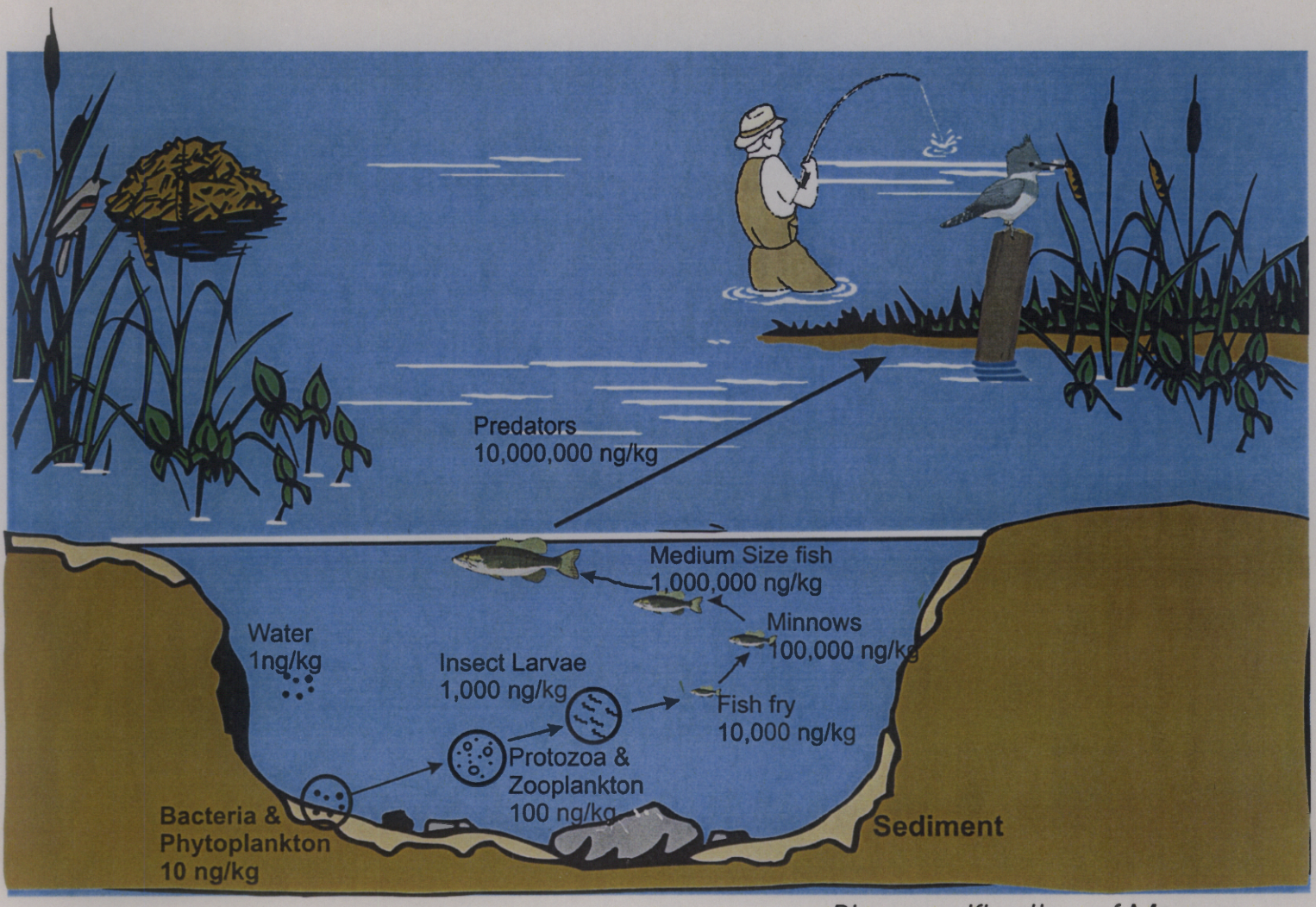
New Jersey Mercury Task Force

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VOLUME I: EXECUTIVE SUMMARY & RECOMMENDATIONS



Biomagnification of Mercury

December, 2001

Prepared for New Jersey Department of Environmental Protection

New Jersey Mercury Task Force Report
Volume I: Executive Summary and Recommendations

December 2001

New Jersey Mercury Task Force Report
Volume 1: Executive Summary and Recommendations

December 2001

New Jersey Mercury Task Force

Donald T. DiFrancesco
Acting Governor

Robert C. Shinn, Jr.
Commissioner

State of New Jersey
Department of Environmental Protection
PO Box 402
Trenton, NJ 08625-0402

DONALD T. DIFRANCESCO
Acting Governor

Robert C. Shinn, Jr.
Commissioner
Tel. # (609) 292-2885
Fax # (609) 292-7695

Dear Reader:

Mercury is a persistent, bioaccumulative, toxic pollutant. An organic form of mercury (methylmercury) has been found at unacceptably high levels in certain fish, and can cause serious health effects in some fish consumers.

