Pre-Treatment Requirements for Hazardous Wastes Prior to Land Disposal

(Land Disposal Restrictions)

Discussion Document

Waste Management Policy Branch
Ministry of Environment

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Pre-Treatment Requirements for Hazardous Wastes Prior to Land Disposal (Land Disposal Restrictions)

Executive Summary

The purpose of this document is to seek input from stakeholders regarding the establishment of pre-treatment standards for hazardous wastes prior to their being land disposed and to identify options to implement these standards in Ontario.

Ontario's regulatory framework for identifying and classifying hazardous wastes is based on U.S. EPA regulations. In 1999 and 2000 Ontario updated its regulations to strengthen its hazardous waste framework. The manner in which Ontario now determines whether a waste is hazardous is essentially identical to that of the U.S. EPA.

Through an Act of Congress in 1984, the U.S. EPA spent more than a decade developing and phasing-in regulatory requirements for the pre-treatment of hazardous wastes prior to their land disposal; also known as Land Disposal Restrictions (LDR). The intent of LDR was to require that waste-specific treatment standards be met before a waste can be land disposed. Pre-treatment standards are based on either:

- processing by a specific technology (such as incineration, thermal recovery, physical/ chemical treatment), or
- meeting a specified contaminant concentration level (either in leachate using the Toxicity Characteristic Leaching Procedure (TCLP) or a bulk concentration).

Contaminant standards are based on the current technical treatment abilities to achieve a certain limit, not a specific chemical's risk assessment of exposure.

In its process of approving landfills, the Ministry has established limits for allowable concentrations of contaminants based on background groundwater quality and the use of groundwater on adjacent properties (Reasonable Use Guideline, 1994). This approach sets site-specific performance-based limits for landfills so that there is no significant effect on the groundwater quality of the adjacent property. Although this approach is among the most stringent in North America, it is markedly different from the U.S. EPA approach which specifies engineering requirements, including liners.

Application of pre-treatment standards in Ontario would provide improved environmental protection by reducing the concentration and quantities of organic hazardous wastes going to landfills. Adopting pre-treatment requirements would also achieve even closer harmonization of Ontario's standards with those of the U.S. EPA and reduce the potential for hazardous wastes being imported to Ontario in order to avoid similar requirements in the United States. Ontario will need additional capability/capacity to treat inorganic (heavy metal) and organic (solvents) hazardous waste, requiring further discussion with the waste management industry. The adoption of pre-treatment standards in Ontario will create new business opportunities for the development of treatment capabilities/capacities that are currently not available for

certain wastes. Finally, the introduction of pre-treatment standards is seen as a key mechanism to reduce the amount of this waste generated in Ontario.

The Ministry intends to proceed with developing and implementing the U.S. EPA LDR concept for hazardous wastes being land disposed in Ontario. Further, the Ministry intends to initially phase-in these pre-treatment standards based on Ontario's hazardous waste processing capability/capacity. The Ministry anticipates that this phase-in period would be completed within two years of the final regulation being promulgated.

To achieve this, the Ministry proposes to adopt the U.S. EPA Universal Treatment Standards (UTS) as a primary means of establishing pre-treatment requirements for hazardous waste prior to land disposal. The Ministry believes that adopting the UTS approach is the least complicated method to incorporate this concept into Regulation 347. This approach should result in a simplified regulatory framework than currently exists in the United States.

These pre-treatment requirements would apply to all hazardous wastes destined for land disposal, including those hazardous wastes destined for landfills owned and operated by companies exclusively for their own wastes. Also subject to these pre-treatment requirements would be technologies like landfarms (primarily used for petroleum wastes) and deep well disposal facilities.

As an interim step prior to these pre-treatment standards being finalized, the Ministry is considering a requirement that any imported hazardous wastes destined for disposal in Ontario, would have to meet any pre-treatment standards that are applicable within the jurisdiction from which they originate. For example, hazardous waste from the United States subject to LDR requirements would need to meet those LDR requirements prior to their disposal in a hazardous waste landfill in Ontario.

This paper is intended to initiate discussion among Ontario stakeholders regarding the Ministry's proposals to establish pre-treatment requirements for hazardous wastes prior to land disposal. Full public consultation on a draft regulation through a further posting on the Environmental Registry will occur prior to a regulation being finalized.

Purpose

The purpose of this document is to seek input from stakeholders regarding the establishment of pre-treatment standards for hazardous wastes prior to their being land disposed and to identify options to implement these standards in Ontario. This concept is also known as Land Disposal Restrictions (LDR) in the United States where it was first developed. The program developed by the United States Environmental Protection Agency (U.S. EPA) prohibits the disposal of hazardous wastes on land unless they are pre-treated in some manner or meet specific treatment standards/concentrations.

Background

- Hazardous Waste Management in Ontario

Definitions and Framework

Hazardous wastes are distinguished from non-hazardous waste in that they require special treatment or handling to ensure they are safely managed. Hazardous wastes include a wide variety of materials - everything from acids, contaminated sludges, waste pesticides and PCBs to motor oil and discarded batteries.

Most hazardous wastes are generated as a by-product/residue in industrial and manufacturing processes. Hospitals, universities, and many small businesses also produce hazardous waste that must be safely managed. Managing hazardous waste includes the systematic control of collection, storage, transportation, treatment, recovery, and disposal.

Quantities

Since 1994 an average of 1.4 million tonnes of hazardous waste (including liquid industrial waste) is transported off-site by Ontario generators for recycling, treatment/processing and disposal. Ontario generators also export hazardous waste to the United States and other provinces for treatment and disposal. These export quantities and trends over the past several years are shown in Table 1. Ontario also receives hazardous waste from the United States and other provinces. These import quantities and trends over the past few years are shown in Table 2.

