

**MODEL TOXICS IN PACKAGING LEGISLATION:
AN EVALUATION OF
ITS PROVISIONS, ADMINISTRATION, AND IMPACT**

A REPORT OF THE TOXICS IN PACKAGING CLEARINGHOUSE

This report does not necessarily express the views of the Coalition of Northeastern Governors, the CONEG Policy Research Center, Inc., the CONEG Source Reduction Task Force, or the Iowa Department of Natural Resources.

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INTRODUCTION

Packaging is essential to public health, economic well-being, living standard, and lifestyle in modern societies. Packaging has enabled us to enjoy the benefits of the world's most efficient product distribution system, which delivers a rich variety of food, personal care products, hardware, and other consumer goods. Packaging keeps products safe, intact, and protected from tampering and damage until they reach the market place.

Packaging also presents a significant public policy challenge. The value and utility of packaging is relatively short-lived; once a consumer purchases and uses a product, its package inevitably ends up in the trash can. To minimize the environmental impact of the discarded package, effective solid waste management systems must be in place.

For more than a decade, the role of packaging in the municipal solid waste (MSW) stream has been the subject of considerable debate among policymakers at all levels of government. Because packaging constitutes about one-third of MSW, policymakers have focused on various proposals to reduce or otherwise divert packaging from municipal disposal systems through recycling, reuse, buy-recycled, and composting systems. More recently, concerns have been raised regarding the presence of toxic substances in packaging that may harm the environment and public health when the package enters the waste stream. These policy debates have occurred as part of a larger effort to improve the management of the nation's natural resources and its solid wastes.

Since 1988, the Coalition of Northeastern Governors (CONEG) has played a lead role in the solid waste debate, not only in the Northeast states, but in other regions of the United States as well. CONEG's approach to addressing the solid waste problem, through policies and programs developed by its Source Reduction Task Force (SRTF), has become the model for other states and regions that are also struggling with similar problems and searching for meaningful solutions.

This report concerns one product of the SRTF—the Model Toxics in Packaging Legislation (Appendix A). Developed by members of the Source Reduction Council (SRC)*, the Model Legislation is the basis for laws in 17 states and legislation before Congress. As required by the Model Legislation, this report presents the findings of a review of its provisions, administration, and impact. The report was compiled with information provided to the Toxics in Packaging Clearinghouse (TPCH), which CONEG and the Task Force created to ease the states' and regulated industries' burden of administering the laws.

CONEG staff wish to acknowledge the assistance and cooperation provided by state and Technical Advisory Group members of the TPCH in the preparation of this report.

*The SRC was restructured into the current SRTF 1991.

Model Toxics in Packaging Legislation Chronology of Key Events

1988

August, 1988.

CONEG creates Source Reduction Council.

1989

September, 1989.

SRTF begins development of Toxics in Packaging Model Legislation.

1990

January 3, 1990.

Model Legislation presented to Governors.

April 17, 1990.

Maine enacts Legislative Document 2368.

April 19, 1990.

New Hampshire enacts House Bill 5835.

April 27, 1990.

Wisconsin enacts Senate Bill 300.

May 8, 1990.

Iowa enacts Senate Bill 2153.

June 6, 1990.

Connecticut enacts House Bill 5852.

June 26, 1990.

New York enacts Ch 286 Laws of 1990.

Vermont enacts House Bill 886.

July 6, 1990.

Rhode Island enacts General Law
23-18.13.

1991

May 20, 1991.

Minnesota enacts Statute 115A.965.

May 21, 1991.

Washington state enacts Senate Bill 5591.

CONEG restructures Source Reduction Council into
Source Reduction Task Force

1992

January 20, 1992.

New Jersey enacts Senate Bill 226.

May 4, 1992.

Georgia enacts House Bill 124.

May 26, 1992.

Maryland enacts Senate Bill 554.

July 1, 1992.

Illinois enacts Senate Bill 1295.

November, 1992.

Toxics in Packaging Clearinghouse created.

1993

May 12, 1993.

Florida enacts Section 403.7191, F.S.(1993).

July 1, 1993.

Missouri enacts G.A. Section 1-4, 260.820-260-826.

1994

April 20, 1994.

Virginia enacts House Bill 1202.

December 2, 1994.

Pennsylvania enacts House Bill 337.

EXECUTIVE SUMMARY

In 1990, the Coalition of Northeastern Governors presented to the Northeastern states Model Legislation designed to phase out the use and presence of mercury, lead, cadmium, and hexavalent chromium in packaging within four years following enactment of the legislation. The Model Legislation attracted immediate attention from state officials in the Northeast and in other regions because it responded to public concerns about the potential public health and environmental effects presented by these substances when they are introduced into the municipal solid waste stream in discarded packaging.

This report reviews the history of the CONEG Model Toxics in Packaging Legislation (Appendix A), evaluates its administrative procedures, reviews the states' enforcement policies and actions regarding this legislation, examines methodologies for testing and measuring industry compliance and the laws' effectiveness, addresses barriers to compliance, and suggests improvements to the Model Legislation's provisions.

CHAPTER HIGHLIGHTS

- Chapter One** Describes the genesis of the Model Toxics in Packaging Legislation, an early product of CONEG's Source Reduction Council (SRC) (the predecessor to the current Source Reduction Task Force (SRTF), its objectives, key provisions and requirements, exemptions for certain products, and certification procedures. The Model Legislation presents an unusual self-certification approach to regulating packaging and its components; it does not regulate products.
- Chapter Two** Describes the Toxics in Packaging Clearinghouse (TPCH), created by the SRTF to simplify the laws' administrative procedures, promote cooperation between participating states, minimize procedural burdens on affected industries, and promote understanding and greater awareness of the Model Legislation's objectives. This chapter also explains the TPCH procedures for addressing industry requests for exemptions and clarifications of the laws' provisions and intent as well as actions taken to improve the program's efficiency.
- Chapter Three** Discusses issues that have arisen concerning the Model Legislation's administration, enforcement, impact, and effectiveness. Although a number of states (18 to date) have enacted the Model Legislation with few variations, none of the states have aggressively enforced its provisions. This chapter also examines available methodologies for testing packaging for the regulated metals and limitations facing states in determining the effectiveness of this legislation in decreasing the presence of the regulated metals' concentrations in the MSW stream.

- Chapter Four** Presents the Clearinghouse's recommended changes to the Model Toxics in Packaging Legislation and the rationale for each change. The TPCCH suggests an extension of the existing exemption for packaging containing recycled material; a definition to clarify "intentional introduction" of the four heavy metals into packaging; an exemption for reusable packaging; definitions for "manufacturing," "distribution," "manufacturer," and "supplier"; additional clarifying language in existing exemptions; and a severability and construction clause.
- Chapter Five** States that no additional toxic substances will be recommended by the TPCCH for regulation under the Model Legislation pending the completion of a toxicity protocol.
- Chapter Six** Presents conclusions based upon the review and suggests future actions for the Model Toxics in Packaging Legislation and the TPCCH.

Key Conclusions

The Model Toxics in Packaging Legislation has been enacted in 18 states to help reduce the presence of four heavy metals in the municipal solid waste stream. The Model Legislation provides for affected industries to self-certify their compliance with the law. The Model also allows exemptions for certain packages.

The TPCCH has helped to ease the states' and industries' administration of the laws and to disseminate information about the Model Legislation to other states and interested parties. Methodologies exist to test packaging for the regulated metals, but a more effective test is needed for hexavalent chromium. Determining the impact of the Model Legislation's impact on the municipal solid waste stream is feasible but cannot be measured at this time.

The TPCCH has recommended several changes to the Model Legislation to ease its administration, clarify its provisions, and to ensure its requirements do not interfere with programs and policies that promote the production and use of recycled-content products and certain reusable containers. A toxics protocol should be developed by the Clearinghouse and approved by the Task Force before any additional substances are considered for regulation.

The Clearinghouse recommended several future actions based on these findings. Among those are the following:

- Periodically review the implementation and effectiveness of the law and provide a report to the Northeast Governors and state legislatures based on that review;

- Periodically review, develop, and recommend alternative legislative language and definitions for the Model for the purpose's of consistency and clarification of the law for companies that must comply with its provisions;
- Produce outreach and information packages for both industry and the states regarding the Toxics in Packaging Model Legislation and Clearinghouse;
- Periodically define and develop a program to determine the level of compliance with the Toxics in Packaging Legislation; and
- Produce a year-end activities report for member reference and information.

CHAPTER ONE: REDUCING PACKAGING WASTE VOLUME AND TOXICITY

This chapter focuses on the Northeastern states' response to the solid waste management challenge. CONEG created a unique forum—the Source Reduction Council (SRC)—targeted specifically to reducing the volume and toxicity of packaging in municipal solid wastes. The Model Toxics in Packaging Legislation (Appendix A) is one of its first initiatives and is the most widely adopted packaging restriction proposal at the state level. This section, therefore, describes the overall program of the SRC and its rationale for creation of the Model Toxics in Packaging Legislation. Also included is a brief summary of the Model's key provisions.

1.1 CONEG created the SRC to develop regionwide policies and programs aimed at reducing the volume and toxicity of packaging wastes.

Since the mid-1980's, the Northeast region has been a focal point for policy debates concerning the development of strategies to improve the management of solid wastes. The density of the region's population and limitations on land and other resources necessary to support traditional disposal methods led the Northeastern Governors to consider other options for managing the solid waste problem. In August 1988, CONEG established the SRC, a unique partnership of state officials, industry representatives, and nonprofit and environmental organizations, to develop policies and meaningful initiatives designed to reduce packaging wastes. In 1991, the SRC was restructured into the Source Reduction Task Force (SRTF).

The SRTF and its advisory group of industry and nonprofit members strive to achieve the following objectives:

- Encourage cooperative action among industry, nonprofit organizations, and state decision-makers to further reduce toxics in packaging and products;
- Place state decision-makers in direct contact with those whose actions affect packaging;
- Encourage leadership and coordination of the Northeastern states' solid waste policies and activities; and
- Encourage credible, voluntary, and market-based source reduction activities that reduce the amount of materials going to the waste stream while giving industry the flexibility to meet customer needs.

The SRTF has become an essential means by which state decision-makers obtain information about technical, economic, and market issues concerning packaging source reduction. Task Force programs and projects also provide CONEG states with the framework

for encouraging consistent, compatible source reduction policies and practices within the region. Programs and projects sponsored by the Task Force include the following:

- The "Preferred Packaging Guidelines" recommends, in descending order of priority, that companies (1) eliminate packaging whenever possible, or (2) minimize packaging, or (3) design packaging to be refillable or reusable, or (4) design packaging to contain recycled material or be recyclable.
- The CONEG Challenge encourages companies to voluntarily reduce their packaging voluntarily—using the "Preferred Packaging Guidelines"—and to inform public policymakers of the actions they take and the results of those actions.
- The CONEG Challenge Awards program acknowledges the source reduction efforts of companies that have taken the Challenge through a national competition and award program.
- The Model Packaging Standards Legislation provides interested states with a statutory means to bring about reductions in packaging. The legislation has been introduced in two states.
- The Model Toxics in Packaging Legislation requires the reduction of four metals in packaging to incidental levels. The Toxics in Packaging Clearinghouse (TPCH) assists the states and industry with administration of the laws.

1.2 The Toxics in Packaging Model Legislation responded to the Northeastern Governors' concerns about the potential adverse public health and environmental impacts resulting from the presence of heavy metals in the municipal solid waste stream.

Among the more notable achievements of the SRTF's predecessor, the SRC, is the Toxics in Packaging Model Legislation. The Council began developing the Model Toxics in Packaging Legislation in September 1989 after the Governors approved the initiative as well as the establishment of a more permanent forum focused on source reduction. In accepting the SRC's recommendations concerning a Toxics in Packaging legislative initiative, the Governors recognized the potential solid waste management difficulties presented by certain metals contained in discarded packaging. Although these elements generally present no health risks to consumers, potential difficulties may arise once the package enters the solid waste stream. Concerns about the potentially detrimental environmental and health effects from metals present in landfill leachate, incinerator ash, and stack emissions were underscored.

Although the Governors recognized and applauded industry's voluntary efforts to remove toxic constituents from packaging, they still agreed to support development of a policy mandating the removal from packaging of four metals (lead, mercury, cadmium, and hexavalent chromium) considered to pose potentially significant risks to the public's health and the environment when present in the municipal solid waste stream. An extensive body of information, studies, and reports from government (Federal, state, and international) and from independent sources (universities, medical schools, industry, and environmental groups) assisted the SRC and the Governors in determining a course of action.

On January 3, 1990, the Council presented to the Governors the Model Toxics in Packaging Legislation. To date, 18 states have enacted laws based on the Model: Connecticut, Florida, Georgia, Illinois, Iowa, Maine, Maryland, Minnesota, Missouri, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, Washington, and Wisconsin. In addition, Massachusetts and Michigan have also introduced bills based on the Model. The main features of the Model Legislation follow.

1.3 The Model Toxics in Packaging Legislation covers only packages, not products.

All packages—including their immediate subassemblies (called packaging components), coatings, inks, and labels, whether offered in a state for sale or promotional purposes—are covered by the Model Legislation. The Model's focus on packaging is consistent with the CONEG Governors' charge that the Council concentrate its source reduction activities on packaging, not products. The presence of toxics in products is a different issue and requires further study.

1.4 The Model Legislation mandates a phased elimination of four metals and prohibits further intentional use of those metals in product packaging.

The Model Toxics in Packaging Legislation has two objectives:

- Phase out the use and presence of the four regulated metals in packaging and packaging components sold and/or used in states where the law has passed; and
- Prohibit the *intentional* addition of any of the four regulated metals to packaging and packaging components.

To achieve those objectives, the Model Legislation mandates that package manufacturers and users (as defined) certify that the package and its components contain no more than the following total concentrations by weight of the four regulated metals by the deadlines established:

- 600 ppm (0.06%) two years after adoption;
- 250 ppm (0.025%) three years after adoption; and
- 100 ppm (0.01%) four years after adoption.

Note: The numerical standards (especially the 600 ppm level) were suggested by industries that advised CONEG and the Source Reduction Council on development of the Model Legislation. According to the National Association of Printing Ink Manufacturers (NAPIM), the 600 ppm standard was established by the Consumer Product Safety Commission (CPSC) in 1977 as a safe limit for lead content in paints and coatings used on toys, in books, and in other items intended for use by children. The Task Force understands CPSC based this standard on a recommendation of the National Academy of Sciences. The Academy conducted a careful evaluation of available scientific studies and concluded that a reasonable maximum safe level for lead contaminants is 600 ppm. "PPM" means parts per million, on a weight basis.

Industry representatives on the SRC and representatives from other industry groups generally agreed that 600 ppm had already been achieved for lead in many packaging applications. Based on known information about current industry practices, the Council agreed that adding the other three elements (cadmium, mercury, and hexavalent chromium) to the Model would not present an undue burden to affected industries. Because the limit of 600 ppm would apply to any particular component or piece of the package, the composite levels for all the regulated metals in the package would be less than 600 ppm.

The Model provides a two-year delay in the effective date of the 600 ppm standard to allow affected industries sufficient time to make the necessary adjustments in their packaging manufacturing processes and printing equipment and to their inventories to meet the law's requirements. After consulting with a range of industries, the Council agreed that the two-year delay provided a reasonable transition period.

The SRC established the out-year levels of 250 ppm and 100 ppm after consulting industry experts who indicated the technology would be available to enable the packaging industry to meet those levels within the time frames established in the Model Legislation.

The Council also recognized that complete elimination of the regulated metals from packaging (i.e., 0 ppm) would be impossible to accomplish. The raw materials used to make packaging contain background levels of these metals, which occur naturally or result from contamination by other sources of these metals in the environment. Thus, the Model Legislation provides the 100 ppm limit for the sum of the four regulated metals as an indicator that the package contains only trace amounts of these metals.

1.5 The authors of the Model Legislation incorporated exemptions for industries that could not comply with the standards without compromising essential functions or violating safety and health requirements.

While developing the Model Toxics in Packaging Legislation, the SRC acknowledged that provisions must be made for packaging manufacturers/users that could not achieve the required standards for the package without compromising essential functions (i.e., safety) or without incurring extreme burdens. Therefore, the Model Legislation exempts the following:

- Those packages or packaging components with a code indicating that the date of manufacture preceded the effective date of the law;
- Those packaging and packaging components to which regulated metals have been added to ensure the package complies with Federal health and safety requirements;
- Those packages and packaging components to which regulated metals have been added during its production for which there is no feasible, technical alternative; and
- Those packages and packaging components that use post-consumer recycled materials.

Exemptions are limited to two years, except for those applying to recycled content products, and are renewable for an additional two years. The Model Legislation recommends that the state agency review and approve exemption requests submitted by manufacturers. The state agency must determine whether the exemption is necessary to insure the package performs essential functions, such as protecting its contents or protecting the user from its contents. The law does not consider advertising an essential function of a package. Under the law, a manufacturer's request for an exemption to brighten the color of a product label would generally not qualify for an exemption. Brightening or intensifying a color on a package component is considered a marketing concern, not a health or safety issue.

The SRC included a six-year exemption for packages made from recycled materials because recycling programs are relatively immature and, therefore, do not have the technical capability to detect or screen post-consumer materials for the regulated metals. For example, paper mills may accept post-consumer paper for recycling printed with inks containing significant amounts of one or more of the regulated elements. The exemption allows recycled products to exceed the numeric standard(s) specified in the Model Legislation if the exceedance is due to the recycled content.

The recycling industry is also encouraged to develop detection techniques that would assist in eliminating the regulated metals from recycled materials. The Model Legislation does not require manufacturers to apply for the recycled products exemption. The original Model provided for the exemption to expire six years after its enactment.

The Model Legislation also exempts packaging requiring the use of one or more of these four regulated metals to protect that package's contents (i.e., use of lead shielding to protect photographic or X-ray film) or to protect the health and safety of shippers and handlers from the product (e.g., use of lead shielding to contain radioactive material intended for medical uses). Again, this exemption was not intended to be used for product promotion or marketing purposes.

1.6 The Model Toxics in Packaging Legislation provides for self-certification.

Manufacturers or suppliers of any package or packaging component must, within two years of adoption and thereafter, maintain a certificate stating that the package or packaging component complies with the statute or explains the basis for any exemption claimed. An authorized company official must sign the original certificate and new or amended certificates. The self-certification process was adopted to ease the administrative burden on the states presented by this Model Legislation. The law requires that the original certificate of compliance for each package must remain with the company that places the product in the package. Copies of the certificate are provided to product/package purchasers, distributors, and suppliers. This requirement does not apply to the retailer or to the individual consumer.

The state administrative agency may request the certificate of compliance from the certifying entity at any time. The Model Legislation authorizes members of the public to request copies of certificates from the certifying company. Written requests for certificates of compliance must also be submitted to the state agency. The company must respond within 60 days. Some states have modified this procedure in their statute or regulations.

Enforcement presented another set of challenges to the Council. Recognizing that the states have separate and distinct statutes and procedures governing enforcement, the Council agreed to allow each state to determine its own enforcement provisions.

1.7 The Model Legislation does not specify a test for the regulated metals in packaging, a matter which the Task Force left to the states.

The Council did not mandate the use of a specific test protocol for detecting the regulated metals in packaging. States may prefer their own testing method, or they may refer to the American Society for Testing and Materials (ASTM) which can provide information on accepted testing methods. In addition, the states are encouraged to also refer to Test Methods for Evaluating Solid Waste, SW-846, third edition, November 1986, by the U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response.

1.8 With implementation of the Toxics in Packaging laws, industries have raised issues concerning its requirements and administrative provisions.

The Model Toxics in Packaging Legislation has enjoyed almost unprecedented success in terms of its wide acceptance by individual states. As of August 1994, seventeen states have enacted the proposal into law. Soon after its first enactment, state agencies realized that, despite its self-certification provisions, the law presented certain administrative challenges. The SRTF has responded to issues and concerns raised by industry regarding the laws' requirements. These include the following:

- **Administrative burdens**, as a result of the laws' requirements that manufacturers, their suppliers, and customers complete and maintain records of certificates of compliance on all packages they make or use;
- **Economic burdens** on small businesses that are not staffed or equipped to meet the laws' administrative requirements;
- **Adverse market impact** on small businesses that could not develop or use alternative materials or processes without incurring a substantial economic burden;
- **Misinformation or lack of information** about the laws and their requirements, including differences between the states;
- **Differing views regarding the potential health and environmental risks** associated with the presence of the regulated metals in certain packaging materials; and
- **Confusion regarding the exemption application process.**

CONEG responded to some of these concerns by proposing to establish a forum that would assist states with processing exemption and clarification requests and responding to industry inquiries about the laws' requirements. This forum would also provide the means by which industry and the states could resolve their differences concerning the administration of the laws. In 1992, the Toxics in Packaging Clearinghouse (TPCH) was established.

CHAPTER TWO: TOXICS IN PACKAGING CLEARINGHOUSE

The CONEG Source Reduction Task Force (SRTF) created the Toxics in Packaging Clearinghouse (TPCH) in November 1992 to ease the administrative and logistical burdens associated with the Toxics in Packaging laws on state agencies and regulated companies. The program was also designed to provide information on the Model Legislation to interested states, public interest groups, and industry.

This chapter presents an overview of the program, describes its procedures, and suggests some areas where improvements are indicated.

2.1 The SRTF created the TPCH to provide administrative support to participating states and information on the Model Legislation to other states and interested and/or regulated companies.

The objectives of the TPCH are to:

- Encourage consistent implementation of individual state Toxics in Packaging laws through joint consideration of exemptions;
- Minimize the administrative burden on states and applicants; and
- Create a centralized location for the receipt and processing of written requests.

State members of the TPCH are Connecticut, Iowa, Maine, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. States that participate in the TPCH commit to observe the administrative procedures for applicant filings and to consult with other participating states in considering requests for exemptions. The Clearinghouse has no authority to make rulings on exemption requests; that authority lies solely with the individual states. Rather, the Clearinghouse serves as an advisory body to the states. Membership is open to any state that has enacted legislation based upon the CONEG Model. Membership does not require a state to accept the findings of the full Clearinghouse.

A technical group advises the TPCH in its reviews and consideration of exemption requests. The group is comprised of representatives from industry/corporate and public interest organizations (Appendix B) designated by the SRTF from its Advisory Group, Associate, and Subscriber members. It exists exclusively to participate in discussions, to exchange information and ideas, and to lend technical support to the TPCH.

2.2 The TPCCH coordinates state review and consideration of company requests for exemptions and clarification of the Model Legislation's provisions.

The TPCCH receives and processes requests for exemptions, information, and clarification of provisions or definitions concerning implementation of the Toxics in Packaging laws enacted by one or more of the member states. Product or packaging manufacturers seeking an exemption for their package from a Toxics in Packaging law enacted by a state which participates in the TPCCH or clarification of the law's provisions should send written requests to the Clearinghouse.

The TPCCH and its group of technical advisors participate in monthly conference calls (third Tuesday of every month, - 10:00 A.M.) and meet quarterly to discuss all written exemption and clarification requests. Requests submitted to the TPCCH are placed on the agenda for discussion, and applicants are notified of the meeting or conference call at which their request is to be considered. Applicants are encouraged to participate in either the conference calls or the quarterly meetings to explain their requests and to answer any pertinent questions.

These discussions may require additional information from the applicant. In cases involving highly technical questions and issues, the TPCCH may consult with technical experts before acting on a request. This additional information would be specific to the original request for exemption. When the state members of the Clearinghouse are unable to decide on an exemption request, the Clearinghouse must send an interim response to the applicant explaining the reason(s) for the indecision and requesting any additional information that the TPCCH states may need to reach a decision.

Once the TPCCH states reach a decision, each member state (where the applicant has operations) notifies the applicant of its action (which may or may not agree with the TPCCH decision) on the applicants' requests. Findings of the states on nonexemption actions (i.e., such as clarification or definition of the Toxics in Packaging law [s]) will be forwarded to the applicant by the TPCCH staff.

The TPCCH maintains complete records on all matters addressed. To date, the TPCCH has received and processed approximately 50 written requests from companies concerning clarifications and exemptions.

2.3 The TPCCH provides outreach, legislative briefings, and other informational services to states, industry groups, and other interested parties.

The TPCCH provides a number of valuable functions for its state participants and advisory group members. A primary service is information outreach on the Model Legislation and the Clearinghouse program. In support of these efforts, the TPCCH has developed two publications:

- An outreach brochure that summarizes the legislation and the TPOCH; and
- Toxics in Packaging Legislation: A Comparative Analysis*, which presents key provisions of state Toxics in Packaging laws and information concerning their implementation.

In addition, the TPOCH responds daily to inquiries concerning the Model Legislation and the Clearinghouse program from the public, other states, and industry. On the average, TPOCH staff handles from 5 to 10 inquiries per day.

Other services provided by the TPOCH include:

- Inviting states that have enacted legislation based on the Model to become supporting participants in Clearinghouse activities (membership fee required);
- Coordinating monthly conference calls and quarterly meetings between member states and technical advisory group members to discuss and address all requests;
- Tracking and informing state and technical group members of enforcement actions and exemptions granted within the states through informational briefs;
- Responding to requests for information contained in the Comparative Analysis or background information; and
- Providing written informational updates or progress reports on an as-needed basis to major trade organizations representing the packaging industry.

2.4 The TPOCH staff have implemented several procedural changes to facilitate the flow of information and to ease its administrative tasks.

Since its inception, TPOCH staff and state/advisory group participants have made several changes to the Clearinghouse procedures to improve its efficiency. For example, TPOCH staff have prepared and published brochures describing the Model Toxics in Packaging Legislation, and the Clearinghouse program. A Comparative Analysis of state Toxics in Packaging laws is also available. These publications have enabled TPOCH staff to improve the program's information and outreach services.

To expedite TPOCH review of exemption and clarification requests, staff screen information provided by applicants for completeness. The information screen is consistent

*This document is available from the CONEG Policy Research Center, Inc., 400 N. Capitol Street, N.W., Washington, D.C. 20001, (202) 624-8450.

with the information form already approved by the TPCB and provided to applicants. Requests are screened for the following:

General:

- Organization(s) seeking the exemption or clarification. If the organization is a trade association or a group of companies, a listing of all companies is required.
- Name and contact at each organization.
- State(s) from whom action is requested.
- Nature of request.

Exemption Specific:

- Specific exemption that is being requested.
- Supporting documentation for exemption.
- Type of packaging or packaging component.
- Regulated metals present and concentration levels.

These procedures required a change in the original procedures for reviewing such requests. Clearinghouse staff advise applicants to file requests 30 days prior to the meeting or conference call at which the requests will be discussed. Previously, applicants filed their requests 10 days prior to the conference call or meeting.

Participation in the monthly meetings or conference calls is especially important to ensure exemption and clarification requests are discussed and reviewed. States agree to participate regularly in conference calls and meetings as a condition of their membership in the Clearinghouse program. Advisory group members lend their technical expertise, which may help other TPCB participants understand the issue(s) and, therefore, render informed judgments.

2.5 The TPCB has created a pool of experts to assist with technical questions.

The TPCB has added a pool of scientists and engineering experts from academic and consulting organizations to assist members in their deliberations over complex technical issues, particularly those pertaining to exemption requests. These persons are recognized national experts in their respective technical fields and may be called upon as needed.

2.6 No changes in the Clearinghouse procedures are recommended at this time.

Evaluation of the TPOCH procedures indicates the program has achieved its objectives. For participating states, the Clearinghouse has eased their administration of the Toxics in Packaging laws, as evidenced by the flow of information to companies, the coordination and processing of exemption and clarification requests, and the number of inquiries that the program has handled. By providing information to states interested in the Model Toxics in Packaging Legislation, the TPOCH has encouraged consistency in the laws' provisions across the states and has helped to keep variations in provisions to a minimum.

CHAPTER THREE: CERTIFICATION AND ENFORCEMENT OF THE TOXICS IN PACKAGING LAW

In the four years since the CONEG Governors adopted the Model Toxics in Packaging Legislation, 18 states have accepted and enacted the proposal. Several of those states have developed and promulgated regulations to implement the law as required by their administrative procedures. Through these processes of legislative and regulatory scrutiny, issues have arisen concerning the Model Legislation's intent, administration, effectiveness, and impact. The purpose of this chapter is to examine and evaluate these issues and present an appropriate course of action.