Through a combination of source reduction and aggressive pollution control measures, we in New Jersey, have achieved some very notable reductions in the environmental releases of mercury over the past decade including reductions in emissions from municipal solid waste and medical waste incinerators.

More significant reductions are feasible and necessary. The Mercury Task Force recommends a strategic goal of an 85% decrease in in-state mercury emissions from 1990 to 2011. (This goal equates to a 65% decrease from today to 2011.) At my request, the Mercury Task Force has diligently assembled a vast body of information to serve as the basis for a comprehensive set of recommendations to reduce the environmental impacts of mercury releases. These recommendations are designed to provide New Jersey with its first comprehensive mercury pollution reduction plan. Implementation of these recommendations will limit mercury exposures to our citizens and wildlife.

I would like to thank all of the Task Force members for their hard work and dedicated service to the citizens of New Jersey, and I am pleased to accept this comprehensive Mercury Task Force Report. I urge legislators, government officials, the environmental community, business and industry, the scientific and technical community, and all other interested citizens to review this report and determine how they can most effectively work in partnership with the New Jersey Department of Environmental Protection and other state agencies, to achieve these important New Jersey mercury reduction goals.

Sincerely,

Robert C. Shinn, Jr.
Commissioner

E O H S I

ENVIRONMENTAL AND OCCUPATIONAL HEALTH SCIENCES INSTITUTE

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November 2001

Commissioner Robert C. Shinn, Jr.
NJ Department of Environmental Protection
P.O. Box 402
Trenton, NJ 08625-04002

Dear Commissioner:

The members of the Task Force are pleased to submit to you our recommendations for reducing mercury impacts to the environment.

Mercury is a highly toxic material that has no known essential biological properties. It is toxic to adults, but the main health concern today is its potentially profound impact on the developing nervous system and the concern that fetal development can be significantly altered by even low levels of mercury (particularly methylmercury) in the mother's diet. This growing concern, spurred by recent epidemiologic research, has led many governments and other groups to address the problem of mercury in the environment.

Mercury's unique physical properties have led to its use for centuries in a wide variety of commercial applications and industrial processes. Its toxic properties have also been exploited in medicine, dentistry, agriculture, and paint manufacture. Although most uses have been eliminated or reduced (for example, mercury fungicides and batteries), or are being phased out today (for example, mercury thermometers), mercury remains in commerce in a number of forms including dental amalgams, fluorescent lights, thermostats, and certain electric switches.

Today, however, many of the most serious sources of mercury are inadvertent. These include the burning of waste, the use of coal to generate electricity, and the recycling of a variety of mercury-containing products, such as metals. Recognizing that toxic methylmercury occurred at surprisingly high levels in some freshwater fish from many waterbodies in the State, the New Jersey Department of Environmental Protection convened the first Mercury Task force in 1993. This advisory group concluded that

emissions from municipal solid waste incinerators were, at that time, the main controllable sources of mercury emissions in the state. Its recommendations and subsequent regulations led to a major reduction in mercury emissions from New Jersey incinerators; the targets set by the first Task Force for this particular industrial sector have been met and surpassed.

It has been my privilege to chair the second Mercury Task Force, convened in 1998 by Commissioner Robert C. Shinn, Jr., which has tackled a much wider array of mercury sources. Triggered, in part, by the concern that energy deregulation would increase the output from midwestern power plants which, as a whole, have relatively high emissions including mercury, the Task Force had to grapple at the outset with recommendations to assure that New Jersey's own energy deregulation law would not exacerbate New Jersey's mercury pollution problem. The Task Force went on to inventory many other sources of mercury to the environment, some of them unanticipated.

Our work has been rendered at times easier, and at times more difficult, by the many reports from federal agencies, other states, non-governmental organizations, and public interest groups that have appeared during the lifetime of the Task Force. New Jersey is by no means alone in considering various approaches, including legislation, to reduce mercury uses and emissions. It has indeed been an exciting time to learn about mercury.

