporting toxicity of the whole effluent;

* reporting on analytical and toxicity data;

* keeping records;

* communicating changes; and

* reporting on unusual events such as bypasses.

Violating the effluent limits are the most serious non-compliance for industries.

3.5.2. Evaluation of Enforcement Design

The three enforcement actions to discover violators of Effluent Limit Regulations are essentially the same as currently

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* **EXPLAIN!**

used to enforce environmental regulations [REFERENCE]. It seems somewhat unrealistic to assume that dischargers will report their own violations, especially since large fines and/or expensive abatement orders may be issued by the MOE.

HELP... Should we ask for a new Enforcement design, and if so, what would it look like?

3.6. Water Quality Standards Regulations

Following the implementation of BAT effluent limits, **water quality-based standards** (WQS) are to be developed; this is the second track of the two track approach presented in the 1986 White Paper. Water quality standards are based on the quality of the receiving water and on the impact of the industrial discharges on that receiving water. That is, instead of setting limits based on what is technological possible, water quality standards are based on what is **ecologically necessary**. Thus, it is expected that water-quality standards will generally be more stringent.

Ontario currently uses **Provincial Water Quality Objectives** (PWQOs) which are a set of criteria that would protect aquatic life and recreational activities based on scientific rationale.[71] However, **"would"** is the operative word for PWQOs because they are **non-enforceable**; that is, the Provincial Objectives are **ideal criteria**, often exceeded and ignored because they cannot be legally enforced.[REFERENCe]. Therefore, if the MOE decides to establish water-quality standards under the MISA program they must be legally binding, backed by a thorough enforcement strategy and procedure to get dischargers to reduce their effluents accordingly.

3.6.1. The 1986 Proposal and Intentions

The 1986 White Paper promised a **"...major review and revision of [MOE's] traditional water quality impact approach."**[72] The overall purpose of identifying water bodies requiring more stringent effluent limits will be achieved by:[73]

* providing a capability to assess the impacts of toxics;
* developing PWQOs for more toxic substances; and
* setting clear policies for assessing the acceptability of discharges.

The MOE also plans to prioritize sensitive receiving waters requiring more stringent discharge limits.

The assessment of the water quality impacts associated with effluent levels is the responsibility of the polluter.[74] The assessment of discharge impacts on receiving water is a two part process, with an preliminary and detailed water quality impact study. A series of standardized water quality assessment procedures will be developed by the MOE for dischargers. After the assessment has been reviewed and verified by the MOE, the Ministry will specify the new effluent requirements.

The 1986 proposal set 1995 as the goal by which the water quality assessment studies were to be completed and water quality standards implemented.[75]

3.6.2. Progress to Date

- mention six pilot projects. Not may people heard of them. I think they're a WRB project.

- At the present time, it appears that the water quality track has been indefinitely postponed until all the BAT regulations are concluded in the mid 1990's.

3.6.3. Evaluation of Water Quality Standards

With the exception of the six pilot project no progress whatsoever has been made with water quality standards. Although they are ecologically very important, the MOE has ignored water quality standards until the BAT approach is completed. This strategy ignores the need of Ontario citizens living in Area of Concerns of the Great Lakes and around other immensely polluted water bodies.* The 17 Areas of Concern are ecological nightmares that need the immediate attention of the MOE. By focusing only on monitoring and BAT regulations, MISA has ignored the urgent ecological recovery need for certain Ontario water ecosystems. If the current Provincial Government attempts to be concerned with water quality issues, they must redirect the MISA program to establish water quality standards for these areas concurrently with the BAT approach.

The 1986 proposal did not mention how, once developed, water

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* See section 2.2 for an explanation of Areas of Concerns and Remedial Action Plans.

quality standards will be implemented. To protect Ontario rivers and lakes, it is absolutely necessary to have legally enforceable standards. The fact that the 1986 White Paper refers to Provincial Water Quality Objectives seems to indicate an unwillingness to introduce legally binding water quality standards. A similar system as in the U.S., where WQS are entered into the industrial discharge permits and are enforceable [REFERENCE], must be installed simultaneously with the BAT approach.

The strategy whereby industrial dischargers have to undertake the water quality assessment is questionable. Will industrial dischargers actually admit that their effluents are killing aquatic life and will they honestly assist in developing appropriate water quality standards? Since the assessment requires an enormous amount of information, MISA staff cannot undertake the studies by themselves, but with information from, and in co-operation with, the Ontario Ministry of Natural Resources, Environment Canada and the International Joint Commission, water quality assessments could be undertaken without involving the polluters.

Also, the developing WQS, the MOE still accepts the use of mixing zones; mixing zones refer to the area where effluents mix with the receiving water and are consequently diluted.[76]

HELP.....

Finally, the MOE Water Resources Branch is in the process of establishing a development process for Ontario's Water Quality Objectives. This project aims at documenting and developing a process by which PWQOs are set. Interestingly enough, this process is developed independently of MISA; while MISA staff reviews and comments on proposed drafts of the document, the project was not a joint effort. MISA must incorporate this process immediately into its agenda to arrive at water quality standards in due time.

3.7. Report Card and Overall Evaluation

A report card summarizes the overall evaluation of the direct discharge arm of the MISA program.

Table X: Report Card on MISA's Approach to Reduce Direct Discharges.

Field/Phase	Grade	Reason
Pre-regulation	B	- good to divide into sectors, except STPs are not toxic dischargers - await Kai's comments
Monitoring	C	- good to fill information gap - no radionuclide control for Ontario Hydro - discharge pipe and not effluent pipe monitoring - pulp and paper sector problems
BATEA Limits	D	- good that used uniformly across province - process is time and resource intensive - no emphasis on source reduction - no provisions for shock loadings
WQ Standards	F	- almost no work done yet; not a priority - mixing zones still accepted - no indication of legal enforcement
Enforcement and Compliance		
Overall Timing	F	- monitoring regulation 18 months late - BATEA regulations approx. four years late - WQS indefinitely postponed

- list the most important concerns with MISA in decreasing order after CB and PM have added their comments.

* The sequential two-track approach (BATEA and Water Quality) may prose problems for industry: having already pollution control equipment installed for the BATEA standards, industry may have to spend further resources to meet new, likely tougher, standards. [Pickfield et. al. says water quality approach would provide valuable information early in the standard setting process.][77]

* no source reduction incentive

* late timing

* not prioritizing; no RAP involvement

* no radionuclides

3.8. Advocacy - Recommendations for Reform

The following recommendations will improve the MISA program and will speed its implementation significantly.

- what needs to be done? WQS now? Better funding? Less Staff turn-over? More resources? Include source reduction potential from Literature review and from CIELAP's PP report.

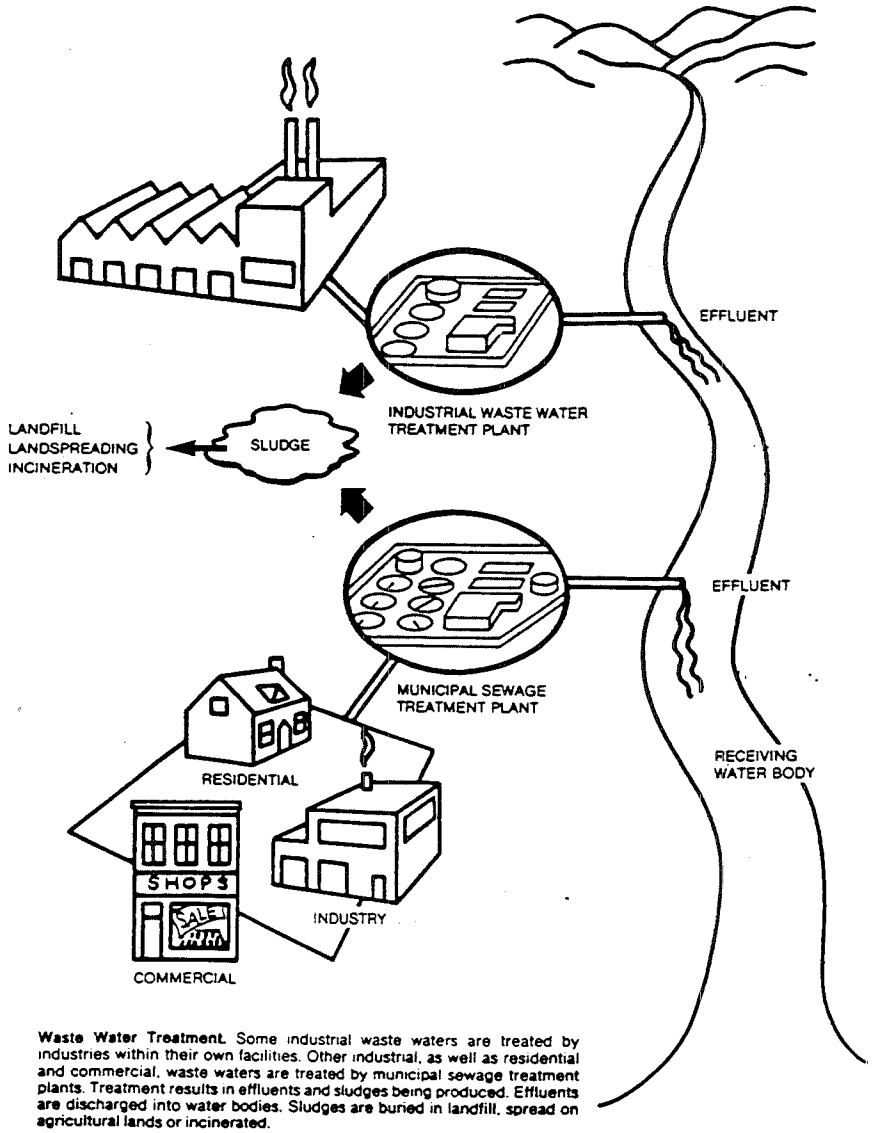
QUESTION: wouldn't it be better to place the recommendations right after the critiques? I propose to do just that and this section shall be the summary of critiques and recommendations.

4. Indirect Discharges

The proposed MISA regulations pertaining to indirect dischargers are discussed in this section. For each part of the MISA proposal, a review of the policies and an update on the progress to date is given, followed by an evaluation of both policy and update. Based on the evaluation, a report card summarizes the current state of the MISA program, and the section closes with recommendations for reform.

Industrial indirect dischargers do not directly release their effluents into lakes and rivers but instead discharge into municipal sewers. A visual overview of pollution pathways for indirect and direct discharges can be seen in figure X.

Figure X: Pollution Pathways for Indirect and Direct Dischargers.[78]



Waste Water Treatment. Some industrial waste waters are treated by industries within their own facilities. Other industrial, as well as residential and commercial, waste waters are treated by municipal sewage treatment plants. Treatment results in effluents and sludges being produced. Effluents are discharged into water bodies. Sludges are buried in landfill, spread on agricultural lands or incinerated.