3.1 The Model Toxics in Packaging Legislation's unusual approach to regulating packaging and packaging components has been widely accepted by the states, while variations in provisions have been minimal.

One measure of effectiveness against which any model bill should be judged is the extent to which governmental bodies accept the proposal. In January 1990, the CONEG Source Reduction Council (SRC) completed development of the Model Toxics in Packaging Legislation and recommended its adoption to the Governors. As of May 1994, eighteen states have enacted laws based upon the Model Legislation. Presently, two states are considering proposed legislation, also modeled after the CONEG proposal.

When states express interest in the Model Toxics Legislation, the Source Reduction Task Force and CONEG staff urge state legislators to minimize substantive differences in their proposals. Such variations complicate administration and compliance procedures. Although most laws follow the original Model closely, some variations have occurred.

Appendix E presents a comparative analysis of significant provisions of each state Toxics in Packaging law. The chart does not include every distinction and should not be considered the definitive interpretation of each law or bill. For complete information, each statute and pending bill should be reviewed.

Iowa, Maine, Florida, and New Hampshire have developed regulations to implement their laws. These regulations apply to manufacturers, distributors, and suppliers of packaging and packaging components sold or offered for sale within the states. New regulations required to implement the New Jersey Toxics in Packaging Reduction Act, NJSA 13:1E-99.44 have not been officially proposed to date. Draft regulations have been developed and are being reviewed by staff in the Division of Solid Waste Management. Appendix F provides the full text of proposed or promulgated regulations from each state.

3.2 The certificate of compliance process has enabled states and regulated companies to minimize the administrative burdens associated with the Model Toxics in Packaging Legislation.

The Model Toxics in Packaging Legislation requires manufacturers, suppliers, and distributors of packaging and packaging components (whichever entity has operating units within a particular state where the law is in effect) to comply with the standards by the effective date. The affected company records its compliance by completing a certificate of compliance for each type of package it makes or uses. The company must also keep on file certificates for a new or modified package.

The Model Legislation requires, as soon as feasible (but not later than two years after enactment of the law), a certificate stating that a package or packaging component is in compliance with the requirements of the law. The certificate accompanying a product must be furnished by its manufacturer or supplier to the product purchaser. Those manufacturers that receive an exemption must include in the certificate an explanation of the specific basis on which the exemption is claimed. The certificate of compliance must be signed by an authorized official of the manufacturing or supplying company. The package manufacturer/supplier retains the certificate of compliance for as long as the package or packaging component is in use.

Companies furnish certificates of compliance, or copies, to the state administrative agency upon request and to members of the public. Requests for certificates from the public must be as follows:

- In written form, with a copy provided to the state administrative agency;
- Specific regarding the package or packaging component information requested; and
- Answered by the manufacturer or supplier within sixty (60) days.

If the manufacturer or supplier of the package or packaging component creates a new package or packaging component, the manufacturer or supplier shall provide an amended or new certificate of compliance for a new package or packaging component.

Appendix C provides a sample certificate of compliance.

3.3 The Model Toxics in Packaging Legislation leaves enforcement procedures to the states.

Enforcement procedures and policies tend to vary between the states, particularly with respect to civil matters. The authors of the Model Toxics in Packaging Legislation

recommended the states individually determine how to enforce their individual Toxics in Packaging laws.

Authors of the Model Legislation largely relied on the certificates of compliance to drive industry compliance. In effect, the process by which manufacturers, suppliers, and distributors request/provide copies of certificates on packages for their respective files has created a ripple effect of compliance and awareness of the law among regulated industries. A statement from the steel industry concerning the impact of the Toxics in Packaging Legislation on its processes illustrates this point:

Passage of the Toxics in Packaging laws has prompted the steel industry to pay closer attention to the issue of heavy metals. It has become the top priority of the industry to assure that such metals remain outside of the manufacturing process. The industry has also stepped up efforts with its **suppliers** to focus their attention on the need to maintain pure raw materials for the manufacture of steel. Finally, the industry continues to improve its technology to remove any trace amounts of the regulated metals that might occur naturally but still fall far below the thresholds required by the law. (Steel Recycling Institute, June 1994)

States have also adopted varying enforcement policies concerning the Toxics in Packaging laws. While most states' laws impose penalties for noncompliance, most states have not initiated forward enforcement actions. Some states have just enacted the legislation, others are just completing their implementing regulations, and others are educating the regulated entities through business, trade organizations, and other similar interest groups. The SRTF and the TPCCH recognize, however, that enforcement of the Toxics in Packaging laws will help ensure consistent compliance among all affected industries, thereby preventing business disruptions. States are considering strategies for improving or initiating enforcement actions. The Clearinghouse also provides information, and serves as a forum for information exchange, on enforcement issues. Appendix D provides a summary of state compliance actions on the Toxics in Packaging laws.

3.4 The Model Toxics in Packaging Legislation leaves the selection of sampling and testing protocols to the individual states.

Sampling and analytical testing protocols were not initially included in the Model Legislation and have not been developed by CONEG because they were considered to be an individual state regulatory or guidance issue. *Regulated industries should conduct a thorough elemental quantitative analysis of their packaging for the four regulated metals to ensure the packaging complies with the Toxics in Packaging laws.* Businesses may use whatever elemental analytical methodology is most appropriate and effective for their packaging. When states have requested information regarding available testing methodologies, the TPCCH has referred them to Test Methods for Evaluating Solid Waste, SW-846, third Edition, November 1986 by the U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response and to the American Society for Testing of Materials (ASTM), recognized for its scientific and analytical credibility on testing procedures.

EPA's SW-846 methodology (see Appendix G) includes standard testing methods to determine the leachability of chemical constituents in liquid, semi-solid, and solid substances. The methods presented are specific steps to be taken in conducting an analysis and include sample handling and preservation, sample digestion or preparation, and sample analysis for specific metal components. From these methods, an analytical protocol is developed that is appropriate for the sample to be analyzed. The description of these procedures provided in Appendix G presents the options available in general terms, background information on the various analytical techniques, and considerations involved with the selection of a total analysis protocol.

This methodology has not been found to be effective for the detection of hexavalent chromium. Another limitation of the EPA SW-846 methodology is that it may not be a satisfactory elemental analysis for all package materials. Materials—glass, steel, and plastics, for example—cannot be accurately evaluated for their total concentration of regulated metals in the package or packaging component according to the EPA SW-846 methodology because the regulated metals may not be totally dissolved during the acid digestion procedure. The SW-846 methodology, however, has demonstrated its usefulness in determining the concentrations of most soluble metals in leachate that might come from landfills.

Companies report using the following methods to detect the regulated metals in their packaging:

- EPA Method 1311, Toxicity Characteristic Leaching Procedure (TCLP);
- ASTM E 1251-88: Standard Test Method for Optical Emission Spectrometric Analysis of Aluminum and Aluminum Alloys by the Argon Atmosphere, Point-to-Plane, Unipolar Self-Initiated Capacitor Discharge;
- Test methods prescribed in EPA SW 846 (7130 and 7131 for cadmium); 7190, 7195, 7196, and 7197 for hexavalent chromium; 7420 and 7421 for lead; and 7470 and 7471 for mercury.

Many companies have developed their own testing procedures to meet their specific needs for in-house quality assurance or quality control. These procedures are developed to be reasonably accurate, expeditious, economical, and tailored to meet specific circumstances of a company's manufacturing operations. They are also generally adapted from ASTM or EPA published methodologies. For example, the steel industry has adopted a methodology to determine the concentration of lead in tinplate coatings:

Recently, the American Iron and Steel Institute (AISI), through its domestic and Canadian members, developed an accurate method by which to determine the amount of lead present in tinplated materials. This method involves the following steps:

1. Removal of the pure tin alloy layer from the steel substrate via chemical digestion

with hydrochloric acid. Platinum catalysts are used so as to enhance the digestion without excessive steel dissolution. A minimum sample size is necessary to ensure accuracy. Further, because only one surface is tested, the opposite surface must be carefully masked to prevent contact with the acid solution.

2. The solution obtained from the previous step is then subjected to the required dilution and analyzed using atomic absorption (AA) spectroscopy.
3. An appropriate calculation is made involving the AA result and the original sample size to yield a concentration result in terms of the weights percentage of lead in the tinplate coating.
4. Because the amount of lead in tinplate is very small, care must be taken to ensure that all reagents and glassware used throughout the analysis are clean and lead-free. (Steel Recycling Institute, June 1994).

Other companies may use less sophisticated testing equipment, less qualified personnel to perform the tests, and/or not analyze for each of the four regulated metals. While such procedures may be acceptable and effective for manufacturing operations, these tests may not be satisfactory to the state regulators for determining the concentration of the four regulated metals. A difficulty arises in that small companies incur significant costs if they upgrade their laboratory analytical testing equipment, personnel, and/or procedures to use standard EPA or ASTM methods for the four regulated metals.

3.5 The TPCB will obtain information from ASTM, EPA, and material trade associations about additional sampling and testing methodologies.

There is a need for a satisfactory analytical testing methodology for hexavalent chromium. If an acceptable methodology is not determined, a total chromium analysis might be substituted, although this would represent a worse-case situation. For example, until recently, when sampling groundwater wells at solid or hazardous waste landfills, the conservative environmental practice assumed that all chromium was in the hexavalent form. For compliance purposes, if the hexavalent chromium level is determined by a total chromium analysis and the sum of the four regulated metals exceeds the standard, it would then be appropriate to reconsider the total chromium value. In such cases, the total hexavalent chromium value could be determined by nonanalytical (scientific calculation) testing methods. A scientific evaluation of the raw materials, manufacturing process, and other relevant factors could be used to calculate an expected hexavalent chromium concentration level.

There is also a need for a standard method of sampling for a package component when it becomes part of an assembled package. For example, while it is relatively straightforward to sample and analyze the regulated metals in a liquid or semi-solid component such as a printing ink, the matter becomes more complex after the ink is applied to a cap, container, or label and has dried or cured.

There is a need for a standard method of analytical testing for packaging components where the EPA SW-846 methodology is not satisfactory for the elemental analysis of packaging component materials.

It is recommended that the TPCCH obtain information from ASTM, EPA, and/or material trade associations regarding the relative merits of alternative methodologies, particularly with respect to hexavalent chromium. A universal test method for all packaging materials may not exist, and it may be necessary to tailor individual methodologies to the type of materials being tested.

If TPCCH efforts to find reasonable, accurate procedures for detecting hexavalent chromium are unsuccessful, the TPCCH may consider the environmentally conservative approach of testing for total chromium, assuming all chromium is hexavalent chromium, unless refuted by scientific calculation.

If additional methodologies become available for testing packaging for the regulated metals, the TPCCH will make available to CONEG state officials and other interested parties information regarding these methodologies. Each state would then have the option of adopting these methodologies in statute, in regulation, or as guidance criteria.

3.6 Based on available data, the impact of Toxics in Packaging laws on decreasing the regulated metal content of the municipal solid waste (MSW) stream is technically feasible, but extremely difficult to quantify.

Regulated metals in the MSW stream are from a number of sources. Consequently, determining an accurate measure of the specific impact of the Toxics in Packaging laws on the concentration of the regulated metals in the MSW stream would be very difficult to accomplish. Samples of the waste stream would have to be extracted and their regulated metals concentrations compared prior to, and at various points after, enactment of the law. Points of analysis should include a mass balance approach of the solid waste to be incinerated, incinerator ash, landfilled solid waste, the landfill leachate, and sludge. Furthermore, data analysis would have to control for other nonpackaging sources of the regulated metals based on estimates of their presence in the waste stream, in incinerator ash, and in wastes being landfilled. This is an extremely complex and difficult analysis, and because of the variable nature of waste streams, there is no assurance that the results would be accurate. Nonpackaging sources of these metals tend to be far in excess of the amounts found in packaging.

The New Jersey Department of Environmental Protection and Energy (NJDEPE) has proposed a method for evaluating the effects of source reduction/source separation for regulated metals contained in discarded products and packaging, which is described in detail in Appendix H. The Minnesota Pollution Control Agency and the New Hampshire Department of Environmental Services have contributed data for evaluation by this proposed method. The NJDEPE has reviewed and summarized the results of the sampling and analysis

of municipal solid waste incinerator (MSWI) ash from facilities in New Jersey, Minnesota, and New Hampshire. Total metal concentration levels for three metals (mercury, lead, and cadmium) were measured in the MSWI bottom and combined residual ash. A baseline for these metals in solid waste can be established. The concentration of regulated metals in MSW can be estimated from the results of the total metals concentration in the residual ash. The NJDEPE is also developing a method to determine the contribution of packaging to the total MSW regulated metals levels. This method would need to be established before an estimated measurement of the effects and impacts of packaging changes from the Toxics in Packaging laws could be determined.

The NJDEPE also measured and compared the concentration levels for three of the regulated metals against their concentrations in other mediums (groundwater, surface water, safe drinking water, sludge, and soils). Although the NJDEPE believes the Toxics in Packaging law has helped improve the MSW stream (when implemented with other source reduction and source separation programs for the regulated metals), the impact has not been quantified at this time. The data provided analyzes the metal concentrations in samples taken at one point in time. To determine the impact of the Toxics in Packaging laws, subsequent samples must be taken and analyzed.

3.7 Anecdotal evidence of industry actions to reduce the regulated metals from packaging indicate the positive effect of the Toxics in Packaging laws.

Although the Task Force has not been able to quantify the effects of the Toxics in Packaging laws on the regulated metals content of the MSW stream, industry has provided information through the annual CONEG Challenge program report to the Governors illustrating manufacturers' efforts to reduce or eliminate the presence of these four metals in packaging and packaging components. While most companies reported efforts to eliminate pollutants or environmentally harmful substances from their packaging and packaging components, companies that specifically mentioned efforts to ensure compliance with the Model Toxics in Packaging Legislation are noted below:

- *Baxter Healthcare Corporation* report's as one of its goals that "no heavy metals are intentionally added to inks, dyes, adhesives, or other packaging components."
- *Bristol-Myers Squibb* reports using only "packaging materials and printing inks that are free of heavy metals."
- *Clorox* "has placed itself in full compliance with CONEG's Model Toxics Legislation by eliminating all heavy metals from its inks and pigments for packaging."

- *Digital Corporation's* statement of source reduction goals includes reducing "heavy metal content in packaging to a minimum, less than 100 parts per million."
- *Eastman Kodak Company's* Corporate Packaging Environmental Committee is charged to "address the toxics in packaging issue to ensure compliance with the CONEG model legislation," among other responsibilities.
- *The Gillette Company* eliminated heavy metals in inks, dyes, and colorants from all packaging materials in North America by 1992 and in Europe by 1993.
- *International Business Machines* "certifies heavy metals reductions" in its packaging as one of its worldwide packaging initiatives.
- *Johnson & Johnson* removed "heavy metal printing inks . . . from all packaging prior to 1991."
- *Lever Brothers Company* reports "by working with its printed material vendors, Lever was one of the first companies to voluntarily reduce heavy metal content for inks used in its packages to meet CONEG requirements."
- *Millipore Corporation* reports "the packaging suppliers' certification of heavy metal reductions in packaging, per the CONEG model, was initiated in 1992, with a 70 percent compliance response from suppliers in that year. The remaining suppliers will provide the same information when the verification is complete."
- *Mobil Chemical Company* "will continue to assure compliance with the CONEG Toxics in Packaging Model Legislation for heavy metals in inks, additives, and other packaging components."
- *Scott Paper Company* "will not allow the intentional inclusion of heavy metals in its packaging, and will meet or be lower than the most stringent requirements for total heavy metal content in each of its packages, as defined in legislation developed by CONEG's Source Reduction Council."

More detailed reports from these and other companies that have taken the CONEG Challenge are included in *The CONEG Challenge. Voluntary Packaging Reductions by Industry* (November 1993)*.

*A copy of the report is available through the CONEG Policy Research Center, Inc., 400 N. Capitol Street, N.W., Washington, D.C. 20001 (202) 624-8450.

CHAPTER FOUR: IMPROVING THE MODEL TOXICS IN PACKAGING LEGISLATION

After reviewing the provisions of the Model Toxics in Packaging Legislation, the Toxics in Packaging Clearinghouse (TPCH) has identified several areas requiring clarification and modification. This chapter presents those findings and recommendations and the rationale for suggested actions.

4.1 The TPCH recommends extension of the recycling exemption.

Recycling programs should not be subjected to regulations that would hinder their development or discourage new programs. The TPCH recommends that the recycling exemption be extended to January 1, 2000. The following legislative change is recommended:*

Section 5. Exemptions

*c. packages and packaging components that would not exceed the maximum contaminant levels set forth in subsection c of Section 4 of this Act but for the addition of recycled materials; and provided that the exemption for this subparagraph shall expire ~~six (6) years after the adoption of this act~~ **January 1, 2000; or***

For future consideration of continuing the recycling exemption beyond January 1, 2000 the following change is also recommended:

Section 8. State Review

[The state administrative agency] shall, in consultation with the Source Reduction Task Force of CONEG, review the effectiveness of this Act no later than forty-two (42) months after its adoption and shall provide a report based upon that review to the Governor and Legislature. The report may contain recommendations to add other toxic substances contained in packaging to the list set forth in this Act in order to further reduce the toxicity of packaging waste, ~~and shall contain a recommendation whether to continue the recycling exemption as it is provided for in Subsection c of Section 5 of this act,~~ and a description of the nature of the substitutes used in lieu of lead, mercury, cadmium, and hexavalent chromium.

[The State administrative agency] shall, in consultation with the Source Reduction Task Force of CONEG, review the extension of the recycling exemption as it is provided for in subsection c of Section 5 of this Act. This review shall commence

*Bold type represents new language; struck-out type represents deleted former language.

no later than January 1, 1997. A report based upon that review shall be provided to the Governor and Legislature by January 1, 1999.

4.2 The Model Legislation provided an exemption for packaging containing recycled material to avoid impeding municipal recycling programs.

When the Model Toxics in Packaging Legislation was drafted by the CONEG Source Reduction Task Force (SRTF) in 1989, an exemption was provided for packages and packaging components made from recycled materials. The relative immaturity of state and local recycling programs and the uncertainty of their future economic success were reasons for this exemption. In addition, unintentional processing of some of the regulated elements could occur in recycling systems (see Toxics in Packaging Legislation: A Comparative Analysis, page 2, Revised Edition, August 1993). Because the CONEG Governors were committed to recycling programs, it was the Task Force's intent that this legislation *not* hinder recycling programs. At the same time, however, the Source Reduction Council wanted to encourage the recycling industry to develop techniques to eliminate these elements from packaging during the first six years the Model was in effect. The recycling exemption was to expire six years after its enactment.

4.3 The TPCCH acknowledges that most recycling programs are still developing and should not be hindered by additional regulations.

Several CONEG states and industry advisors have expressed their concerns regarding the expiration of the recycling exemption. Although recycling programs and market development programs have progressed since 1989, the TPCCH recognizes these programs are still developing and may take longer to stabilize—especially from an economic and marketing standpoint. Recycling businesses are presented a number of challenges, including the following:

- Type of materials collected and/or their availability;
- Quality of collected materials and their proximity to markets;
- Capacity for use in new products;
- Variability of incoming material and degree of sorting or testing required to establish consistent composition;
- The state of the economy over the past several years, with depressed production and the consequent lack of demand for raw materials, including recycled materials;
- Limited availability of state and local government resources for the establishment of recycling programs;

- Willingness of the private sector to make necessary capital investments;
- Level of consumer participation; and
- Need for consumer education programs.

4.4 The TPCCH recognizes that the testing of post-consumer recycled materials for the regulated metals prior to recycling is not economical or practical.

Currently, most recycling systems are not "closed-loop" (i.e., packaging recycled into packaging). Most recycling is "open-loop" (i.e., materials collected from a variety of sources, including products used in making packaging). For example, the steel industry uses a variety of scrap steel from sources such as automobiles, appliances, construction material, and cans as well as "in-house" scrap. These materials are mixed together to manufacture new steel which, in turn, is made into automobiles, appliances, construction materials, and cans. Other substance groups use recycled material in a similar fashion.

This open-loop recycling process is economically advantageous; it allows industry to use a variety of source material—not just packaging. If the system were closed-loop, concerns about toxicity would not exist because the feedstock materials (collected packaging) would already meet legislative requirements. However, this is not the case. It is neither technically feasible nor economically practical to require a guarantee that all nonpackaging recycled material entering the process be completely free of the regulated metals.

An example taken from the steel recycling industry illustrates this point. Small amounts of the regulated metals may be present in the feedstocks from old automobiles or appliances (not cans). Even though the metals are totally eliminated during the steel manufacturing process (or are under the threshold limits), the final package (cans) could be considered out of compliance because the metals had been intentionally introduced into the process earlier. Although it is not economically feasible to test each item of recovered nonpackaging material prior to its recycling, it is possible and practical to test a single homogeneous batch of steel that results when the individual, heterogeneous recycled feedstocks are compiled, mixed, and melted.

The Model Legislation implies the intent to expand the use of post-consumer material in packaging and packaging components. The Model does not distinguish between post-consumer recycled materials that are packaging or packaging components and other post-consumer materials defined as products. Restrictions on the levels of the regulated metals do not exist for these products, yet they are very much in demand for recycling.

All collected material, including pre-consumer wastes and post-industrial scrap, should be considered recyclable feedstock. Pre-consumer materials produced from the manufacture of products that are not packages are often recycled into material that may become packaging. Again, it must be emphasized that the four metals are regulated in packaging and packaging

components only, not products. Recyclers do not control the addition of metals from recycled products.

Final packaging manufactured from recycled material should not be allowed to exceed the 100 ppm limit. This level can be achieved by refining the materials or adding virgin or noncontaminated materials. As long as the concentration of the four regulated metals in the finished packaging or packaging component meets or is below the threshold of 100 ppm, the goal of encouraging recycling, using recycled materials from a variety of sources, should be met in perpetuity.

4.5 The TPCCH recommends the following changes to the exemptions to clarify legislative intent and eliminate confusion.

Section 5 of the Model Legislation lists four exemptions. However, the exemptions are presented in three sections. The second (b.) combines the "comply with health and safety requirements" and the "no feasible technical alternatives" exemptions. These exemptions should be separated to reduce confusion and further clarify the Legislation.

Concerns have been raised that some packages cannot comply with the law either because feasible substitute materials are unavailable or compliance would conflict with Federal health and safety requirements. In some cases, this dilemma is due to the intrinsic properties of the regulated elements for which there are clearly no documented substitutes (i.e., lead shielding for radioactive isotopes). Therefore, the "renewed at two-year intervals" language has been added in response to these circumstances. This is not merely an extension of existing exemptions, but is applied only in unique circumstances. The phrase "up to two years" is included to provide for a limited exemption where a petitioner can come into compliance in a shorter period of time. The TPCCH, therefore, recommends the following changes in the Model's legislative language:

Section 5. Exemptions

All packages and packaging components shall be subject to this Act except the following:

b. those packages or packaging components to which lead, cadmium, mercury or hexavalent chromium have been added in the manufacturing, forming, printing or distribution process in order to comply with health or safety requirements of Federal law ~~or for which there is no feasible alternative~~, provided that the manufacturer of a package or packaging component must petition the [State administrative agency] for any exemption from the provisions of this subsection for a particular package or packaging component based upon either criterion; and provided further that the [State administrative agency] may grant ~~a two-year exemption~~ an exemption for up to two years if warranted by the circumstances; and provided further that such an exemption may, upon reapplication for exemption and meeting either the criteria of this

~~subsection, be renewed for at two-years intervals; For purposes of this subsection, a use for which there is no feasible alternative is one in which the regulated substance is essential to the protection, safe handling, or function of the package's contents; or~~

d. those packages or packaging components to which lead, cadmium, mercury or hexavalent chromium have been added in the manufacturing, forming, printing or distribution process for which there is no feasible alternative, provided that the manufacturer of a package or packaging component must petition the [State administrative agency] for any exemption from the provisions of this subsection for a particular package or packaging component based upon the criterion; and provided further that the [State administrative agency] may grant an exemption for up to two years if warranted by the circumstances; and provided further that such an exemption may, upon reapplication for exemption and meeting the criterion of this subsection, be renewed at two year intervals. For purposes of this subsection, a use for which there is no feasible alternative is one in which the regulated substance is essential to the protection, safe handling, or function of the package's contents; or

4.6 The TPCCH recommends the Model Toxics in Packaging Legislation include a definition of "intentional introduction" of the four regulated metals (to clarify legislative intent).

The current Model Legislation requires that:

As soon as feasible but not later than two years after the adoption of this Act, no product shall be offered for sale or for promotional purposes by its manufacturer or distributor in the state of _____ in a package which includes, in the package itself or in any of its packaging components, inks, dyes, pigments, adhesives, stabilizers or any other additives, any lead, cadmium, mercury, or hexavalent chromium which has been **intentionally introduced** as an element during manufacturing or distribution as opposed to the incidental presence of any of these elements.

The law does not define "intentional introduction," a deficiency noted by companies that must comply with the law. Because the law does not include this definition, companies are confused about legislative intent. The definition presented below responds to this problem by eliminating any confusion regarding "intentional introduction" versus "incidental presence."

Originally, the Model Legislation established a standard allowing for the presence of trace amounts of the regulated metals in finished packaging. Trace levels are indicated by the sum of the concentration of the four regulated metals, not to exceed 100 ppm. This determination reflects consideration of health and product performance requirements. Additionally, there is usually no reason to deliberately introduce trace amounts of these materials deliberately into packaging at a level below 100 ppm as this would generally yield insignificant benefits.

Finally, the Model Legislation, as currently implemented, stifles the application of sensitive analytical techniques. The suggested definition of incidental presence addresses that issue by:

- Reducing the logistical problem of state regulators determining minimum analytical detection limits; and
- Responding to manufacturers' reluctance to conduct sampling and analytical testing at very low, sensitive detection limits.

To encourage recycling, the revised Model Legislation considers reclaimed post-consumer materials to be raw materials or feedstocks. Furthermore, the presence of the four regulated metals below 100 ppm should not be considered intentional introduction. The following definitions recommended for addition to the Model Toxics in Packaging Legislation are:

Section 3: Definitions.

"Intentional introduction" means: The act of deliberately utilizing a regulated metal in the formulation of a package or packaging component where its continued presence is desired in the final package or packaging component to provide a specific characteristic, appearance, or quality.

The use of a regulated metal as a processing agent or intermediate to impart certain chemical or physical changes during manufacturing, whereupon the incidental retention of a residue of said metal in the final package or packaging component is neither desired nor deliberate, is not considered intentional introduction for the purposes of this Act where said final package or packaging component is in compliance with subsection c of Section 4 of this Act.

The use of recycled materials as feedstock for the manufacture of new packaging materials, where some portion of the recycled materials may contain amounts of the regulated metals, is not considered intentional introduction for the purposes of this Act where the new package or packaging component is in compliance with subsection c of Section 4 of this Act.

"Incidental Presence" means: The presence of a regulated metal as an unintended or undesired ingredient of a package or packaging component.

4.7 The TPCCH recommends an additional exemption from the Model Toxics in Packaging Legislation for reusable packaging.

The CONEG SRTF has supported reuse and encouraged greater reuse of packaging, as evidenced in its "Preferred Packaging Guidelines." Just as the exemption for packages and

packaging components made in whole or in part from recycled material reduces materials going to landfills, so does reuse of packaging. The Model Legislation, however, provides no exemption for packages or packaging components that are reused.

There are two narrow circumstances under which packages or packaging components could be reasonably considered for a finite exemption. One circumstance concerns packages that are already subject to other regulatory constraints and controls. The second circumstance concerns those packages managed under a tightly controlled reuse plan. The following rationale provides a more detailed explanation of the two circumstances:

First circumstance:

An exemption from the Toxics in Packaging Legislation for reusable packages or packaging components that are currently regulated from their manufacture to the point of disposal or specifically required by Federal or state law for a regulated product is appropriate to prevent conflicts between laws and the imposition of additional regulatory burdens on industry. Also, by limiting this exemption to packaging or packaging components that are regulated for management and disposal as hazardous or radioactive wastes by manufacturers, concerns regarding the effects of their disposal in commercial incinerators or landfills may be reduced.