For three years now I have had the opportunity to work with and learn from many dedicated and knowledgeable Task Force members and NJDEP representatives. We have also benefited from the numerous presentations made to the Task Force by outside groups, each with unique knowledge and perspectives. They are identified in Appendix VI.

Work on a voluntary Task Force of this nature is extremely demanding of time and energy. A number of Task Force members and other stable participants were indefatigable in their participation, and I particularly want to thank:

William Baker
Andrew Bellina
Janet Cox
Daniel Cunningham
Robert Dixon
Tom Fote
Betty Jensen
Russ Like
Jerry Marcus
Leslie McGeorge (NJDEP Representative)
Keith Michels
Robert Morris
Joel O'Connor
Valerie Thomas
Robert Tucker

Also, Dolores Phillips played a very active role in the origin and early deliberations of the Task Force.

Many NJDEP representatives contributed to the research and writing of the report. All are listed in Appendix IV.

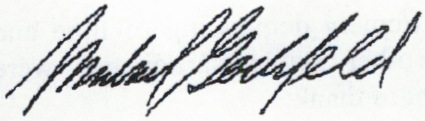
I particularly thank Bob Morris, Alan Stern and Michael Aucott whose time commitments to the Task Force were great and who each co-chaired one of the two working sub-committees (Impacts and Sources). Leslie McGeorge coordinated all NJDEP technical support for the Task Force, kept the Task Force focused on its charges and integrated its work with other NJDEP projects and programs. Sue Shannon coordinated various aspects of the Task Force and managed the communications and planning of meetings.

Other NJDEP staffers who made major contributions include:

Sunila Agrawal
Alan Bookman
Gary Buchanan
Robert Confer
Jim DeNoble
Mary Downes-Gastrich
Randy England
Joann Held
Mike McLinden
Eileen Murphy
Bill O'Sullivan
Anthony Pilawski
Bruce Ruppel
Michael Winka

I personally thank Commissioner Shinn for the thoughtful organization of the Task Force and his patience in awaiting this report. I trust that it will prove valuable in helping New Jersey and the Nation grapple with an insidious pollutant and reduce its impact on future generations. I echo his charge, that the lessons learned from mercury toxicity, mercury pollution and mercury control, should also help us in reducing human and ecosystem exposure to other environmental hazards which can threaten our growing population.

Sincerely yours,



Michael Gochfeld, MD, PhD
Chair

Charge to the Mercury Task Force
From Administrative Order 1998-08
Signed by Commissioner Shinn in March 1998

The mission of the Task Force is to develop a mercury pollution reduction plan for New Jersey. The Task Force is directed to complete the following tasks:

1. Review the current science on: a) impacts of mercury pollution on public health and ecosystems; and b) mercury deposition, transport, and exposure pathways.

2. Inventory and assess current sources of mercury pollution to the extent feasible, including both in-state and regional sources of mercury pollution.

3. Utilizing available information, quantify mercury pollution's impact on New Jersey's ecosystems, public health, and tourism and recreation industries.

4. Review New Jersey's existing mercury pollution policies.

5. Develop a mercury pollution reduction plan for the State of New Jersey, including:
   A) Recommend mercury emission controls and standards for in-state sources, including: coal fired generators; hazardous waste incinerators; sludge incinerators; hospital waste incinerators; and for other sources deemed necessary by the task force. In recommending controls and standards, the task force will explore renewable energy and alternative fuels to mercury emitting fuels now in use, and review innovative and low cost emission reduction strategies available in various industrial sectors.
   B) Provide timely interim recommendations, as feasible, prior to completion of the task force's overall mission, to the New Jersey Department of Environmental Protection, New Jersey Board of Public Utilities, other state agencies, interstate agencies, and the federal Environmental Protection Agency regarding mercury pollution, mercury pollution controls and standards and the relationship of energy deregulation to mercury pollution.