While only 300 direct industrial operations discharge effluents directly into waterways, approximately **18,600 polluters release their effluents to municipal sewer systems.**[79] Ontario's 413* municipal sewage treatment plants, of which 238 are operated by the MOE on behalf of the municipalities, discharge 5.3 million cubic meters a day, or **1.93 billion cubic meters a year.**[80] According to MOE estimates, **industry discharges approximately 643 million cubic meters a year** into sewage systems.[81]

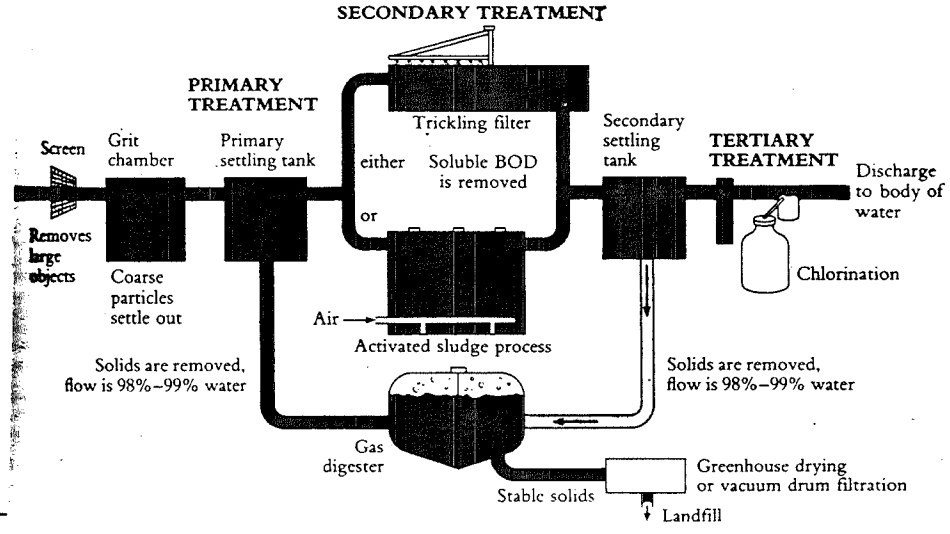
Currently, three conventional pollutants are regulated in some STP effluents - suspended solids, 5-day biochemical oxygen demand (BOD), and total phosphorous. The removal of phosphorous requires chemical additions to the normal process and all plants discharging into the Great Lakes basin must control phosphorous for **eutrophication prevention.**

Several different types and efficiency levels exist for sewage treatment plants. The least effective type of STP are lagoons which technically are not sewage treatment plant but

HELP....

A sewage treatment plant is categorized into three levels of efficiency - **primary, secondary and tertiary treatment.** Figure X presents a schematic diagram of these three levels of treatment.

Figure X: Primary, Secondary and Tertiary Treatment Stages used in STPs.[82]



* The figures in this paragraph are 1987 values; as of September 1989, 399 STPs existed in Ontario, 232 of which were operated by the MOE (MacLaren, page 8).

The **primary** stage is simply a **settling tank** where organic solids settle out - a purely physical process in which no chemical or biological processes take place. Typically, the primary treatment stage can remove up to 35% of the inflowing organic matter.[83]

While the primary process removes organic materials that are suspended in the wastewater, the **secondary treatment removes dissolved organic matter.** Two types of secondary treatments exist; one type, known as the **activated sludge treatment**, uses micro-organisms in large, well-aerated tanks which break down organic materials. The solids produced by the microbes are suspended and the wastewater enters a settling tank which removes the solids. Approximately 80% to 85% of the dissolved organic substances can be removed with the aerated sludge process.[84] The second type of secondary is called a **trickling filter** and features a similar efficiency in removing dissolved organic matter.[85] In this process, the wastewater is distributed and passed down through a bed of rocks on which a slime of microbes grow. Again, the microbes remove dissolved organics for growth and energy and when the slime moves of the rocks the solid material in suspension is allowed to settle.

The **tertiary treatment** generally removes plant nutrients responsible for **eutrophication** (over-nourishment). The removal of phosphates is accomplished by chemical precipitation and settling: chemicals such as aluminum salts and lime are added to the waste water and precipitate the phosphate ions as solid matter which can be removed by allowing them to settle. Nitrogen compounds such as ammonia and nitrate ions are more difficult to remove from the wastewater. A combination of biological and chemical procedures as well as **activated carbon adsorption** can do the trick.

In 1987, 52 percent of Ontario sewage treatment facilities operated a secondary treatment stage (with almost 80% of the total flow), 7.5 percent provided primary treatment, 39 percent were lagoons and 1.7 percent were facilities with no discharges (ie,: septic tanks).[86] Table X below shows the 23 largest STPs in Ontario with their treatment type and 1988 effluent flow volume.

Table X: Ontario's Largest Sewage Treatment Plants.[87]

Location	Average Daily Flow	Treatment Type	% Industrial

	1000 m3/day		Flow
Toronto (Main)	765	secondary	8%
Ottawa (Green Creek)	400	primary	3%
Toronto (Humber)	399	secondary	19%
Hamilton	303	secondary	17%
Mississauga (Lakeview)	255	secondary	12%
Pickering (Dufferin)	187	secondary	25%
Toronto (Highland)	152	secondary	22%
London (Greenway)	117	secondary	8%
Windsor (Westerly)	114	primary	24%
Thunder Bay	85	primary	28%
Mississauga (Clarkson)	80	secondary	25%
Kitchener	70	secondary	39%
Burlington (Skyway)	64	secondary	17%
Sudbury	62	secondary	1%
Niagara Falls (Stamford)	59	secondary	18%
Kingston City	57	primary	2%
Brantford	55	secondary	40%
Sarnia	53	primary	28%
Cornwall	49	primary	10%
Peterborough	46	secondary	22%
Waterloo	45	secondary	13%

Guelph	42	sec.-tertiary	25%
Sault Ste. Marie (East)	34	primary	26%

Several health and environmental problems have arisen from industries discharging toxic substances into sewer systems. First and most important, because sewage treatment plants are not designed to remove toxic waste, many contaminants pass through the STP untreated.[88] This is known as the **"pass-through" phenomenon".**

Second, toxics, especially metals, **kill the essential micro-organisms necessary for the secondary treatment systems.**[89] Therefore, the treatment process is slowed down, causing STPs to become less efficient in their original purpose, or as happened in Louisville, Kentucky, causing the whole municipal STP to break down for 45 days.[90]

Third, **storm sewers and sanitary sewers are not separated in many older Ontario** communities and thus carry all domestic wastes, industrial wastes and stormwater. As a result, the capacity of a STP may be exceeded during heavy precipitation and snowmelts, resulting in **by-passing this extra volume of untreated sewer discharges into rivers and lakes.**[91]

Fourth, **sludges from STPs may be contaminated with toxic substances,** prohibiting its use as fertilizer of agricultural land. Therefore, the contaminated sludge must be disposed of in other ways, such as landfills or incinerated. In landfills, contaminated sludges contaminates adjacent ground and surface waters, while incineration releases toxics to the atmosphere.[92]

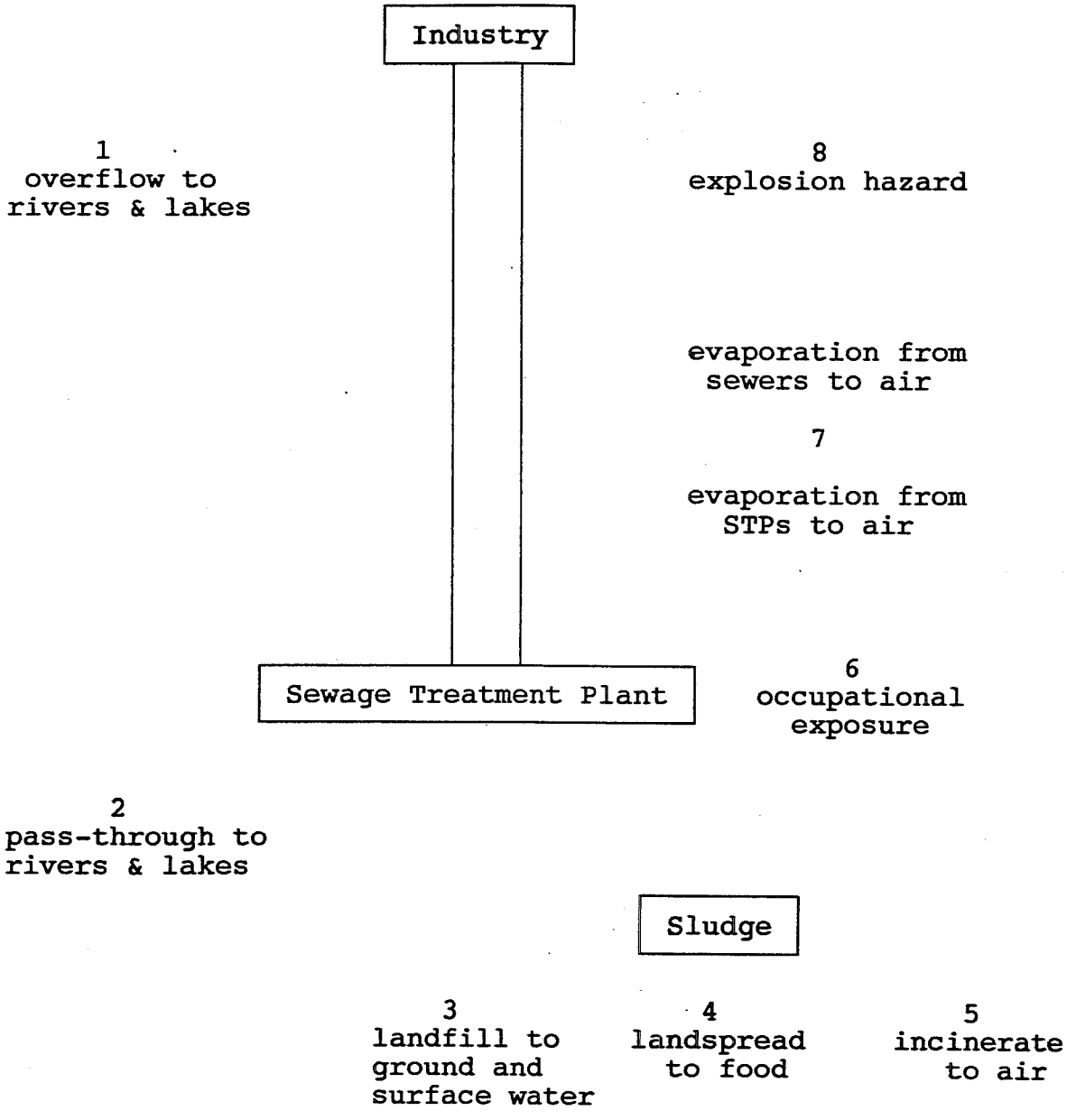
Fifth, **corrosion, explosions and fires in sewer systems can occur** when industries discharge acidic or caustic wastes, volatile substances and gasoline.[93]

Sixth, the health of workers employed in sewage treatment plants may be threatened by poisonous gases resulting from industrial discharges.[94] For example, if cyanide wastes from the electroplating industries combine with acidic wastes from other industries, the highly toxic cyanide gas will be produced.[95]

Finally, **urban run-off and household and commercial wastes** add further toxic substances into the sewage system. Lead from gasoline, chlorine bleach, solvents and cyanide are examples of indirect discharges that also must be dealt with.