Table 1

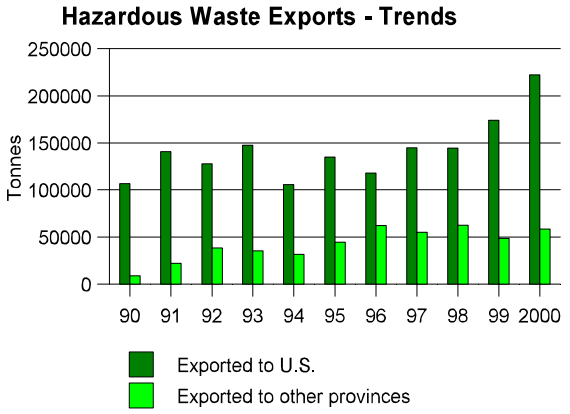
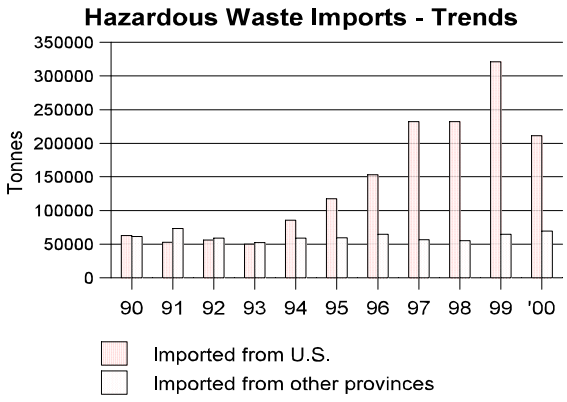


Table 2



Imports of Hazardous Wastes Into Ontario

There are a number of reasons why imports from the United States to Ontario have been on the rise. One reason is that through corporate mergers and acquisitions, the waste management industry has evolved into an industry that serves all of North America providing services across both international borders. Wastes are transported to the nearest plant within a corporate structure to minimize transportation costs, including Ontario's state-of-the-art facilities that are located in close proximity to the United States border. The value of the Canadian dollar has also had an impact by providing a significant economic advantage to United States companies shipping their wastes to Canada.

The increase in imports can also be partly attributed to the difference in environmental standards between the United States and Ontario. In 1985, Ontario adopted the U.S. EPA model and regulatory framework for identifying and classifying hazardous wastes. The U.S. EPA has updated its regulatory framework for hazardous waste since the mid-1980's, the time of Ontario's first major revision to its hazardous waste management framework. In 1999 and 2000 Ontario updated its regulations to strengthen its hazardous waste framework. The manner in which Ontario now determines whether a waste is hazardous is essentially identical to how the U.S. EPA determines whether a waste is hazardous. In fact, by including more chemicals to consider in the leachate test, the potential for wastes to be leachate toxic hazardous is now greater in Ontario than in the United States.

Most importantly however, in the past decade, the U.S. EPA introduced pre-treatment requirements for hazardous wastes prior to their land disposal, also known as Land Disposal Restrictions (LDR). This has increased the costs of hazardous waste management in the United States for those wastes that are captured by the LDR program. Ontario has not yet implemented similar pre-treatment standards or Land Disposal Restrictions to those in the United States.

Pre-Treatment Requirements for Hazardous Wastes

The principle of land disposal restrictions is to prohibit/discourage activities that involve placing untreated hazardous wastes in or on the land when better treatment or destruction alternatives exist. Hazardous wastes cannot be disposed on land until the waste meets specific treatment standards to reduce the mobility or toxicity of its hazardous components.

Current United States Pre-Treatment Requirements

Land Disposal Restrictions (LDR) were put in place to provide an additional level of protection over and above requirements for engineered facilities including liners, leak detection and groundwater monitoring systems for many hazardous waste disposal facilities throughout the United States. This was a significant undertaking that took the U.S. EPA over a decade to fully put into place.

When the program began, hazardous wastes were ranked according to risk and quantities; those with highest risk/toxicity and quantity were addressed initially. At first, these regulations focussed on standards for various waste groups and industrial processes. However, the U.S. EPA has recently moved towards Universal Treatment Standards which focus on controlling specific waste chemicals or constituents.

- Applicability of Land Disposal Restrictions

U.S. EPA defines land disposal to include placement of hazardous waste into:

- Landfills (final land disposal)
- Surface impoundments (temporary storage on land such as earthen ponds)
- Waste piles (temporary storage of solids in non-containerized piles)
- Injection wells (disposal in deep underground wells)
- Land treatment facilities (treatment of waste on surface soils)
- Salt domes or salt bed formations (disposal in deep salt caverns)
- Underground mines or caves (disposal in abandoned sites)
- Concrete vaults or bunkers (similar to surface impoundments)

The LDR program consists of three main components:

- Disposal Prohibition — Requires that waste-specific treatment standards be met before a waste can be land disposed. Also includes variances, exemptions, alternative treatment standards and notification requirements (this constitutes the bulk of the program);
- Dilution Prohibition — Ensures that wastes are properly treated and not simply diluted to mask the concentration of hazardous constituents; and,
- Storage Prohibition — Prevents the indefinite storage of hazardous wastes instead of treating the waste promptly.

As is the case in Ontario, there are two ways in which a waste can be classified as a hazardous waste in the United States; listed hazardous wastes and characteristic

hazardous wastes. Listed hazardous wastes are those wastes that are hazardous because they are on a list in the regulation. These lists include industrial processes and certain chemicals. Characteristic hazardous wastes are wastes that are hazardous based on a test method prescribed in regulation; corrosivity, ignitability, reactivity and leachate toxicity. In the U.S. EPA model, all listed and characteristic hazardous wastes that are to be land disposed are subject to the LDR program. However, certain exceptions apply if wastes meet an exclusion. There are general exclusions that apply to all Resource Conservation and Recovery Act (RCRA) regulations, such as the exclusions from the definition of solid waste (e.g., the domestic sewage exclusion) or exclusions from the definition of hazardous waste (e.g., the household hazardous waste exclusion).