NJ Mercury Task Force
Final Report

Volume I
Executive Summary and Recommendations

Volume II
Exposure and Impacts

Volume III
Sources of Mercury to New Jersey's Environment

Volume I

Executive Summary and Recommendations

Revised – 2nd Printing

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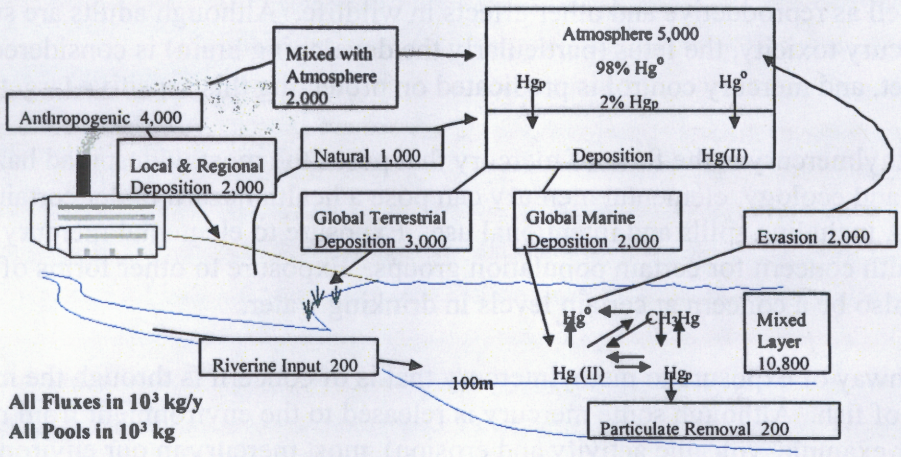
NEW JERSEY MERCURY TASK FORCE REPORT
VOLUME 1: EXECUTIVE SUMMARY AND RECOMMENDATIONS

Introduction

Mercury is a highly toxic heavy metal with unique chemical and physical properties and no known essential biological function either for humans or for other organisms. Its unique properties have led to its use by humans in a variety of ways. Because of its broad spectrum toxicity, it has been used as an antiseptic and a pesticide. Mercury is a high density liquid metal at room temperature and has been used in a wide variety of mechanical and electrical devices including thermometers, barometers, pressure gauges, batteries and switches. Because it can form amalgams with other metals, it has been used extensively as a dental restorative and in the extraction of gold. Mercury also occurs as a naturally occurring trace contaminant in fossil fuels, particularly coal.

These commercial uses and the wide scale and long-term combustion of fossil fuels have resulted in the global dispersion of mercury and its occurrence in biologically significant concentrations in all environmental media. Figure 1.1 depicts the current global mercury cycle. In this figure, estimates are shown for source quantities, deposition quantities, and global inventories, or pools, of mercury. Flux quantities are in thousands of kilograms (metric tons) per year, and pool quantities are in tons.

Figure 1.1
The Current Global Mercury Cycle



Hgp = mercury associated with particles
Hg° = elemental mercury
Hg(II) = oxidized mercury
CH_3Hg = methylmercury
kg = kilograms
kg/y = kilograms per year

Adapted from: Mason, R.P., W.F. Fitzgerald, & F.M.M. Morel, 1994, biogeochemical cycling of elemental mercury: Anthropogenic influences, *Geochimica et Cosmochimica Acta.*, Vol. 58, pp. 3191-3198.

Figure 1.1 shows that an estimated 50% of human-caused (anthropogenic) emissions deposit locally or regionally, and the rest join the global atmospheric pool. Natural emissions of mercury also occur. In the atmosphere, mercury exists primarily in the elemental form (Hg^o), although a small percentage exists adsorbed to, or otherwise associated with, particles or aerosols (Hg_p). Through atmospheric processes, some elemental mercury is converted to oxidized mercury, Hg(II). Both Hg(II) and Hg_p are subject to relatively rapid wet and dry deposition. Some of this deposition falls on the land, and some falls on the ocean. In the ocean and other waterbodies, Hg(II) enters into a cycle involving Hg^o, Hg_p and methylated forms of mercury, CH_3Hg. Oceanic Hg^o tends to leave the ocean and enter the atmosphere (evasion). The mixed surface layer of the ocean, which extends to approximately 100 meters in depth, contains an estimated 10,800 tons (a ton is equal to 10^3 kg) of mercury. Much of this mercury is anthropogenic; in pre-industrial times the surface layer of the ocean is estimated to have contained approximately 1/3 of what it contains today. Likewise, pre-industrial mercury deposition to the land and the oceans is estimated to have been approximately one-third of the current quantity.