The potential health and environmental threats can be summarized as shown in Figure X.

Figure X: Threats to Human Health and the Environment from Toxic Indirect Discharges.[96]



- expand figure

Therefore, any new provincial regulation attempting to

establish new water pollution regulation must do so on a fundamental level. The above mentioned sewer-use facts cannot be ignored in an attempt to reshape Ontario's regulatory scheme for indirect polluters.

4.1. The 1986 MISA Proposal and Intentions

The 1986 White Paper concentrated primarily on direct discharges to Ontario waterways; sewage treatment plants (STPs) were regarded direct dischargers. **Very little consideration was given to change the regulatory system addressing STPs.** Following considerable pressure from public interest groups, the majority of industrial and commercial dischargers were addressed in 1988 with another White Paper; this fact remains a serious mis-judgement by the PRovincial Government. Not surprisingly, in a 1986 report, Pollution Probe renamed MISA to **"ISA" because the 1986 did not address Municipal dischargers.**[97]

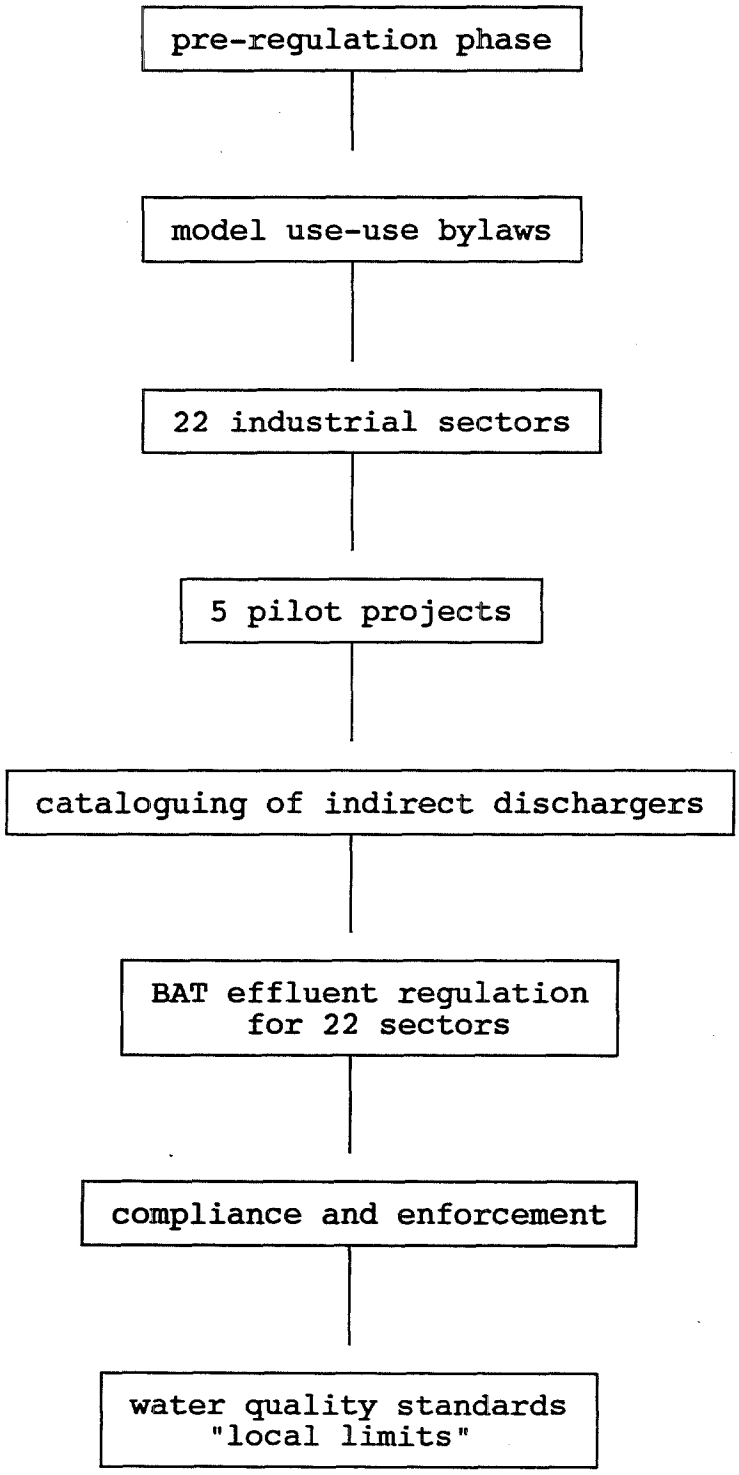
4.2. Overview of the 1988 Proposal

In September of 1988, the MOE released the White Paper Controlling Industrial Discharges to Sewers which dealt specifically with indirect discharges. The Minister of the Environment, James Bradley, pointed out in the introduction of this proposal that **"...we must stop pollution at the source."**[98]

The environmental problems and regulatory inadequacies of Ontario's sewage treatment systems are recognized by the 1986 proposal. As a result, the two-track approach was again chosen to replace the current regulatory strategy. **Provincially set BATEA limits** apply for the indirect dischargers, and **local limits** (water quality standards) are set for the STP-effluent receiving water body.[99] However, the municipality sets these local limits which only need approval from the MOE.[100] Also, **the municipality will be the first line of enforcement;** that is, the municipality will be given the authority to prosecute industries that violate the BATEA limits.[101] The MOE can also prosecute industries for non-compliance, and the **MOE can prosecute local governments for not enforcing effluent limits.**[102]

The MISA program for indirect discharges can be graphically summarized as follows:

Figure X: Graphical Overview of the MISA Proposal for Indirect Discharges.



4.3. Pre-regulation Phase

As part of the pre-regulation phase, the MOE engaged a consulting firm to review sewer use control programs in 16 jurisdictions around the world.[103] The purpose of this study was to examine the compatibility of these programs to the MISA program and to analyze environmental, economic, legislative and administrative factors.[104] As a result, the sewer use control program of the U.S. was identified as the most suitable option for Ontario.[105]

Furthermore, the MOE promised to consider the Control at Source report by the Canadian Institute for Environmental Law and Policy.[106] This report makes specific recommendations on the regulatory aspects of a sewer use control program.

As a result of the pre-regulation phase, the MOE formulated five fundamental principles in developing a sewer use control program:[107]

1. control indirect discharges at the **source.**
2. set **provincial discharge limits for industrial sectors** using the best available technology economically achievable (**BATEA**).
3. apply **more stringent discharge limits** on a site-specific basis (ie.: water quality standards, or **local limits**).
4. require municipalities to act as the **first line of enforcement.**
5. **involve the public** in program development and implementation.

Industries discharging into sewer systems are divided into 22 industrial categories in the 1988 White Paper:[108]

* fabricated metal products
* waste treatment and recycling
* primary metal
* inorganic chemicals
* petroleum refining
* leather tanning and products
* organic chemicals
* electrical and electronic equipment manufacturing
* non-ferrous metals
* pulp and paper
* textile mills
* timber products

* industrial laundries
* rubber and rubber products manufacturing
* integrated automobile manufacturing facilities
* stone, clay and cement
* printing and publications
* food processing
* hospitals, clinics and funeral services
* equipment manufacturing and assembly
* service industries
* transportation

4.4. Model Sewer-Use Bylaws

In August of 1988, the MOE released a revised a **Model Sewer-Use Bylaw** to provide an interim measure of control until the MISA sewer use control program is implemented.[109] The 1988 revised model by-law incorporates more stringent controls on toxic discharges than the outdated bylaw of 1975.[110] Significant components of the 1988 version include:

* **prohibits the discharge of specified hazardous materials** and pollutants which cause STP effluents to contravene standards under the Environmental Protection Act (EPA) or the Water Resources Act, or cause sludges to fail provincial sludge quality guidelines.[111] All chemicals and wastes* listed in Regulation 309 of the EPA are prohibited from being discharges into sewers.[112]

* **specifies new discharge limits** for copper, nickel, cadmium, phosphorous, chlorides, sulphates, fluorides and cyanide.[113] For the purposes of meeting discharge limits, dilution is not allowed.[114]

* adds requirements to **control stormwater discharges.**[115]

* enables municipalities to **require industrial dischargers to develop and implement abatement programs,** and enforce these accordingly.[116]

* requires industries to **report spills to municipalities.**[117]

* provides authority to municipalities to **inspect, monitor and sample industrial discharges.**[118]

---

* A number of exceptions to the Regulation 309 list are possible with special approvals, including, waste radioactive materials, trace amounts of PCBs and waste disposal leachate (Pickfield et. al., 1988, page 80).

A copy of the model sewer use bylaw can be found in Appendix 2.

4.4.1. Progress to Date

Approximately 25 municipalities have adopted parts or all of the model sewer-use bylaw. It is not yet completely known what municipality has adopted which parts of the Model Bylaw and what environmental benefit, if any, may have resulted. In general though, it appears that municipalities adopted the sections dealing with sanitary and combined sewers un-modified, but changed the sections of the bylaw concerned with hazardous waste.[119] The MISA office has distributed sewer-use questionnaires to get a better understanding of the activities of participating municipalities. As of July 31, 1989, the following local governments have adopted the 1988 Model Sewer-Use Bylaw or a modified version of it:[120]

Chatham	North Bay	Picton
Deseronto	Stephen Twp.	Durham RM
Exeter	Penetanguishene	Stirling
Gananoque	Elora	Innisfil Twp.
Goderich	Fergus	Guelph
Hanover	Petrolia	Metro Toronto
Napanee	Kincardine	Muskoka DM
Hamilton-Wentworth RM		

- want to call representatives from Metro, Guelph, Chatam, Napanee, Durham, and North Bay next week.

4.4.2. Evaluation of Model Sewer-Use Bylaws

However comprehensive the 1988 model bylaws may appear, municipalities do not have to implement any part of the bylaw, making "model" the operative word.[121] The bylaws are intended as an interim set of guidelines until the sewer use control program comes into effect. As an interim step, however, they have no teeth and achieved next to nothing in preventing industries to use sewers as an extended discharged pipe. It is simply not enough for the Minister of the Environment to state:

"I strongly encourage municipalities to adopt this model bylaw."[122]

With respect to the content of the Model Bylaw, it has been criticized for not specifying how a municipality is to apply the general prohibitions under the EPA and OWRA for contamination of sludges; that is, no process is provided to the municipality to determine whether or not the contaminants contained in the industrial effluent will cause STP effluent or sludge to contravene provincial standards.[123] A violation of a standard in these Acts can be determined only after that contaminant has been discharged into the sewers and the EPA and OWRA standards fail to account for the fact that contaminants discharged into sewers may escape into the environment prior, or during, sewage treatment plant process.[124]

- not released question-answer document from 1988 workshops.