- Pre-Treatment Standards

For each hazardous waste produced, the generator must determine the pre-treatment standards that apply to the waste. All pre-treatment standards are included in a table in the regulation. As noted above, pre-treatment standards apply to all hazardous wastes (both listed hazardous wastes and characteristic hazardous wastes) and wastewaters. The standards comprise close to 100 pages of the regulation. Alternative pre-treatment standards are allowed, but only apply to certain specific wastes (e.g., soil, debris, lab packs, and residues from high temperature metal recovery).

Pre-Treatment standards are based on either:

- processing by some technology (e.g. incineration, thermal recovery, physical/ chemical treatment of organic hazardous wastes and stabilization/removal of heavy metal-containing inorganic waste), or
- meeting a specified contaminant concentration level (either a concentration level in leachate using the TCLP leachate test or a bulk concentration level).

Rather than using an approach that assessed the risk to human health or the environment of exposure to hazardous constituents, the U.S. EPA chose to use best demonstrated available technologies (BDAT) to establish pre-treatment standards necessary for specific waste streams. The contaminant standards are based on the current technical treatment abilities to achieve a certain limit as opposed to a specific chemical's risk assessment of exposure. There are currently 30 pre-treatment technologies specified in the regulation, representing specific technology-based standards.

Once a generator identifies its waste as hazardous and determines its type, it must be treated in accordance with the LDR requirements before being land disposed. The generator can treat the waste on-site or send it off-site for proper treatment and ultimate disposal. If the hazardous waste meets the LDR pre-treatment standard by the generator at its site, further treatment is not necessary prior to land disposal. The hazardous waste generator has the legal responsibility to inform the receiver of the waste whether or not the waste meets LDR requirements and to ensure that it is handled appropriately.

- Universal Treatment Standards

Listed hazardous wastes need to be pre-treated and meet LDR requirements prior to land disposal in hazardous waste landfills. Pre-treatment standards for most characteristic hazardous wastes require that the wastes be treated to the point that they are considered to be non-hazardous waste for any reason. For example, a waste that is both corrosive and ignitible would need to be treated so that it exhibited neither of those characteristics.

These concepts are embodied in what is known as Universal Treatment Standards (UTS). UTS is a list of approximately 250 constituents for which LDR pre-treatment standards have been developed. UTS standards need to be met by both listed and characteristic hazardous wastes prior to their land disposal. Characteristic wastes that meet UTS standards can be disposed in non-hazardous waste landfills, but listed hazardous wastes that meet UTS must be disposed in hazardous waste landfills. A further technical delisting process would need to be completed before pre-treated listed hazardous wastes could be disposed in non-hazardous waste landfills.

- Exemptions, Variances and Extensions

The U.S. EPA has also established procedures that allow wastes to be disposed under special circumstances. These are defined as exemptions, variances and extensions and are generally issued through specific petitions by facilities. The six provisions are:

- National Capacity Variance
- Case-by-Case Extension
- Treatability Variance
- Equivalent Method Variance
- No-Migration Petition
- Surface Impoundment Treatment Exemption

A National Capacity Variance is the only variance that can be broadly applied to all hazardous waste management facilities. When developing pre-treatment standards, the U.S. EPA examines the available national treatment capacity to determine whether it is sufficient to handle current and future waste management needs. The U.S. EPA can extend the effective date of a new pre-treatment standard if it is determined national treatment capacity is insufficient. This flexibility, while still used, was more important in the earlier stages of developing the LDR program.

A Case-by-Case Extension may be granted in site-specific cases where adequate treatment capacity for a specific waste cannot reasonably be made available by the date that the treatment standard comes into effect. It may be granted for up to one year, renewable only once, for up to one additional year.

A Treatability Variance may be granted to generators or treatment facilities that can demonstrate that certain wastes cannot be treated to achieve the treatment standards, or for which treatment standards are not appropriate. Wastes that may be eligible include unique wastes, remediation wastes and wastes formed by inadvertent mixing.

A treatment variance establishes an alternative LDR treatment standard for the particular waste, which are independent of broader alternative treatment standards described below.

An Equivalent Method Variance may be granted in cases where an alternate treatment technology can be demonstrated to be equivalent to the treatment technology specified in regulation for a particular waste.

A No-Migration variance may be approved under certain circumstances if a petitioner can demonstrate that hazardous constituents will not migrate from a land disposal facility at concentrations greater than U.S. EPA-approved health-based levels. A no-migration variance may be granted for up to ten years, but cannot exceed the life of the facility's site approval. The no-migration variance applies only to the landfill and specific wastes identified in the petition. The U.S. EPA has granted the majority of such petitions to underground injection wells (primarily into deep salt formations).

A Surface Impoundment Treatment Exemption may be granted where a non-hazardous waste surface impoundment is storing waste that then becomes newly subject to hazardous waste requirements under RCRA. Regulations require such a surface impoundment either to be closed or upgraded to meet minimum technological requirements within four years.

- Alternative Treatment Standards

Some types of hazardous waste were not taken into account by the BDAT process when pre-treatment standards were being established. As a result, the U.S. EPA has created broad, alternative treatment standards for the management of special types of wastes, namely lab packs, high temperature metal recovery residues, hazardous debris and contaminated soils. These treatment standards are optional; generators can comply with either the original treatment standards or the alternative standards.

Current Canadian Pre-Treatment Requirements

- Environment Canada

Environment Canada is working to establish a national regime for environmentally sound management (ESM) in cooperation with the provinces and territories through a working group under the Canadian Council of Ministers of the Environment (CCME). Environment Canada plans to develop and incorporate hazardous waste landfill guidelines, along with broader environmentally sound management (ESM) criteria, into their 2003 amendments to the Export and Import of Hazardous Waste Regulations.