Manufacturers would, therefore, have to meet the following criteria for their packages to qualify for such an exemption:

- The package or packaging component and/or the product conveyed is currently regulated by Federal and/or state regulations due to health or safety concerns;
- The transportation of the package and/or product conveyed is regulated; and
- The disposal of the package and/or package component is regulated as hazardous waste under the Resource Conservation and Recovery Act (RCRA) requirements or radioactive waste under applicable Federal and/or state requirements.

The proposed exemption would have a limited, narrow application. Containers used to transport radioactive medicine and compressed gas cylinders equipped with fusible plugs for safety relief are two typical examples of packages that would be exempted under this provision.

Second circumstance:

An exemption for reusable packages is appropriate when a package or product

manufacturer or its designated representative develops and implements a tightly controlled reuse plan for the package or packaging component (hereinafter referred to as "reusable entity") containing the regulated metals. Under this provision, the manufacturer would petition the state administrative agency that would work with the TPCB in considering the exemption request. Packages that are no longer reusable should be recycled for their material content. Because the original manufacturer or the designated representative recycles the package, the entire process is more manageable and the manufacturer has an incentive to design packages for maximum recyclability. Packages and packaging components (containing the regulated metals) that cannot be reused or recycled, however, must be managed and disposed of as manufacturing wastes under RCRA or other appropriate laws or regulations to prevent their entrance into commercial or municipal incineration or landfill facilities. The petitioner must also demonstrate satisfactorily that such an exemption would produce an overall environmental benefit.

The following elements of a reuse plan must be achieved for a manufacturer to be granted an exemption:

- A means for identifying in a permanent and visible manner those reusable entities containing regulated metals for which an exemption is sought;
- A method of regulatory and financial accountability so that a specific percentage of such reusable entities manufactured and distributed to other persons are not discarded by those persons but are returned to the manufacturer or his designee after use;
- A system of inventory and records maintenance for tracking all reusable entities placed in, and taken out of, service;
- A means of transforming returned, reusable containers—when they have reached the end of their useful life—into recycled materials for manufacturing, or into manufacturing waste that is managed according to existing applicable state and Federal laws or regulations governing such materials or waste; and
- A system of annually updating the appropriate administrative agency regarding changes in the system and an updated list of designees.

The exemption petitions would be processed through the TPCB to assure consistency of implementation and to relieve the states of the administrative burden. It is expected that this exemption would apply only in very limited cases, such as to refillable containers that use a permanent label or to reusable/returnable weatherproof pallets used for transporting goods. To allow for a reasonable degree of accidental breakage or loss of these containers during transportation and use, the CONEG TPCB believes the manufacturer's plan must ensure that at least 80 percent of the packages and packaging components placed in service under this

exemption would be used at least five times (reused four times after the original use). The actual allowable percentage would be established by the state administrative agency.

The TPOCH recommends that each of the above exemptions expire on January 1, 2000 (coincides with the proposed expiration date for the recycled content exemption). The recommended changes to the Model Toxics in Packaging Legislation are presented below:

Section 5. Exemptions

- e. packages and packaging components that are reused but exceed contaminant levels set forth in subsection c of Section 4 of this Act, provided that the product being conveyed by such package and/or the package/packaging or packaging component is (are) regulated under Federal and/or State health or safety requirements; and provided that transportation of such packaged product is regulated under Federal and/or State transportation requirements, and provided that disposal of such package is performed according to Federal and/or State radioactive or hazardous waste disposal requirements, and provided that an exemption under this subparagraph shall expire on January 1, 2000; or*
- f. packages and packaging components having a controlled distribution and reuse (hereinafter referred to as "reusable entities") that exceed the contaminant levels set forth in subsection c of Section 4 of this Act, provided that the manufacturers or distributors of such packages or packaging components must petition the (State administrative agency) for exemption and receive approval from the (State administrative agency, working with the CONEG Toxics in Packaging Clearinghouse) according to standards in subsection f.1 below set by such agency and based upon satisfactory demonstrations that the environmental benefit of the controlled distribution and reuse is significantly greater as compared to the same package manufactured in compliance with the contaminant levels set forth in subsection c of Section 4; and provided that an exemption under this subparagraph shall expire on January 1, 2000.*

1. Standards

A plan, to be proposed by the manufacturer seeking the exemption or his designee, shall include each of the following elements:

- i. a means of identifying in a permanent and visible manner those reusable entities containing regulated metals for which an exemption is sought;*
- ii. a method of regulatory and financial accountability so that a specified percentage of such reusable entities manufactured and distributed to other persons are not discarded by those persons after use but are returned to the manufacturer or his designee;*

iii. a system of inventory and record maintenance to account for the reusable entities placed in, and removed from, service;

iv. a means of transforming returned entities, that are no longer reusable, into recycled materials for manufacturing or into manufacturing wastes which are subject to existing Federal and/or State laws or regulations governing such manufacturing wastes to ensure that these wastes do not enter the commercial or municipal waste stream; and

v. a system of annually reporting to the (appropriate State administrative agency) changes to the system and changes in designees.

4.8 The TPCCH recommends additional changes to certain definitions to clarify legislative intent regarding affected groups.

Currently, the Model Toxics in Packaging Legislation affects manufacturers, distributors, and suppliers of packaging, but the Legislation does not define manufacturing, manufacturers, distribution, or suppliers. The TPCCH suggests adding the following definitions to clarify intent and eliminate any resulting confusion.

Section 3. Definitions

"Manufacturing" means: Physical or chemical modification of (a) material(s) to produce packaging or packaging components.

"Distribution" means: The practice of taking title to (a) package(s) or packaging component(s) for promotional purposes or resale. Persons involved solely in delivering (a) package(s) or packaging component(s) on behalf of third parties are not considered distributors.

"Manufacturer" means: Any person, firm, association, partnership, or corporation producing (a) package(s) or packaging component(s) as defined in this Act.

"Supplier" means: Any person, firm, association, partnership, or corporation who sells, offers for sale, or offers for promotional purposes packages or packaging components which shall be used by any other person, firm, association, partnership, or corporation to package (a) product(s).

4.9 The TPCCH recommends adding a "severability and construction" clause.

The TPCCH recommends adding this clause to the Model Legislation in the event any portion of a law is declared invalid. In such a case, this clause allows the remaining valid sections of the law to stand intact.

Section 11. Severability and Construction

The provisions of this Act shall be severable, and if any court declares any phrase, clause, sentence, or provision of this Act to be invalid, or its applicability to any government, agency, person or circumstance is declared invalid, the remainder of the Act and its relevant applicability shall not be affected. The provisions of this Act shall be liberally construed to give effect to the purposes thereof.

CHAPTER FIVE: REGULATING ADDITIONAL TOXICS IN PACKAGING

In 1993, the Toxics in Packaging Clearinghouse (TPCH) considered extending the Model Toxics in Packaging Legislation to other compounds used in making packaging. To help guide its consideration of this proposal, the Clearinghouse began discussions on the development of a toxicity protocol for approval by the Source Reduction Task Force (SRTF). The Clearinghouse will continue its deliberations on this issue and is expecting to recommend future action by July 1995.

CHAPTER SIX: CONCLUSIONS, FUTURE ACTIONS

The CONEG Source Reduction Council (SRC) developed and recommended to the Governors a policy that was intended to address the Governors' concerns regarding the potential adverse public health and environmental effects presented by four heavy metals—mercury, lead, cadmium, and hexavalent chromium—when they enter the waste stream as constituents in packaging and packaging components. This policy was presented to the Governors in the form of Model Legislation that they subsequently endorsed for consideration by the Northeastern states. The policy and the Model Legislation were developed through a consensus process involving representatives from the nine CONEG states, concerned nonprofit and environmental organizations, and representatives of affected industries.

The records and history of this Model Legislation indicate that its standards for regulated metal concentrations were based upon scientific evidence available at the time. All parties present agreed the standards were reasonable and achievable, based on known industry manufacturing practices and emerging technologies. Its exemptions reflect concerns from all parties that the legislation not impose undue economic or regulatory burdens on affected industries. For similar reasons, the Model Legislation provides for a self-certification process to ease administrative burdens on the states and regulated industries. To further simplify administrative procedures for all affected parties, the CONEG SRTF created a clearinghouse program—the Toxics in Packaging Clearinghouse (TPCH)—to facilitate and expedite industry's exemption and clarification requests and inquiries about the Model Legislation.

Based on the review of the Model Legislation, its administration, and impact, the following conclusions are presented:

- The Model Toxics in Packaging Legislation has been widely adopted by state governments as a means to reduce the presence of four heavy metals in the municipal solid waste (MSW) stream.
- The TPCH has helped to ease the administrative burdens for nine participating states and for industries seeking exemptions or clarifications from those states. Because the benefits of the TPCH do not extend to nonparticipating states, affected industries must deal individually with those states when applying for exemptions and clarifications.
- Methodologies exist and are being used by affected industries to test their packaging for the heavy metals. The test methods have not proven effective for hexavalent chromium, and therefore, a more accurate detection methodology is needed.

- Determining the impact of the Toxics in Packaging laws on the toxicity levels of MSW streams is technically feasible, but cannot be quantified at this time.
- The TPOCH has recommended adoption of several changes to the Model Legislation designed to clarify its provisions and prevent the imposition of impediments to recycling and reusable container programs.
- A toxics protocol should be developed by the TPOCH and approved by the SRTF before any additional chemicals are considered for regulation.

Based on these findings, the TPOCH recommends the following future actions:

- Periodically review the implementation and the effectiveness of the law, and provide a report to the northeast Governors and State legislatures based on that review;
- Periodically review, develop, and recommend alternative legislative language and definitions for the Model for the purpose's of consistency and clarification of the law for companies that must comply with the law;
- Continue to encourage non Task Force states that have enacted laws based on the Model Toxics in Packaging Legislation to participate in the TPOCH;
- Expand the pool of toxics experts to assist on technical issues submitted to the Clearinghouse that require expertise or specialized knowledge;
- Continue to update the *Comparative Analysis* of state Toxics in Packaging laws to identify variations in provisions;
- Monitor, track, and report to Clearinghouse state members on the progress of other states' Toxics in Packaging Legislation;
- Receive all exemption requests and written questions on behalf of the member states, and in turn coordinate the dissemination of these requests and questions to the participating states on a regular basis;
- Produce outreach and information packages for both industry and states regarding the Toxics in Packaging Model Legislation and Clearinghouse;.
- Periodically define and develop a program to determine the level of compliance with the Toxics in Packaging Legislation; and
- Produce a year-end activities report for member reference and information.

APPENDIX A

(TEXT OF MODEL TOXICS IN PACKAGING LEGISLATION)

MODEL TOXICS IN PACKAGING LEGISLATION

Summary

The legislation calls for the reduction of lead, mercury, cadmium and hexavalent chromium in packaging or packaging materials used or sold within the state.

Manufacturers and distributors have two years to clear inventory and make necessary adjustments to their operations in order to comply with the law.

Manufacturers and distributors of packaging or packaging materials would be required to reduce the sum of the concentration levels of incidentally introduced lead, cadmium, mercury and hexavalent chromium to 600 parts per million two (2) years after the legislation is signed into law; 250 parts per million 3 years after it is signed into law; and 100 parts per million 4 years after it is signed into law. The legislation prohibits the intentional introduction of the four heavy metals during manufacturing or distribution.

The legislation provides an exemption for packaging made from recycled materials; packages and packaging components manufactured prior to the effective date of the legislation; packaging that is essential to the protection, safe handling or function of the package's contents - for example, medical products related to radiation therapy, x-rays, etc.; packages and packaging components for which there is no feasible alternative; reusable packaging for products that are subject to other Federal or state health, safety, transportation, or disposal requirements (i.e., hazardous waste); and packaging having a controlled distribution and reuse (i.e., beverage containers subject to mandatory deposit requirements).

Manufacturers and suppliers of packaging and packaging components are required to furnish a certificate of compliance to the purchasers of packaging. (This applies to companies who actually put their products in the package and does not apply to the retailer or the individual consumer). The public and the state have access to these certificates.

The legislation also provides for a review process by the state to determine the effectiveness of the Act. More specifically, that review will address the need to continue the recycling exemption and will determine if other toxic substances contained in packaging should be subject to reduction.

**Model Toxics in Packaging Legislation
of
CONEG Source Reduction Task Force**

Section 1. (Title)

Section 2. The legislature finds and declares that:

- a. The management of solid waste can pose a wide range of hazards to public health and safety and to the environment;
- b. Packaging comprises a significant percentage of the overall solid waste stream;
- c. The presence of heavy metals in packaging is a part of the total concern in light of their likely presence in emissions or ash when packaging is incinerated, or in leachate when packaging is landfilled;
- d. Lead, mercury, cadmium and hexavalent chromium, on the basis of available scientific and medical evidence, are of particular concern;
- e. It is desirable, as a first step in reducing the toxicity of packaging waste, to eliminate the addition of these heavy metals to packaging; and
- f. The intent of this Act is to achieve this reduction in toxicity without impeding or discouraging the expanded use of post-consumer materials in the production of packaging and its components.

Section 3. Definitions

"Package": means a container providing a means of marketing, protecting or handling a product and shall include a unit package, an intermediate package and a shipping container as defined in ASTM D996. "Package" shall also mean and include such unsealed receptacles as carrying cases, crates, cups, pails, rigid foil and other trays, wrappers and wrapping films, bags and tubs.

"Distributor": means any person, firm or corporation who takes title to goods purchased for resale.

"Packaging Component": means any individual assembled part of a package such as, but not limited to, any interior or exterior blocking, bracing, cushioning, weatherproofing, exterior strapping, coatings, closures, inks and labels. Tin-plated steel that meets the American

Society for Testing and Materials (ASTM) specification A-623 shall be considered as a single package component. Electro-galvanized coated steel and hot dipped coated galvanized steel that meets the American Society for Testing and Materials (ASTM) specification A-525 and A-879 shall be treated in the same manner as tin-plated steel.

"Manufacturing" means: Physical or chemical modification of (a) material(s) to produce packaging or packaging components.

"Distribution" means: The practice of taking title to (a) package(s) or packaging components(s) for promotional purposes or resale. Persons involved solely in delivering (a) package(s) or packaging component(s) on behalf of third parties are not considered distributors.

"Manufacturer" means: Any person, firm, association, partnership, or corporation producing (a) package(s) or packaging component(s) as defined in this Act.

"Supplier" means: Any person, firm, association, partnership, or corporation who sells, offers for sale, or offers for promotional purposes packages or packaging components which shall be used by any other person, firm, association, partnership, or corporation to package (a) product(s).

"Intentional Introduction" means: The act of deliberately utilizing a regulated metal in the formation of a package or packaging component where its continued presence is desired in the final package or packaging component to provide a specific characteristic, appearance, or quality.

The use of a regulated metal as a processing agent or intermediate to impart certain chemical or physical changes during manufacturing, whereupon the incidental retention of a residue of said metal in the final package or packaging component is neither desired nor deliberate, is not considered intentional introduction for the purposes of this Act where said final package or packaging component is in compliance with subsection c of Section 4 of this Act.

The use of recycled materials as feedstock for the manufacture of new packaging materials, where some portion of the recycled materials may contain amounts of the regulated metals, is not considered intentional introduction for the purposes of this Act where the new package or packaging component is in compliance with subsection c of Section 4 of this Act.

"Incidental Presence" means: The presence of a regulated metal as an unintended or undesired ingredient of a package or packaging component.

Section 4. Prohibition/Schedule for Removal of Incidental Amounts

a. As soon as feasible but not later than two years after the adoption of this Act, no package or packaging component shall be offered for sale or for promotional purposes by its

manufacturer or distributor in the state of _____, which includes, in the package itself or in any packaging component, inks, dyes, pigments, adhesives, stabilizers or any other additives, any lead, cadmium, mercury or hexavalent chromium which has been intentionally introduced as an element during manufacturing or distribution as opposed to the incidental presence of any of these elements.

b. As soon as feasible, but not later than two years after the adoption of this Act, no product shall be offered for sale or for promotional purposes by its manufacturer or distributor in the state of _____ in a package which includes, in the package itself or in any of its packaging components, inks, dyes, pigments, adhesives, stabilizers or any other additives, any lead, cadmium, mercury or hexavalent chromium which has been intentionally introduced as an element during manufacturing or distribution as opposed to the incidental presence of any of these elements.

c. The sum of the concentration levels of lead, cadmium, mercury and hexavalent chromium present in any package or packaging component shall not exceed the following:

- 600 parts per million by weight (0.06%) effective two (2) years after adoption of this statute;
- 250 parts per million by weight (0.025%) effective three (3) years after adoption of this statute; and
- 100 parts per million by weight (0.01%) effective four (4) years after adoption of this statute.

Section 5. Exemptions

All packages and packaging components shall be subject to this Act except the following:

a. those packages or package components with a code indicating date of manufacture that were manufactured prior to the effective date of this statute; or

b. those packages or packaging components to which lead, cadmium, mercury or hexavalent chromium have been added in the manufacturing, forming, printing or distribution process in order to comply with health or safety requirements of Federal law, provided that the manufacturer of a package or packaging component must petition the [State administrative agency] for any exemption from the provisions of this subsection for a particular package or packaging component based upon either criterion; and provided further that the [State administrative agency] may grant an exemption for up to two years if warranted by the circumstances; and provided further that such an exemption may, upon reapplication for exemption and meeting the criteria of this subsection, be renewed at two-year intervals; or

c. packages and packaging components that would not exceed the maximum contaminant levels set forth in subsection c of Section 4 of this Act but for the addition of recycled materials; and provided that the exemption for this subparagraph shall expire January 1, 2000; or

d. those packages or packaging components to which lead, cadmium, mercury or hexavalent chromium have been added in the manufacturing, forming, printing or distribution process for which there is no feasible alternative, provided that the manufacturer of a package or packaging component must petition the [State administrative agency] for any exemption from the provisions of this subsection for a particular package or packaging component based upon the criterion; and provided further that the [State administrative agency] may grant an exemption for up to two years if warranted by the circumstances; and provided further that such an exemption may, upon reapplication for exemption and meeting the criterion of this subsection, be renewed at two-year intervals. For purposes of this subsection, a use for which there is no feasible alternative is one in which the regulated substance is essential to the protection, safe handling, or function of the package's contents; or

e. packages and packaging components that are reused but exceed contaminant levels set forth in subsection c of Section 4 of this Act, provided that the product being conveyed by such package and/or the package/packaging component is (are) regulated under Federal and/or State health or safety requirements; and provided that transportation of such packaged product is regulated under Federal and/or State transportation requirements, and provided that disposal of such package is preformed according to Federal and/or State radioactive or hazardous waste disposal requirements, and provided that an exemption under this subparagraph shall expire on January 1, 2000; or

f. packages and packaging components having a controlled distribution and reuse that exceed the contaminant levels set forth in subsection c of Section 4 of this Act, provided that the manufacturer or distributor of such packages or packaging components must petition the (State administrative agency) for exemption and receive approval from the (State administrative agency, working with the CONEG Toxics in Packaging Clearinghouse) according to standards in subsection f.1 below set by such agency and based upon satisfactory demonstrations that the environmental benefit of the controlled distribution and reuse is significantly greater as compared to the same package manufactured in compliance with the contaminant levels set forth in subsection c of Section 4; and provided that an exemption under this subparagraph shall expire on January 1, 2000.

1. Standards

A plan, to be proposed by the manufacturer seeking the exemption of his designee, shall include each of the following elements:

- i. a means of identifying in a permanent and visible manner those reusable entities containing regulated metals for which an exemption is sought;

- ii. a method of regulatory and financial accountability so that a specified percentage of such reusable entities manufactured and distributed to other persons are not discarded by those persons after use, but are returned to the manufacturer or his/her designee;
- iii. a system of inventory and record maintenance to account for reusable entities placed in, and removed from, service;
- iv. a means of transforming returned entities, that are no longer reusable, into recycled materials for manufacturing or into manufacturing wastes which are subject to existing Federal and/or State laws or regulations governing such manufacturing wastes to ensure that these wastes do not enter the commercial or municipal waste stream; and
- v. a system of annually reporting to the (appropriate State administrative agency) changes to the system and changes in designees.

Section 6. Certificate of Compliance

As soon as feasible, but not later than two years after the adoption of this Act, a Certificate of Compliance stating that a package or packaging component is in compliance with the requirements of this Act shall be furnished by its manufacturer or supplier to its purchaser provided, however, where compliance is achieved under the exemption(s) provided in subsection 5 b or c, the Certificate shall state the specific basis upon which the exemption is claimed. The Certificate of Compliance shall be signed by an authorized official of the manufacturing or supplying company. The purchaser shall retain the Certificate of Compliance for as long as the package or packaging component is in use. A copy of the Certificate of Compliance shall be kept on file by the manufacturer or supplier of the package or packaging component. Certificates of Compliance, or copies thereof, shall be furnished to the [state administrative agency] upon its request and to members of the public in accordance with section 9.

If the manufacturer or supplier of the package or packaging component reformulates or creates a new package or packaging component, the manufacturer or supplier shall provide an amended or new Certificate of Compliance for the reformulated or new package or packaging component.

Section 7. Enforcement

[Each state to add its own enforcement provisions]

Section 8. State Review

[The state administrative agency] shall, in consultation with the Source Reduction Task Force of CONEG, review the effectiveness of this Act no later than forty-two (42) months after its adoption and shall provide a report based upon that review to the Governor and legislature.

The report may contain recommendations to add other toxic substances contained in packaging to the list set forth in this Act in order to further reduce the toxicity of packaging waste, and a description of the nature of the substitutes used in lieu of lead, mercury, cadmium, and hexavalent chromium.

[The State administrative agency] shall, in consultation with the Source Reduction Task Force of CONEG, review the extension of the recycling exemption as it is provided for in subsection c of Section 5 of this Act. This review shall commence no later than January 1, 1997. A report based upon that review shall be provided to the Governor and Legislature by January 1, 1999.

Section 9. Public Access

Any request from a member of the public for any Certificate of Compliance from the manufacturer or supplier of a package or packaging component shall be:

- a. Made in writing with a copy provided to the [state administrative agency];
- b. Made specific as to package or packaging component information requested; and
- c. Responded to by the manufacturer or supplier within 60 days.

Section 10. Effective Date

This Act shall become effective immediately upon adoption.

Section 11. Severability and Construction

The provisions of this Act shall be severable, and if any court declares any phase, clause, sentence, or provision of this Act to be invalid, or its applicability to any government, agency, person, or circumstance is declared invalid, the remainder of the Act and its relevant applicability shall not be affected. The provisions of this Act shall be liberally construed to give effect to the purposes thereof.

As revised, October 1994.

APPENDIX B
(TPCH MEMBER LIST)

APPENDIX B

TOXICS IN PACKAGING CLEARINGHOUSE (TPCH) MEMBERS

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APPENDIX C

(SAMPLE CERTIFICATE OF COMPLIANCE/EXEMPTION)

SAMPLE

REDUCTION OF TOXICS IN PACKAGING LAW CERTIFICATE OF COMPLIANCE

We certify that all packaging and packaging components sold to (Company Name) or its subsidiaries in the State of (state name) comply with the requirements of this law; namely that the sum or incidental concentration levels of **lead, mercury, cadmium & hexavalent chromium** present in any package or package component shall not exceed the following:

- **600 Parts Per Million by weight**
(Effective two years after the legislation was signed into law)
- **250 Parts Per Million by weight**
(Effective three years after the legislation was signed into law)
- **100 Parts Per Million by weight**
(Effective four years after the legislation was signed into law)

We further certify that in cases where the regulated metals are present at levels below the schedule stated above, the regulated metals were not intentionally added during the manufacturing process.

COMPANY NAME: _____

ADDRESS: _____

CERTIFIED BY:

(Name) (Signature)

(Title)

Date: _____

We will maintain adequate documentation of this certification for inspection upon request.

SAMPLE

REDUCTION OF TOXICS IN PACKAGING LAW CERTIFICATE OF COMPLIANCE: EXEMPTION STATUS

We certify that all packaging and packaging components sold to (company name) or its subsidiaries in the state of (state name) are in compliance with this law. However, certain packages or packaging components produced by (company name) are exempt from this law for one or more of the following reasons:

- **Package and/or packaging components were made or delivered before the effective date of the statute prohibition;**

(List package or
packaging components)

- **Package and/or packaging component contains heavy metals in order to comply with federal health and safety requirements and there is no feasible alternative;**

(List package or
packaging components)

- **Package and/or packaging component is made from post consumer material.**

(List package or
Packaging components)

COMPANY NAME: _____

ADDRESS: _____

CERTIFIED BY:

(Name)

(Signature)

Title: _____

Date: _____

We will maintain adequate documentation of this certification for inspection upon request.

APPENDIX D

(STATE-BY-STATE SUMMARY OF COMPLIANCE EFFORTS)

APPENDIX D

STATE-BY-STATE SUMMARY OF COMPLIANCE EFFORTS

CONNECTICUT

The Connecticut Department of Environmental Protection (DEP) has not taken any enforcement action to date under the CONEG Toxics in Packaging Legislation, Connecticut General Statutes Section (CGS) 22a-255g to 22a-255m. Civil penalties of up to \$10,000 may be assessed for any person violating any provision of the legislation (CGS Section 22a-2551 (a)). Persons making false statements in certificates of compliance may be fined up to \$50,000 for each false statement, or imprisoned not more than one year, or both (CGS Section 22a-255 1(b)).

Regulations are not required to be promulgated by the legislation. Connecticut relies on companies taking the initiative to be in compliance. The Connecticut DEP, in conjunction with other CONEG states and the Toxics in Packaging Clearinghouse, seeks to educate companies about the requirements of the legislation.

MAINE

To date, Maine has not taken any enforcement action. By law the Maine Department of Agriculture, Food and Rural Resources has the responsibility for enforcing the provisions of Maine's Reduction of Toxics in Packaging law. The Department is authorized to inspect, with the consent of the owner or agent, any property or building in order to accomplish the objectives of this statute.

Any manufacturer or supplier not in compliance with the law commits a civil violation for which a fine of not more than \$100.00 may be adjudged. Each package or packaging component in violation constitutes the basis of a separate offense.

The Department of Agriculture, Food and Rural Resources shall provide an opportunity for a hearing that is held in a manner consistent with the Maine Administrative Procedures Act, Title 5, chapter 375.

MINNESOTA

The Minnesota Pollution Control Agency has not taken any enforcement actions to date. In general, Agency staff have found that larger manufacturers and suppliers who do business beyond Minnesota's borders were already in compliance since at least nine other states had toxics legislation in effect prior to the effective date in Minnesota. Staff anticipate working through the Minnesota Chamber of Commerce to inform manufacturers about the requirements who are not already aware of them, particularly those to whom the applicability

of the legislation would not be immediately apparent. Minnesota statute 115A.965 subd. 5. provides for enforcement. A civil fine of up to \$5,000 per day of violation, plus court costs, attorney's fees, and the cost of properly disposing of any nonconforming packaging is specified in the section. In addition, an administrative penalty order may be used to enforce the prohibition.

NEW HAMPSHIRE

of 38

The New Hampshire Department of Environmental Services has not yet used provisions allowed under RSA 149-H:30 to enforce the Toxics Reduction law. The law establishes fines up to \$25,000 per day of continuing violations; regulations promulgated under authority of the law specify procedures for complying with the law.

NEW JERSEY

Enforcement actions have not been taken to date.

NEW YORK

The New York State Department of Environmental Conservation has not initiated any enforcement proceeding to date. Although the Department has been relying on companies to take the initiative to be in compliance, there are several enforcement actions under consideration. Primary efforts continue to be focused on educating those who are making a conscientious effort to make the needed changes to be in compliance and on working toward the development of appropriate guidance and State regulations as a firm foundation before formal enforcement actions are initiated. The New York State statutory enforcement provisions for this legislation are contained in the Environmental Conservation Law (ECL) 37-0209, which includes a civil penalty of up to \$10,000 for a first violation and up to \$25,000 for a second and any further violation.

RHODE ISLAND

The Rhode Island Department of Environmental Management (DEM) has not taken any enforcement action to date. Rhode Island General Law 23-18.13-7 provides that the state has the power to bring an action for restraining orders and injunctive relief at the request of the DEM. Regulations, which have not been promulgated to date, must require manufacturers or distributors to pay a fee rationally related to costs of program enforcement. The DEM will defer enforcement action until educational efforts have been conducted.