4.5. Pilot Projects

In September 1989, James Bradley announced that six municipalities were to take part in pilot projects following many of the principles outlined in the 1988 paper.[125] Officially called the Municipal Enforcement Program Demonstration Projects, their purpose is to address as many situations and difficulties as possible that a municipality may encounter during the implementation of the MISA objectives.[126] Furthermore, with the pilot projects, the MOE and municipalities expect to gain practical experience in developing program requirements, streamlining implementation, and testing various user-pay mechanisms.[127]

The following steps are included with the pilot projects:[128]

1. **Develop a public participation program involving all interested parties.**

This step is supposed to be ongoing throughout the process; public meetings, workshops, and newsletters are the tools with which the municipality involves and informs the general public. Industry is also a participant.

2. **Define the legal authority to implement the project.**

The identification of what kinds of agreements on sewer use already exist in the affected areas, whether or not there are areas that are served by the municipality outside of its boundaries, and other possible legal barriers to implementation is made under this step. Workshops, organized by the MOE, will aid municipal officials in completing this step.

3. **Establish an inventory of industrial sewer users, the nature of their contaminants, and a system for updating that list.**

The inventory includes commercial, institutional, and industrial users of the sewer system. There are two different sets of inventory "forms"; the short form, and, the long form (see Step 4). The short form basically reveals the potential for a user to get a long form; in it are questions about the products a user produces, raw materials used, and what connections exist to the sewer system.

4. **Collect detailed technical data from industry.**

If the user is deemed to be an important enough discharger through its responses on the short form, a long form is then distributed. The discharger completes the form, and undergoes inspection and sampling by municipal officials.

If the long and short forms, along with other data that may have been collected under previous agreements by the municipality show cause, the discharger is labelled a "Significant Industrial Discharger" (SID). (see Step 9)

5. **Compile and analyze technical data on the local STP to determine if special local limits on pollutants are required.**

The unique sensitivities of receiving bodies of water (e.g. RAPs), and data from industry (Step 4), are considered as local limits are developed. In cases where there is existing water quality information (eg with RAPs or the water quality pilot projects), it is taken into account. Eventually, a uniform methodology for all STPs cross-province is to be developed.

6. **Develop a sampling and inspection program for industrial sewer users.**

Once all of the dischargers have been classified, a sampling strategy can be developed. There are two types of sampling - to make limits and to ensure compliance. The former is necessary in order to address contaminant sources while the latter is an integral part of enforcement.

7. **Establish an enforcement strategy, including a computerized compliance tracking system using ministry software.**

The determination of types of violations that are possible and a standard form of responses to such violations form the bulk of an enforcement strategy. A computerised tracking system will be used using MOE software. The penalties for non-compliance will be gauged according to the potential impact on the system (see Step 9). [IS THIS TRUE?]

8. **Develop a sewer use bylaw.**

After studying what regulations are presently in place (see Step 2), and what is needed to satisfy the additional requirements outlined by the MISA program, a sewer use bylaw will be developed. This bylaw will authorize industrial use permits, allowing municipalities to (i) require industrial self-monitoring and reporting, and (ii) limit or ban industrial pollutants.

(i) Industrial self-monitoring and reporting will be unique to each of the 22 identified sector. Sectors will be enacted by order of priority, starting with those judged to be the greatest pollution threat.

(ii) The development of sector limits regulations through industrial use permits will be discussed below.

9. **Develop Significant Industrial Discharger Permits (SIDs).**

These permits, based on an MOE model will be written and distributed by each municipality. Each permit will list the enforcement requirements for the discharger wrt monitoring, limits, and penalties.

10. **Evaluate resource requirements and financing options.**

The MOE will propose a model to the municipalities for their comment. 75% of operating and capital costs on average are at present covered by user fees. Such an arrangement will form the basis of revenue for the program, along with one-time provincial subsidies under the LifeLines Program (Giorno) for improvements to STPs. A provincial program to assist direct dischargers who can prove financial need, (called the LEND Program -Giorno) may be extended to indirect dischargers.

4.5.1. Progress to Date

The original six municipalities participating in these pilot project are:

* the Town of Cobourg
* the Town of Gananoque
* the Regional Municipality of Hamilton-Wentworth
* the Town of Ingersoll
* the City of North Bay
* the City of Thunder Bay

Since the announcement, North Bay decided to withdraw from the pilot projects because **the Province refused to fund the full costs of the pilot project** as North Bay's city council requested.[129]

The participating municipalities are eligible for 50 percent provincial funding for development costs, as well as capital funding on a population-related sliding scale starting at 33 percent.[130] In total, the MOE allocated $750,000 to assist the municipalities, and direct technical assistance is also available from MOE staff.

The pilot projects commenced in November of 1989 and were planned to be completed by September 1990, with reports following shortly thereafter.[131] Both the individual and the overall report evaluating the pilot projects will provide the basis for implementing the municipal section of MISA.

Hamilton

The Regional Municipality of Hamilton Wentworth owns and operates its sewage treatment plant, and has already a user-pay system in place in which is based on the assumption that all water used will eventually enter the sewer system: each water user pays a water surcharge geared towards the amount of water used.[132]

Hamilton participates in the pilot projects so it can better influence the final provincial legislation, and because it will give Hamilton's industries more lee time to get prepared for the MISA sewer regulations.[133]

4.5.2. Evaluation of Pilot Projects

- In his announcement, Mr. Bradley called the plan to reduce industrial sewage dumping and make industries pay for municipal enforcement "simple justice".[134] Does that mean the province and the municipality will get their investment back once the control program is in place.

- according to Peter Dunn (Hamilton):

    - timeline: now looks like end of 1990 before reports are released.[135]

    - Hamilton will not enact sewer use bylaws until provincial legislation is out: gives industries more lee time, but still polluting.[136]

- late again.

4.6. Monitoring

Considering the amount of time and information necessary to implement a 12 month monitoring regulation for some 200 direct dischargers, a similar program for 18,600 indirect discharges would involve tremendously more time, resources, and information processing. Nearly all of the industries listed in Table x discharge some effluent into sewers and monitoring all of them would be an administrative nightmare.

Table X: Ontario Industries by Sector Conceivably Discharging into Sewers.

SECTOR	NUMBER
Food and Kindred Products	1,646
Textile Mill Products	1,086
Lumber and Wood Products	1,894
Paper and Allied Products	439
Printing and Publications	2,413
Organic Chemicals	128
Chemicals and Allied Products	801
Rubber and Misc. Products	128
Plastics Moldings	675
Leather and Leather Products	170
Stone, Clay and Glass	881
Primary Metal Products	345
Fabricated Metal Products	2,308
Equipment and Machinery	5,686
TOTAL	18,600

* Based on information from Scott's Directory, 16th Edition.

4.6.1. The 1988 Proposal and Intentions

According to the 1988 White Paper, it is **the municipalities which must conduct a comprehensive industrial inventory** and not the MOE.[137] The inventory is established by requiring all dischargers to file a report indicating the nature of the business, hours of operation, the volume and content of discharges and the discharge locations.[138] The inventory will be completed by the municipality with industrial site visits, sampling, questionnaires and interviews.[139]

The local government must also develop a system whereby new industrial dischargers can be identified, and any changes in industrial processes and discharges can be tracked.[140] The inventory must be annually updated and approved by the MOE.

Once the inventory is complete, the BATEA sector dischargers and **significant industrial dischargers** (SIDs) can be identified and will be given sewer use requirements and other responsibilities.[141] Significant industrial dischargers are industries with any of the following characteristics:[142]

* discharge **more than 114 cubic meters** of process wastewater a day.

* discharge wastewater which is **more than five percent of the average dry weather flow** to the STP.

* discharge wastewater which contributes **more than five percent of the average biochemical oxygen demand** loading to the STP.

* discharge contaminants that may **endanger STP workers, adversely affects STP operation and sewer system, contaminate sludge** or that may pass through to waterways.

* has the potential to spill any chemical which may endanger STP workers, adversely affects STP operation and sewer system, contaminate sludge or that may pass through to waterways.

As with direct dischargers, the regulated industries will be required to monitor their own discharges once the BAT standards are set.[143] The **self-monitoring** results will be audited by the municipality and the MOE through inspections and random sampling.[144]

The MOE has proposed a staged process to designate which municipalities must implement the MISA program: priority will be

given to municipalities with a population greater than 10,000 or with STP flows greater than 4,546 cubic meters per day. Thus, initially only 90 municipalities will be considered, with the remaining 309 to follow.[145]

4.6.2. Progress to Date

To fullfil the information needs in developing a cost-effective and practical monitoring regulation, the MOE, Environment Canada and the Municipal Engineers Association sponsored a pilot monitoring study. The study encompassed 37 municipal sewage treatment plants, including:[146]

* all plants discharging more than 45,000 cubic meters a day (17 secondary plants and 7 primary plants);
* five STPs in the **Upper Great Lakes Connecting Channels Program;***
* seven geographically spaced secondary treatment plants processing less than 20,000 cubic meters daily; and
* two lagoons.

When the study was initiated in January 1987**, the **Effluent Monitoring Priority Pollutants List** (EMPPL) was not available, and thus, the original **USEPA Priority Pollutant List**, featuring 144 organic compounds, 15 metals and 14 conventional pollutants was used to monitor the STP effluent.[147] These contaminants were sampled before the wastewater entered the STP, after the water was treated and in the sludge. The results of this study are reproduced in Appendix 3, and the results of a study commissioned by the **MISA Advisory Committee** calculated the total loadings for the sampled metals are shown below in Table X. The results are based on pro-rated calculations; that is, the figures in Table X are based on the flow from the 37 STPs sampled and extrapolated onto the total flow of all STPs in Ontario.

Table X: Total Metal Loadings from all Ontario STPs.[148]

Metal	Influent (kg/day)	Effluent (kg/day)	Amount Removed (kg/day)

* EXPLAIN briefly.