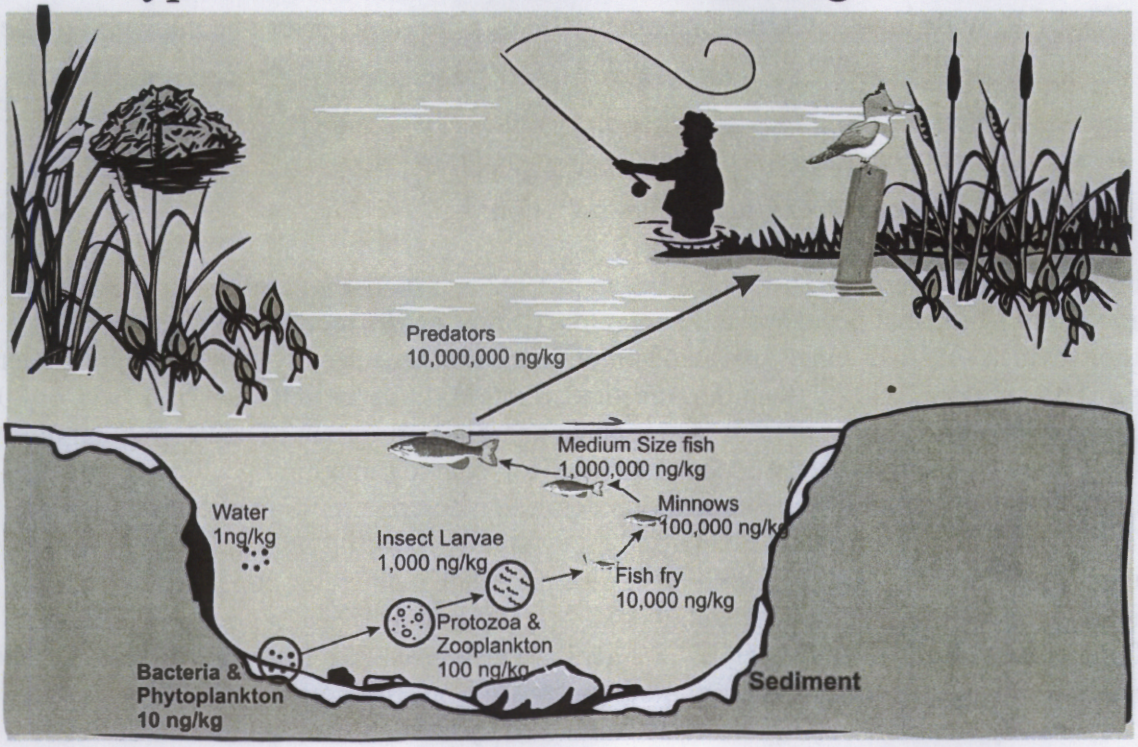
Mercury present in the bottom sediment of aquatic environments can be methylated by certain bacteria to form methylmercury. Methylmercury is far more bioavailable and more toxic than other forms of mercury. Furthermore, methylmercury is highly retained in organisms, and therefore, becomes biomagnified through aquatic food chains. Predatory fish commonly have methylmercury up to a million times greater than the concentration of mercury in the waters in which they live. As a result, higher level predators, including predatory fish as well as those organisms that feed on fish (such as birds, aquatic mammals, and humans), may accumulate methylmercury at levels sufficient to cause toxic effects. The biomagnification process is shown conceptually in Figure 1.2.

Toxicity from methylmercury can take the form of neurological and developmental effects in humans, as well as reproductive and other effects in wildlife. Although adults are susceptible to methylmercury toxicity, the fetus (particularly the developing brain) is considered the most sensitive target, and mercury control is predicated on protecting this sensitive target.

Although methylmercury is the form of mercury that poses the most widespread hazard to public health and ecology, elemental mercury can pose a health hazard under certain circumstances, including spills and intentional use. Exposure to elemental mercury may be an important health concern for certain population groups. Exposure to other forms of inorganic mercury can also be a concern at certain levels in drinking water.

The main pathway of exposure to methylmercury that is of concern is through the mother's consumption of fish. Although some mercury is released to the environment from natural processes (for example, volcanic activity and erosion), most mercury in our environment is anthropogenic, from many different sources - local, regional and global.

Figure 1.2
Typical Pattern of Mercury Biomagnification



Establishment of Task Force

Recognizing the ubiquity of mercury in the environment, including relatively high concentrations in some species of fish in New Jersey lakes, the high toxicity of methylmercury, and the fact that many people consume fish, Commissioner Robert C. Shinn, Jr., of the New Jersey Department of Environmental Protection (NJDEP) formed this Mercury Task Force by Administrative Order 1998-08 on March 9, 1998.