- Quebec

In July 2001, the Quebec government acted on an "urgent basis" to require that contaminated soils be pre-treated prior to being disposed in landfill. These pre-treatment requirements do not apply to "wastes".

The requirements of the regulation come into effect for existing facilities on January 11, 2002. This will impact the four landfills that are currently receiving contaminated soils. The requirements of the regulation came into effect on July 11, 2001 for any new disposal facilities.

Currently in Quebec there is one hazardous waste landfill located near Blainville that accepts primarily inorganic hazardous wastes (heavy metal wastes like those produced by electroplating processes) for treatment and subsequent landfilling. This facility meets the technology standards specified by the U.S. EPA LDR regulations for these waste streams. Several Ontario generators send their wastes to this facility for treatment and disposal.

- Alberta

Alberta approaches issues regarding the pre-treatment of hazardous wastes in two ways. The first is through regulation. Wastes with concentrations of PCBs greater than 50 ppm and wastes containing various organic (solvents, dry cleaning fluids) and inorganic (heavy metals) chemicals above prescribed concentration limits are prohibited from landfill disposal. These limits are based on criteria developed by Alberta Environment and are different than the U.S. EPA pre-treatment standards. In addition, no imported hazardous waste is allowed for direct landfill disposal as it must be pre-treated prior to landfilling. These requirements are currently under review.

The second way in which Alberta approaches this issue is through the permit for the Swan Hills hazardous waste treatment facility. This plant is a fully-integrated facility able to treat all forms of hazardous waste. The treatment processes at the facility include rotary kiln incineration, a physical/chemical treatment plant (for inorganic solid waste such as heavy metal contaminated soils), a disposal well for treated liquid residue and a landfill for disposal of treated solids. Ash from the incinerator is put through the stabilization/solidification process to remove any remaining toxins. The facility's permit requires that hazardous wastes be pre-treated prior to depositing in the landfill.

- Ontario

One of the key components used by MOE in its process of approving landfills is the Reasonable Use Guideline (1994), which establishes limits for allowable concentrations of contaminants based on background groundwater quality and the use of groundwater on adjacent property. The limits, among the most stringent in North America, are set so that there is no significant effect on the groundwater quality (commonly used for drinking water) of the adjacent property. This site-specific approach is performance-based with the landfill design required to meet the reasonable use limits for the site and applies to both hazardous and non-hazardous landfills. This approach is markedly different from the U.S. EPA approach which specifies engineering and liners to ensure that the environment is protected.

Ontario has only one commercial hazardous waste disposal facility which is located in the Sarnia area. This facility consists of a liquid injection incinerator, a landfill pre-treatment system (physical treatment only) and a secure landfill.

In addition to the Sarnia landfill, several other large chemical manufacturing companies operate their own on-site hazardous waste landfills. The practice of landfarming as a means of treating/managing sludges (hazardous and non-hazardous) on the sites of petroleum refineries in the province is also currently allowed.

Rationale for Proceeding with Pre-Treatment Requirements in Ontario

Application of pre-treatment standards in Ontario would provide improved environmental protection. Pre-treatment standards will result in a reduction of the concentration and quantities of organic hazardous wastes going to landfills. The impact on inorganic wastes is not fully known, as concentration and quantities will depend on the type of treatment applied. This could further have an effect of prolonging the lifespan of hazardous waste landfills, due to the decrease in annual volumes of waste being directly disposed.

Adopting pre-treatment requirements would also achieve even closer harmonization of Ontario's standards with those of the U.S. EPA and reduce the potential for hazardous wastes being imported to Ontario in order to avoid similar requirements in the United States. Although reduced, imports from the United States will likely continue because of other issues, including the proximity to facilities in Ontario and the value of the Canadian dollar.

The need for additional treatment capability/capacity to meet the new pre-treatment standards requires further discussion with the waste management industry. Ontario will need additional capability/capacity to treat inorganic (heavy metal) hazardous wastes and organic (solvents) hazardous wastes. For example, Ontario currently has no facilities able to destroy solid organic or halogenated (dry-cleaning solvents) hazardous wastes. However, new business opportunities for the development of treatment capabilities/capacities that are currently not available in Ontario for certain wastes will be created with the adoption of pre-treatment standards in Ontario.

The businesses that generate hazardous wastes will be affected by the pre-treatment requirements because of the increased costs for treatment and disposal. This increased cost however, should encourage the development of alternative manufacturing technologies that produce less quantities of hazardous waste or waste that is less toxic. Although the U.S. EPA experience suggests that the final amount of waste landfilled is only about 15% of the total amount of hazardous waste managed, industry will likely need to audit all of their waste management practices to reduce the increased quantity of waste requiring management.

Proposed Course of Action

The Ministry intends to proceed with developing and implementing the U.S. EPA LDR concept for hazardous wastes being land disposed in Ontario. Further, the Ministry intends to initially phase-in these pre-treatment standards based on Ontario's hazardous waste processing capability/capacity.

To achieve this, the Ministry proposes to adopt the U.S. EPA Universal Treatment Standards (UTS) as a primary means of establishing pre-treatment requirements for hazardous waste prior to land disposal. The Ministry believes that adopting the UTS approach is the least complicated method to incorporate this concept into Regulation 347. This approach should result in a simplified regulatory framework than currently exists in the United States.

These pre-treatment requirements would apply to all hazardous wastes destined for land disposal, including those hazardous wastes destined for landfills owned and operated by companies exclusively for their own wastes. Also subject to these pre-treatment requirements would be technologies like landfarms (primarily used for petroleum wastes) and deep well disposal facilities.

As an interim step prior to these pre-treatment standards being finalized, the Ministry is considering a requirement that any imported hazardous wastes destined for disposal in Ontario, would have to meet any pre-treatment standards from where they originated. For example, hazardous waste from the United States subject to LDR requirements would need to meet those LDR requirements prior to their disposal in a hazardous waste landfill in Ontario.