** Note that the Pilot study started prior to the 1988 White Paper announcement.

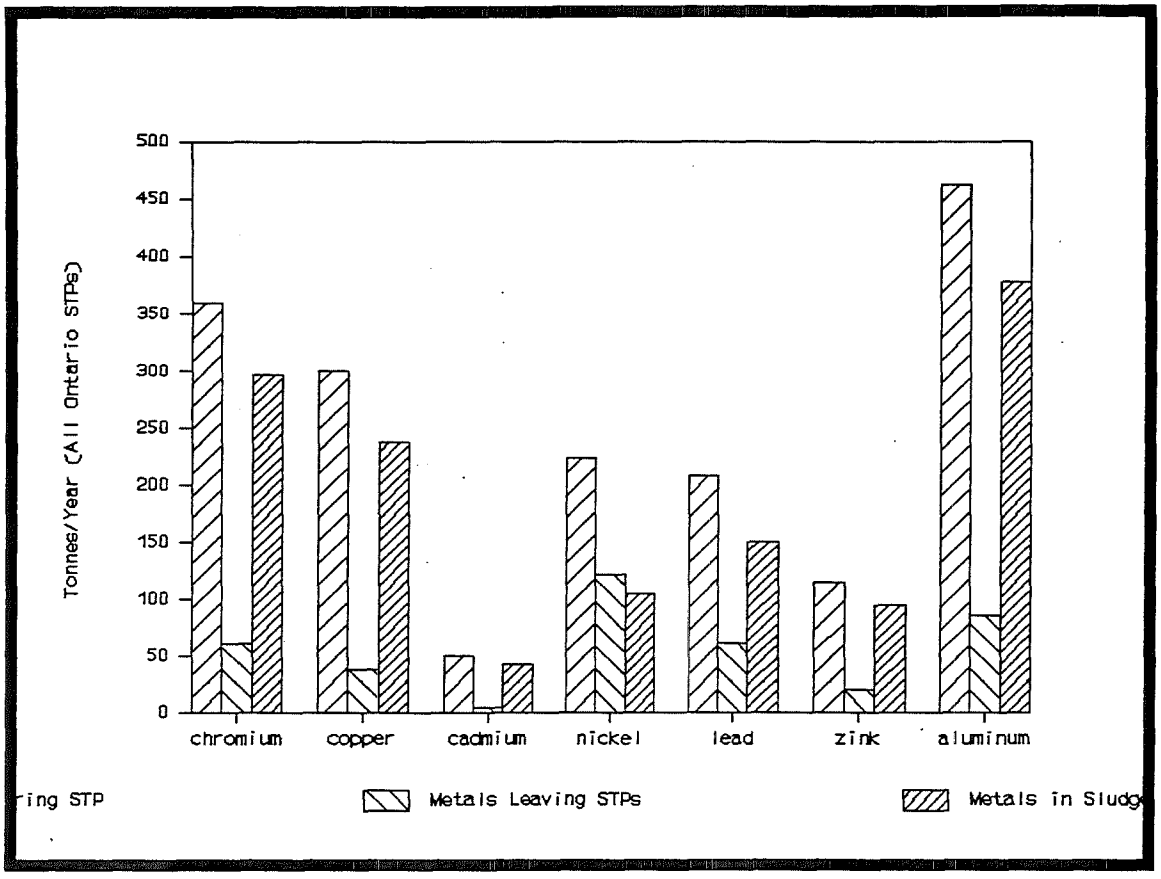
chromium	984	168	814
copper	824	105	651
mercury	1.2	0.3	1.8
cadmium	137	12	115
nickel	612	333	286
lead	569	166	411
zink	3148	547	2600
aluminum	12638	2351	10325

Figure X summarizes the yearly amount of metals entering sewage treatment plants, as compared to the amount that enters the receiving water and the amount removed. The removal is just a **transfer of medium** - from water to the STP sludges - and thus, toxic pollution still has to be dealt with. The ecosystem approach, of course, dictates that such a transfer of toxics is unacceptable.

Figure X: Amount of Metals in STP's Influents, effluents and sludges (in tonnes per year).[149]

4.6.3. Evaluation of Monitoring Activities

- why does municipalities have to do inventory and not MOE district offices? Seems to start a trend in distributing MOE jurisdiction to local governments.



- self-monitoring for 18,600 dischargers: need comprehensive and stringent enforcement program..

- sewer use control program on hold: interim report of 37 plant study in Dec. 1988;

The independent MISA Advisory Committee (MAC) recommended that resources should not be spend on developing monitoring regulation for the municipal sector.[150] Instead, MAC maintained that primary efforts should be focused to develop BATEA standards for industrial sewer-users.[151]

4.7. BATEA Standards

4.7.1. The 1988 Proposal and Intentions

Each industry, when either part of the SID list of part of one of the 22 industrial sectors, will be subject to province-wide and sector-specific BATEA effluent limits.[152] These limits

will be periodically reviewed to ascertain whether or not technological advances allow for tightening.[153]

The MOE also plans to prohibit the discharge of certain contaminants including those that are flammable, explosive, corrosive, and those discharges that are in excess of 65 degrees Celsius.[154] The prohibition would also extend to hazardous materials, waste pesticides and herbicides and chemicals listed in Schedule 1-3 of Regulation 309 under the Environmental Protection Act.[155]

Finally, the 1988 White Paper requires industries with contaminated run-off to develop and implement a **Best Management Practices** (BMP) plan.[156] Measures include in a BMP will address materials storage, housekeeping practices, preventative maintenance procedures, safety programs and employee training.

4.7.2. Progress to Date

NONE !!

4.7.3. Evaluation of BATEA Standards

- timing; amount of work done

- again, why set BATEA standards prior to setting local limits (take main argument from section 3)

- Minister said: "...we must stop this pollution at the source."[157] Is source reduction a BAT? Was any prioritizing done in terms of first SR, then re-use, then recycling, then treatment? NOT IN 1988 proposal.

- industry agrees with control at source (but should be selective and deal with what is not removed at the STP). Letter by Jean M. Belanger, president of the Canadian Chemical Producers' Association, to Bradley, December 16, 1988. See also 37 plant pilot study.

- include MAC's recommendations on ACTION !!

4.8. Enforcement and Compliance Strategy

4.8.1. The 1988 Proposal and Intentions

Under the 1988 proposal, the MOE delegates the first line of enforcement for all discharge limits and other control measures

to the municipalities.[158] Each municipality that has one of the 22 industry sector or a SID industrial discharge to its sewer system **must develop its own enforcement plan** and submit it to the Ministry for approval.[159] The municipal enforcement program must incorporate the following aspects to be undertaken by the local governments:[160]

* provide proof that the local government has the authority to implement and enforce their sewer use control program.

* develop an enforcement mechanism which will incorporate provincial regulations.

* describe the permit system which allows industries to use the sewer system (the permit will specify effluent limits, self-monitoring requirements, reporting requirements, special and general conditions, violation determination and dates such as date of permit, date for compliance and expiry date).

* specify the staffing and resources employed in implementing the enforcement plan.

* specify the enforcement actions undertaken.

* describe public participation involvement and procedures of public access to information.

* establish municipal sewer use bylaws so that municipalities can enforce provincial regulations.

* conduct on-site inspections, sampling, flow measurement and analytical programs to monitor industrial discharges.

The estimated costs of the municipal enforcement programs are summarized in Table X below.[161]

Table X: Summary of Estimated Costs of the Municipal Enforcement Program.

Type of Activity	Estimated Cost (province wide)	Provincial Contribution
developing the enforcement program	$13.5 million	50 percent

cost of sampling and laboratory equipment	$15 million	33 percent
annual operating costs	$20.6 million	to be paid by sewer users

The local governments must provide quarterly reports and annual summaries of enforcement activities which describe the results of municipal monitoring and auditing activities, as well as progress of prosecutions.[162] In cases where a municipality lacks the expertise or resources, the MOE will conduct the enforcement role, but will **charge-back the municipality.**[163]

The MOE will also undertake monitoring of industrial discharges and inspect plant sites to verify compliance and the integrity of the quarterly and annual municipal reports.[164]

In cases where an industry is out of compliance, **the municipality will be able to prosecute the discharger. The MOE can also prosecute the industry in case of non-compliance, and can prosecute the municipality for failure of enforcement.**[165]

4.8.2. Progress to Date

NONE, except that for local governments this is the most important issue

4.8.3. Evaluation of Enforcement and Compliance

- good that sewer-user pays.

The MOE presented four arguments for municipal enforcement in the 1988 White Paper.[166] First, municipal officials are familiar with local industrial users by knowing the location, wastewater flow and pollutant loadings of industries discharging into sewers. Second, many local governments "...already possess the administrative mechanisms on which to base enforcement measures." Third, municipal officials are in the best position to correct problems within their own treatment system. Finally, because STPs will be regulated under MISA as direct dischargers, it is in the municipalities' interest to ensure compliance, or otherwise, the MOE may prosecute the municipal government for

being out of compliance with the STP effluent limits.

My response:

- first argument: why wouldn't the MOE know this information, through either C. of As., control orders or other regulatory tools?

- second argument: I doubt that municipalities already possess these administrative mechanisms.

- third argument: the Minister said control at source is the only option, so why is there a shift of emphasis in this argument.

- fourth argument: so the MOE can prosecute the MOE. Very interesting.

* again, delegated power/jurisdiction to municipality

* compliance is crucial cause of large number and ease by which violations are "missed".

4.9. Local Limits

4.9.1. The 1988 White Paper and Intentions

As with direct industrial dischargers, provincial BATEA standards will not eliminate all health and environmental problems and thus, water quality standards or **"local limits"** need to be established.[167] In such cases,

> **"...the principle of economic fairness will be overridden by an urgent need to protect the environment and public health."**[168]

These water-specific limits will be **developed by the municipalities** using standardized methods provided by the MOE, and will be approved by the MOE before being implemented.[169] Local limits will be set for conventional and for toxic pollutants, and in cases where both BATEA and local limits conflict, the more stringent of the two will apply.[170] Local limits will apply to all indirect dischargers within the municipality.

4.9.2. Progress to Date

NONE!!

4.9.3. Evaluation of Local Limits

- why not done simultaneously with BATEA because better for receiving water and also industry won't be able to complain that they already made investments under the BATEA regulations and must do so again with local limits.

- again, delegated power/jurisdiction to municipality

4.10. Report Card and Overall Evaluation

* not released 1988 response document; out in September 90.

* quote from Bradley: "the missing brick in the MISA house is the municipal sector" (Speech to U. of T. p.6)

* GLWQA says: municipal abatement programs necessary (find location)

* The current practice, in which municipalities are responsible to regulate discharges to sewers, is questionable. Why should indirect dischargers be regulated differently than direct dischargers? Just because the local government built the toxic delivery system leading to a lake or river? Industries releasing their effluents into sewer systems find themselves with a huge dilution system which hides their toxic discharges.

* In their response to the 1986 proposal, municipalities warned that the additional costs under MISA regulations, including monitoring, treatment upgrading, enforcement and administration, could not be met.[171] Include Leclair's estimated costs for up-grading.

* The sequential two-track approach (BATEA and Water Quality) may prose problems for industry: having already pollution control equipment installed for the BATEA standards, industry may have to spend further resources to meet new, likely tougher, standards. [Pickfield et. al. says water quality approach would provide valuable information early in the standard setting process.][172]

* example of terrible timing: public response to 1988 White Paper not released yet.

* no emphasis on source reduction

* what happens when OWMC opens: is that part of BAT when the

toxics will be hauled off? Should not be allowed.

Field/Area	Grade	Reason
model sewer-use bylaws		
pilot projects		
monitoring		
BATEA standards		
local limits		
enforcement & compliance		
timing		

4.11. Implications of New Water Crown Corporation

MISA staff's arguments:

- municipality unable to generate necessary funds for capital investments; crown corporation can raise more funds easier by borrowing money at lower interest rates in greater quantities than the municipalities can.