The Task Force was charged to:

1) Review the current science on
   a) impacts of mercury pollution on public health and ecosystems
   b) mercury deposition, transport, and exposure pathways.
2) Inventory and assess current sources of mercury pollution to the extent feasible, including both in-state and regional sources of mercury pollution.
3) Utilizing available information, quantify mercury pollution's impact on New Jersey's ecosystems, public health, and tourism and recreational industries.
4) Review New Jersey's existing mercury pollution policies.
5) Develop a mercury pollution reduction plan for the State of New Jersey, including:
   a) Recommend mercury emission controls and standards for in-state sources, including: coal-fired generators; hazardous waste incinerators; sludge

incinerators; hospital waste incinerators; and for other sources deemed necessary by the task force. In recommending controls and standards, the task force will explore renewable energy and alternative fuels to mercury-containing fuels now in use, and review innovative and low cost emission reduction strategies available in various industrial sectors.

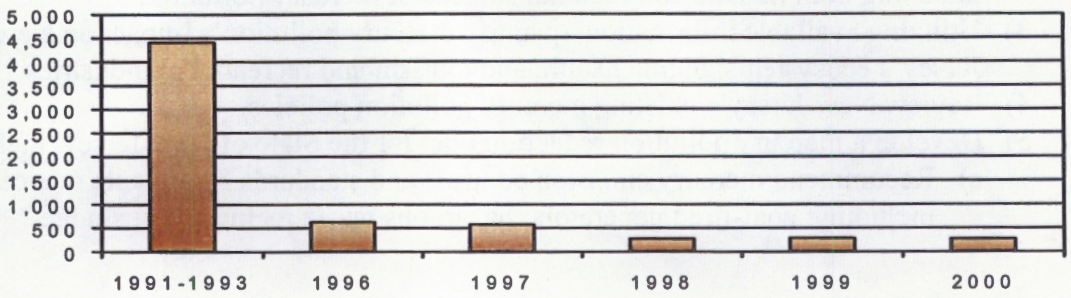
b) Provide timely interim recommendations, as feasible, prior to completion of the task force's overall mission, to the New Jersey Department of Environmental Protection, New Jersey Board of Public Utilities, other state agencies, interstate agencies, and the federal Environmental Protection Agency regarding mercury pollution, mercury pollution controls and standards and the relationship of energy deregulation to mercury pollution.

The first New Jersey Mercury Task Force began in 1992 and focused attention on mercury emissions from Municipal Solid Waste Incinerators (MSWIs). Its report resulted in NJDEP regulations which set an air emissions standard of 28 micrograms per dry standard cubic meter (µg/dscm) by the year 2000 (with an interim standard of 65 µg/dscm to be met by 1995), or 80 percent removal of mercury emissions. Through an aggressive program of source reduction (removing mercury from products, especially batteries), source separation (removing mercury-containing products from the waste stream), and emission controls, all five of New Jersey's MSWIs were able to meet the new standard, thereby greatly reducing in-state air emissions of mercury. Since the first Mercury Task Force, medical waste incinerator emissions were also significantly reduced with source separation and mercury-free purchasing practices. The first Task Force, and additional study by NJDEP scientists, also broke significant new ground in the assessment of the public health risk from methylmercury from fish consumption. This work was subsequently confirmed by assessments conducted by the U.S. Environmental Protection Agency.

In 1996, the first year after mercury controls were required on New Jersey municipal solid waste incinerators, greater than 85% mercury reductions was demonstrated. By 1998, overall mercury reduction improved to about 94%, primarily with increased carbon injection control efficiency. (See Figure 1.3)