VERMONT

No enforcement actions have been taken to date.

APPENDIX E

(TOXICS IN PACKAGING LEGISLATION: A COMPARATIVE ANALYSIS)

APPENDIX E

TOXICS IN PACKAGING LEGISLATION: A COMPARATIVE ANALYSIS

Introduction

As of late-1994, eighteen (18) states nationwide have enacted legislation designed to eliminate heavy metals in packaging.* These laws are based upon the Model Toxics in Packaging Legislation developed in 1989 by the Source Reduction Council of CONEG, an advisory group of states, industry and public interest representatives to the Coalition of Northeastern Governors(CONEG).** The CONEG Governors' source reduction initiative is designed to develop public policy actions that will enable both the amount and toxicity of packaging to be reduced at the source. These actions are being pursued through voluntary and legislative efforts.

The intent of the Model Toxics in Packaging Legislation is to reduce heavy metals in packaging and packaging components sold or distributed throughout the state. With packaging accounting for approximately one-third of the total solid waste stream, the reduction of heavy metals in packaging should contribute significantly to decreasing the amount of toxics present in our environment.

Brief Summary

The Model prohibits the sale of any package or packaging component to which lead, cadmium, mercury, or hexavalent chromium has been intentionally introduced. The Model states that this prohibition should take effect within two years after the legislation is enacted in order to give affected companies adequate time to clear inventory and reformulate. The model further requires that incidental introductions of the heavy metals be limited to 600 parts per million two years after the legislation is enacted, 250 ppm three years after it is enacted, and 100 ppm four years after it is enacted.

The Model allows for certain exemptions while recommending an expiration date for each. The Model's exemptions include packages and packaging components which: were manufactured prior to the effective date; must comply with federal health or safety requirements; for which there is no feasible alternative; and would not exceed the maximum contaminant levels but for the addition of post-consumer materials. Some states have provided for exemptions which are not included in the Model.

The Model requires that manufacturers, distributors and suppliers furnish a certificate of compliance to the purchasers of packaging. **This provision does not apply**

* The 18 states are: Connecticut, Florida, Georgia, Illinois, Iowa, Maryland, Maine, Minnesota, Missouri, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, Washington, Wisconsin.

** The Council was reorganized in 1991 into a states-only Task Force with an industry-public interest advisory group.

to individual consumers making purchases at the retail level. The certification must be made accessible to the state or the public upon request. The Model leaves enforcement provisions to the discretion of each individual state. Finally, the Model suggests that each state review the effectiveness of the act and specify areas for revision after a designated time.

In addition to the eighteen (18) states which have enacted toxics in packaging legislation based on the CONEG Model, this legislation is currently pending in at least two states (Massachusetts and Michigan) and has been introduced in both houses of Congress. Where it has been signed into law or is currently pending, the legislation follows fairly closely to the general guidelines of the Model. Yet, variations do exist, some of which are significant. For this reason, the CONEG Source Reduction Task Force (SRTF) established a Toxics in Packaging Clearinghouse (TPCH) as a central mechanism to encourage consistent implementation of the toxics in packaging laws by individual states.

Furthermore, the CONEG Policy Research Center has developed the following tables to assess and compare the key provisions of these enacted laws. Also included is an analysis of available pending bills. As more bills are introduced and enacted, the Center will update the report.

How to Interpret the Tables

Columns in the eight tables display the 10 categories of information on which the enacted and pending legislation are compared. These are:

- materials affected & date of adoption
- compliance date
- definition of "package," "packaging component," "distributor," and "manufacturer"
- prohibition
- concentration levels by weight (incidental)
- exemptions
- certificate of compliance
- enforcement/penalties
- state review
- public access

The first row contains provisions of the CONEG Model, with each of the 18 enacted and two pending laws listed in subsequent rows. Provisions of a law which are identical to the CONEG Model are noted as "same." Significant changes from the Model are also noted.

The tables are presented as an informational summary of major provisions, with comparative analysis of significant provisions. They do not include every distinction and should not be considered as definitive interpretation of each bill. For complete information, each statute and pending bill should be reviewed.

CONEG MODEL TOXICS IN PACKAGING LEGISLATION - COMPARATIVE ANALYSIS
TABLE 1

	Materials Affected & Date of Adoption	Compliance Date
CONEG Model Toxics in Packaging Legislation	Effective upon date of adoption, no package or packaging component shall be offered for sale or for promotional purposes by its manufacturer or distributor which includes in the package itself or packaging component, inks, dyes, pigments, adhesives, stabilizers or any additives, any lead, mercury, cadmium or hexavalent chromium which has been intentionally introduced during manufacturing or distribution. 12/14/89	MODEL.
CT G.S. Section 22a-255g to 22a-255m	Same. 6/6/90.	10/1/92.
FL Section 403.7191, F.S.(1993)	Same, but does not mention intentionally introduced. 5/12/93.	7/1/94.
GA H.B. 124 - Act 1397	Same. 5/4/92.	7/1/94.
IL S.B. 1295 - Section 21.5	Same. 7/1/92.	7/1/94.
IA Chapter 213 Section 455D.19	Same. 5/8/90	7/1/92.
ME Title 32, Section 1734(2)(A)	Same. 4/17/90	4/1/92.
MD Chapter 491, Senate Bill 554	Same. 5/26/92.	7/1/93.
MN Chapter 337, Section 115.965	Same. 5/20/91.	8/1/93.
MO G.A. Section 1-4, 260.820-260.826	Same. 7/1/93.	7/1/94.
NH RSA 149-M:26-32	Same. 4/19/90	4/19/92.
NJ S.A. 13:1E-99.44 <u>et seq.</u>	Same. 1/20/92.	1/1/93.
NY Article 37-0207, Title 2	Same, but does not mention intentionally introduced. 6/26/90.	1/1/92.
PA H.B. 337 Section 101	Same. 12/02/94.	12/1/96
RI G.L. 23-18.13	Same. 7/6/90.	7/6/92
VA Title 10.1-1425.19	Same. 4/20/94	7/1/95
VT Title 10 V.S.A. Chapter 159, Section 6620	Same. 6/26/90.	7/1/92.
WA S.B. 5591 Chapter 319	Same. 5/21/91.	7/1/93.
WI Act 335, Section 100.285	Same. 4/27/90.	5/1/92.
States with Pending Legislation:		
MA H.B. 3765	Same.	
MI S.B. 24	Same.	

CONEG MODEL TOXICS IN PACKAGING LEGISLATION - COMPARATIVE ANALYSIS
TABLE 2

	"Package"	"Packaging Component"
CONEG Model Toxics in Packaging Legislation	Containers that market, protect, or handle a product. Unit, intermediate & shipping containers as defined in ASTM D996, tinplated steel as defined in ASTM A-623.* Unsealed receptacles, e.g. carrying cases, crates, cups, pails, rigid foil & other trays, wrappers & wrapping films, bags & tubs.	Individual assembled parts of a package, including, but not limited to, interior/exterior blocking, bracing, cushioning, weatherproofing, exterior strapping, coatings, closures, inks & labels. Tinplated steel that meets the ASTM specification A-623 shall be considered as a single package component (See model legislation for specifics.) Electro-galvanized coated steel and hot dipped coated galvanized steel that meets ASTM specification A-525 and ASTM A-879 shall be treated in the same manner as tinplated steel.
CT	Same, but does not include any glass, ceramic or metal receptacle intended to be reused or refilled.	Same, but specifically includes dyes, pigments, adhesives, stabilizers or other additives. There is no mention of the tinplated steel specification.
FL	Same.	Same, but does not include industrial packaging component intended to protect, secure, close, unitize, and provide pilferage protection for any product destined for commercial use.
GA	Same.	Same.
IL	Same.	Same.
IA	Same.	Same, but does not mention the tinplated steel precedent.
ME	Same, but does not mention intermediate containers.	Same, but does not mention the tinplated steel precedent.
MD	Same.	Same, but does not include exterior strapping and packaging/packaging components containing cadmium and intended for reuse of more than 5 times.
MN	Same.	Undefined.
MO	Same.	Same.
NH	Undefined.	Same, but there is no mention of the tinplated steel precedent.
NJ	Same.	Same, but specifically includes dyes, pigments, adhesives, stabilizers or other additives.
NY	Same, but does not reference ASTM D996 or tinplated steel as defined in ASTM A-623.	Same, but does not mention the tinplated steel precedent.
PA	Same, but specifically mentions galvanized wire and excludes "ceramic cup" (see PA bill for specifics).	Same, but specifically mentions dye, pigments, adhesives, stabilizers or any other additive.
RI	Same.	Same, but does not mention the tinplated steel precedent.
VA	Same.	Same.
VT	Same.	Same, but does not mention the tinplated steel precedent.
WA	Same.	Same, but does not mention the tinplated steel precedent.
WI	Same.	Same, but does not specifically include exterior strapping. There is no mention of the tinplated steel precedent.

	"Package"	"Packaging Component"
States with Pending Legislation:		
MA	Same.	Same, but does not mention the tinplated steel precedent.
MI	Same.	Same.

MODEL TOXICS IN PACKAGING LEGISLATION - COMPARATIVE ANALYSIS
TABLE 3

	"Distributor"	"Manufacturer"
CONEG Model Toxics in Packaging Legislation	Person taking title to goods purchased for resale.	Any person, firm, association, partnership, or corporation producing (a) package(s) or (b) packaging component(s) as defined in Model Legislation.
CT	Any person taking title or delivery from the manufacturer of a package, packaging component or product to use for promotional purposes or to sell.	Undefined.
FL	Same.	Any person, firm or corporation who manufactures packages, packaging or packaging components.
GA	Same.	Any person offering for sale or selling products or packaging to a distributor.
IL	Same.	Undefined.
IA	Same.	Any person offering for sale or selling products or packaging to a distributor.
ME	Any person selling packaged products to a retailer, firm or corporation that receives a shipment or consignment of, or in any other manner acquires, packaged products outside Maine for sale to consumers within the state.	Any person who manufactures a package or packaging component.
MD	Any person that sells a packaged product to a retailer or receives a shipment or consignment of or in any other manner acquires, packaged products for distribution to a retailer for sale to a consumer or promotional purposes.	Any person that manufactures a package or packaging component including any person that sells a package or packaging component to a distributor.
MN	Undefined.	Any person who imports packaging or causes packaging to be imported into the state.
MO	Undefined.	Undefined.
NH	Same.	Undefined.
NJ	Any person who distributes packaged products intended for retail sale in packages or packaging components.	Any person who manufactures packages or packaging components.
NY	Any person, firm, association, partnership or corporation who imports or causes to be imported any container, whether filled or unfilled, used to package products.	Any person, firm, association, partnership or corporation who or which makes containers to be used to package products.
PA	Any person, firm or corporation who takes title to goods purchased for resale.	Undefined.
RI	Undefined.	Undefined.
VA	Any person who takes title to products or packaging purchased for resale.	Any person that produces products, packages, packaging, or components of products or packaging.
VT	Same.	Undefined.
WA	Undefined.	Any person applying packaging to a product for distribution or sale.
WI	Undefined.	Undefined.

	"Distributor"	"Manufacturer"
States with Pending Legislation:		
MA	Same.	Undefined.
MI	Undefined.	Undefined.

CONEG MODEL TOXICS IN PACKAGING LEGISLATION - COMPARATIVE ANALYSIS

TABLE 4

	Prohibition	Concentration Levels By Weight (Incidental)
CONEG Model Toxics in Packaging Legislation	<p>Within two years following the adoption of this act, no package or packaging component shall be offered for sale or for promotional purposes by its manufacturer or distributor, which includes, in the package itself or in any packaging component inks, dyes, pigments, adhesives, stabilizers or any other additives, any lead, cadmium, mercury or hexavalent chromium which has been intentionally introduced during the manufacturing or distribution as opposed to the incidental presence of any of these elements.</p> <p>Within two years, no product shall be offered for sale or for promotional purposes by its manufacturer or distributor in a package which includes, in the package itself or in any packaging components the elements listed above which has been intentionally introduced as opposed to the incidental presence of any of these elements.</p>	<p>600 PPM 2 years after adoption;</p> <p>250 PPM 3 years after adoption; and</p> <p>100 PPM 4 years after adoption.</p>
CT	Same.	Same.
FL	Same.	Same, except 600 ppm 14 months after adoption.
GA	Same.	Same.
IL	Same.	Same.
IA	Same.	Same.
ME	Same.	Same.
MD	Same, but does not specifically mention inks, dyes, pigments, adhesives and stabilizers.	Same, except 600 ppm in 1 year after adoption.
MN	Same, but does not specifically mention packaging component.	Same.
MO	Same.	Same, except 600 ppm 1 year after adoption.
NH	Same.	Same.
NJ	Same.	Same, except 600 ppm 18 months after adoption.
NY	Same, but does not distinguish between intentionally introduced or incidental amounts.	Same.
PA	Same, but specifically mentions that "steel strapping" shall not be considered as intentional introduction.	Same.
RI	Same.	Same.
VA	Same.	Same, except 600 ppm 15 months after adoption.
VT	Same.	Same.
WA	Same, but does not specifically mention incidental amounts.	Same.
WI	Same, but does not specifically mention intentionally introduced or incidental amounts.	Same.

	Prohibition	Concentration Levels by Weight (Incidental)
STATES WITH PENDING LEGISLATION:		
MA	Same.	Same.
MI	Same.	Same.

CONEG MODEL TOXICS IN PACKAGING LEGISLATION - COMPARATIVE ANALYSIS
TABLE 5

	Exemption #1	Exemption #2
CONEG Model Toxics in Packaging Legislation	Package or packaging component manufactured prior to effective date.	To comply with federal health or safety requirements, or for which there is no feasible alternative (must be essential to the protection, safe handling or function of package contents) provided that the manufacturer petitions the state. Two-year exemption upon petition. Two-year renewal possible.
CT	Same.	Same, and for which there is no substitute.
FL	Same.	Same.
GA	Same.	Same.
IL	Same.	Same.
IA	Manufactured prior to 7/1/90.	Same.
MD	Manufactured prior to 7/1/93.	Same.
ME	Same.	Same, also includes state health and safety requirements.
MO	None.	Same.
MN	Same, also packaging or packaging components which have been delivered to a manufacturer or distributor prior to 8/1/93.	Same.
NH	Same.	Same.
NJ	Same.	Same, renewal for up to 2 years and expires 1/1/94.
NY	Same, also packaging or packaging components which have been delivered to a distributor or manufacturer prior to 1/1/92.	Same, but parenthetical statement not included.
PA	Same, also any alcoholic beverage bottled before the effective date of this act.	Same.
RI	None.	Same.
VA	Same.	Same.
VT	Same.	Same.
WA	Same.	Same.
WI	None.	Same, except does not mention 2 year exemption or renewal.
States with Pending Legislation:		
MA	Same.	Same.
MI	Same.	Same.

CONEG MODEL TOXICS IN PACKAGING LEGISLATION - COMPARATIVE ANALYSIS
TABLE 6

	Exemption #3	Other Exemptions
CONEG Model Toxics in Packaging Legislation	Packages and packaging components that would not exceed the maximum contaminant levels but for the addition of post-consumer materials. Expires on January 1, 2000.	<p>Packages/packaging components to which heavy metals have been added during the manufacturing, forming, printing, distribution process for which there is no feasible alternative.</p> <p>Packages/packaging components that are reused but exceed contaminant levels, provided that product being conveyed is regulated under Federal and/or State health or safety requirements. (See Model for more details).</p> <p>Packages/packaging components having a controlled distribution and reuse that exceed the contaminant levels. (See Model for more details).</p>
CT	Same, except applies to "recycled materials."	Alcoholic liquor bottled prior to 10/1/92.
FL	Same, except applies to "recycled materials."	None.
GA	Same.	Alcoholic products bottled prior to 1-1-94
IA	None.	None.
IL	Same.	None.
ME	Same.	None.
MD	Same, except expires in 4 yrs. and applies to "recycled materials."	Alcoholic beverage bottled prior to 10/1/92.
MO	Same, except applies to "recycled materials".	<p>Glass and ceramic package that is intended to be refilled or reusable.</p> <p>Lead foil purchased and used on or before 12/31/93, to wrap liquor bottle openings or any package that contains intoxicating liquor if the package was filled and sealed prior to 12/31/93.</p>
MN	None.	Until 8/1/97, packaging that would not exceed the total toxics concentration levels but for the addition in the packaging of materials that have fulfilled their intended use and have been discarded by consumers.
NH	Same.	Bottles containing liquor which have lead foil tops and baskets as seals.
NJ	Same.	<p>Packaging or packaging components used to contain alcoholic beverages, including liquor, wine, vermouth and sparkling wine, bottled prior to 7/1/92.</p> <p>Glass containers with ceramic labeling used to contain pharmaceutical preparations or cosmetics. Expires 7/1/94.</p> <p>Packages or packaging components composed of metal and commonly referred to as "tin cans" to which lead has been added in the manufacturing process for the purposes of forming, soldering or sealing the can. Expires 7/1/96.</p>

	Exemption #3	Other Exemptions
NY	Same.	Glass containers intended for reuse or refilling that use pigments in or on the container prior to 1/1/94.
PA	Same, but will expire after five (5) years after the effective date.	Glass and ceramic package that is recyclable, refillable or reusable and meet FDA regulations. Expire two years after the effective date.
RI	Same.	Packaging & packaging components incidental to any alcoholic beverage bottled prior to 10/1/92.
VA	Same, except refers to "recovered or recycled materials" and does not expire.	None.
VT	Same, except expires in 4 years.	None.
WA	Same.	Packages and packaging components purchased by, delivered to, or are possessed by a retailer prior to 2 years of the effective date in order to clear existing inventory.
WI	Same, except applies to "recycled materials."	Lead foil wrap on liquor bottles or any package that contains intoxicating liquor if filled and sealed prior to 12/31/92.
States with Pending Legislation:		
MA	Same.	Alcoholic products bottled prior to 7/1/92.
MI	Same, except applies to "recycled materials".	Package or packaging component that is used to contain distilled spirits or wine delivered by a manufacturer or distributor prior to the effective date. Package, packaging material or packaging component made from glass or ceramics.

CONEG MODEL TOXICS IN PACKAGING LEGISLATION - COMPARATIVE ANALYSIS
TABLE 7

	Certificate of Compliance	Enforcement/Penalties
CONEG Model Toxics in Packaging Legislation	Manufacturers and suppliers of packaging and packaging components are required to furnish a certificate of compliance to the purchaser of packaging. Upon request, the state and public must be provided a copy of the certificate.	Each state to add its own enforcement provisions.
CT	Same. Also serves to limit purchaser's liability.	Civil penalty maximum of \$10,000 per violation with each day's continuance constituting a separate violation; if act is knowingly violated, maximum fine of \$50,000 or 1 year in injunctive relief.
FL	Same, but mentions distributor as opposed to supplier.	Violations shall be punishable by a civil penalty.
GA	Same.	Violation is a misdemeanor. Other penalties to be adopted in rules and regulations.
IL	Same.	None.
IA	Same.	Non-compliance is a misdemeanor.
ME	Same. Must be filed with agency upon request.	Civil penalty of \$100 per violation per package or component.
MD	Same.	Maximum of \$1000 per violation but not exceeding \$10,000. For repeated violation a fine assessed at, but not exceeding \$20,000.
MN	Same.	Civil fine maximum of \$5,000 per day of violation.
MO	None.	None.
NH	Same.	Administrative enforcement action; injunctive relief; if act is knowingly violated, misdemeanor if a "natural person" or felony if any other person with each day's continuance constituting a separate violation; in addition to imprisonment, probation, or conditional discharge, maximum fine of \$25,000 for a "natural person" for each violation; maximum administrative fine of \$2,000.
NJ	Same.	Civil administrative penalty maximum of \$7,500 first offense, \$10,000 maximum of second offense, and maximum of \$25,000 for every subsequent offense with each day of continuance constituting a separate violation.
NY	Same, except does not require that certificate be furnished to public, nor does it mention amended certificate if packaging is reformulated.	First violation civil penalty maximum of \$10,000; further violations maximum of \$25,000 each.
PA	Same.	Maximum civil penalty is \$10,000 per violation.
RI	Same.	Restraining order, injunctive relief.
VA	Same, but mentions distributor as opposed to supplier, and mandates the certificate be supplied to "purchasers, the Department, and the public." Also, does not require "authorized official" to sign certificate.	Establishes authority of the Department to promulgate regulations if they become necessary, and to establish an advisory panel to assist the Department in implementing the bill.
VT	On grounds of suspension, the Secretary of State may request a certificate of compliance from the manufacturer.	Failure by manufacturer to certify the package or packaging component may result in the removal of the package or packaging component from sale.

	Certificate of Compliance	Enforcement/Penalties
WA	Same.	Failure to deliver certificate of compliance may result in prohibition of the sale of the package.
WI	None.	None.
States with Pending Legislation:		
MA	Same.	Civil penalty maximum of \$25,000 per day for each violation, with each day of continuance constituting a separate violation.
MI	None.	The manufacturer is subject to a civil fine of \$1,000 per day of violation.

CONEG MODEL TOXICS IN PACKAGING LEGISLATION - COMPARATIVE ANALYSIS

TABLE 8

	State Review	Public Access
CONEG Model Toxics in Packaging Legislation	State administration agencies in consultation with CONEG shall review act's effectiveness no later than forty-two (42) months after adoption and provide a report to the governors and legislature. The report may contain recommendations to add other toxic substances contained in packaging in order to further reduce the toxicity of packaging waste, and contain a recommendation whether to continue the recycling exemption. States will gather information on nature of substitutes used in lieu of toxics materials.	Certificate of compliance must be made available upon written request within 60 days.
CT	Department <u>may</u> review the effectiveness of the law and provide a report based on its review to the Governor. No time frame included.	Same.
FL	Same, but no later than 12-1-96	Same, but must respond within 90 days.
GA	None.	Same.
IL	Same, but no later than 1-1-96	Same.
IA	Same, except does not mention reviewing exemption or gathering info. on nature of substitutes and does not mention consultation with CONEG.	Same.
ME	Same, but review due by 12-1-92	Same, but certificate of compliance must be requested in writing through the state.
MD	None.	None.
MN	None.	Same.
MO	Department of Natural Resources will conduct a review to determine the effectiveness of the law and make recommendations on whether the provisions should be repealed, strengthened or otherwise amended to the general assembly and the governor by January 15, 1996.	None.
NH	Same, except review shall take place no later than 36 months after adoption.	Same.
NJ	Same.	Same.
NY	Same, but the report will be furnished as part of the annual solid waste management plan.	None.
PA	Same.	Same.
RI	Same.	Same.
VA	None.	None.
VT	Same.	None.
WA	Same, except review date is 7/1/93. No mention of consultation with CONEG.	Same.
WI	Department shall review legislation and report results, including recommendation of whether enforcement provisions and penalties should be instituted on or before the first day of the 37th month beginning after the effective day. Does not mention consultation with CONEG.	None.
STATES WITH PENDING LEGISLATION:		
MA	Same, but does not mention consultation with CONEG.	Same.
MI	None.	None.

IOWA

CHAPTER 213

PACKAGING—— HEAVY METAL CONTENT

567-213.1(455D) **Purpose.** The purpose of this chapter is to implement the provisions of Iowa Code Section 455D.19, which seeks to reduce toxicity of packaging waste to eliminate the addition of heavy metals such as lead, mercury, cadmium, and hexavalent chromium, in packaging and packaging components.

567-213.2(455D) **Applicability.** This chapter applies to manufacturers and distributors of packaging and packaging materials offered for sale or for promotional purposes in the state.

567-213.3(455D) **Definitions.** The following terms, as used in this chapter, shall have the following meanings:

"Department" means the Department of Natural Resources as created under Iowa Code Section 455 A.2.

"Distributor" means a person who takes title to products or packaging purchased for resale.

"Incidental Presence" means that these elements were not intentionally added and are below the concentration levels established by the Department in subrule 213.4(3).

"Manufacturer" means a person who offers for sale or sells products or packaging to a distributor.

"Offer for promotional purposes" means any transfer of title or possession, or both, of packaging or products in packaging without consideration.

"Offer for sale" means any transfer of title or possession, or both, exchange, barter, lease, rental, conditional or otherwise, of packaging or products in packaging for a consideration, in any manner or any means whatsoever.

"Package" means a container which provides a means of marketing, protecting, or handling a product, including a unit package, an intermediate package, or a shipping container. Package also includes, but is not limited to, unsealed receptacles, such as carrying cases, crates, cups, pails, rigid foil and other trays, wrappers and wrapping films, bags, and tubs.

"Packaging component" means any individual assembled part of a package, including, but not limited to, interior and exterior blocking, bracing, cushioning, weather proofing, exterior strapping, coatings, closures, inks, or labels.

"*Tin-plated steel*" means a material that meets the American Society for Testing and Materials (ASTM) specification A-623 and shall be considered as a single package component.

567-213.4(455D) PROHIBITION; SCHEDULE FOR REMOVAL OF INCIDENTAL AMOUNTS

213.4(1) Prohibition of packaging. Effective July 1, 1992, a manufacturer, or distributor shall not offer for sale or sell, or offer for promotional purposes, a package or packaging component in this state, which includes in the package itself or in any packaging component, inks, dyes, pigments, adhesives, stabilizers or any other additives, any lead, cadmium, mercury, or hexavalent chromium which has been intentionally introduced as an element during manufacturing or distribution. This prohibition does not apply to the incidental presence of any of these elements. In addition, this prohibition does not apply to any refillable glass and ceramic package or packaging component that is managed under a comprehensive system resulting in reuse and where the lead and cadmium from the component do not exceed the Toxicity Characteristic Leachability Procedures (TCLP) of leachability of lead and cadmium as set forth by U.S. EPA

213.4(2) Prohibition of sale of product in packaging. Effective July 1, 1992, a manufacturer or distributor shall not offer for sale or sell, or offer for promotional purposes in this state, a product in a package which includes in the package itself or in any of the packaging components, inks, dyes, pigments, adhesives, stabilizers or any other additives, any lead, cadmium, mercury, or hexavalent chromium which has been intentionally introduced as an element during manufacturing or distribution. This prohibition does not apply to the incidental presence of any of these elements. In addition, this prohibition does not apply to any refillable glass and ceramic package or packaging component that is managed under a comprehensive system resulting in reuse and where the lead and cadmium from the component do not exceed the Toxicity Characteristic Leachability Procedures (TCLP) of leachability of lead and cadmium as set forth by U.S. EPA

213.4(3) Concentration Levels. The sum of the concentration levels of lead, cadmium, mercury, and hexavalent chromium present in a package or packaging component shall not exceed the following:

- a. Effective July 1, 1992, 600 parts per million by weight, or 0.06%.
- b. Effective July 1, 1993, 250 parts per million by weight, or 0.025%.

c. Effective July 1, 1994, 100 parts per million by weight, or 0.01%.

Concentration levels of lead, cadmium, mercury, and hexavalent chromium shall be determined using American Standard of Testing Materials test methods, as revised, or United States Environmental Protection Agency test methods for evaluating solid waste, S-W 846, as revised.

213.4(4) Substitute Materials. No material used to replace lead, cadmium, mercury, or hexavalent chromium in a package or packaging component may be used in a quantity or manner that creates a hazard as great or greater than the hazard created by the lead, cadmium, mercury, or hexavalent chromium. The Certificate of Compliance will require an assurance to this effect.

567—213.5(455D) Certification of compliance By July 1, 1992, a manufacturer or distributor of packaging or packaging components shall make available to purchasers, to the Department, and to the general public upon request, certificates of compliance conforming to the requirements of this rule.

Certificates provided shall substantially conform with either or both, as applicable, of the following forms:

**1. Reduction of Toxics in Packaging Law
Certificate of Compliance**

We certify that all packaging and packaging components sold to _____
(Company Name)

or its subsidiaries in the State of Iowa comply with the requirements of this law, namely that the sum of the incidental concentration levels of lead, mercury, cadmium, and hexavalent chromium present in any package or package component shall not exceed the following:

600 Parts Per Million by weight

(Effective July 1, 1992)

250 Parts Per Million by weight

(Effective July 1, 1993)

100 Parts Per Million by weight

(Effective July 1, 1994)

We further certify that in cases where the regulated metals are present at levels less than the schedule stated above, the regulated metals were not intentionally added during the manufacturing process.