- me: must be part of MOE to address ecological repair and not economical or developmental issues.

4.12. Advocacy - Recommendations for Reform

- see question in section 3

- what needs to be done (see Pickfield et. al., Part II.

- Pickfield's paper was mentioned in 1988 White Paper as being considered in the development of sewer regulations.[173] Were its recommendations followed?

- see pages 8/9 of Probe, 1987 for general 3-point plan for plugging 11,000 loopholes.

5. The Decision-Making Process

5.1. Management and Structure on MISA

A well-defined management and decision-making structure has evolved since 1986. The process for monitoring regulation development originated at the MOE staff level for the first sector (petroleum); by the second round the process was "highly structured" [174]; following the pattern in Figure 5.1 (below).

Figure X: Decision Making Structure Used to Develop Monitoring Regulations.[175]

Public Review

Cabinet

Representative Experts from each Ministry*

Minister MAC

DM

ADM

MOE staff

JTC

* At this level, usually 5 or 6 ministries mainly concerned with the legislation.

* Observers from MAC are present on the JTCs: they do not assist in the development of regs at this stage.

-for the monitoring regs, the JTCs operated by consensus

-MOE staff are available for advice to the two external committees (JTC and MAC) [176]

-after passing through MOE staff level,the Assistant Deputy Ministers (ADM) and the Deputy Minister (DM) must approve: it can be sent back down to the JTC level from any one of these (eg pulp and paper)

-MAC receives the legislation and officially comments to the

Minister. MAC representatives on the JTCs have previously informed the committee about the decisions made at that level (speeds up process[177])

-after taking MAC's comments under consideration, the Minister sends the draft to all Ministries, where Ministry "experts" assess the implications of the legislation/paper for their own ministries. Their recommendations go to cabinet.

-for those ministries that have a special concern for a particular piece of legislation, the MOE Executive Director (ED) goes over the package in detail with the EDs from the concerned Ministries

-goes to cabinet committee for approval (up to 60 days)

-out for public review, then back to JTC level, process starts over- up to cabinet.

5.1.1. Internal MOE Committees

1) IRP committees-see also 3.1.3, 5.2
-18 internal Issues Working Groups (IWGs)
3-4 people; leader responsible for preparing initial positions and changes

MISA Steering Committee
-apparently co-chaired by the ADMs

Issues Steering Committee
-meets once a week
-listens to both sides if there is a dispute
-if the issues are too "big", goes up the hierarchy

2) Others

MISA Implementation Committee (MIC)

-"formed to ensure the satisfactory implementation of the MISA program." [178]

-virtually all branches of MOE are represented (check with Giorno)

-28 members [179]

-Task forces exist for resource allocation questions, data management, coordination between MOE regions, training, compliance issues, and audits.

-MIC also acts as a support structure for the MISA program (role of some task forces)

5.1.2. External Committees

1) The MISA Advisory Committee (MAC)

In late 1986, the MISA Advisory Committee (MAC) was formed by special Order-in-Council.

-a "sunset clause" for the committee takes effect after three years; it has been renewed once, but members may not be able to get renewal a second time unless special arrangements are made [180]

-Its mandate is as follows:

A) to review draft regulations relating to monitoring and effluent limits prepared by the JTCs

B) to liaise and work with the technical committees

C) to provide advice and recommendations on the contents of the regulations

D) to provide advice with respect to other related matters [181]

-the protection of the public interest was in mind upon the formation of MAC, but individual members do not represent the public. [182]

[-should I go into examples of how MAC has influenced: need for generic monitoring reg; radionuclide recommendation--or, best left in their respective sections?]

Membership

-great diversity of members (see Appendix __)

-the committee is drawn from the public, and primarily includes independent water quality experts

-members sit as observers on the Joint Technical Committees; when sector regs are being reviewed, an industrial or municipal representative is appointed to the committee [183]

Referrals

-the primary contribution of MAC to MISA

-the General Effluent Monitoring Regulation, the 9 industrial sector regulations, a brief on municipal sewer use control, and general comments on the overall program form the bulk of MAC's contributions [184])

2) The Joint Technical Committees (JTCs)

-nine industrial JTCs and one municipal committee are responsible for a series of sector-specific issues

-membership is from MOE, DOE, and the affected industry for each sector (municipal reps for that sector as well); MAC has an observer

Objectives:

i) Monitoring:

a) Reach agreement on the definition of each respective sector and possible sub-sectors
b) Develop a program for the identification, characterization and calculation of loadings of contaminants from process streams, stormwater, and cooling water
c) Establish detailed monitoring procedures
d) To recommend and direct laboratories engaged to carry out analysis and evaluation of results in the pre-regulation phase
e) To advise the DM on technical matters relating to the promulgation of the monitoring regs.[185]

ii) Limits Regulations:

-review monitoring regulation data, initial reports, inspection and audit documentations
-develop sector effluent limits regs with reference to the above and the final definitions of the 18 generic issues from the IRP
-Petroleum JTC meeting at present (June/90); Organic JTC meets in early July to begin develop of limits regs. [186]

3) The Issues Resolution Committees (IRCs), or Issues Resolution Process Committees (IRPCs)

-5 in number, have responsibility for similar issues within the

18 generic ones in the IRP.

made up of:
-2 MOE staff:
1) Coordinator- main spokesperson,
2) Issue Working Group Leader

-2 industry reps:
1) Coordinator
2) IWG leader

-1 MAC rep
-1 DOE rep
-1 Municipal rep (where necessary)

-the latter 3 take a less active role

5.1.3. External Contracts and Consulting

-External contracts are awarded for the following:

1) by industry/municipalities for effluent analyses

Effluent monitoring under MISA is more comprehensive and wide-scale than any seen before in the province, and requires hiring a large body of skilled people in order to meet the demand.[187] This creates problems for MOE (see 6.1- Staff and Resources) in that many qualified individuals are lured away to the higher-paying private sector. [188]

In fact, the demand is so great that a whole "pollution monitoring sector" has been created. [189]

2) when outside expertise is needed in decision-making; for background documentation

The MISA Advisory Committee (MAC) has made extensive use of outside reporting in assisting its decision-making. [get list]

5.2. Public Participation

The only reference to public participation in the 1986 white paper is as follows:
"the general public will be invited to review and comment on the draft regulations as they are developed." [190]

The public has commented in depth on the 1986 white paper, the 1988 "Controlling Discharges to Sewers"[191] document, and the initial draft monitoring regulations. Summaries of public comments, including the MOE responses to them, are available at present, with the exception of the comments on 1988 document. This response document should be available by September, 1990. [192]

One example of effective public input was early on in the process, when various environmental groups, including Pollution Probe, expressed concern at the lack of commitment in MISA for addressing indirect dischargers at source.[193] This resulted in the 1988 "Controlling Discharges to Sewers" document which addressed sewer discharges in a more comprehensive way.

The resulting six site sewer use pilot project study has public participation built into at least five of its ten steps, ranging from attending public meetings to submitting written briefs. [194]

The public participation process broke down in November of 1989, when the Ministry initiated the "Issues Resolution Process" (See 3.1.3). 18 "generic" issues had to be defined in order to ensure consistency for the upcoming effluent limits regulations across all of the industrial sectors. An Issues Resolution structure was created, consisting of 18 Issues Working Groups (internal MOE), Group Coordinators, 5 Issues Resolution Committees (external), and the internal MISA Steering Committee (see Section 5.1.1; 5.1.2, and Figure 5.2).

The public to that point was not included in the process, and, in a letter dated Nov. 31, 1989, a coalition of six environmental groups expressed their concern [195] (Appendix?). They demanded a meeting in order to be briefed on the IRP, which was not granted until 3 months later. At the February 21/90 meeting, the groups were issued a "Statement of Ministry Initial Positions", outlining what appeared to be a process of "negotiating with industry behind closed doors". Refusing to endorse the process, the environmental groups listed a series of demands in order to open it up to the public, even though meetings were already underway. Eventually a settlement was reached allowing for a public comment period of 60 days after the results of the "negotiations" are documented (sometime in June 1990).

The process now looks as follows:

Figure X: The Amended Issues Resolution Process. [196]

Public

Minister

Division Heads
(DM chairs)

MISA Steering Committee
(co-chaired by ADMs)

Issues Resolution Committees
(5 in total- chaired by WRB)

Coordinator (Le Clair)

Issues Working Groups #1

(18 in total)

Coordinator (Tuszynski)

Issues Working Groups #2

-the confusion as to MAC's public/private role???

6. MISA in Retrospect

This section has two purposes; first, to undertake an examination of the institutional and financial aspects of the MISA program, and second, to summarize MISA's accomplishments, short-comings and necessary recommendations. A brief discussion on the challenges MISA has to face in the 1990's completes this report.

6.1. Resources and Staff Availability

The funding for MISA program has steadily increased over the last four years, indicating an increased workload for the Ministry to fullfil the mandate of the Abatement Program. Figures x and X summarize the financial and staff growth of MISA since its inception.

Figure X: MISA Staff Growth from 1986/87 to 1989/90.[197]