Stakeholder Input Sought

1. Adoption of Universal Treatment Standards (UTS)

The Ministry believes that the adoption of Universal Treatment Standards (UTS) would result in a simplified regulatory approach in which the LDR concept can be incorporated into law in Ontario. **The Ministry is seeking input on this view and if there are other methods that could achieve similar results.**

2. Non-Standard Circumstances

The U.S. EPA established procedures that allow wastes to be disposed under special or non-standard circumstances. These are defined as exemptions, variances and extensions in the regulation and are generally issued through specific petitions by facilities. **The Ministry is seeking input on how to recognize special circumstances for LDR.**

3. Assessment of Capability/Capacity in Ontario

While the Ministry has information on the hazardous waste management industry's general treatment capability/capacity, further discussion on the ability of these facilities to treat hazardous wastes to meet LDR requirements is required. **The Ministry is**

seeking input on the capability/capacity of existing hazardous waste treatment facilities in achieving LDR requirements.

4. Industry's Willingness to Develop Additional Capability/Capacity in Ontario

While certain hazardous waste management capability/capacity exists in North America but not in Ontario (such as rotary kiln incinerators), further information is required from industry regarding how they would intend to meet Ontario's needs once LDR is finalized. **The Ministry is seeking input regarding industry's interest in developing capability/capacity to treat all types of hazardous wastes generated in Ontario.**

5. Method of Phasing-In LDR Requirements in Ontario

The Ministry is considering to initially phase-in pre-treatment standards based on the greatest hazardous waste processing capability/capacity in Ontario. This requires that the Ministry assess Ontario's ability for pre-treatment, then target those wastes that have adequate Ontario capability/capacity first. The Ministry anticipates that this would likely result in pre-treatment standards for hazardous inorganic wastes coming into effect first, with standards for organic hazardous wastes coming into effect at a later date. **The Ministry is seeking input regarding the types of hazardous wastes that can be subject to LDR requirements first and those that will require some additional time prior to their being subject to the LDR requirements.**

6. Proposed LDR Phase-In Schedule

Given current hazardous waste treatment capability/capacity in Ontario, the Ministry would phase-in requirements for inorganic hazardous wastes one year after the regulation was finalized and two years after the regulation was finalized for organic hazardous wastes. This would allow industry to set up the appropriate infrastructure to manage these hazardous wastes. Any hazardous wastes imported into Ontario however, would be subject to the LDR requirements applicable in the jurisdiction from which the waste originates, immediately upon the regulation being finalized. **The Ministry is seeking input on this proposed phase-in schedule.**

Steps To Be Taken After Pre-Consultation Is Completed

This paper is intended to initiate discussion among Ontario stakeholders regarding the Ministry's proposals to establish pre-treatment requirements for hazardous wastes prior to their disposal on land. Information provided to the Ministry through this pre-consultation period will be reviewed prior to developing a draft regulation. Full public discussion of a draft regulation through a further posting on the Environmental Registry will occur prior to a regulation being finalized.

Appendix A

Ontario's Proposed Universal Treatment Standards

ONTARIO'S PROPOSED UNIVERSAL TREATMENT STANDARDS NOTE: NA means not applicable		
REGULATED CONSTITUENT Common Name	CAS[1] Number	Nonwastewater Standard Concentration in mg/kg[3] unless noted as "mg/l TCLP"
Organic Constituents		
Acenaphthylene	208-96-8	3.4
Acenaphthene	83-32-9	3.4
Acetone	67-64-1	160
Acetonitrile	75-05-8	38
Acetophenone	98-86-2	9.7
2-Acetylaminofluorene	53-96-3	140
Acrolein	107-02-8	NA
Acrylamide	79-06-1	23
Acrylonitrile	107-13-1	84
Aldicarb sulfone [6]	1646-88-4	0.28
Aldrin	309-00-2	0.066
4-Aminobiphenyl	92-67-1	NA
Aniline	62-53-3	14
Anthracene	120-12-7	3.4
Aramite	140-57-8	NA
Atrazine + N-dealklated metabolites (Weedex)		0.5 mg/l TCLP
Azinphos-methyl		2 mg/l TCLP
alpha-BHC	319-84-6	0.066
beta-BHC	319-85-7	0.066
delta-BHC	319-86-8	0.066
gamma-BHC	58-89-9	0.066
Barban [6]	101-27-9	1.4
Bendiocarb [6]	22781-23-3	1.4
Benomyl [6]	17804-35-2	1.4
Benzene	71-43-2	10
Benz(a)anthracene	56-55-3	3.4
Benzal chloride	98-87-3	6.0

ONTARIO'S PROPOSED UNIVERSAL TREATMENT STANDARDS NOTE: NA means not applicable		
REGULATED CONSTITUENT Common Name	CAS[1] Number	Nonwastewater Standard Concentration in mg/kg[3] unless noted as "mg/l TCLP"
Benzo(b)fluoranthene (difficult to distinguish from benzo(k)fluoranthene)	205-99-2	6.8
Benzo(k)fluoranthene (difficult to distinguish from benzo(b)fluoranthene)	207-08-9	6.8
Benzo(g,h,i)perylene	191-24-2	1.8
Benzo(a)pyrene	50-32-8	3.4
Boron		500 mg/l TCLP
Bromoxynil		0.5 mg/l TCLP
Bromodichloromethane	75-27-4	15
Bromomethane/Methyl bromide	74-83-9	15
4-Bromophenyl phenyl ether	101-55-3	15
n-Butyl alcohol	71-36-3	2.6
Butylate [6]	2008-41-5	1.4
Butyl benzyl phthalate	85-68-7	28
2-sec-Butyl-4,6-dinitrophenol/Dinoseb	88-85-7	2.5
Carbaryl [6]	63-25-2	0.14
Carbendazim [6]	10605-21-7	1.4
Carbofuran [6]	1563-66-2	0.14
Carbofuran phenol [6]	1563-38-8	1.4
Carbon disulfide	75-15-0	4.8 mg/l TCLP
Carbon tetrachloride	56-23-5	6.0
Carbosulfan [6]	55285-14-8	1.4
Chlordane (alpha and gamma isomers)	57-74-9	0.26
p-Chloroaniline	106-47-8	16
Chlorobenzene	108-90-7	6.0
Chlorobenzilate	510-15-6	NA
2-Chloro-1,3-butadiene	126-99-8	0.28
Chlorodibromomethane	124-48-1	15
Chloroethane	75-00-3	6.0
bis(2-Chloroethoxy)methane	111-91-1	7.2