We further certify that no material used to replace the regulated metals are present in a quantity or manner that creates a hazard as great or greater than the hazard created by the regulated materials.

We will maintain adequate documentation of this certification for inspection upon request.

Company Name _____

Address _____

Certified by:

(Name) (Signature)

(Title)

Date: _____

2. Reduction of Toxics in packaging Law
Certificate Of Compliance: Exemption Status

We certify that all packaging and packaging components sold to _____ (Company Name)
or its subsidiaries in the State of Iowa are in compliance with the law. However, certain packages or
packaging components produced by _____ are exempt from this law for
(Company Name)
one or more of the following reasons:

Package and / or packaging components were made or delivered before the law was signed into effect:

(List package
or packaging
component) _____

Package and / or packaging component contains heavy metals in order to comply with state or federal health and safety requirements or there is no feasible alternative (i.e. the regulated substance is essential to the production, safe handling, or function of the package's contents) :

(List package
or packaging
component) _____

Package and/or packaging component is made from post-consumer material:

(List package
or packaging
component) _____

Alcoholic beverage bottled prior to effective date:

(List package
or packaging
component) _____

We will maintain adequate documentation of this certification for inspection upon request.

Company Name _____

Address _____

Certified by: _____
(Name) (Signature)

(Title)

Date: _____

If the manufacturer or distributor of the package or packaging component reformulates or creates a new package or packaging component, the manufacturer or distributor shall provide an amended or new certificate of compliance for the reformulated or new package or packaging component.

567-213.6(455D) Exemptions

213.6(1) A manufacturer is entitled to an exemption where:

a. The package or packaging component has a code indicating a date of manufacture prior to July 1, 1990, or the manufacturer can provide written documentation that the package or packaging component was manufactured prior to July 1, 1990; or

b. The package or packaging component contains an alcoholic beverage bottled prior to July 1, 1992.

213.6(2) A manufacturer may petition the Department for an exemption for a particular package or packaging component where:

a. The package or packaging component contains lead, cadmium, mercury, or hexavalent chromium added in the manufacturing, forming, printing, or distribution process in order to comply with health or safety requirements of state or federal law; or

b. There is no feasible alternative to the use of lead, cadmium, mercury, or hexavalent chromium in the package or packaging component. For the purposes of this section, "no feasible alternative" means a

use in which the regulated substance is essential to the protection, safe handling, or function of the package's contents; or

c. The addition of post - consumer materials causes the package or packaging component to exceed the maximum concentration levels set forth in subrule 213.4(3); For a package where all components contain recycled content, the entire package is exempt. However, in the case where one component contains recycled content and the other components do not, only the component containing recycled content would be exempt and not the entire package.

213.6(3) All manufacturers claiming an exemption shall file a certificate of compliance with the Department conforming to the form set forth in rule 213.5(455D) and stating the specific basis upon which the exemption is requested.

213.6(4) Exemptions under subrule 213.6(1) paragraphs a and b are effective only so long as those package or packaging components are used. Exemptions under subrule 213.6(2) paragraphs a , b and c may be granted for periods of two years. In order to receive an exemption for additional two-year periods, the manufacturer must file an exemption request.

213.6(5) Exemptions are deemed to be approved for maximum times under 567--213.6(4), unless the manufacturer is notified otherwise within 60 days of the Department's receipt of the Certificate of Compliance. During this 60-day period the manufacturer shall not utilize the claimed exemption.

567--213.7(455D). INSPECTION AND PENALTIES

213.7(1). **Inspection.** The Department may inspect, with the consent of the owner or agent, any property or building to determine compliance with the requirements of this chapter.

213.7(2) **Violation.** A manufacturer or distributor who does not comply with the requirements of Iowa Code Section 455D.19 is guilty of a simple misdemeanor. Each package or packaging component in violation constitutes the basis of a separate offense.

MAINE

STATE OF MAINE
WASTE MANAGEMENT AGENCY

CHAPTER 103: REDUCTION OF TOXICS IN PACKAGING

SUMMARY: This rule establishes the procedure and criteria by which manufacturers will comply with the toxics reduction in packaging requirements.

SECTION 1. PURPOSE

The purpose of this chapter is to implement the provisions of Title 32, chapter 26-A, §§1731-1739, of the Maine Revised Statutes, which seek to reduce toxicity of packaging waste by prohibiting the unnecessary addition of heavy metals, such as lead, mercury, cadmium and hexavalent chromium, in packaging and packaging components.

SECTION 2. APPLICABILITY

This chapter applies to manufacturers, suppliers and distributors of packaging and packaging materials offered for sale or for promotional purposes in the State.

SECTION 3. DEFINITIONS

The following terms, as used in this chapter, shall have the following meanings:

- A. **"Agency"** means the Maine Waste Management Agency.
- B. **"Department"** means the Maine Department of Agriculture, Food and Rural Resources.
- C. **"Distributor"** means any person, firm or corporation that sells a packaged product to a retailer in this State or any person, firm or corporation that receives a shipment or consignment of, or in any other manner acquires, packaged products outside the State for sale to consumers in the State.
- D. **"Manufacturer"** means any person who manufactures a package or packaging component.
- E. **"Package"** means a container used in marketing, protecting or handling a product and includes a unit package and a shipping container defined by the American Society for Testing and Materials in its annual book of standards as ASTM, D996. "Package" also includes such unsealed receptacles as carrying cases, crates, cups, pails, rigid foil and other trays, wrappers and wrapping films, bags and tubs.
- F. **"Packaging component"** means any individual part of an assembled package such as, but not limited to, any interior or exterior strapping, coatings, closures, inks and labels.

G. "Person" means any individual, partnership, corporation or other legal entity.

H. "Offer for promotional purposes" means any transfer of title or possession, or both, of packaging or products in packaging without consideration.

I. "Offer for sale" means any transfer of title or possession, or both, exchange, barter, lease, rental, conditional or otherwise, of packaging or products in packaging for a consideration, in any manner or by any means whatsoever.

J. "Supplier" means any person, firm or corporation that sells packages or packaging components to a distributor.

K. "Tin-Plated Steel" means a material that meets the American Society for Testing and Materials (ASTM) specification A-623 and shall be considered as a single package component.

SECTION 4. PROHIBITION: SCHEDULE FOR REMOVAL OF INCIDENTAL AMOUNTS

A. Prohibition of sale of packaging. A manufacturer, supplier or distributor may not offer for sale or for promotional purposes a package or packaging component that includes inks, dyes, pigments, adhesives, stabilizers or any other additives to which any lead, cadmium, mercury or hexavalent chromium has been intentionally introduced during manufacturing or distribution. This prohibition does not apply to the incidental presence of any of these elements. Incidental means that these elements were not intentionally added and are below the concentration levels listed in Section 4.C below.

B. Prohibition of sale of product in packaging. A manufacturer or distributor may not offer for sale or for promotional purposes any product in a package that includes, in the package itself or any packaging components, inks, dyes, pigments, adhesives, stabilizers or any other additives to which any lead, cadmium, mercury or hexavalent chromium has been intentionally introduced during manufacturing or distribution. This prohibition does not apply to the incidental presence of any of these elements.

C. Concentration levels. The sum of the concentration levels of lead, cadmium, mercury and hexavalent chromium that are incidentally present in any package or packaging component including the inks or adhesives affixed to such packaging or packaging component, may not exceed:

- (1) Effective April 1, 1992, 600 parts per million by weight, or 0.06%;
- (2) Effective April 1, 1993, 250 parts per million by weight, or 0.025%; and
- (3) Effective April 1, 1994, 100 parts per million by weight, or 0.01%.

D. Substitute materials. No material used to replace lead, cadmium, mercury or hexavalent chromium in a package or packaging component may be used in a quantity or manner

that creates a hazard as great or greater than the hazard created by the lead, cadmium, mercury or hexavalent chromium. The certificate of compliance will require an assurance to this effect.

SECTION 5. CERTIFICATE OF COMPLIANCE

After September 30, 1993, a certificate of compliance conforming to the form attached as Exhibit 1 and stating that a package or packaging component is in compliance with standards established in Section 4 shall be furnished by its manufacturer to the agency. A certificate of compliance may cover more than one type of package or packaging component as long as each type is identified separately. The certificate of compliance shall be signed by an authorized official of the manufacturing company. If requested, test results shall be made available to the agency to verify information provided in a certificate of compliance.

A. New or reformulated packaging. If the manufacturer reformulates or creates a new package or packaging component, the manufacturer shall provide the agency with an amended or new certificate of compliance for the reformulated or new package or packaging component.

B. Presentation of certificates. Each manufacturer shall furnish the agency with an original certificate of compliance and each manufacturer or supplier shall furnish, at the agency's request, copies of a certificate of compliance for distribution to the public.

SECTION 6. EXEMPTIONS

A. A manufacturer is entitled to an exemption where:

(1) The package or packaging component has a code indicating a date of manufacture prior to April 1, 1992 or the manufacturer can provide written documentation that the package or packaging component was manufactured prior to April 1, 1992; or

(2) The package or packaging component contains an alcoholic beverage bottled prior to April 1, 1992.

B. A manufacturer may petition the agency for an exemption for a particular package or packaging component where:

(1) The package or packaging component contains lead, cadmium, mercury or hexavalent chromium added in the manufacturing, forming, printing or distribution process in order to comply with health or safety requirements of state or federal law; or

(2) There is no feasible alternative to the use of lead, cadmium, mercury or hexavalent chromium in the package or packaging component. For the purposes of this section, "no feasible alternative" means a use in which the regulated substance is essential to the protection, safe handling or function of the package's contents; or

(3) The addition of post-consumer materials causes the package or packaging component to exceed the maximum concentration levels set forth in Section 4; or

(NOTE: For a package where all components contain recycled content, the entire package is exempt. However, in the case where one component contains recycled content and the other components do not, only the component containing recycled content would be exempt and not the entire package.)

(4) The package or packaging component has been exempted by another Northeastern state with similar legislation.

C. All manufacturers claiming an exemption shall file a certificate of compliance with the agency conforming to the form attached as Exhibit 2 and stating the specific basis upon which the exemption is requested.

D. Exemptions under paragraphs A(1) and A(2) are permanent. Exemptions under paragraphs B(1) and B(2) may be granted for periods of two years. In order to receive an exemption for additional two year periods, the manufacturer would have to file an exemption request. Exemptions under paragraph B(3) expire April 1, 1996. Exemptions granted under paragraph B(4) will continue in effect only as long as the applicant can show that it holds an exemption under similar legislation from another Northeastern state.

E. Exemptions are deemed to be approved for maximum times under Section 6.D., unless the manufacturer is notified otherwise within 60 days of the agency's receipt of the certificate of compliance.

SECTION 7. ENFORCEMENT AND PENALTIES

A. Enforcement. The Department of Agriculture, Food and Rural Resources shall enforce the provisions of this chapter and may inspect, with the consent of the owner or agent, any property or building to accomplish the objectives of this chapter.

B. Violation. Any manufacturer or supplier that violates this chapter commits a civil violation for which a forfeiture of not more than \$100 may be adjudged. Each package or packaging component in violation constitutes the basis of a separate offense.

C. Hearings on violations. The Department shall provide an opportunity for hearing in a manner consistent with the Maine Administrative Procedures Act, Title 5, chapter 375.

FISCAL IMPACT ON POLITICAL SUBDIVISIONS: Compliance with this rule will have no fiscal impact on municipalities or counties of this State.

AUTHORITY TO ADOPT RULE: 32 M.R.S.A., section 1737

ADOPTED: September 2, 1992

EFFECTIVE DATE: September 11, 1992

REVISED: April 14, 1993

Exhibit 1
State of Maine
(Title 32, Ch. 26-A)
Reduction of Toxics in Packaging Law
Certificate of Compliance:

We certify that all packaging and packaging components sold to (company name) or its subsidiaries in the State of Maine comply with the requirements of this law, namely that the sum or incidental concentration levels of lead, mercury, cadmium & hexavalent chromium present in any package or package component shall not exceed the following:

- 600 Parts Per Million by weight
(Effective April 1, 1992)
- 250 Parts Per Million by weight
(Effective April 1, 1993)
- 100 Parts Per Million by weight
(Effective April 1, 1994)

We further certify that in cases where the regulated metals are present at levels below the schedule stated above, the regulated metals were not intentionally added during the manufacturing process.

We further certify that no material used to replace the regulated metals are present in a quantity or manner that creates a hazard as great or greater than the hazard created by the regulated materials.

COMPANY NAME _____

ADDRESS _____

CERTIFIED BY:

(Name)

(Signature)

(Title)

Date: _____

We will maintain adequate documentation of this certification for inspection upon request.

Exhibit 2
State of Maine
(Title 32, Ch. 26-A)
Reduction of Toxics in Packaging Law
Certificate of Compliance:

Exemption Status

We certify that all packaging and packaging components sold to (company name) or its subsidiaries in the State of Maine are in compliance with this law. However, certain packages or packaging components produced by (company name) are exempt from this law for one or more of the following reasons:

- Package and/or packaging components were made or delivered before the law was signed into effect;

(List package or
packaging components)

- Package and/or packaging component contains heavy metals in order to comply with state or federal health and safety requirements or there is no feasible alternative;

(List package or
packaging components)

- Package and/or packaging component is made from post consumer material;

(List package or
packaging components)

- Alcoholic beverage bottled prior to effective date;

(List package or
packaging components)

- Package and/or packaging component has been exempted by another northeastern state. List state and basis for an exemption.

(List package or
packaging components)

COMPANY NAME _____

ADDRESS _____

CERTIFIED BY:

(Name)

(Signature)

(Title)

Date _____

We will maintain adequate documentation of this certification for inspection upon request.

NEW HAMPSHIRE

NEW HAMPSHIRE CODE OF ADMINISTRATIVE RULES

CHAPTER Env-Wm 3500 REDUCTION OF TOXICS IN PACKAGING

Statutory Authority: RSA 149-M:25-32

PART Env-Wm 3501 PURPOSE, APPLICABILITY, AND DEFINITIONS

Env-Wm 3501.01 Purpose. The purpose of these rules is to supplement the provisions of RSA 149-M:25-32, relative to reduce heavy metals in package and packaging components as one step in reducing the toxicity of solid waste when it is disposed of by landfilling or incineration.

Source. #5768, eff 12-29-93

Env-Wm 3501.02 Applicability. These rules shall apply to all package and packaging components sold, offered for sale or otherwise distributed in New Hampshire except as provided by RSA 149-M:27.

Source. #5768, eff 12-29-93

Env-Wm 3501.03 Definitions.

(a) "Commissioner" means the commissioner of the department of environmental services.

(b) "Department" means the department of environmental services.

(c) "Division" means the waste management division of the department of environmental services.

(d) "Intentional introduction" means the act of deliberately using a regulated heavy metal in the formulation of a package or packaging component where its continued presence in the final package or packaging component is to provide a specific characteristic or quality. The use of a regulated heavy metal as a processing agent or intermediate to impart certain chemical or physical changes during manufacturing, whereupon the incidental retention of a residue of the metal in the final package or packaging component is neither desired nor deliberate but is inherent in the process, is not considered to be "intentional introduction" where the final package or packaging component is in compliance with RSA 149-M:26, III.

(e) "Manufacturer" means any person producing a package or packaging component which is used by a purchaser to package a product.

(f) "Package" means "package" as defined in RSA 149-M:1, XI-b.

(g) "Packaging component" means "packaging component" as defined in RSA 149-M:1, XI-c.

(h) "Person" means "person" as defined in RSA 149-M:1, XIII.

(i) "Petitioner" means a manufacturer or supplier filing a petition for exemption from RSA 149-M:27.

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(j) "Post-consumer material" means "post-consumer material" as defined in RSA 149-M:1, XIII-a.

(k) "Purchaser" means any person receiving a package or packaging component directly from the manufacturer or supplier of the package or packaging component who then sells or distributes the package or packaging component to a retail consumer.

(l) "Reformulate" means to change the way a package or packaging component is manufactured so as to result in a different concentration of lead, cadmium, mercury or hexavalent chromium.

(m) "Supplier" means any person offering to sell or selling a package or packaging component which is used by a purchaser to package a product.

(n) "Tinplated steel" means tinplated steel as defined by the American Society for Testing and Materials (ASTM) Specification A-623.

Source. #5768, eff 12-29-93

PART Env-Wm 3502 EXEMPTIONS

Env-Wm 3502.01 Petition for Exemption.

(a) No petition for exemption shall be necessary if a package or packaging component is eligible for an automatic exemption under RSA 149-M:27.

(b) Subject to (c) below, in order for a petition for exemption from RSA 149-M:25-32 to be valid, the manufacturer of the package or packaging component shall file the petition.

(c) If a manufacturer of a package or packaging component does not provide a supplier with a certificate of compliance and the supplier believes the package or packaging component is eligible for an exemption, the supplier may file a petition for exemption.

(d) The petition for exemption shall be filed with the department and shall include the following:

(1) The name, address, and telephone number of the manufacturer or supplier seeking the exemption;

(2) The name and position of the individual who can answer questions on behalf of the petitioner about the petition;

(3) The reason why the exemption is being sought;

(4) The type of package or packaging component for which the exemption is sought and the use thereof;

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(5) The heavy metals identified in RSA 149-M:25 that are present in the package or packaging components;

(6) The concentration(s) of the identified heavy metal(s) present in the package or packaging component, and the testing methods used to determine the concentration(s);

(7) If the package or packaging components are necessary in order to comply with health or safety requirements of federal law as specified in RSA 149-M:27, II, identification of the federal law(s) together with a copy of the law(s); and

(8) If there is no feasible alternative for reducing the identified heavy metals in the package or packaging components, substantiating information addressing the criteria in Env-Wm 3502.02, including a timetable for ongoing and future efforts to achieve compliance through feasible alternatives to using the identified heavy metals.

(e) Pursuant to RSA 149-M:27, II, an exemption shall be effective for 2 years unless the petitioner requests a shorter time period, in which case the extension shall be effective for the shorter time.

Source. #5768, eff 12-29-93

Env-Wm 3502.02 Criteria for Petitioned Exemptions.

(a) No petition for an exemption shall be granted unless the petitioner demonstrates to the commissioner either that:

(1) The identified heavy metals present in the package or packaging component are necessary in order to comply with federal health or safety requirements; or

(2) No feasible alternative to the use of the identified heavy metals exists, "no feasible alternative" being, as stated in RSA 149-M:27, II, "one in which the regulated substance is essential to the protection, safe handling, or function of the package's contents."

(b) A petitioner shall demonstrate that the identified heavy metals present in the package or packaging component are necessary in order to comply with federal health or safety requirements by providing a copy of the federal requirements together with such additional information as would allow an independent reasonable person to conclude that the metals are necessary.

(c) A petitioner shall demonstrate that no feasible alternative exists to the use of the heavy metal in the package or packaging component by submitting such written materials as would allow an independent reasonable person to conclude that the metals are essential to the protection, safe handling or functioning of the package's contents.

Source. #5768, eff 12-29-93

NEW HAMPSHIRE CODE OF ADMINISTRATIVE RULES

Env-Wm 3502.03 Processing of Petition for Exemption.

(a) The department shall notify the petitioner in writing within 5 working days of receiving a petition for exemption that the exemption petition has been received.

(b) The department shall review the exemption petition for completeness within 30 days of receipt.

(c) If the exemption petition is determined to be incomplete, the department shall notify the petitioner within 10 working days of the determination with a specific request for the information needed to complete the application.

(d) If the exemption petition is determined to be complete, the commissioner shall designate staff to review the petition and make a recommendation to grant or deny, based on the criteria specified in Env-Wm 3502.02.

(e) The commissioner shall review the petition, the recommendation, and the criteria specified in Env-Wm 3502.02. If the commissioner determines that the petition meets the criteria, the commissioner shall grant the petition within 60 days of the date it was forwarded, and shall notify the petitioner in writing of the decision.

(f) If the petition is granted, the written notice shall include:

(1) The effective date of the exemption;

(2) The expiration date of the exemption; and

(3) The deadline for the application for renewal of the exemption, which shall be 90 days prior to the expiration date of the exemption.

(g) The petitioner shall send an annual progress report to the commissioner based on the petitioner's efforts to come into compliance with RSA 149-M:25-32.

(h) If the commissioner determines that the petition does not meet the criteria, the commissioner shall deny the petition within 60 days of the date it was forwarded, and shall notify the petitioner in writing of the decision. The written notice shall state the reason(s) for the denial.

Source. #5768, eff 12-29-93

NEW HAMPSHIRE CODE OF ADMINISTRATIVE RULES

PART Env-Wm 3503 RENEWAL OF EXEMPTIONS

Env-Wm 3503.01 Request for Renewal of Exemption.

(a) Any manufacturer or supplier seeking a renewal of an exemption received pursuant to Env-Wm 3502.03 shall file a written renewal request at least 90 days prior to the exemption's expiration date on a form supplied by the department.

(b) The renewal request shall contain:

(1) The information specified in Env-Wm 3502.01(d);

(2) The differences, if any, between the information in the renewal request and the information provided with the original exemption petition; and

(3) For exemption renewals based on there being no feasible alternative to the use of the identified heavy metal, a report on progress in meeting the timetable for achieving compliance that was submitted with the original exemption request.

Source. #5768, eff 12-29-93

Env-Wm 3503.02 Criteria for Renewal of Exemption.

(a) Criteria for renewal of exemption shall be as specified in Env-Wm 3502.02.

(b) Pursuant to RSA 149-M:27, II, a renewal shall be effective for 2 years unless the petitioner requests a shorter time period, in which case the extension shall be granted for the shorter time.

Source. #5768, eff 12-29-93

Env-Wm 3503.03 Processing of Petition for Renewal of Exemption. The renewal request shall be processed in accordance with Env-Wm 3502.03.

Source. #5768, eff 12-29-93

PART Env-Wm 3504 CERTIFICATE OF COMPLIANCE

Env-Wm 3504.01 Availability of Certificate of Compliance.

(a) Certificates of compliance shall be made available as prescribed by RSA 149-M:28, I.

(b) If a supplier is unable to obtain a certificate of compliance from a manufacturer of a package or packaging component but has sufficient information to prepare the certificate, the supplier shall prepare the certificate based on that information.

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(c) If a supplier is unable to obtain a certificate of compliance from a manufacturer of a package or packaging component and does not have sufficient information to prepare the certificate, the supplier shall not be guilty of a failure to provide the certificate if the supplier has notified the department in accordance with (e) below that the certificate is unavailable from the manufacturer.

(d) If a purchaser is unable to obtain a certificate of compliance from a manufacturer or supplier of a package or packaging component, the purchaser shall not be liable for failure to retain the certificate as required by RSA 149-M:28, 1 if the purchaser has notified the department in accordance with (e) below that the certificate is unavailable from the manufacturer or supplier.

(e) Notification under (c) or (d) above shall be in writing and shall include the following:

- (1) The name, address and telephone number of the person filing the notification;
- (2) The type of package or packaging component for which a certificate cannot be obtained;
- (3) The name(s) and address(es) and, if available, the telephone number(s) of the manufacturer of the package or packaging component;
- (4) If the notice is filed pursuant to (d) above, the name(s) and address(es) and, if available, the telephone number(s) of the supplier(s) of the package or packaging component; and
- (5) A brief summary of the attempts made to obtain the certificate.

(f) No person shall be held responsible for erroneous information in a certificate of compliance if all of the following are true:

- (1) The person is not the manufacturer of the package or packaging component;
- (2) The person did not prepare the certificate;
- (3) The person did not have any reason to believe the information in the certificate was erroneous; and
- (4) The person in good faith believed the information in the certificate to be true.

Source. #5768, eff 12-29-93

NEW HAMPSHIRE CODE OF ADMINISTRATIVE RULES

Env-Wm 3504.02 Certificate of Compliance Contents.

(a) All certificates of compliance for package or packaging components shall be completed by the manufacturer or supplier and included in the shipment of the package or packaging component to the purchaser.

(b) Each certificate of compliance shall include the following:

- (1) Type of package or packaging component;
- (2) Company name;
- (3) Company address;
- (4) Name, signature, and title of authorized official;
- (5) Name and position of the individual who can answer questions regarding the composition of the package or packaging component;
- (6) Date the certificate of compliance is completed;
- (7) Either a statement that there has been no intentional introduction of the identified heavy metals in the package or packaging component, or, for a package or packaging component for which an exemption has been granted under RSA 149-M:27, a statement identifying the applicable exemption which allows the intentional introduction; and
- (8) Either a statement that the total concentration of any incidental amounts of the identified heavy metals in the package or packaging component does not exceed the limit established in RSA 149-M:26, III or, for a package or packaging component for which an exemption has been granted under RSA 149-M:27, a statement identifying the applicable exemption allowing the exceedence of the limits.

(c) For the purpose of completing a certificate of compliance for the use of tinplated steel as a package or packaging component, the manufacturer or supplier shall consider tinplated steel as a single packaging component.

Source. #5768, eff 12-29-93

Env-Wm 3504.03 Requests for Certificate of Compliance.

(a) Requests for copies of certificates of compliance shall be made in accordance with RSA 149-M:32.

NEW HAMPSHIRE CODE OF ADMINISTRATIVE RULES

(b) The manufacturer or supplier who receives a request for a certificate of compliance in accordance with RSA 149-M:32 shall provide a copy of the written request to the department with the copy of its response required by RSA 149-M:32.

Source. #5768, eff 12-29-93

Env-Wm 3504.04 Amended Certificate of Compliance.

(a) Amendments to certificates of compliance shall be made in accordance with RSA 149-M:28, II.

(b) In addition to the information specified in Env-Wm 3504.02, the amended certificate shall include the following:

- (1) The previous composition of the package or packaging component;
- (2) The reformulation, including the new level of identified heavy metals used; and
- (3) Any difference(s) between the grounds for compliance as stated in the original certificate of compliance and the amended certificate of compliance.

Source. #5768, eff 12-29-93

APPENDIX G
(METALLIC ANALYTES)

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TABLE

METALLIC ANALYTES

3.1 SAMPLING CONSIDERATIONS

3.1.1 Introduction

This manual contains procedures for the analysis of metals in a variety of matrices. These methods are written as specific steps in the overall analysis scheme -- sample handling and preservation, sample digestion or preparation, and sample analysis for specific metal components. From these methods, the analyst must assemble a total analytical protocol which is appropriate for the sample to be analyzed and for the information required. This introduction discusses the options available in general terms, provides background information on the analytical techniques, and highlights some of the considerations to be made when selecting a total analysis protocol.

3.1.2 Definition of Terms

Optimum concentration range: A range, defined by limits expressed in concentration, below which scale expansion must be used and above which curve correction should be considered. This range will vary with the sensitivity of the instrument and the operating conditions employed.

Sensitivity: a) Atomic Absorption: The concentration in milligrams of metal per liter that produces an absorption of 1%; b) ICP: The slope of the analytical curve, i.e., the functional relationship between emission intensity and concentration.

Method detection limit (MDL): The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The MDL is determined from analysis of a sample in a given matrix containing analyte which has been processed through the preparative procedure.

Total recoverable metals: The concentration of metals in an unfiltered sample following treatment with hot dilute mineral acid (Method 3005).

Dissolved metals: The concentration of metals determined in sample after the sample is filtered through a 0.45- μ m filter (Method 3005).

Suspended metals: The concentration of metals determined in the portion of a sample that is retained by a 0.45- μ m filter (Method 3005).

Total metals: The concentration of metals determined in a sample following digestion by Methods 3010, 3020, or 3050.

AND RECOMMENDED COLLECTION VOLUMES FOR METAL DETERMINATIONS

Measurement	Digestion Vol. Req. ^a (mL)	Collection Volume (mL) ^b	Preservative	Holding Time
Metals (except hexavalent chromium and mercury):				
Total recoverable	100	600	HNO ₃ to pH <2	6 mo
Dissolved	100	600	Filter on site; HNO ₃ to pH <2	6 mo
Suspended	100	600	Filter on site	6 mo
Total	100	600	HNO ₃ to pH <2	6 mo
Chromium VI:	100	400	Cool, 4°C	24 hr
Mercury:				
Total	100	400	HNO ₃ to pH <2	28 days
Dissolved	100	400	Filter; HNO ₃ to pH <2	28 days

^aSolid samples must be at least 200 g and usually require no preservation other than storing at 4°C until analyzed.