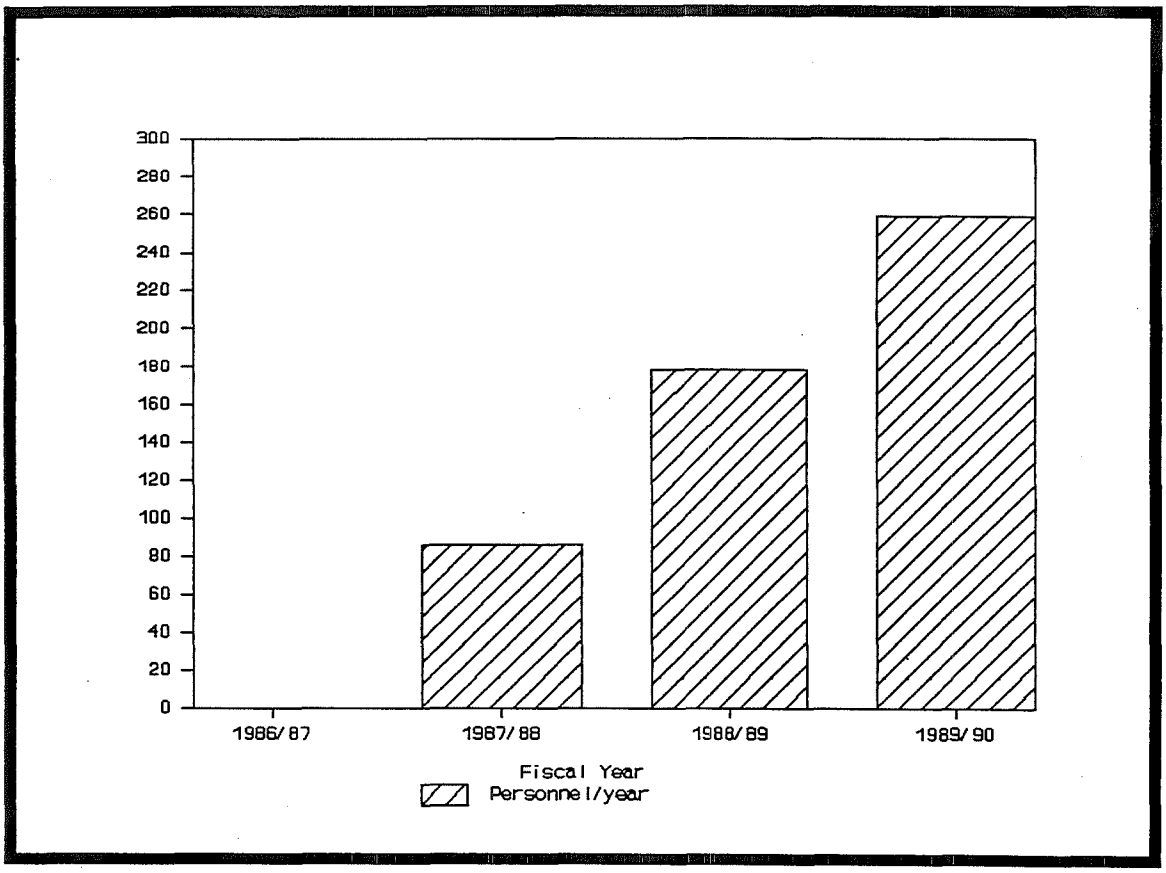
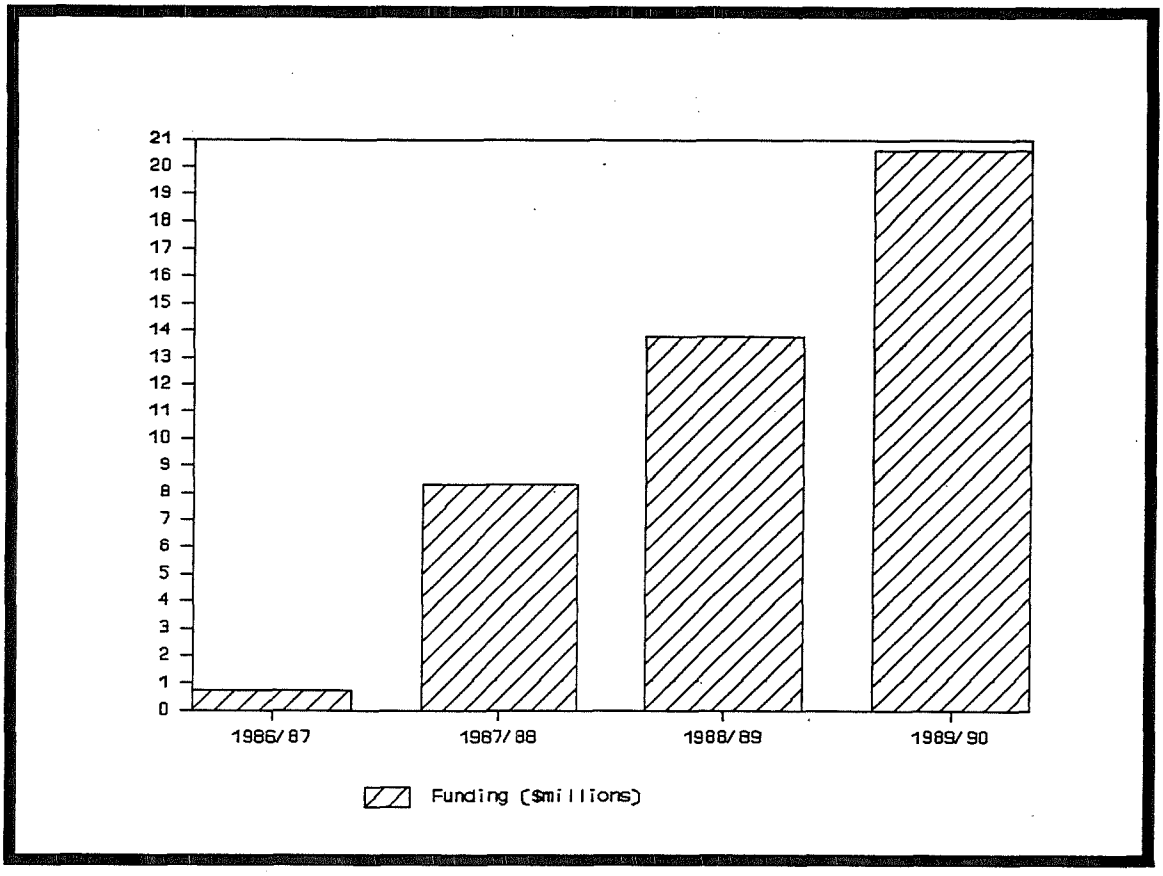


Figure X: MISA Funding Growth from 1986/87 to 1989/90.[198]



In total, the MISA program has cost **$43.45 million dollars.**

Table X below, summarizes how and where the MOE specifically spends the $21 million dollars for the 1989/90 fiscal year.

Table X: Detailed Funding Allocations within MISA for 1989/90 Fiscal Year.[199]

see next page

~~copy MIC, page 57.~~

V MISA ALLOCATED RESOURCES SUMMARY 1989-90

	STAFF	SALARIES ($000's)	BENEFITS ($000's)	ODOE ($000's)	TOTAL ($000's)
Water Resources Branch	71	2,868.3	430.7	4,039.3	7,338.3
Waste Management Branch	1	48.7	8.0	5.7	62.4
Laboratory	49	1,520.0	236.2	1,544.5	3,300.7
Approvals	17	779.7	121.0	126.4	1.027.1
REGIONS:					
- Regular	73	2,710.0	407.0	1,442.2	4,559.2
- Laboratories	3	96.0	11.4	-	107.4
Investigation and Enforcement	1	32.0	5.0	-	37.0
Hazardous Contaminants Coordination	4	173.0	26.5	296.3	495.8
CORPORATE SUPPORT:					
- Systems Information and Technology	14	544.0	48.5	707.5	1,300.0
- Legal	4	194.0	29.0	250.5	473.5
- MISA Advisory Committee	2	82.3	13.0	136.7	232.0
- Other Regular	19	605.0	87.2	174.2	866.4
- Accommodations	-	-	-	1,300.0	1,300.0
- Socio-Economic Studies	-	-	-	270.0	270.0
TOTAL MISA	258	9,653.0	1,423.5	10,293.3	21,469.8

* talk about staff-turnover (2/3 of positions filled; 3 sector specialists for Petroleum and P'n P; Seto is only senior manager left; Jim Bishop)

* industry reps not paid for sitting on JTC.

6.2. Agency Evaluation

MISA staff must not only do their job of arriving at environmental policies, but also answer questions from the public at large and from the environmental groups. To deal with inquiries by industry and environmental groups, the MISA office provides a communication office within the **Communications Branch** of the MOE. For more detailed questions, MISA staff has always been available for the purpose of this report.

All MISA documents are available for free, generally from the MOE Information Office but occasionally also directly from the MISA office. Appendix 5 provides a inventory of MISA documents available as of March 1990.

To announce progress, the MOE publishes MISA Update, a short, free and irregular newsletter which includes announcements of MISA workshop and activities.

6.3. List of Accomplishments

* monitoring regs

* sufficient STP effluent data

* indirect discharge pilot projects under way

* EMPPL

* six water quality studies under way ??

* model sewer-use bylaws ??

* MAC

6.4. Overall Report Card

The unifying message from part one of International Joint Commission's recent 5th Biennial Report is the lack of real commitment for zero discharge, and the IJC concluded that:

> **"...positive steps to translate Agreement objectives into effective and enforceable legislation are desperately needed."[200]**

Moreover, Part Two the IJC report arrives at several important conclusions:

> **"...we urge the Parties to take every available action to stop the inflow of persistent toxic substances into the Great Lakes environment."[201]**

> **"Unfortunately, each nation's rhetorical commitment concerning "best efforts" to meet the Purpose and General and Specific Objectives of the Agreement has not been enough."[202]** (emphasis added)

> **"...there is no clear indication that [the parties] consistently and comprehensively support the intentions of the GLWQA as a priority, with specific actions and adequate resources."[203]**

It should be remembered that these critical statements have not come from environmental groups, but from a **government agency!**

* Minister admitted at announcement that goals of MISA is idealistic; goal of virtual elimination was supposed to be long-term (undefined);

* no public participation in IRP until NGOs complained and sent letter to Bradley.

* no public participation on JTC

* Probe predicted somewhat of a 'secrecy' for decision making[204]; happened with Issues Resolution Process until April 26, 1990.

* In response to the 1986 White Paper, some environmental groups predicted that, because of the emphasis on economic considerations, the standard-setting process would develop into negotiations in the joint government-industry (JTC) committees responsible for developing regulations.[205]

- suggestion for overall report card:

Field/Area	Grade	Reason
monitoring regulations		
BATEA regulations		
water quality standards		
enforcement & compliance		
timing		
public participation		
allocated resources		

6.5. Overall Recommendations

6.6. MISA into the 1990's - Challenges and Action

- use as overall advocacy in terms of directions MISA must take to fulfil 1986 objectives.

APPENDICES TO BE INCLUDED:

Appendix 1

The Effluent Monitoring Priority Pollutants List (EMPPL)

Appendix 2

The Model Sewer-Use Bylaw

Appendix 3

Complete Results of the 37 STP Monitoring Study

Appendix 4

List of MAC Members

Appendix 5

List of MISA Documents (until March 1990)

ENDNOTES

1. MOE,1986, page ii.

2. Bradley, Speech at U. of t. Workshop on MISA and the Municipalities, September 12, 1989, page 2.

3. GLWQA, Article 6 (a) and (b), page 10 (September, 1989 edition).

4. Memorandum of Understanding on Control of Toxic Substances in the Great Lakes Environment, page 3.

5. COA, Article two.

6. COA, Article III.2(a).

7. GLWQA, Article 2 (a), page 7. (September 1989 printing)

8. GLWQA, Annex 12.2. (a) (ii), page 70 (September, 1989 edition).

9. IJC, 1990, Part II, page 17.

10. IJC, 1990, Part II, pages 17 and 18.

11. GLWQA, Annex 2, 2 (a), page 32 (September, 1989 edition).

12. GLWQA, Annex 2.2 (b), page 30 (September 1989 edition).

13. GLWQA, Annex 2.2 (b), page 32 (September, 1989 edition).

14. IJC, part II, page 37.

15. GLWQA, Annex 2.2 (b), page 30 (September 1989 edition).

16. GLWQA, Annex 2.6. (a), page 34 (September 1989 edition).

17. GLQWA, Annex 2.6 (a) (i) to (x), pages 34 and 35 (September, 1989 edition).

18. Lake Ontario Toxics Committee, 1989. Lake Ontario Toxics Management Plan. (MOE, NYDEC, EC, EPA), page 5.

19. MOE, 1986, page i.

20. MOE, 1986 White paper, page 1, Minister's Foreword.

21. Probe, 1986, page 2.

22. Probe, 1986, page 2.

23. Probe, 1986, page 2.

24.Pickfield et. al., page 71.