ONTARIO'S PROPOSED UNIVERSAL TREATMENT STANDARDS NOTE: NA means not applicable		
REGULATED CONSTITUENT Common Name	CAS[1] Number	Nonwastewater Standard Concentration in mg/kg[3] unless noted as "mg/l TCLP"
bis(2-Chloroethyl)ether	111-44-4	6.0
Chloroform	67-66-3	6.0
bis(2-Chloro-1-methylethyl)ether	108-60-1	7.2
p-Chloro-m-cresol	59-50-7	14
2-Chloroethyl vinyl ether	110-75-8	NA
Chloromethane/Methyl chloride	74-87-3	30
2-Chloronaphthalene	91-58-7	5.6
2-Chlorophenol	95-57-8	5.7
3-Chloropropylene	107-05-1	30
Chlorpyrifos		9 mg/l TCLP
Chrysene	218-01-9	3.4
o-Cresol	95-48-7	5.6
m-Cresol (difficult to distinguish from p-cresol)	108-39-4	5.6
p-Cresol (difficult to distinguish from m-cresol)	106-44-5	5.6
m-Cumenyl methylcarbamate [6]	64-00-6	1.4
Cyanazine		1 mg/l TCLP
Cyclohexanone	108-94-1	0.75 mg/l TCLP
o,p'-DDD	53-19-0	0.087
p,p'-DDD	72-54-8	0.087
o,p'-DDE	3424-82-6	0.087
p,p'-DDE	72-55-9	0.087
o,p'-DDT	789-02-6	0.087
p,p'-DDT	50-29-3	0.087
Diazinon/Phosphordithioic acid, o o-diethyl o-(2-isopropyl 6-methyl-4-pyrimidinyl)ester		2 mg/l TCLP
Dibenz(a,h)anthracene	53-70-3	8.2
Dibenz(a,e)pyrene	192-65-4	NA
1,2-Dibromo-3-chloropropane	96-12-8	15

ONTARIO'S PROPOSED UNIVERSAL TREATMENT STANDARDS NOTE: NA means not applicable		
REGULATED CONSTITUENT Common Name	CAS[1] Number	Nonwastewater Standard Concentration in mg/kg[3] unless noted as "mg/l TCLP"
1,2-Dibromoethane/Ethylene dibromide	106-93-4	15
Dibromomethane	74-95-3	15
Dicamba		12 mg/l TCLP
m-Dichlorobenzene	541-73-1	6.0
o-Dichlorobenzene	95-50-1	6.0
p-Dichlorobenzene	106-46-7	6.0
Dichlorodifluoromethane	75-71-8	7.2
1,1-Dichloroethane	75-34-3	6.0
1,2-Dichloroethane	107-06-2	6.0
1,1-Dichloroethylene	75-35-4	6.0
trans-1,2-Dichloroethylene	156-60-5	30
2,4-Dichlorophenol	120-83-2	14
2,6-Dichlorophenol	87-65-0	14
2,4-Dichlorophenoxyacetic acid/2,4-D	94-75-7	10
1,2-Dichloropropane	78-87-5	18
cis-1,3-Dichloropropylene	10061-01-5	18
trans-1,3-Dichloropropylene	10061-02-6	18
Diclofop-methyl		0.9 mg/l TCLP
Dieldrin	60-57-1	0.13
Diethyl phthalate	84-66-2	28
Dimethoate	60515	2 mg/l TCLP
p-Dimethylaminoazobenzene	60-11-7	NA
2-4-Dimethyl phenol	105-67-9	14
Dimethyl phthalate	131-11-3	28
Di-n-butyl phthalate	84-74-2	28
1,4-Dinitrobenzene	100-25-4	2.3
4,6-Dinitro-o-cresol	534-52-1	160
2,4-Dinitrophenol	51-28-5	160
2,4-Dinitrotoluene	121-14-2	140

ONTARIO'S PROPOSED UNIVERSAL TREATMENT STANDARDS NOTE: NA means not applicable		
REGULATED CONSTITUENT Common Name	CAS[1] Number	Nonwastewater Standard Concentration in mg/kg[3] unless noted as "mg/l TCLP"
2,6-Dinitrotoluene	606-20-2	28
Di-n-octyl phthalate	117-84-0	28
Di-n-propylnitrosamine	621-64-7	14
Dinoseb	88857	1 mg/l TCLP
Dioxin & Furan		0.0000015* mg/l TCLP
1,4-Dioxane	123-91-1	170
Diphenylamine (difficult to distinguish from diphenylnitrosamine)	122-39-4	13
Diphenylnitrosamine (difficult to distinguish from diphenylamine)	86-30-6	13
1,2-Diphenylhydrazine	122-66-7	NA
Disulfoton	298-04-4	6.2
Dithiocarbamates (total) [6]	NA	28
Diquat		7 mg/l TCLP
Diuron		15 mg/l TCLP
Endosulfan I	959-98-8	0.066
Endosulfan II	33213-65-9	0.13
Endosulfan sulfate	1031-07-8	0.13
Endrin	72-20-8	0.13
Endrin aldehyde	7421-93-4	0.13
EPTC [6]	759-94-4	1.4
Ethyl acetate	141-78-6	33
Ethyl benzene	100-41-4	10
Ethyl cyanide/Propanenitrile	107-12-0	360
Ethyl ether	60-29-7	160
Ethyl methacrylate	97-63-2	160
Ethylene oxide	75-21-8	NA
Famphur	52-85-7	15
Fluoranthene	206-44-0	3.4
Fluorene	86-73-7	3.4