^bEither plastic or glass containers may be used.

determined by the application of graphite-furnace atomic absorption spectrometry (GFAA), flame atomic absorption spectrometry (FLAA), inductively coupled argon plasma emission spectrometry (ICP), hydride-generation atomic absorption spectrometry (HGAA), or cold-vapor atomic absorption spectrometry (CVAA) techniques, each of which may require different digestion procedures. The indicated volumes in Table 1 refer to that required for the individual digestion procedures and recommended sample collection volumes.

In the determination of trace metals, containers can introduce either positive or negative errors in the measurement of trace metals by (a) contributing contaminants through leaching or surface desorption, and (b) depleting concentrations through adsorption. Thus the collection and treatment of the sample prior to analysis require particular attention. The

following cleaning treatment sequence has been determined to be adequate to minimize contamination in the sample bottle, whether borosilicate glass, linear polyethylene, polypropylene, or Teflon: detergent, tap water, 1:1 nitric acid, tap water, 1:1 hydrochloric acid, tap water, and Type II water.

NOTE: Chromic acid should not be used to clean glassware, especially if chromium is to be included in the analytical scheme. Commercial, non-chromate products (e.g., Nochromix) may be used in place of chromic acid if adequate cleaning is documented by an analytical quality control program. (Chromic acid should also not be used with plastic bottles.)

3.1.4 Safety

The toxicity or carcinogenicity of each reagent used in this method has not been precisely defined. However, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. The laboratory is responsible for maintaining a current awareness file of OSHA regulations regarding the safe handling of the chemicals specified in this method. A reference file of material data-handling sheets should also be made available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available. They are:

1. "Carcinogens - Working with Carcinogens," Department of Health, Education, and Welfare, Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health, Publication No. 77-206, August 1977.
2. "OSHA Safety and Health Standards, General Industry" (29 CFR 1910), Occupational Safety and Health Administration, OSHA 2206, revised January 1976.
3. "Proposed OSHA Safety and Health Standards, Laboratories," Occupational Safety and Health Administration, Federal Register, July 24, 1986, p. 26660.
4. "Safety in Academic Chemistry Laboratories," American Chemical Society Publication, Committee on Chemical Safety, 3rd edition, 1979.

3.2 SAMPLE PREPARATION METHODS

The methods in SW-846 for sample digestion or preparation are as follows:

Method 3005 prepares ground water and surface water samples for total recoverable and dissolved metals determination by FLAA or ICP. The unfiltered or filtered sample is heated with dilute HCl and HNO₃ prior to metal determination.

Method 3010 prepares waste samples for total metal determination by FLAA and ICP. The samples are vigorously digested with nitric acid followed by dilution with hydrochloric acid. The method is applicable to aqueous samples, EP and mobility-procedure extracts.

Method 3020 prepares waste samples for total metals determination by furnace GFAA. The samples are vigorously digested with nitric acid followed by dilution with nitric acid. The method is applicable to aqueous samples, EP and mobility-procedure extracts.

Method 3040 prepares oily waste samples for soluble metals determination by AA and ICP methods. The samples are dissolved and diluted in organic solvent prior to analysis. The method is applicable to the organic extract in the oily waste EP procedure and other samples high in oil, grease, or wax content.

Method 3050 prepares waste samples for total metals determination by AA and ICP. The samples are vigorously digested in nitric acid and hydrogen peroxide followed by dilution with either nitric or hydrochloric acid. The method is applicable to soils, sludges, and solid waste samples.

3.3 METHODS FOR DETERMINATION OF METALS

This manual contains six analytical techniques for trace metal determinations: inductively coupled argon plasma emission spectrometry (ICP), direct-aspiration or flame atomic absorption spectrometry (FAA), graphite-furnace atomic absorption spectrometry (GFAA), hydride-generation atomic absorption spectrometry (HGAA), cold-vapor atomic absorption spectrometry (CVAA), and several procedures for hexavalent chromium analysis. Each of these is briefly discussed below in terms of advantages, disadvantages, and cautions for analysis of wastes.

ICP's primary advantage is that it allows simultaneous or rapid sequential determination of many elements in a short time. The primary disadvantage of ICP is background radiation from other elements and the plasma gases. Although all ICP instruments utilize high-resolution optics and background correction to minimize these interferences, analysis for traces of metals in the presence of a large excess of a single metal is difficult. Examples would be traces of metals in an alloy or traces of metals in a lined (high calcium) waste. ICP and Flame AA have comparable detection limits (within a factor of 4) except that ICP exhibits greater sensitivity for refractories (Al, Ba, etc.). Furnace AA, in general, will exhibit lower detection limits than either ICP or FLAA.

Flame AAS (FLAA) determinations, as opposed to ICP, are normally completed as single element analyses and are relatively free of interelement spectral interferences. Either a nitrous-oxide/acetylene or air/acetylene flame is used as an energy source for dissociating the aspirated sample into the free atomic state making analyte atoms available for absorption of light. In the analysis of some elements the temperature or type of flame used is critical. If the proper flame and analytical conditions are not used, chemical and ionization interferences can occur.

Graphite Furnace AAS (GFAA) replaces the flame with an electrically heated graphite furnace. The furnace allows for gradual heating of the sample aliquot in several stages. Thus, the processes of desolvation, drying, decomposition of organic and inorganic molecules and salts, and formation of atoms which must occur in a flame or ICP in a few milliseconds may be allowed to occur over a much longer time period and at controlled temperatures in the furnace. This allows an experienced analyst to remove unwanted matrix components by using temperature programming and/or matrix modifiers. The major advantage of this technique is that it affords extremely low detection limits. It is the easiest to perform on relatively clean samples. Because this technique is so sensitive, interferences can be a real problem; finding the optimum combination of digestion, heating times and temperatures, and matrix modifiers can be a challenge for complex matrices.

Hydride AA utilizes a chemical reduction to reduce and separate arsenic or selenium selectively from a sample digestate. The technique therefore has the advantage of being able to isolate these two elements from complex samples which may cause interferences for other analytical procedures. Significant interferences have been reported when any of the following is present: 1) easily reduced metals (Cu, Ag, Hg); 2) high concentrations of transition metals (>200 mg/L); 3) oxidizing agents (oxides of nitrogen) remaining following sample digestion.

Cold-Vapor AA uses a chemical reduction to reduce mercury selectively. The procedure is extremely sensitive but is subject to interferences from some volatile organics, chlorine, and sulfur compounds.

METHOD 3050

ACID DIGESTION OF SEDIMENTS, SLUDGES, AND SOILS

1.0 SCOPE AND APPLICATION

1.1 This method is an acid digestion procedure used to prepare sediments, sludges, and soil samples for analysis by flame or furnace atomic absorption spectroscopy (FLAA and GFAA, respectively) or by inductively coupled argon plasma spectroscopy (ICP). Samples prepared by this method may be analyzed by ICP for all the listed metals, or by FLAA or GFAA as indicated below (see also Paragraph 2.1):

<u>FLAA</u>		<u>GFAA</u>
Aluminum	Magnesium	- Arsenic
Barium	Manganese	- Beryllium
- Beryllium	Molybdenum	- Cadmium
- Cadmium	- Nickel	- Chromium
Calcium	Potassium	Cobalt
- Chromium	Sodium	Iron
Cobalt	- Thallium	Molybdenum
Copper	Vanadium	- Selenium
Iron	Zinc	- Thallium
- Lead		Vanadium

2.0 SUMMARY OF METHOD

2.1 A representative 1- to 2-g (wet weight) sample is digested in nitric acid and hydrogen peroxide. The digestate is then refluxed with either nitric acid or hydrochloric acid. Dilute hydrochloric acid is used as the final reflux acid for (1) the ICP analysis of As and Se, and (2) the flame AA or ICP analysis of Al, Ba, Be, Ca, Cd, Cr, Co, Cu, Fe, Mo, Pb, Ni, K, Na, Tl, V, and Zn. Dilute nitric acid is employed as the final dilution acid for the furnace AA analysis of As, Be, Cd, Cr, Co, Pb, Mo, Se, Tl, and V. A separate sample shall be dried for a total solids determination.

3.0 INTERFERENCES

3.1 Sludge samples can contain diverse matrix types, each of which may present its own analytical challenge. Spiked samples and any relevant standard reference material should be processed to aid in determining whether Method 3050 is applicable to a given waste.

4.0 APPARATUS AND MATERIALS

- 4.1 Conical Phillips beakers: 250-mL.
- 4.2 Watch glasses.
- 4.3 Drying ovens: That can be maintained at 30°C.
- 4.4 Thermometer: That covers range of 0 to 200°C.
- 4.5 Whatman No. 41 filter paper (or equivalent).
- 4.6 Centrifuge and centrifuge tubes.

5.0 REAGENTS

5.1 ASTM Type II water (ASTM D1193): Water should be monitored for impurities.

5.2 Concentrated nitric acid, reagent grade (HNO_3): Acid should be analyzed to determine level of impurities. If method blank is \leq MDL, the acid can be used.

5.3 Concentrated hydrochloric acid, reagent grade (HCl): Acid should be analyzed to determine level of impurities. If method blank is \leq MDL, the acid can be used.

5.4 Hydrogen peroxide (30%) (H_2O_2): Oxidant should be analyzed to determine level of impurities.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 All samples must have been collected using a sampling plan that addresses the considerations discussed in Chapter Nine of this manual.

6.2 All sample containers must be prewashed with detergents, acids, and Type II water. Plastic and glass containers are both suitable. See Chapter Three, Section 3.1.3, for further information.

6.3 Nonaqueous samples shall be refrigerated upon receipt and analyzed as soon as possible.

7.0 PROCEDURE

7.1 Mix the sample thoroughly to achieve homogeneity. For each digestion procedure, weigh to the nearest 0.01 g and transfer to a conical beaker a 1.00- to 2.00-g portion of sample.

7.2 Add 10 mL of 1:1 HNO_3 , mix the slurry, and cover with a watch glass. Heat the sample to 95°C and reflux for 10 to 15 min without boiling. → Allow the sample to cool, add 5 mL of concentrated HNO_3 , replace the watch glass, and reflux for 30 min. Repeat this last step to ensure complete oxidation.

Using a ribbed watch glass, allow the solution to evaporate to 5 mL without boiling, while maintaining a covering of solution over the bottom of the beaker.

7.3 After Step 7.2 has been completed and the sample has cooled, add 2 mL of Type II water and 3 mL of 30% H_2O_2 . Cover the beaker with a watch glass and return the covered beaker to the hot plate for warming and to start the peroxide reaction. Care must be taken to ensure that losses do not occur due to excessively vigorous effervescence. Heat until effervescence subsides and cool the beaker.

7.4 Continue to add 30% H_2O_2 in 1-mL aliquots with warming until the effervescence is minimal or until the general sample appearance is unchanged.

NOTE: Do not add more than a total of 10 mL 30% H_2O_2 .

7.5 If the sample is being prepared for (a) the ICP analysis of As and Se, or (b) the flame AA or ICP analysis of Al, Ba, Be, Ca, Cd, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Na, Tl, V, and Zn, then add 5 mL of concentrated HCl and 10 mL of Type II water, return the covered beaker to the hot plate, and reflux for an additional 15 min without boiling. After cooling, dilute to 100 mL with Type II water. Particulates in the digestate that may clog the nebulizer should be removed by filtration, by centrifugation, or by allowing the sample to settle.

7.5.1 Filtration: Filter through Whatman No. 41 filter paper (or equivalent) and dilute to 100 mL with Type II water.

7.5.2 Centrifugation: Centrifugation at 2,000-3,000 rpm for 10 min is usually sufficient to clear the supernatant.

7.5.3 The diluted sample has an approximate acid concentration of 5.0% (v/v) HCl and 5.0% (v/v) HNO_3 . The sample is now ready for analysis.

7.6 If the sample is being prepared for the furnace analysis of As, Be, Cd, Cr, Co, Pb, Mo, Se, Tl, and V, cover the sample with a ribbed watch glass and continue heating the acid-peroxide digestate until the volume has been reduced to approximately 5 mL. After cooling, dilute to 100 mL with Type II water. Particulates in the digestate should then be removed by filtration, by centrifugation, or by allowing the sample to settle.

7.6.1 Filtration: Filter through Whatman No. 41 filter paper (or equivalent) and dilute to 100 mL with Type II water.

7.6.2 Centrifugation: Centrifugation at 2,000-3,000 for 10 min is usually sufficient to clear the supernatant.

7.6.3 The diluted digestate solution contains approximately 5% (v/v) HNO_3 . For analysis, withdraw aliquots of appropriate volume and add any required reagent or matrix modifier. The sample is now ready for analysis.

7.7 Calculations:

7.7.1 The concentrations determined are to be reported on the basis of the actual weight of the sample. If a dry weight analysis is desired, then the percent solids of the sample must also be provided.

7.7.2 If percent solids is desired, a separate determination of percent solids must be performed on a homogeneous aliquot of the sample.

8.0 QUALITY CONTROL

8.1 For each group of samples processed, preparation blanks (Type II water and reagents) should be carried throughout the entire sample preparation and analytical process. These blanks will be useful in determining if samples are being contaminated.

8.2 Duplicate samples should be processed on a routine basis. Duplicate samples will be used to determine precision. The sample load will dictate the frequency, but 20% is recommended.

8.3 Spiked samples or standard reference materials must be employed to determine accuracy. A spiked sample should be included with each group of samples processed and whenever a new sample matrix is being analyzed.

8.4 The concentration of all calibration standards should be verified against a quality control check sample obtained from an outside source.

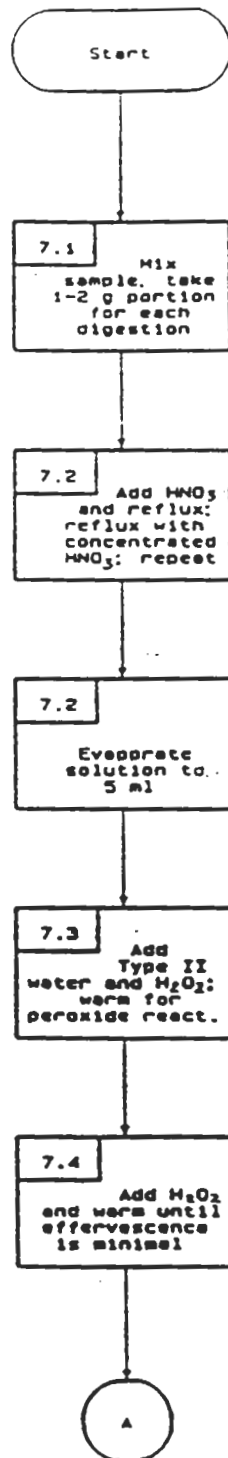
9.0 METHOD PERFORMANCE

9.1 No data provided.

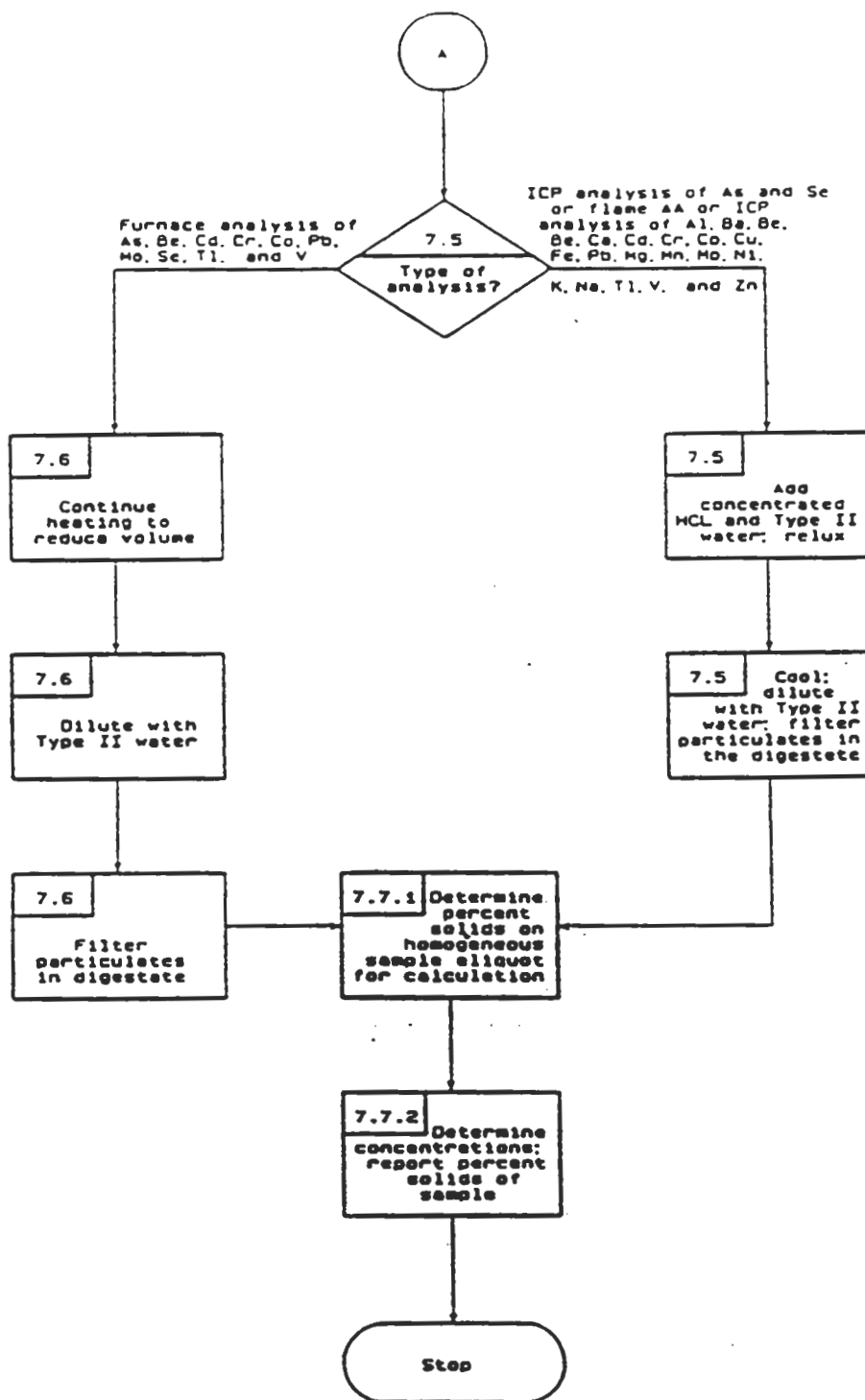
10.0 REFERENCES

10.1 None required.

METHOD 3050
ACID DIGESTION OF SEDIMENTS, SLUDGES, AND SOILS



METHOD 3050
ACID DIGESTION OF SEDIMENTS, SLUDGES AND SOILS
(Continued)



METHOD 6010A

INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION SPECTROSCOPY

1.0 SCOPE AND APPLICATION

1.1 Inductively coupled plasma-atomic emission spectroscopy (ICP) determines trace elements, including metals, in solution. The method is applicable to all of the elements listed in Table 1. All matrices, including ground water, aqueous samples, TCLP and EP extracts, industrial and organic wastes, soils, sludges, sediments, and other solid wastes, require digestion prior to analysis.

1.2 Elements for which Method 6010A is applicable are listed in Table 1. Detection limits, sensitivity, and optimum ranges of the metals will vary with the matrices and model of spectrometer. The data shown in Table 1 provide concentration ranges for clean aqueous samples. Use of this method is restricted to spectroscopists who are knowledgeable in the correction of spectral, chemical, and physical interferences.

2.0 SUMMARY OF METHOD

2.1 Prior to analysis, samples must be solubilized or digested using appropriate Sample Preparation Methods (e.g. Methods 3005A-3050A). When analyzing for dissolved constituents, acid digestion is not necessary if the samples are filtered and acid preserved prior to analysis.

2.2 Method 6010A describes the simultaneous, or sequential, multielemental determination of elements by ICP. The method measures element-emitted light by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. Element-specific atomic-line emission spectra are produced by a radio-frequency inductively coupled plasma. The spectra are dispersed by a grating spectrometer, and the intensities of the lines are monitored by photomultiplier tubes. Background correction is required for trace element determination. Background must be measured adjacent to analyte lines on samples during analysis. The position selected for the background-intensity measurement, on either or both sides of the analytical line, will be determined by the complexity of the spectrum adjacent to the analyte line. The position used must be free of spectral interference and reflect the same change in background intensity as occurs at the analyte wavelength measured. Background correction is not required in cases of line broadening where a background correction measurement would actually degrade the analytical result. The possibility of additional interferences named in Section 3.0 should also be recognized and appropriate corrections made; tests for their presence are described in Step 8.5.

3.0 INTERFERENCES

3.1 Spectral interferences are caused by: (1) overlap of a spectral line from another element; (2) unresolved overlap of molecular band spectra;

TABLE 1.
RECOMMENDED WAVELENGTHS AND ESTIMATED INSTRUMENTAL DETECTION LIMITS

Detection Element	Wavelength ^a (nm)	Estimated Limit ^b (ug/L)
Aluminum	308.215	45
Antimony	206.833	32
Arsenic	193.696	53
Barium	455.403	2
Beryllium	313.042	0.3
Cadmium	226.502	4
Calcium	317.933	10
Chromium	267.716	7
Cobalt	228.616	7
Copper	324.754	6
Iron	259.940	7
Lead	220.353	42
Lithium	670.784	5
Magnesium	279.079	30
Manganese	257.610	2
Molybdenum	202.030	8
Nickel	231.604	15
Phosphorus	213.618	51
Potassium	766.491	See note c
Selenium	196.026	75
Silver	328.068	7
Sodium	588.995	29
Strontium	407.771	0.3
Thallium	190.864	40
Vanadium	292.402	8
Zinc	213.856	2

^aThe wavelengths listed are recommended because of their sensitivity and overall acceptance. Other wavelengths may be substituted if they can provide the needed sensitivity and are treated with the same corrective techniques for spectral interference (see Step 3.1). In time, other elements may be added as more information becomes available and as required.

^bThe estimated instrumental detection limits shown are taken from Reference 1 in Section 10.0 below. They are given as a guide for an instrumental limit. The actual method detection limits are sample dependent and may vary as the sample matrix varies.

^cHighly dependent on operating conditions and plasma position.

(3) background contribution from continuous or recombination phenomena; and (4) stray light from the line emission of high-concentration elements. Spectral overlap can be compensated for by computer-correcting the raw data after monitoring and measuring the interfering element. Unresolved overlap requires selection of an alternate wavelength. Background contribution and stray light can usually be compensated for by a background correction adjacent to the analyte line.

Users of simultaneous multielement instruments must verify the absence of spectral interference from an element in a sample for which there is no instrument detection channel. Potential spectral interferences for the recommended wavelengths are given in Table 2. The data in Table 2 are intended as rudimentary guides for indicating potential interferences; for this purpose, linear relations between concentration and intensity for the analytes and the interferences can be assumed.

3.1.1 The interference is expressed as analyte concentration equivalents (i.e. false analyte concentrations) arising from 100 mg/L of the interference element. For example, assume that As is to be determined (at 193.696 nm) in a sample containing approximately 10 mg/L of Al. According to Table 2, 100 mg/L of Al would yield a false signal for As equivalent to approximately 1.3 mg/L. Therefore, the presence of 10 mg/L of Al would result in a false signal for As equivalent to approximately 0.13 mg/L. The user is cautioned that other instruments may exhibit somewhat different levels of interference than those shown in Table 2. The interference effects must be evaluated for each individual instrument since the intensities will vary with operating conditions, power, viewing height, argon flow rate, etc.

3.1.2 The dashes in Table 2 indicate that no measurable interferences were observed even at higher interferent concentrations. Generally, interferences were discernible if they produced peaks, or background shifts, corresponding to 2 to 5% of the peaks generated by the analyte concentrations.

3.1.3 At present, information on the listed silver and potassium wavelengths is not available, but it has been reported that second-order energy from the magnesium 383.231-nm wavelength interferes with the listed potassium line at 766.491 nm.

TABLE 2.
ANALYTE CONCENTRATION EQUIVALENTS ARISING FROM
INTERFERENCE AT THE 100-mg/L LEVEL

Analyte	Wavelength (nm)	Interferent ^{a,b}									
		Al	Ca	Cr	Cu	Fe	Mg	Mn	Ni	Tl	V
Aluminum	308.215	--	--	--	--	--	--	0.21	--	--	1.4
Antimony	206.833	0.47	--	2.9	--	0.08	--	--	--	0.25	0.45
Arsenic	193.696	1.3	--	0.44	--	--	--	--	--	--	1.1
Barium	455.403	--	--	--	--	--	--	--	--	--	--
Beryllium	313.042	--	--	--	--	--	--	--	--	0.04	0.05
Cadmium	226.502	--	--	--	--	0.03	--	--	0.02	--	--
Calcium	317.933	--	--	0.08	--	0.01	0.01	0.04	--	0.03	0.03
Chromium	267.716	--	--	--	--	0.003	--	0.04	--	--	0.04
Cobalt	228.616	--	--	0.03	--	0.005	--	--	0.03	0.15	--
Copper	324.754	--	--	--	--	0.003	--	--	--	0.05	0.02
Iron	259.940	--	--	--	--	--	--	0.12	--	--	--
Lead	220.353	0.17	--	--	--	--	--	--	--	--	--
Magnesium	279.079	--	0.02	0.11	--	0.13	--	0.25	--	0.07	0.12
Manganese	257.610	0.005	--	0.01	--	0.002	0.002	--	--	--	--
Molybdenum	202.030	0.05	--	--	--	0.03	--	--	--	--	--
Nickel	231.604	--	--	--	--	--	--	--	--	--	--
Selenium	196.026	0.23	--	--	--	0.09	--	--	--	--	--
Sodium	588.995	--	--	--	--	--	--	--	--	0.08	--
Thallium	190.864	0.30	--	--	--	--	--	--	--	--	--
Vanadium	292.402	--	--	0.05	--	0.005	--	--	--	0.02	--
Zinc	213.856	--	--	--	0.14	--	--	--	0.29	--	--

^aDashes indicate that no interference was observed even when interferents were introduced at the following levels:

Al - 1000 mg/L
Ca - 1000 mg/L
Cr - 200 mg/L
Cu - 200 mg/L
Fe - 1000 mg/L

Mg - 1000 mg/L
Mn - 200 mg/L
Tl - 200 mg/L
V - 200 mg/L

^bThe figures recorded as analyte concentrations are not the actual observed concentrations; to obtain those figures, add the listed concentration to the interferent figure.

3.2 Physical interferences are effects associated with the sample nebulization and transport processes. Changes in viscosity and surface tension can cause significant inaccuracies, especially in samples containing high dissolved solids or high acid concentrations. If physical interferences are present, they must be reduced by diluting the sample or by using a peristaltic pump. Another problem that can occur with high dissolved solids is salt buildup at the tip of the nebulizer, which affects aerosol flow rate and causes instrumental drift. The problem can be controlled by wetting the argon prior to nebulization, using a tip washer, or diluting the sample. Also, it has been reported that better control of the argon flow rate improves instrument performance; this is accomplished with the use of mass flow controllers.

3.3 Chemical interferences include molecular compound formation, ionization effects, and solute vaporization effects. Normally, these effects are not significant with the ICP technique. If observed, they can be minimized by careful selection of operating conditions (incident power, observation position, and so forth), by buffering of the sample, by matrix matching, and by standard addition procedures. Chemical interferences are highly dependent on matrix type and the specific analyte element.

4.0 APPARATUS AND MATERIALS

4.1 Inductively coupled argon plasma emission spectrometer:

4.1.1 Computer-controlled emission spectrometer with background correction.

4.1.2 Radio frequency generator compliant with FCC regulations.

4.1.3 Argon gas supply - Welding grade or better.

4.2 Operating conditions - The analyst should follow the instructions provided by the instrument manufacturer. For operation with organic solvents, use of the auxiliary argon inlet is recommended, as are solvent-resistant tubing, increased plasma (coolant) argon flow, decreased nebulizer flow, and increased RF power to obtain stable operation and precise measurements. Sensitivity, instrumental detection limit, precision, linear dynamic range, and interference effects must be established for each individual analyte line on that particular instrument. All measurements must be within the instrument linear range where coordination factors are valid. The analyst must (1) verify that the instrument configuration and operating conditions satisfy the analytical requirements and (2) maintain quality control data confirming instrument performance and analytical results.