25.Pickfield et. al., page 71.

26. Millard somewhere, also MOE, 1986, page 3.

27. MOE, 1989, Report on the 1988 Industrial Direct Discharges in Ontario, page 5.

28. MOE, 1989, Appendix A.

29. MOE, 1986, page 7.

30. MOE, 1986, page 12.

31. MOE, 1986, page 3.

32. MOE, 1986, page 3.

33. MOE, 1988, The Effluent Monitoring Priority Pollutants List (1987). Page (i)

34. MOE, 1988, The Effluent Monitoring Priority Pollutants List (1987). Page (i)

35. GET Quote, I think it is in the response document to the public review of the Draft monitoring regulations of the electric power sector.

36. COA, Article II.

37. The Atomic Energy Control Board, 1990. Radioactive Release Data from Canadian Nuclear Generating Stations, 1972-1980. Report INFO-0210[E] RIV-3, page 4.

38. The Atomic Energy Control Board, 1990. Radioactive Release Data from Canadian Nuclear Generating Stations, 1972-1980. Report INFO-0210[E] RIV-3, page 4.

39. MOE, 1986, page 14.

40. MOE, 1986, page 21.

41. Sources: MOE, 1986 (white paper), pages 21, 24 and 26, and pers. communications with most MISA sector specialists, June 1990..

42. MOE, 1989, page 47. (direct industrial discharge green book)

43. MOE, 1989, page 47.

44. MOe, 1989, page 48 (1988 direct discharges; green book).

45. Dr. Peter Seto, pers. comm., May, 1990.

46. Dr. Peter Seto, pers. comm., May, 1990.

47. Walter Suboch

48. Walter Suboch, pers. comm., May 23, 1990.

49. Water Suboch, pers. comm., May 23, 1990.

50. Suboch, pers. comm.

51. Suboch, pers. comm.

52. Suboch, pers. comm.

53. Unpublished Report by Michael Hardkte.

54. Chandru Ramchandami, Sector Specialist for the Electric Power Generating sector, pers. comm, June, 1990.

55. Ljuba Simovic, Sector Specialist for the Metal Casting sector, pers. comm., June 1990.

56. Ljuba Simovic, Sector Specialist for the Metal Casting sector, pers. comm., June 1990.

57. Loftus, pages 4-7.

58. MOE, 1986, pages 36-38.

59. MOE, 1986, page 49 and MOE, 1990, page 5 (IRP paper).

60. MOE, 1990, page 5 (IRP paper).

61. MOE, 1990, pages 5 and 6 (IRP paper).

62. MOE, 1990, page 5 (IRP paper).

63. Sources: MOE, 1986 (white paper) page 26, and .

64. B.A. Ackerman and R.B. Stewart. Reforming Environmental Law. In Stanford Law Review, Vol. 37, May 1985, pages 1336 and 1341.

65. Probe, 1986, page 23, and CELA/CLERF response to 1986 White Paper, page 24.

66. Probe, 1986, page 36.

67. Sources: MOE, 1989, page 10 (1988 discharges); MOE, 1988, page 12 (1987 discharges); MOE, 1987, page 16 (1986 discharges).

68. MOE, 1986, page 46.

69. MOE, 1986, page 47.

70. MOE, 1990. IRP paper, page 21.

71. Blue Book, pages 10 and 11.

72. MOE, 1986, page 39.

73. MOE, 1986, page 39.

74. MOE, 1986, page 40.

75. MOE, 1986, page 26.

76. MOE, 1986, page 39.

77. Pickfield et. al., page 95.

78. MOE, 1986, page 6.

79. MOE News Release, August 17, 1988, page 2.

80. MOE, 1988, page 1.

81. MOE, 1988, page 1.

82. Taken, by permission, from Revelle and Revelle, page 291.

83. Revelle and Revelle page 289.

84. Revelle and Revelle, pages 289-290.

85. Revelle and Revelle, page 290.

86. MOE, 37 Municipal Water Pollution Control Plants, Pilot Monitoring Study Volume I, December 1988, page 30.

87. Sources: MOE: 37 STP Pilot Monitoring Study, Vol. 1., pages 5, 35 and 39. Report of the 1988 Discharges from STPs in Ontario, Appendix C. Note that except for Ottawa (1987) the daily flow rates represent 1988 discharges.

88. MOE, 1988, page 1.

89. MOE, 1988, pages 1 and 2.

90. MOE, 1988, pages 1 and 2, and Revelle and Revelle, page 298.

91. MOE, 1988, page 2.

92. MOE, 1988, pages 2 and 3.

93. MOE, 1988, page 3.

94. MOE, 1988, page 3.

95. MOE, 1988, page 3.

96. Based on Pollution Probe, 1987, page 4.

97. Probe, July 1986, page 38.

98. MOE, 1988, page (i), Minister's Introduction.

99. MOE, 1988, pages 8 and 9.

100. MOE, 1988, pages 8 and 9.

101. MOE, 1988, page 17.

102. MOE, 1988, page 17.

103. MOE, 1988, page 6.

104. MOE, 1988, page 6.

105. MOE, 1988, page 6.

106. MOE, 1988, page 6.

107. MOE, 1988, pages 6 and 7.

108. MOE, 1988, pages 24 and 25.

109. MOE, 1988, page 52.

110. MOE, 1988, page 52.

111. Pickfield et. al., page 77.

112. Pickfield et. al., pages 78 and 79.

113. MOE, 1988, page 53, and Pickfield et. al., 1988, page 81.

114. Pickfield et. al., 1988, page 81.

115. MOE, 1988, page 52.

116. MOE, 1988, page 53.

117. MOE, 1988, page 53.

118. MOE, 1988, page 54.

119. LeClair and Winston, POSITION, pers. comm., June 1990.

120. MOE, 1989. Unavailable report summarizing the question/answers in MISA workshops explaining the MISA indirect discharge program to municipalities (January and February 1989).

121. Pickfield et. al., 1988, page 86.

122. MOE News Release, August 17, 1988, page 2.

123. Pickfield et. al., 1988, page 77 and 78.

124. Pickfield et. al., 1988, page 77 and 78.

125. MOE News Release, September 12, 1989, page 1.

126. Jim Bradley, speech at U. of T. workshop on MISA and the Municipalities, September 12, 1989.

127. Jim Bradley, speech at U. of T. workshop on MISA and the Municipalities, September 12, 1989.

128. MOE News Release, September 12, 189, page 2 and 3.

129. Girono pers. comm and Winston and LeClair pers. comm.

130. MOE News Release, September 12, 1989, page 2.

131. Frank Giorno, MISA Communications Director, pers. comm., May 1990, and Winston and LeClair, pers. comm.

132. Peter Dunn, Environmental Control Officer, Department of Engineering, Regional Municipality of Hamilton-Wentworth, pers. comm., May 24, 1990.

133. Peter Dunn, Environmental Control Officer, Department of Engineering, Regional Municipality of Hamilton-Wentworth, pers. comm., May 24, 1990.

134. MOE News Release, September 12, 1989, page 2.

135. Peter Dunn, Environmental Control Officer, Department of Engineering, Regional Municipality of Hamilton-Wentworth, pers. comm., May 24, 1990.

136. Peter Dunn, Environmental Control Officer, Department of Engineering, Regional Municipality of Hamilton-Wentworth, pers. comm., May 24, 1990.

137. MOE, 1988, page 22.

187. Seto, pers. comm.

188. Ibid.

189. Ibid.

190. June, 1986, MISA Policy and Program Statement, p. 25

191. September, 1988, "Controlling Discharges to Sewers", MISA document.

192. Giorno, pers. comm., May 8, 1990.

193. May, 1987, Pollution Probe, "Plugging the Loopholes".

194. November, 1989, Regional Municipality "Working Together" newsletter.

195. Letter, Nov. 31/89, John Jackson, Great Lakes United, to Jim Bradley.

196. Seto, pers. comm.

197. Data supplied by Peter Seto, Policy and Planning Branch, December 4, 1989.

198. Data supplied by Dr. Seto, policy and Planning Branch, Dec. 9, 1989.

199. MOE, MISA implementation Committee, Second Annual Report.

200. IJC, 5th Biennial Report, part I, page 19.

201. IJC, 1990, Part II, page 53.

202. IJC, 5th Biennial Report, Part II, p.3.

203. IJC, 5th Biennial Report, Part II, p. 10.

204. Probe, 1986, page 24.

205. Pickfield et. al., page 96.

138. MOE, 1988, page 23.

139. MOE, 1988, page 23.

140. MOE, 1988, page 23.

141. MOE, 1988, page 23.

142. MOE, 1988, pages 23 and 24.

143. MOE, 1988, page 38.

144. MOE, 1988, page 38.

145. MacLaren, 1989, Fate of Chemicals in Municipal Sewage Treatment Facilities; An Overview. Paper presented at a joint PCAO/MOE Seminar, London, Ontario, November 1989, page 7.

146. MacLaren, Speech.

147. MOE, 1988, Interim report, 37 STP pilot Monitoring Study, page 7.

148. MAC, 1990, Table 7.

149. MAC, 1990, Table 7.

150. Letter to Bradley by James MacLaren, January 11, 1988. In: Pickfield et. al., 1988, page 94.

151. Letter to Bradley by James MacLaren, January 11, 1988. In: Pickfield et. al., 1988, page 94.

152. MOE, 1988, page 8.

153. MOE, 1988, page 13.

154. MOE, 1988, pages 14 and 15.

155. MOE, 1988, page 15.

156. MOE, 1988, page 15.

157. MOE, 1988, page (i), Minister's Introduction.

158. MOE, 1988, page 15.

159. MOE, 1988, page 41.

160. MOE, 1988, pages 41 to 47.

161. Adapted from MOE News Release, September 14, 1988, page 3.

162. MOE, 1988, pages 16 and 17.

163. MOE, 1988, pages 15 and 16.

164. MOE, 1988, page 17.

165. MOE, 1988, page 17.

166. All arguments appear in MOE, 1988, page 10.

167. MOE, 1988, page 9.

168. MOE, 1988, page 9.

169. MOE, 1988, page 9.

170. MOE, 1988, page 14.

171. Pickfield et. al., page 96.

172. Pickfield et. al., page 95.

173. MOE, 1988, page 6.

174. Seto interview, May 31/90

175. Ibid.

176. Seto, May 31; and MacLaren interview, June 7/90

177. MacLaren, pers. comm.

178. MIC Annual Report, p.3

179. Ibid., p.3

180. MacLaren, pers. comm.

181. MAC Annual Report, 1988-89, p.1

182. MacLaren, pers. comm.

183. MAC Annual Report, p.2

184. Ibid., p.3

185. Letter from Frank Ryan,MISA Industrial Section, Sept 4,1987, Appendix 3: "Terms of Reference"

186. MacLaren, pers. comm.