ONTARIO'S PROPOSED UNIVERSAL TREATMENT STANDARDS NOTE: NA means not applicable		
REGULATED CONSTITUENT Common Name	CAS[1] Number	Nonwastewater Standard Concentration in mg/kg[3] unless noted as "mg/l TCLP"
Formetanate hydrochloride [6]	23422-53-9	1.4
Glyphosate		28 mg/l TCLP
Heptachlor	76-44-8	0.066
Heptachlor epoxide	1024-57-3	0.066
1,2,3,4,6,7,8-Heptachlorodibenzo-*p*-dioxin (1,2,3,4,6,7,8-HpCDD)	35822-46-9	0.0025
1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-HpCDF)	67562-39-4	0.0025
1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,6,7,8,9-HpCDF)	55673-89-7	0.0025
Hexachlorobenzene	118-74-1	10
Hexachlorobutadiene	87-68-3	5.6
Hexachlorocyclopentadiene	77-47-4	2.4
HxCDDs (All Hexachlorodibenzo-p-dioxins)	NA	0.001
HxCDFs (All Hexachlorodibenzofurans)	NA	0.001
Hexachloroethane	67-72-1	30
Indeno (1,2,3-c,d) pyrene	193-39-5	3.4
Iodomethane	74-88-4	65
Isobutyl alcohol	78-83-1	170
Isodrin	465-73-6	0.066
Isosafrole	120-58-1	2.6
Kepone	143-50-0	0.13
Lindane	58899	0.4 mg/l TCLP
Malathion		19 mg/l TCLP
Methacrylonitrile	126-98-7	84
Methanol	67-56-1	0.75 mg/l TCLP
Methapyrilene	91-80-5	1.5
Methiocarb [6]	2032-65-7	1.4
Methomyl [6]	16752-77-5	0.14

ONTARIO'S PROPOSED UNIVERSAL TREATMENT STANDARDS NOTE: NA means not applicable		
REGULATED CONSTITUENT Common Name	CAS[1] Number	Nonwastewater Standard Concentration in mg/kg[3] unless noted as "mg/l TCLP"
Methoxychlor	72-43-5	0.18
3-Methylcholanthrene	56-49-5	15
4,4-Methylene bis(2-chloroaniline)	101-14-4	30
Methylene chloride	75-09-2	30
Methyl ethyl ketone	78-93-3	36
Methyl isobutyl ketone	108-10-1	33
Methyl methacrylate	80-62-6	160
Methyl methanesulfonate	66-27-3	NA
Methyl parathion	298-00-0	4.6
Metolachlor		5 mg/l TCLP
Metolcarb [6]	1129-41-5	1.4
Metribuzin		8 mg/l TCLP
Mexacarbate [6]	315-18-4	1.4
Molinate [6]	2212-67-1	1.4
Naphthalene	91-20-3	5.6
2-Naphthylamine	91-59-8	NA
NDMA		0.0009 mg/l TCLP
Nitrate + Nitrite (as Nitrogen)		1000 mg/l TCLP
Nitrilotriacetic acid (NTA)		40 mg/l TCLP
o-Nitroaniline	88-74-4	14
p-Nitroaniline	100-01-6	28
Nitrobenzene	98-95-3	14
5-Nitro-o-toluidine	99-55-8	28
o-Nitrophenol	88-75-5	13
p-Nitrophenol	100-02-7	29
N-Nitrosodiethylamine	55-18-5	28
N-Nitrosodimethylamine	62-75-9	2.3
N-Nitroso-di-n-butylamine	924-16-3	17
N-Nitrosomethylethylamine	10595-95-6	2.3

ONTARIO'S PROPOSED UNIVERSAL TREATMENT STANDARDS NOTE: NA means not applicable		
REGULATED CONSTITUENT Common Name	CAS[1] Number	Nonwastewater Standard Concentration in mg/kg[3] unless noted as "mg/l TCLP"
N-Nitrosomorpholine	59-89-2	2.3
N-Nitrosopiperidine	100-75-4	35
N-Nitrosopyrrolidine	930-55-2	35
1,2,3,4,6,7,8,9-Octachlorodibenzo-*p*-dioxin (OCDD)	3268-87-9	0.005
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	39001-02-0	0.005
Oxamyl [6]	23135-22-0	0.28
Parathion	56-38-2	4.6
Paraquot		1 mg/l TCLP
Total PCBs (sum of all PCB isomers, or all Aroclors)	1336-36-3	10
Pebulate [6]	1114-71-2	1.4
Pentachlorobenzene	608-93-5	10
PeCDDs (All Pentachlorodibenzo-p-dioxins)	NA	0.001
PeCDFs (All Pentachlorodibenzofurans)	NA	0.001
Pentachloroethane	76-01-7	6.0
Pentachloronitrobenzene	82-68-8	4.8
Pentachlorophenol	87-86-5	7.4
Phenacetin	62-44-2	16
Phenanthrene	85-01-8	5.6
Phenol	108-95-2	6.2
Phorate	298-02-2	4.6
Phthalic acid	88-99-3	28
Phthalic anhydride	85-44-9	28
Physostigmine [6]	57-47-6	1.4
Physostigmine salicylate [6]	57-64-7	1.4
Picloram		19 mg/l TCLP
Promecarb [6]	2631-37-0	1.4
Pronamide	23950-58-5	1.5