4.3 Class A volumetric flasks

4.4 Class A volumetric pipets

5.0 REAGENTS

5.1 Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination. If the purity of a reagent is in question analyze for contamination. If the concentration is less than the MDL then the reagent is acceptable.

5.1.1 Hydrochloric acid (conc), HCl.

5.1.2 Hydrochloric acid (1:1), HCl. Add 500 mL concentrated HCl to 400 mL water and dilute to 1 liter in an appropriate beaker.

5.1.3 Nitric acid (conc), HNO₃.

5.1.4 Nitric acid (1:1), HNO₃. Add 500 mL concentrated HNO₃ to 400 mL water and dilute to 1 liter in an appropriate beaker.

5.2 Reagent Water. All references to water in the method refer to reagent water unless otherwise specified. Reagent water will be interference free. Refer to Chapter One for a definition of reagent water.

5.3 Standard stock solutions may be purchased or prepared from ultra-high purity grade chemicals or metals (99.99 to 99.999% pure). All salts must be dried for 1 hour at 105°C, unless otherwise specified.

CAUTION: Many metal salts are extremely toxic if inhaled or swallowed. Wash hands thoroughly after handling.

Typical stock solution preparation procedures follow. Concentrations are calculated based upon the weight of pure metal added, or with the use of the mole fraction and the weight of the metal salt added.

Metal

$$\text{Concentration (ppm)} = \frac{\text{weight (mg)}}{\text{volume (L)}}$$

Metal salts

$$\text{Concentration (ppm)} = \frac{\text{weight (mg)} \times \text{mole fraction}}{\text{volume (L)}}$$

5.3.1 Aluminum solution, stock, 1 mL = 1000 ug Al: Dissolve 1.0 g of aluminum metal, weighed accurately to at least four significant figures, in an acid mixture of 4 mL of (1:1) HCl and 1 mL of concentrated HNO₃ in a beaker. Warm gently to effect solution. When solution is complete, transfer quantitatively to a liter flask, add an additional 10 mL of (1:1) HCl and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.2 Antimony solution, stock, 1 mL = 1000 ug Sb: Dissolve 2.70 g $K(SbO)C_4H_4O_6$ (mole fraction Sb = 0.3749), weighed accurately to at least four significant figures, in water, add 10 mL (1:1) HCl, and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.3 Arsenic solution, stock, 1 mL = 1000 ug As: Dissolve 1.30 g of As_2O_3 (mole fraction As = 0.7574), weighed accurately to at least four significant figures, in 100 mL of water containing 0.4 g NaOH. Acidify the solution with 2 mL concentrated HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.4 Barium solution, stock, 1 mL = 1000 ug Ba: Dissolve 1.50 g $BaCl_2$ (mole fraction Ba = 0.6595), dried at 250°C for 2 hours, weighed accurately to at least four significant figures, in 10 mL water with 1 mL (1:1) HCl. Add 10.0 mL (1:1) HCl and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.5 Beryllium solution, stock, 1 mL = 1000 ug Be: Do not dry. Dissolve 19.7 g $BeSO_4 \cdot 4H_2O$ (mole fraction Be = 0.0509), weighed accurately to at least four significant figures, in water, add 10.0 mL concentrated HNO_3 , and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.6 Cadmium solution, stock, 1 mL = 1000 ug Cd: Dissolve 1.10 g CdO (mole fraction Cd = 0.8754), weighed accurately to at least four significant figures, in a minimum amount of (1:1) HNO_3 . Heat to increase rate of dissolution. Add 10.0 mL concentrated HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.7 Calcium solution, stock, 1 mL = 1000 ug Ca: Suspend 2.50 g $CaCO_3$ (mole Ca fraction = 0.4005), dried at 180°C for 1 hour before weighing, weighed accurately to at least four significant figures, in water and dissolve cautiously with a minimum amount of (1:1) HNO_3 . Add 10.0 mL concentrated HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.8 Chromium solution, stock, 1 mL = 1000 ug Cr: Dissolve 1.90 g CrO_3 (mole fraction Cr = 0.5200), weighed accurately to at least four significant figures, in water. When solution is complete, acidify with 10 mL concentrated HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.9 Cobalt solution, stock, 1 mL = 1000 ug Co: Dissolve 1.00 g of cobalt metal, weighed accurately to at least four significant figures, in a minimum amount of (1:1) HNO_3 . Add 10.0 mL (1:1) HCl and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.10 Copper solution, stock, 1 mL = 1000 ug Cu: Dissolve 1.30 g CuO (mole fraction Cu = 0.7989), weighed accurately to at least four significant figures, in a minimum amount of (1:1) HNO_3 . Add 10.0 mL concentrated HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.11 Iron solution, stock, 1 mL = 1000 ug Fe: Dissolve 1.40 g Fe_2O_3 (mole fraction Fe = 0.6994), weighed accurately to at least four significant figures, in a warm mixture of 20 mL (1:1) HCl and 2 mL of concentrated HNO_3 . Cool, add an additional 5.0 mL of concentrated HNO_3 , and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.12 Lead solution, stock, 1 mL = 1000 ug Pb: Dissolve 1.60 g $\text{Pb}(\text{NO}_3)_2$ (mole fraction Pb = 0.6256), weighed accurately to at least four significant figures, in a minimum amount of (1:1) HNO_3 . Add 10 mL (1:1) HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.13 Lithium solution, stock, 1 mL = 1000 ug Li: Dissolve 5.324 g lithium carbonate (mole fraction Li = 0.1878), weighed accurately to at least four significant figures, in a minimum amount of (1:1) HCl and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.14 Magnesium solution, stock, 1 mL = 1000 ug Mg: Dissolve 1.70 g MgO (mole fraction Mg = 0.6030), weighed accurately to at least four significant figures, in a minimum amount of (1:1) HNO_3 . Add 10.0 mL (1:1) concentrated HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.15 Manganese solution, stock, 1 mL = 1000 ug Mn: Dissolve 1.00 g of manganese metal, weighed accurately to at least four significant figures, in acid mixture (10 mL concentrated HCl and 1 mL concentrated HNO_3) and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.16 Molybdenum solution, stock, 1 mL = 1000 ug Mo: Dissolve 2.00 g $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4\text{H}_2\text{O}$ (mole fraction Mo = 0.5772), weighed accurately to at least four significant figures, in water and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.17 Nickel solution, stock, 1 mL = 1000 ug Ni: Dissolve 1.00 g of nickel metal, weighed accurately to at least four significant figures, in 10.0 mL hot concentrated HNO_3 , cool, and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.18 Phosphate solution, stock, 1 mL = 1000 ug P: Dissolve 4.393 g anhydrous KH_2PO_4 (mole fraction P = 0.2276), weighed accurately to at least four significant figures, in water. Dilute to volume in a 1,000 mL volumetric flask with water.

5.3.19 Potassium solution, stock, 1 mL = 1000 ug K: Dissolve 1.90 g KCl (mole fraction K = 0.5244) dried at 110°C , weighed accurately to at least four significant figures, in water, and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.20 Selenium solution, stock, 1 mL = 1000 ug Se: Do not dry. Dissolve 1.70 g H_2SeO_3 (mole fraction Se = 0.6123), weighed accurately to at least four significant figures, in water and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.21 Silver solution, stock, 1 mL = 1000 ug Ag: Dissolve

1.60 g AgNO_3 (mole fraction Ag = 0.6350), weighed accurately to at least four significant figures, in water and 10 mL concentrated HNO_3 . Dilute to volume in a 1,000 mL volumetric flask with water.

5.3.22 Sodium solution, stock, 1 mL = 1000 ug Na: Dissolve 2.50 g NaCl (mole fraction Na = 0.3934), weighed accurately to at least four significant figures, in water. Add 10.0 mL concentrated HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.23 Strontium solution, stock, 1 mL = 1000 ug Sr: Dissolve 2.415 g of strontium nitrate ($\text{Sr}(\text{NO}_3)_2$) (mole fraction 0.4140), weighed accurately to at least four significant figures, in a 1-liter flask containing 10 mL of concentrated HCl and 700 mL of water. Dilute to volume in a 1,000 mL volumetric flask with water.

5.3.24 Thallium solution, stock, 1 mL = 1000 ug Tl: Dissolve 1.30 g TlNO_3 (mole fraction Tl = 0.7672), weighed accurately to at least four significant figures, in water. Add 10.0 mL concentrated HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.25 Vanadium solution, stock, 1 mL = 1000 ug V: Dissolve 2.30 g NH_4VO_3 (mole fraction V = 0.4356), weighed accurately to at least four significant figures, in a minimum amount of concentrated HNO_3 . Heat to increase rate of dissolution. Add 10.0 mL concentrated HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.26 Zinc solution, stock, 1 mL = 1000 ug Zn: Dissolve 1.20 g ZnO (mole fraction Zn = 0.8034), weighed accurately to at least four significant figures, in a minimum amount of dilute HNO_3 . Add 10.0 mL concentrated HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water.

5.4 Mixed calibration standard solutions - Prepare mixed calibration standard solutions by combining appropriate volumes of the stock solutions in volumetric flasks (see Table 3). Add 2 mL (1:1) HNO_3 and 10 mL of (1:1) HCl and dilute to 100 mL with water. Prior to preparing the mixed standards, each stock solution should be analyzed separately to determine possible spectral interference or the presence of impurities. Care should be taken when preparing the mixed standards to ensure that the elements are compatible and stable together. Transfer the mixed standard solutions to FEP fluorocarbon or previously unused polyethylene or polypropylene bottles for storage. Fresh mixed standards should be prepared, as needed, with the realization that concentration can change on aging. Calibration standards must be initially verified using a quality control sample (see Step 5.8) and monitored weekly for stability. Some typical calibration standard combinations are listed in Table 3. All mixtures should then be scanned using a sequential spectrometer to verify the absence of interelement spectral interference in the recommended mixed standard solutions.

NOTE: If the addition of silver to the recommended acid combination results in an initial precipitation, add 15 mL of water and warm the flask until the solution clears. Cool and dilute to 100 mL with water. For this acid combination, the silver concentration should be limited to 2 mg/L. Silver under these conditions is stable

in a tap-water matrix for 30 days. Higher concentrations of silver require additional HCl.

TABLE 3.
MIXED STANDARD SOLUTIONS

Solution	Elements
I	Be, Cd, Mn, Pb, Se and Zn
II	Ba, Co, Cu, Fe, and V
III	As, Mo
IV	Al, Ca, Cr, K, Na, Ni, Li, & Sr
V	Ag (see Note to Step 5.4), Mg, Sb, and Tl
VI	P

5.5 Two types of blanks are required for the analysis. The calibration blank is used in establishing the analytical curve, and the reagent blank is used to correct for possible contamination resulting from varying amounts of the acids used in the sample processing.

5.5.1 The calibration blank is prepared by acidifying reagent water to the same concentrations of the acids found in the standards and samples. Prepare a sufficient quantity to flush the system between standards and samples.

5.5.2 The reagent blank must contain all the reagents and in the same volumes as used in the processing of the samples. The reagent blank must be carried through the complete procedure and contain the same acid concentration in the final solution as the sample solution used for analysis.

5.6 The instrument check standard is prepared by the analyst by combining compatible elements at concentrations equivalent to the midpoint of their respective calibration curves (see Step 8.6.2.1 for use).

5.7 The interference check solution is prepared to contain known concentrations of interfering elements that will provide an adequate test of the correction factors. Spike the sample with the elements of interest at approximate concentrations of 10 times the instrumental detection limits. In the absence of measurable analyte, overcorrection could go undetected because a negative value could be reported as zero. If the particular instrument will display overcorrection as a negative number, this spiking procedure will not be necessary.

5.8 The quality control sample should be prepared in the same acid matrix as the calibration standards at 10 times the instrumental detection limits and in accordance with the instructions provided by the supplier.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 See the introductory material in Chapter Three, Metallic Analytes, Steps 3.1 through 3.3.

7.0 PROCEDURE

7.1 Preliminary treatment of most matrices is necessary because of the complexity and variability of sample matrices. Water samples which have been prefiltered and acidified will not need acid digestion. Solubilization and digestion procedures are presented in Sample Preparation Methods (Methods 3005A-3050A).

7.2 Set up the instrument with proper operating parameters established in Step 4.2. The instrument must be allowed to become thermally stable before beginning (usually requiring at least 30 minutes of operation prior to calibration).

7.3 Profile and calibrate the instrument according to the instrument manufacturer's recommended procedures, using the typical mixed calibration standard solutions described in Step 5.4. Flush the system with the calibration blank (Step 5.5.1) between each standard or as the manufacturer recommends. (Use the average intensity of multiple exposures for both standardization and sample analysis to reduce random error.) The calibration curve should consist of a blank and three standards.

7.4 Before beginning the sample run, reanalyze the highest mixed calibration standard as if it were a sample. Concentration values obtained should not deviate from the actual values by more than 5% (or the established control limits, whichever is lower). If they do, follow the recommendations of the instrument manufacturer to correct for this condition.

7.5 Flush the system with the calibration blank solution for at least 1 minute (Step 5.5.1) before the analysis of each sample (see Note to Step 7.3). Analyze the instrument check standard (Step 5.6) and the calibration blank (Step 5.5.1) after each 10 samples.

7.6 Calculations: If dilutions were performed, the appropriate factors must be applied to sample values. All results should be reported in ug/L with up to three significant figures.

8.0 QUALITY CONTROL

8.1 All quality control data should be maintained and available for easy reference or inspection. All quality control measures described in Chapter One should be followed.

8.2 Dilute and reanalyze samples that are more concentrated than the linear calibration limit or use an alternate, less sensitive line for which quality control data is already established.

8.3 Employ a minimum of one reagent blank per sample batch to determine if contamination or any memory effects are occurring. A reagent blank is a volume of reagent water acidified with the same amounts of acids as were the standards and samples.

8.4 Analyze replicate samples at the frequency described in Chapter One. A replicate sample is a sample brought through the whole sample preparation and analytical process in duplicate.

8.5 It is recommended that whenever a new or unusual sample matrix is encountered, a series of tests be performed prior to reporting concentration data for analyte elements. These tests, as outlined in Steps 8.5.1 and 8.5.2, will ensure the analyst that neither positive nor negative interferences are operating on any of the analyte elements to distort the accuracy of the reported values.

8.5.1 Serial dilution: If the analyte concentration is sufficiently high (minimally, a factor of 10 above the instrumental detection limit after dilution), an analysis of a 1:4 dilution should agree within $\pm 10\%$ of the original determination. If not, a chemical or physical interference effect should be suspected.

8.5.2 Matrix spike addition: An analyte spike added to a portion of a prepared sample, or its dilution, should be recovered to within 75% to 125% of the known value. The spike addition should produce a minimum level of 10 times and a maximum of 100 times the instrumental detection limit. If the spike is not recovered within the specified limits, a matrix effect should be suspected.

CAUTION: If spectral overlap is suspected, use of computerized compensation, an alternate wavelength, or comparison with an alternate method is recommended.

8.6 Check the instrument standardization by analyzing appropriate check standards as follows.

8.6.1 Verify calibration every 10 samples and at the end of the analytical run, using a calibration blank (Step 5.5.1) and a check standard (Step 5.6).

8.6.1.1 The results of the check standard are to agree within 10% of the expected value; if not, terminate the analysis, correct the problem, and recalibrate the instrument.

8.6.1.2 The results of the calibration blank are to agree within three standard deviations of the mean blank value. If not, repeat the analysis two more times and average the results. If the average is not within three standard deviations of the background

mean, terminate the analysis, correct the problem, recalibrate, and reanalyze the previous 10 samples.

8.6.2 Verify the interelement and background correction factors at the beginning and end of an analytical run or twice during every 8-hour work shift, whichever is more frequent. Do this by analyzing the interference check sample (Step 5.7). Results should be within $\pm 20\%$ of the true value obtained in Step 8.6.1.1.

8.6.3 Spiked replicate samples are to be analyzed at a frequency described in Chapter One.

8.6.3.1 The relative percent difference between replicate determinations is to be calculated as follows:

$$RPD = \frac{D_1 - D_2}{(D_1 + D_2)/2} \times 100$$

where:

RPD = relative percent difference.
 D_1 = first sample value.
 D_2 = second sample value (replicate).

(A control limit of $\pm 20\%$ RPD shall be used for sample values greater than ten times the instrument detection limit.)

8.6.3.2 The spiked replicate sample recovery is to be within $\pm 20\%$ of the actual value.

9.0 METHOD PERFORMANCE

9.1 In an EPA round-robin Phase 1 study, seven laboratories applied the ICP technique to acid-distilled water matrices that had been spiked with various metal concentrates. Table 4 lists the true values, the mean reported values, and the mean percent relative standard deviations.

9.2 In a single laboratory evaluation, seven wastes were analyzed for 22 elements by this method. The mean percent relative standard deviation from triplicate analyses for all elements and wastes was $9 \pm 2\%$. The mean percent recovery of spiked elements for all wastes was $93 \pm 6\%$. Spike levels ranged from 100 ug/L to 100 mg/L. The wastes included sludges and industrial wastewaters.

10.0 REFERENCES

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5. Bowmand, P.W.J.M. Line Coincidence Tables for Inductively Coupled Plasma Atomic Emission Spectrometry, 2nd ed.; Pergamon: 1984.
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TABLE 4.
ICP PRECISION AND ACCURACY DATA^a

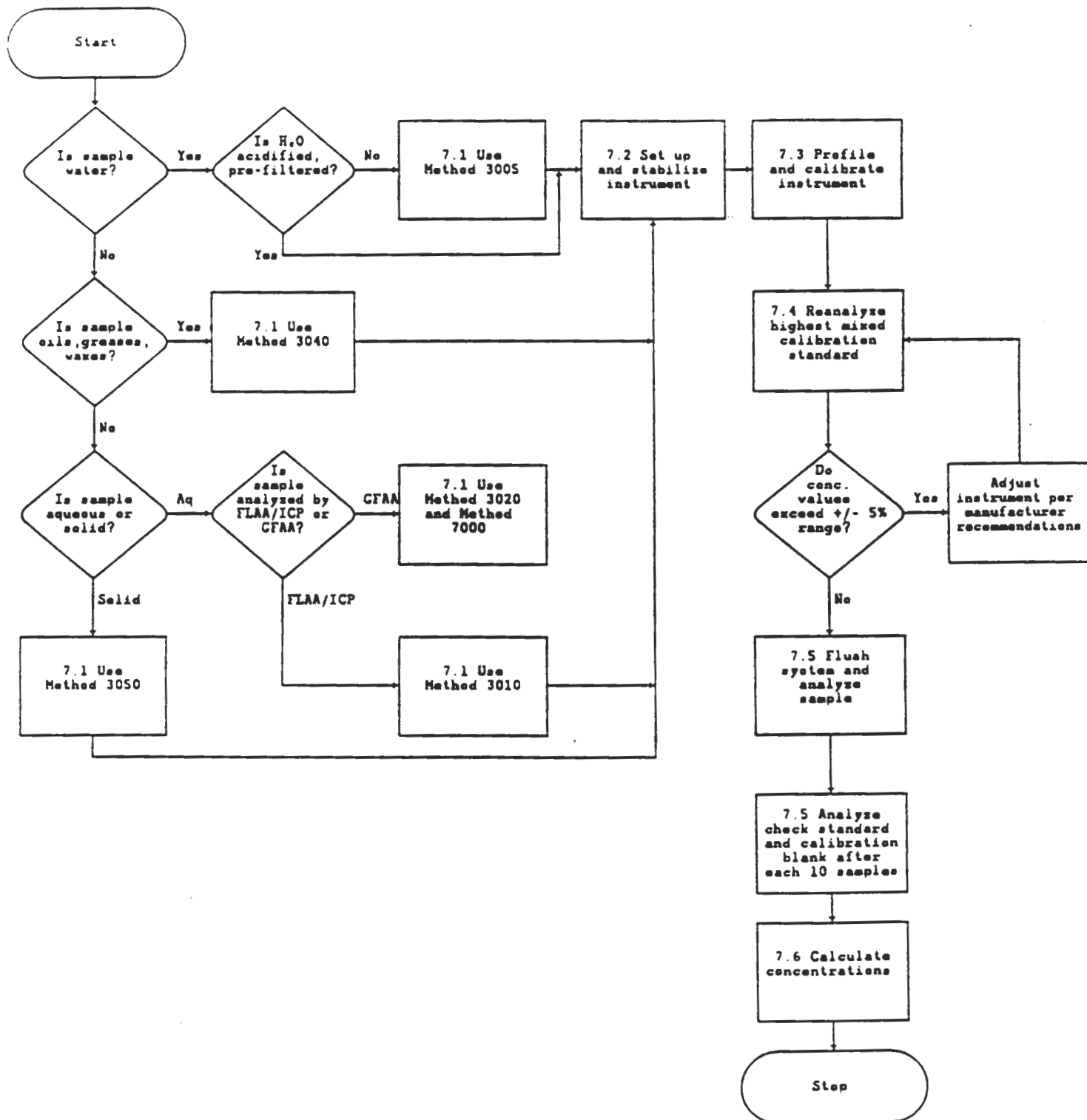
Element	Sample No. 1			Sample No. 2			Sample No. 3		
	True Value (ug/L)	Mean Reported Value (ug/L)	Mean SD ^b (%)	True Value (ug/L)	Mean Reported Value (ug/L)	Mean SD ^b (%)	True Value (ug/L)	Mean Reported Value (ug/L)	Mean SD ^b (%)
Be	750	733	6.2	20	20	9.8	180	176	5.2
Mn	350	345	2.7	15	15	6.7	100	99	3.3
V	750	749	1.8	70	69	2.9	170	169	1.1
As	200	208	7.5	22	19	23	60	63	17
Cr	150	149	3.8	10	10	18	50	50	3.3
Cu	250	235	5.1	11	11	40	70	67	7.9
Fe	600	594	3.0	20	19	15	180	178	6.0
Al	700	696	5.6	60	62	33	160	161	13
Cd	50	48	12 2.5	2.9	16	14	13	16	
Co	700	512	10 20	20	4.1	120	108	21	
Ni	250	245	5.8	30	28	11	60	55	14
Pb	250	236	16 24	30	32	80	80	14	
Zn	200	201	5.6	16	19	45	80	82	9.4
Se ^c	40	32	21.9	6	8.5	42	10	8.5	8.3

^aNot all elements were analyzed by all laboratories.

^bSD = standard deviation.

^cResults for Se are from two laboratories.

METHOD 6010A
INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION SPECTROSCOPY



METHOD 7471

MERCURY IN SOLID OR SEMISOLID WASTE (MANUAL COLD-VAPOR TECHNIQUE)

1.0 SCOPE AND APPLICATION

1.1 Method 7471 is approved for measuring total mercury (organic and inorganic) in soils, sediments, bottom deposits, and sludge-type materials. All samples must be subjected to an appropriate dissolution step prior to analysis.

2.0 SUMMARY OF METHOD

2.1 Prior to analysis, the solid or semi-solid samples must be prepared according to the procedures discussed in this method.

2.2 Method 7471, a cold-vapor atomic absorption method, is based on the absorption of radiation at the 253.7-nm wavelength by mercury vapor. The mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an atomic absorption spectrophotometer. Absorbance (peak height) is measured as a function of mercury concentration.

2.3 The typical detection limit for this method is 0.0002 mg/L.

3.0 INTERFERENCES

3.1 Potassium permanganate is added to eliminate possible interference from sulfide. Concentrations as high as 20 mg/L of sulfide as sodium sulfide do not interfere with the recovery of added inorganic mercury from Type II water.

3.2 Copper has also been reported to interfere; however, copper concentrations as high as 10 mg/L had no effect on recovery of mercury from spiked samples.

3.3 Seawaters, brines, and industrial effluents high in chlorides require additional permanganate (as much as 25 mL) because, during the oxidation step, chlorides are converted to free chlorine, which also absorbs radiation of 253 nm. Care must therefore be taken to ensure that free chlorine is absent before the mercury is reduced and swept into the cell. This may be accomplished by using an excess of hydroxylamine sulfate reagent (25 mL). In addition, the dead air space in the BOD bottle must be purged before adding stannous sulfate. Both inorganic and organic mercury spikes have been quantitatively recovered from seawater by using this technique.

3.4 Certain volatile organic materials that absorb at this wavelength may also cause interference. A preliminary run without reagents should determine if this type of interference is present.

4.0 APPARATUS AND MATERIALS

4.1 Atomic absorption spectrophotometer or equivalent: Any atomic absorption unit with an open sample presentation area in which to mount the absorption cell is suitable. Instrument settings recommended by the particular manufacturer should be followed. Instruments designed specifically for the measurement of mercury using the cold-vapor technique are commercially available and may be substituted for the atomic absorption spectrophotometer.

4.2 Mercury hollow cathode lamp or electrodeless discharge lamp.

4.3 Recorder: Any multirange variable-speed recorder that is compatible with the UV detection system is suitable.

4.4 Absorption cell: Standard spectrophotometer cells 10 cm long with quartz end windows may be used. Suitable cells may be constructed from Plexiglas tubing, 1 in. O.D. x 4.5 in. The ends are ground perpendicular to the longitudinal axis, and quartz windows (1 in. diameter x 1/16 in. thickness) are cemented in place. The cell is strapped to a burner for support and aligned in the light beam by use of two 2-in. x 2-in. cards. One-in.-diameter holes are cut in the middle of each card. The cards are then placed over each end of the cell. The cell is then positioned and adjusted vertically and horizontally to give the maximum transmittance.

4.5 Air pump: Any peristaltic pump capable of delivering 1 L/min air may be used. A Masterflex pump with electronic speed control has been found to be satisfactory.

4.6 Flowmeter: Capable of measuring an air flow of 1 L/min.

4.7 Aeration tubing: A straight glass frit with a coarse porosity. Tygon tubing is used for passage of the mercury vapor from the sample bottle to the absorption cell and return.

4.8 Drying tube: 6-in. x 3/4-in.-diameter tube containing 20 g of magnesium perchlorate or a small reading lamp with 60-W bulb which may be used to prevent condensation of moisture inside the cell. The lamp should be positioned to shine on the absorption cell so that the air temperature in the cell is about 10°C above ambient.

4.9 The cold-vapor generator is assembled as shown in Figure 1.

4.9.1 The apparatus shown in Figure 1 is a closed system. An open system, where the mercury vapor is passed through the absorption cell only once, may be used instead of the closed system.

4.9.2 Because mercury vapor is toxic, precaution must be taken to avoid its inhalation. Therefore, a bypass has been included in the

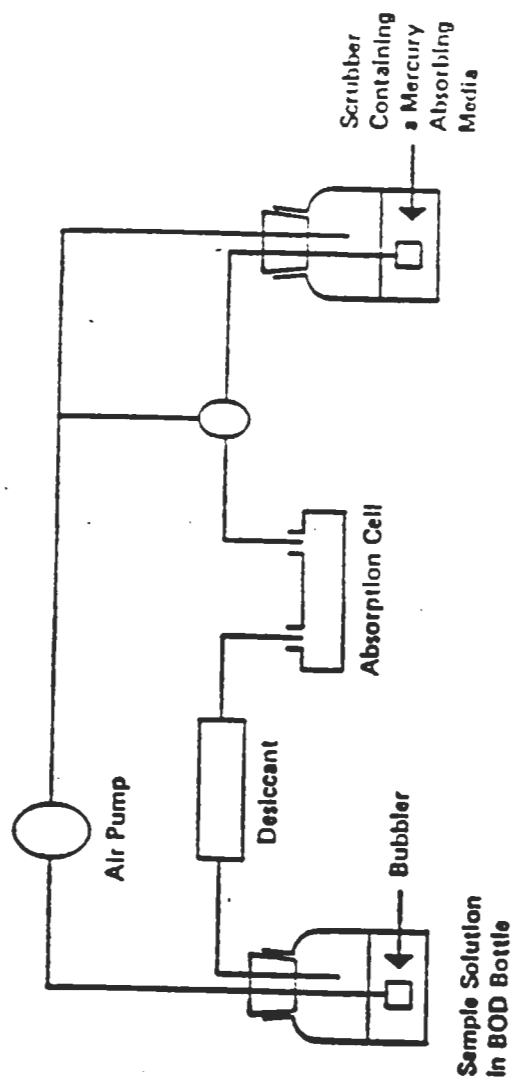


Figure 1. Apparatus for flameless mercury determination.

system either to vent the mercury vapor into an exhaust hood or to pass the vapor through some absorbing medium, such as:

1. equal volumes of 0.1 M KMnO_4 and 10% H_2SO_4 , or
2. 0.25% iodine in a 3% KI solution.