ONTARIO'S PROPOSED UNIVERSAL TREATMENT STANDARDS NOTE: NA means not applicable		
REGULATED CONSTITUENT Common Name	CAS[1] Number	Nonwastewater Standard Concentration in mg/kg[3] unless noted as "mg/l TCLP"
Propham [6]	122-42-9	1.4
Propoxur [6]	114-26-1	1.4
Prosulfocarb [6]	52888-80-9	1.4
Pyrene	129-00-0	8.2
Pyridine	110-86-1	16
Safrole	94-59-7	22
Silvex/2,4,5-TP	93-72-1	7.9
Simazine		1 mg/l TCLP
Temephos		28 mg/l TCLP
Terbufos		0.1 mg/l TCLP
1,2,4,5-Tetrachlorobenzene	95-94-3	14
TCDDs (All Tetrachlorodibenzo-p-dioxins)	NA	0.001
TCDFs (All Tetrachlorodibenzofurans)	NA	0.001
1,1,1,2-Tetrachloroethane	630-20-6	6.0
1,1,2,2-Tetrachloroethane	79-34-5	6.0
Tetrachloroethylene	127-18-4	6.0
2,3,4,6-Tetrachlorophenol	58-90-2	7.4
Thiodicarb [6]	59669-26-0	1.4
Thiophanate-methyl [6]	23564-05-8	1.4
Toluene	108-88-3	10
Toxaphene	8001-35-2	2.6
Triallate [6]	2303-17-5	1.4
Tribromomethane/Bromoform	75-25-2	15
2,4,6-Tribromophenol	118-79-6	7.4
1,2,4-Trichlorobenzene	120-82-1	19
1,1,1-Trichloroethane	71-55-6	6.0
1,1,2-Trichloroethane	79-00-5	6.0
Trichloroethylene	79-01-6	6.0
Trichlorofluoromethane	75-69-4	30

ONTARIO'S PROPOSED UNIVERSAL TREATMENT STANDARDS NOTE: NA means not applicable		
REGULATED CONSTITUENT Common Name	CAS[1] Number	Nonwastewater Standard Concentration in mg/kg[3] unless noted as "mg/l TCLP"
2,4,5-Trichlorophenol	95-95-4	7.4
2,4,6-Trichlorophenol	88-06-2	7.4
2,4,5-Trichlorophenoxyacetic acid/2,4,5-T	93-76-5	7.9
1,2,3-Trichloropropane	96-18-4	30
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	30
Triethylamine [6]	121-44-8	1.5
Trifluralin		4.5 mg/l TCLP
tris-(2,3-Dibromopropyl) phosphate	126-72-7	0.10
Vernolate [6]	1929-77-7	1.4
Vinyl chloride	75-01-4	6.0
Xylenes-mixed isomers (sum of o-, m-, and p-xylene concentrations)	1330-20-7	30
Inorganic Constituents		
Antimony	7440-36-0	1.15 mg/l TCLP
Arsenic	7440-38-2	5.0 mg/l TCLP
Barium	7440-39-3	21 mg/l TCLP
Beryllium	7440-41-7	1.22 mg/l TCLP
Cadmium	7440-43-9	0.11 mg/l TCLP
Chromium (Total)	7440-47-3	0.60 mg/l TCLP
Cyanides (Total)[4]	57-12-5	590
Cyanides (Amenable)[4]	57-12-5	30
Fluoride[5]	16984-48-8	NA
Lead	7439-92-1	0.75 mg/l TCLP
Mercury - Nonwastewater from Retort	7439-97-6	0.20 mg/l TCLP
Mercury - All Others	7439-97-6	0.025 mg/lTCLP
Nickel	7440-02-0	11 mg/l TCLP
Selenium[7]	7782-49-2	5.7 mg/l TCLP
Silver	7440-22-4	0.14 mg/l TCLP
Sulfide[5]	18496-25-8	NA

ONTARIO'S PROPOSED UNIVERSAL TREATMENT STANDARDS NOTE: NA means not applicable		
REGULATED CONSTITUENT Common Name	CAS[1] Number	Nonwastewater Standard Concentration in mg/kg[3] unless noted as "mg/l TCLP"
Thallium	7440-28-0	0.20 mg/l TCLP
Uranium		10 mg/l TCLP
Vanadium[5]	7440-62-2	1.6 mg/l TCLP
Zinc[5]	7440-66-6	4.3 mg/l TCLP

FOOTNOTES TO UTS TABLE

1. CAS means Chemical Abstract Services. When the waste code and/or regulated constituents are described as a combination of a chemical with it's salts and/or esters, the CAS number is given for the parent compound only.

2. Except for Metals (TCLP) and Cyanides (Total and Amenable) the nonwastewater treatment standards expressed as a concentration were established, in part, based upon incineration in units operated in accordance with the technical requirements of 40 CFR part 264, subpart O or 40 CFR part 265, subpart O, or based upon combustion in fuel substitution units operating in accordance with applicable technical requirements. A facility may comply with these treatment standards according to provisions in 40 CFR 268.40(d). All concentration standards for nonwastewaters are based on analysis of grab samples.

3. Both Cyanides (Total) and Cyanides (Amenable) for nonwastewaters are to be analyzed using Method 9010 or 9012, found in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," U.S. EPA Publication SW-846, as incorporated by reference in 40 CFR 260.11, with a sample size of 10 grams and a distillation time of one hour and 15 minutes.

4. These constituents are not "underlying hazardous constituents" in characteristic wastes, according to the definition at §268.2(i).

5. Between August 26, 1996, and March 4, 1998, these constituents are not "underlying hazardous constituents" as defined at §268.2(i) of this Part.

6. This constituent is not an underlying hazardous constituent as defined at §268.2(i) of this Part because its UTS level is greater than its Leachate Toxicity level, thus a treated selenium waste would always be characteristically hazardous, unless it is treated to below its characteristic level.

* Toxic equivalent (TEQ)