A specially treated charcoal that will adsorb mercury vapor is also available from Barneby and Cheney, East 8th Avenue and North Cassidy Street, Columbus, Ohio 43219, Cat. #580-13 or #580-22.

5.0 REAGENTS

5.1 ASTM Type II water (ASTM D1193): Water should be monitored for impurities.

5.2 Aqua regia: Prepare immediately before use by carefully adding three volumes of concentrated HCl to one volume of concentrated HNO_3 .

5.3 Sulfuric acid, 0.5 N: Dilute 14.0 mL of concentrated sulfuric acid to 1 liter.

5.4 Stannous sulfate: Add 25 g stannous sulfate to 250 mL of 0.5 N sulfuric acid. This mixture is a suspension and should be stirred continuously during use. A 10% solution of stannous chloride can be substituted for stannous sulfate.

5.5 Sodium chloride-hydroxylamine sulfate solution: Dissolve 12 g of sodium chloride and 12 g of hydroxylamine sulfate in Type II water and dilute to 100 mL. Hydroxylamine hydrochloride may be used in place of hydroxylamine sulfate.

5.6 Potassium permanganate, mercury-free, 5% solution (w/v): Dissolve 5 g of potassium permanganate in 100 mL of Type II water.

5.7 Mercury stock solution: Dissolve 0.1354 g of mercuric chloride in 75 mL of Type II water. Add 10 mL of concentrated nitric acid and adjust the volume to 100.0 mL (1.0 mL = 1.0 mg Hg).

5.8 Mercury working standard: Make successive dilutions of the stock mercury solution to obtain a working standard containing 0.1 ug/mL. This working standard and the dilution of the stock mercury solutions should be prepared fresh daily. Acidity of the working standard should be maintained at 0.15% nitric acid. This acid should be added to the flask, as needed, before adding the aliquot.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 All samples must have been collected using a sampling plan that addresses the considerations discussed in Chapter Nine of this manual.

6.2 All sample containers must be prewashed with detergents, acids, and Type II water. Plastic and glass containers are both suitable.

6.3 Aqueous samples must be acidified to a pH < 2 with nitric acid.

6.4 For solids or semisolids, moisture may be driven off in a drying oven at a temperature of 60°C.

7.0 PROCEDURE

7.1 Sample preparation: Weigh triplicate 0.2-g portions of untreated sample and place in the bottom of a BOD bottle. Add 5 mL of Type II water and 5 mL of aqua regia. Heat 2 min in a water bath at 95°C. Cool; then add 50 mL Type II water and 15 mL potassium permanganate solution to each sample bottle. Mix thoroughly and place in the water bath for 30 min at 95°C. Cool and add 6 mL of sodium chloride-hydroxylamine sulfate to reduce the excess permanganate.

CAUTION: Do this addition under a hood, as Cl_2 could be evolved. Add 55 mL of Type II water. Treating each bottle individually, add 5 mL of stannous sulfate and immediately attach the bottle to the aeration apparatus. Continue as described under step 7.4.

7.2 An alternate digestion procedure employing an autoclave may also be used. In this method, 5 mL of concentrated H_2SO_4 and 2 mL of concentrated HNO_3 are added to the 0.2 g of sample. Add 5 mL of saturated KMnO_4 solution and cover the bottle with a piece of aluminum foil. The samples are autoclaved at 121°C and 15 lb for 15 min. Cool, dilute to a volume of 100 mL with Type II water, and add 6 mL of sodium chloride-hydroxylamine sulfate solution to reduce the excess permanganate. Purge the dead air space and continue as described under step 7.4.

7.3 Standard preparation: Transfer 0.0-, 0.5-, 1.0-, 2.0-, 5.0-, and 10-mL aliquots of the mercury working standard, containing 0-1.0 μg of mercury, to a series of 300-mL BOD bottles. Add enough Type II water to each bottle to make a total volume of 10 mL. Add 5 mL of aqua regia and heat 2 min in a water bath at 95°C. Allow the sample to cool; add 50 mL Type II water and 15 mL of KMnO_4 solution to each bottle and return to the water bath for 30 min. Cool and add 6 mL of sodium chloride-hydroxylamine sulfate solution to reduce the excess permanganate. Add 50 mL of Type II water. Treating each bottle individually, add 5 mL of stannous sulfate solution, immediately attach the bottle to the aeration apparatus, and continue as described in Step 7.4.

7.4 Analysis: At this point, the sample is allowed to stand quietly without manual agitation. The circulating pump, which has previously been adjusted to a rate of 1 L/min, is allowed to run continuously. The absorbance, as exhibited either on the spectrophotometer or the recorder, will increase and reach maximum within 30 sec. As soon as the recorder pen levels off (approximately 1 min), open the bypass valve and continue the aeration until the absorbance returns to its minimum value. Close the bypass valve, remove the fritted tubing from the BOD bottle, and continue the aeration.

7.5 Construct a calibration curve by plotting the absorbances of standards versus micrograms of mercury. Determine the peak height of the unknown from the chart and read the mercury value from the standard curve.

7.6 Analyze all EP extracts, all samples analyzed as part of a delisting petition, and all samples that suffer from matrix interferences by the method of standard additions (see Method 7000, Section 8.7).

7.7 Duplicates, spiked samples, and check standards should be routinely analyzed.

7.8 Calculate metal concentrations: (1) by the method of standard additions, (2) from a calibration curve, or (3) directly from the instrument's concentration read-out. All dilution or concentration factors must be taken into account. Concentrations reported for multiphased or wet samples must be appropriately qualified (e.g., 5 ug/g dry weight).

8.0 QUALITY CONTROL

8.1 All quality control data should be maintained and available for easy reference or inspection.

8.2 Calibration curves must be composed of a minimum of a blank and three standards. A calibration curve should be made for every hour of continuous sample analysis.

8.3 Dilute samples if they are more concentrated than the highest standard or if they fall on the plateau of a calibration curve.

8.4 Employ a minimum of one blank per sample batch to determine if contamination or any memory effects are occurring.

8.5 Verify calibration with an independently prepared check standard every 15 samples.

8.6 Run one spike duplicate sample for every 10 samples. A duplicate sample is a sample brought through the entire sample preparation and analytical process.

8.7 The method of standard additions (see Method 7000, Section 8.7) shall be used for the analysis of all EP extracts, on all analyses submitted as part of a delisting petition, and whenever a new sample matrix is being analyzed.

9.0 METHOD PERFORMANCE

9.1 Precision and accuracy data are available in Method 245.5 of Methods for Chemical Analysis of Water and Wastes.

9.2 The data shown in Table 1 were obtained from records of state and contractor laboratories. The data are intended to show the precision of the combined sample preparation and analysis method.

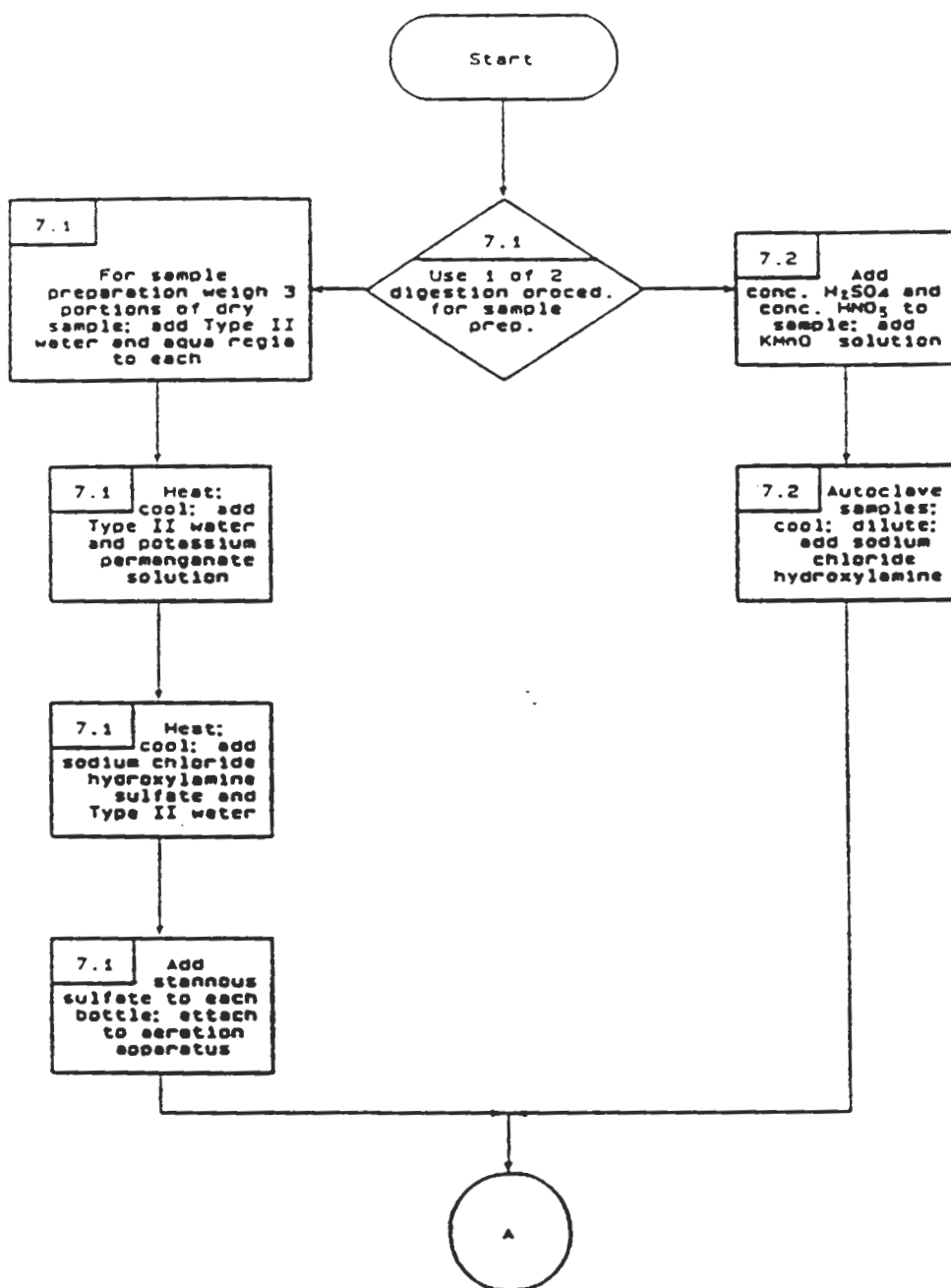
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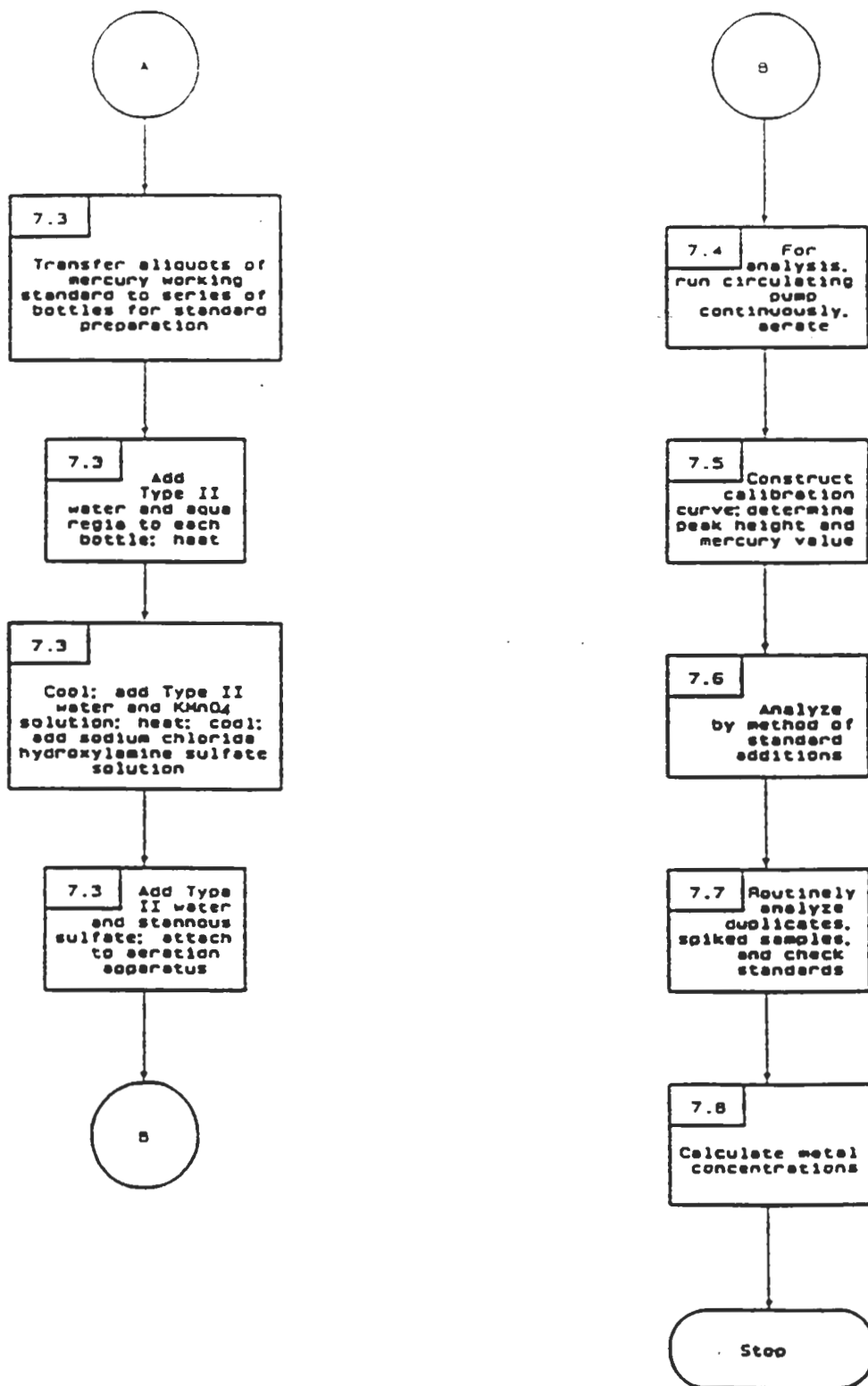
TABLE 1. METHOD PERFORMANCE DATA

Sample Matrix	Preparation Method	Laboratory Replicates
Emission control dust	Not known	12, 12 ug/g
Wastewater treatment sludge	Not known	0.4, 0.28 ug/g

METHOD 7471
MERCURY IN SOLID OR SEMISOLID WASTE (MANUAL COLD-VAPOR TECHNIQUE)



METHOD 7471
MERCURY IN SOLID OR SEMISOLID WASTE (MANUAL COLD-VAPOR TECHNIQUE)
(Continued)



APPENDIX H
(POSITIVE IMPACTS ON SOLID WASTE MANAGEMENT)

APPENDIX H

Positive Impacts on Solid Waste Management

1. Emissions from Municipal Solid Waste (MSW) Incinerators

Solid waste source reduction initiatives, such as the CONEG Toxics in Packaging Model, which reduce the amount of heavy metals in consumer products and packaging have a positive environmental impact on emissions from MSW incinerators. For example, New Jersey's Mercury Emissions Standard Setting Task Force, composed of 27 public members from industry and environmental groups and 20 staff members from the NJ DEPE, concluded that a combination of air quality control technologies, source reduction and source separation techniques will reduce mercury emissions from solid waste incinerators.

Air quality control such as carbon injection or wet scrubbers were evaluated and found to be able to achieve between a 70% to 90% control efficiency for removal of mercury from the flue gases. Source reduction and source separation programs were also evaluated and found to be able to achieve between a 70% to a 95% removal of mercury in solid waste for incineration. The Mercury Emissions Task Force concluded that a strategy which combines 80% source reduction and 80% air quality control will provide for an overall 96% mercury emission reduction for the 1990's. However, the Report stresses the source reduction must be fully implemented if the recommended mercury emissions standards are to be met.

2. Reuse of Solid Waste as a Product

The Resource Conservation and Recovery Act (RCRA) requires that, to the maximum extent achievable, solid waste should be reused, as a resource. The limiting factor in the use or reuse of solid waste as a product becomes the heavy metals in the solid waste. Any use or more appropriately reuse of solid waste in processes such as composting, materials recovery or energy recovery which generates a solid waste derived product, results in a weight and volume reduction of the solid waste. This processing will increase the concentration of heavy metals in the solid waste derived product. The use of those solid waste derived products will be evaluated against current media environmental criteria that are in place in a number of states and the USEPA as identified in Tables one through four.

Tables five through seven identify the trace metal composition for cadmium, lead and mercury in bottom and combined ash from municipal solid waste incinerators from a number of states. Bottom ash is a residue that remains on the grate after combustion. Combined ash includes both bottom ash and fly ash. Fly ash is the residue or particulars that are extracted from the flue gas stream as it moves through the air quality control systems.

There is a significant increase in the metals concentrations between the bottom and combined ash because of the fly ash concentrations enrichment. Given that the air quality control system for most metals are 99% efficient and because of the conservation of matter;

$$C_{swi} V_{sw} = C_{ai} V_a$$

$$C_{swi} = \frac{C_{ai} V_a}{V_{sw}}$$

where,

C_{swi} = the concentration of a heavy metal in the solid waste disposed,

V_{sw} = the total volume of solid waste disposed,

C_{ai} = the concentration of a heavy metal in the residual ash,

V_a = the total volume of the residual ash stream,

i = the specific heavy metal, i.e., lead or cadmium.

Since mass burn municipal solid waste incinerators achieve on average a 75% by volume reduction;

$$\frac{V_a}{V_{sw}} = 0.25$$

Since current mercury control is approximately 40% to 70% efficient, the calculation for mercury assumes a 50% removal efficiency;

$$C_{swHg} = \frac{(C_{aHg} \times .50) V_a}{V_{sw}}$$

Using the concentration levels in Appendix 2, Table 2 from New Jersey, the following metal concentration levels in municipal solid waste are calculated as:

$$C_{swcd} = 61 \times .25 = 15.25;$$

$$C_{swpd} = 2173 \times .25 = 543.25; \text{ and}$$

$$C_{swHg} = 6.5 / .5 \times .25 = 3.25.$$

These concentrations are significantly above background levels for these constituents. This same analysis will be valid for production, processing and use of MSW and sludge derived compost. In order to improve and increase the market share of solid waste-derived products, an improvement in the quality of the solid waste stream through source reduction and source separation programs for heavy metal containing products and packaging must occur. The CONEG Toxics in Packaging Model probably has had a positive impact in this regard. However, this impact has not been quantified.

Table 1: Minnesota Media Environmental Criteria

	Cadmium	Lead	Mercury
Groundwater ¹	1.25 ug/l	5 ug/l	.75 ug/l
Surface Water ²			
* Chronic	1.1 ug/l	3.2 ug/l	.007 ug/l
* Maximum	3.9 ug/l	82.0 ug/l	2.4 ug/l
* Acute	7.8 ug/l	164.0 ug/l	4.9 ug/l
Safe Drinking Water			
* private wells ³	4 ug/l	20 ug/l	2 ug/l
* muni. supply ⁴	10 ug/l	50 ug/l	2 ug/l
Sludges	39 mg/kg	300 mg/kg	17 mg/kg
Soils (R) ⁶	no set standard	no set standard	no set standard
Soils (NR) ⁷	no set standard	no set standard	no set standard

1 - Ground water quality intervention limits Minn. Rules 7035.2815.

2 - Surface water standards Minn. Rules 7050.

3 - Standards for private wells are based on the Minnesota Department of Health, Health Risk limits (HRLs).

4 - Maximum Contaminate Levels (MCLs) for municipal drinking water supplies are based on federal drinking water standards.

5 - Sewage Sludge Quality Criteria 40 CFR Part 503.13.b.3

6 - Minnesota does not have a set criteria for cleanup at residential or non residential sites. Rather the Minnesota Pollution control Agency (MPCA) is developing a model to determine cleanup criteria based on the specific site. This model is similar to one being developed by the USEPA.

Table 2: New Hampshire Media Environmental Criteria

	Cadmium	Lead	Mercury
Groundwater ¹	5 ug/l	15 ug/l	2 ug/l
Surface Water ²	10 ug/l	50 ug/l	0.14 ug/l
Safe Drinking Waters ³	5 ug/l	50 ug/l	2 ug/l
Sludge ⁴	39 mg/kg	300 mg/kg	17 mg/kg
Soils (R) ⁵	1 mg/l	5 mg/l	0.2 mg/l
Soils (NR) ⁵	(same as R)	(same as R)	(same as R)

1 - NH Groundwater Protection Rules Env-Ws 410

2 - NH Surface Water Rules Env-Ws 400

3 - NH Water Quality Rules Env-Ws 316

4 - Sewage Sludge Quality Criteria 40 CFR 503.13 (unless superseded by local agreements)

5 - NH Hazardous Waste Rules Env-Wm 403.06 (residential & non-residential; standards are determined on case by case basis depending on proximity to water supply, health risk, etc. Numbers indicate limits as regulated waste and are least stringent used).

Table 3: New Jersey Media Environmental Criteria¹

	Cadmium	Lead	Mercury
Groundwater ²	4 ug/l ⁸	5 ug/l	2 ug/l
Surface Waters ³	10 ug/l	50 ug/l	2 ug/l
Safe Drinking Water ⁴	5 ug/l	15 ug/l	2 ug/l
Sludge (HQ) ⁵	39 mg/kg ⁹	300 mg/kg	17 mg/kg
Soils (R) ⁶	1 mg/kg	100 mg/kg	14 mg/kg
Soils (NR) ⁷	100 mg/kg	600 mg/kg	270 mg/kg

1 - All media criteria are from current NJDEPE or USEPA promulgated regulations except soil criteria. The soil criteria are from a proposed NJDEPE rule which was not adopted by the NJDEPE. They are currently utilized along with site specific data information and background conditions to establish a site specific site clean up and remediation criteria.

2 - Ground Water Quality Standards NJAC 7:9-6.

3 - Surface Water Quality Standards NJAC 7:9-4

4 - Safe Drinking Water Act Standards NJAC 7:10.

5 - Sewage Sludge Quality Criteria 40 CFR Part 503.13.b.3.

6 - Soil Cleanup Criteria - residential.

7 - Soil Cleanup Criteria - non-residential.

8 - ug/l = microgram/liter (ppb)

9 - mg/kg = milligram/kilogram (ppm)

Table 4: Rhode Island Media Environmental Criteria

	Cadmium	Lead	Mercury
Groundwater ₁	5ug/L	15 ug/L	2ug/L
Surface Water - Salt			
* Chronic	9.3 ug/l	5.6 ug/l	.025 ug/l
* Acute	43 ug/l	140 ug/l	2.1 ug/l
Surface Water ₂ - Fresh			
* Chronic	.38 ug/l	.54 ug/l	.012 ug/l
* Acute	.82 ug/l	14 ug/l	2.4 ug/l
Safe Drinking Water ₃	5 ug/L	15 ug/L	2 ug/L
Sludge (HQ)			
* Urban use ₄	4 mg/kg	10 mg/kg	.2 mg/kg
* field use	15 mg/kg	500 mg/kg	5 mg/kg
Soils ₆			
* residential	3.50 mg/kg	150 mg/kg	0.50 mg/kg
* non-residential	3.50 mg/kg	150 mg/kg	0.50 mg/kg

1 - Groundwater Quality Standards for GAA and Class GA (RI Rules and Regulations for Groundwater Quality).

2 - Based on the following formulas for hardness (assumed typical hardness of 25) where H = water hardness:

$$\text{Cadmium (acute)} = e^{(1.128 \times (\ln H) - 3.828)}$$

$$\text{Cadmium (chronic)} = e^{(0.7852 \times (\ln H) - 3.49)}$$

$$\text{Lead (acute)} = e^{(1.273 \times (\ln H) - 1.46)}$$

$$\text{Lead (chronic)} = e^{(1.273 \times (\ln H) - 4.705)}$$

3 - Groundwater classifications of GAA or GA are considered suitable for drinking water use without treatment.

4 - Allowable limits for use in home gardens and landscaping.

5 - Allowable limits for agricultural field applications.

6 - Lead standards from RI Dept. of Health definitions of lead free soil (Rules and Regulations for Lead Poisoning Prevention Feb. 1992, ammended May 1993). RI DEM does not have soil clean-up standards. The cadmium and mercury numbers represent the upper level of what is considered background levels for RI soils.

TABLE 5: MN: Bottom and Combined Ash Trace Metal Composition for Cadmium, Lead and Mercury₁

	Cadmium	Lead	Mercury
		mg/kg (ppm)	
Bottom Ash	37.6 mg/kg	3199 mg/kg	0.71 mg/kg
Combined Ash	47.85 mg/kg	2735 mg/kg ₂	10.05 mg/kg

1. Total composition for Hennepin Energy Resource Co., a 3,000 ton per day capacity, mass burn facility in Minneapolis, MN. The numbers above are an average of data collected in 1991 and 1992.
2. Combined ash is less due to process used by facility operator to lower the pH of the fly ash.

TABLE 6: NJ: Bottom and Combined Ash Trace Metal Composition for Cadmium, Lead and Mercury₁

	Cadmium	Lead	Mercury
		mg/kg (ppm)	
Bottom Ash	21.2 (12.9-34.0)	1566 (990-1976)	0.275 (0.00-1.0)
Combined Ash	61.0 (39.0-82.0)	2173 (1338-3500)	6.5 (4.0-8.4)

1. Based on a joint research project that was performed by the NJDEPE on the total metals contents of bottom and combined ash for Warren County, a 400 ton per day capacity, mass burn facility in Oxford, NJ. The numbers above were collected in 1991 and 1992.

TABLE 7: NH: Bottom and Combined Ash Trace Metal Composition for Cadmium, Lead and Mercury₁

	Cadmium	Lead	Mercury
		mg/kg (ppm)	
Bottom Ash ₁	18	2855	0.95
Combined Ash ₂	47	1350 ₃	7.3

1. Was analyzed with neutron activation analysis, results are "true totals."
2. Was analyzed with digestion in hot nitric, results are not "true totals."
3. Combined ash is less due to process used by facility operator to lower the pH of the fly ash.

Instrument detection limit: The concentration equivalent to a signal due to the analyte which is equal to three times the standard deviation of a series of 7 replicate measurements of a reagent blank's signal at the same path length.

Interference check sample (ICP): A solution containing both interfering and analyte elements of known concentration that can be used to verify background and interelement correction factors.

Initial calibration verification standard: A certified (EPA or other) or independently prepared solution used to verify the accuracy of the initial calibration. For ICP analysis, it must be run at each wavelength used in the analysis.

Continuing calibration verification: Used to assure calibration accuracy during each analysis run. It must be run for each analyte at a frequency of 10% or every 2 hrs during the run, whichever is more frequent. It must also be analyzed at the beginning of the run and after the last analytical sample. Its concentration must be at or near the mid-range levels of the calibration curve.

Calibration standards: A series of known standard solutions used by the analyst for calibration of the instrument (i.e., preparation of the analytical curve).

Linear dynamic range: The concentration range over which the analytical curve remains linear.

Preparation blank: A volume of Type II water processed through each sample preparation procedure.

Calibration blank: A volume of Type II water acidified with the same amounts of acids as were the standards and samples.

Laboratory control standard: A volume of Type II water spiked with known concentrations of analytes and carried through the preparation and analysis procedure as a sample. It is used to monitor loss/recovery values.

Method of standard addition: The standard-addition technique involves the use of the unknown and the unknown plus a known amount of standard. See Method 7000, Section 8.7 for detailed instructions.

Sample holding time: The storage time allowed between sample collection and sample analysis when the designated preservation and storage techniques are employed.

3.1.3 Sample Handling and Preservation

Sample holding times, digestion procedure and suggested collection volumes are listed in Table 1. The sample volumes required depend upon the number of different digestion procedures necessary for analysis. This may be TABLE 1.