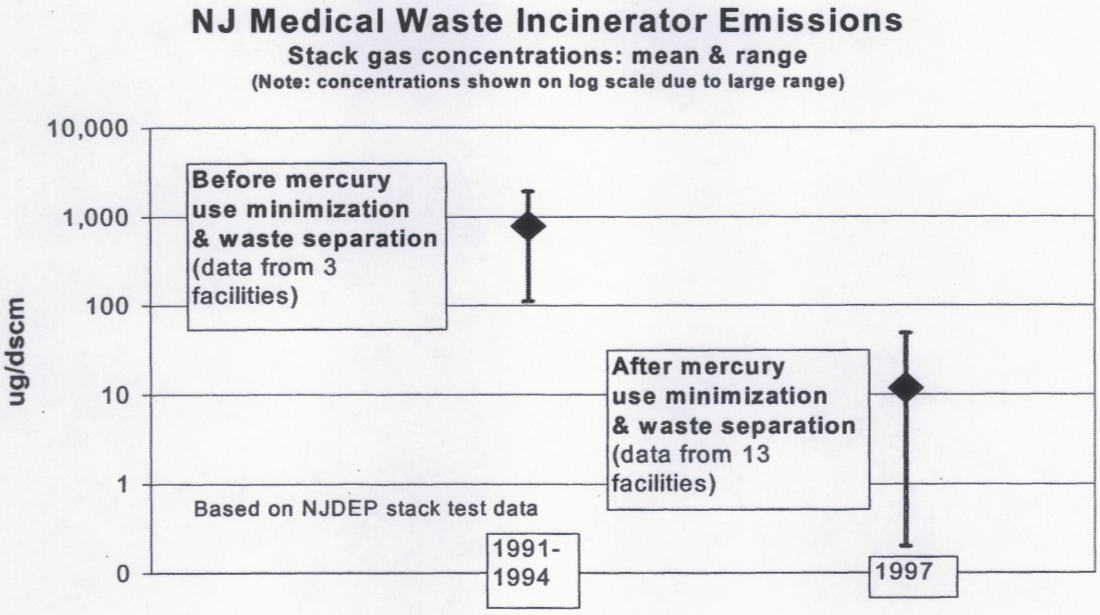
Mercury emissions from New Jersey medical waste incinerators were reduced from a median of about 900 µg/dscm to about 10 µg/dscm, which is about an 98% reduction. This was achieved primarily by mercury-free product purchasing by hospitals and also by mercury waste separation prior to incineration. (See Figure 1.4)

Figure 1.3.
Annual Mercury Emissions from NJ Municipal Solid Waste Incinerators



Follow-up studies, particularly of mercury levels in freshwater fish, revealed that mercury pollution was more pervasive in New Jersey, as well as other states, than previously known. Moreover, studies of fish consumption by the general public and pregnant women in New Jersey revealed a significant minority of women whose fish consumption resulted in an exposure to methylmercury which presented a potential risk to their developing fetuses.

Figure 1.4



The current Task Force began its deliberations in March 1998. It was composed of representatives of state agencies, recreational and commercial fishing interests, industrial and institutional stakeholders, environmental groups, and academic groups. Its main work was accomplished by two subcommittees, the Impacts Subcommittee (see Volume II) and the Sources Subcommittee (see Volume III). All meetings were open to the public. Many additional stakeholders, mercury experts, and representatives of various NJDEP programs were invited to make presentations to the Task Force and to participate in discussions.

The Administrative Order charged the Task Force with developing interim recommendations in addition to the final recommendations. Five interim recommendations were made and can be found in Appendix V of this volume. The interim recommendations concerned: 1) strengthening the environmental component of Assembly Bill A-10 on energy restructuring; 2) endorsing the New England Governors' resolution on the virtual elimination of mercury; 3) adding an amendment to the Pollution Prevention rules; 4) strengthening the environmental component of Assembly Bill A-10 and the support of the Task Force for mercury to be

explicitly on the list of substances for which disclosure will be required; and 5) supporting the New England Governors' resolution regarding retirement and stockpile management of mercury.

The Task Force gathered available information on the behavior of mercury in the environment and its impacts, its sources and control strategies, and also developed recommendations. Key recommendations are presented in this volume, as is a summary of the major findings of the Task Force. Additional recommendations are provided in Volumes 2 and 3.

Goals, Milestones, and Key Recommendations

OVERALL GOALS

The Task Force advocates an overall goal of the virtual elimination of anthropogenic uses and releases of mercury. This goal is consistent with the Mercury Action Plan adopted by the Conference of the New England Governors and Eastern Canadian Premiers. Removing mercury from products is an important part of this effort. The toxicity and persistence of mercury in the environment, and the statewide existence of high levels of mercury in fish, require that New Jersey move on as many fronts as possible to eliminate additional mercury discharges, emissions, and associated deposition. Regional, national, and global actions are also necessary because long-range transport of mercury results in widespread mercury pollution. Reduction of mercury releases will have collateral benefits, such as the reduction of other important environmental pollutants.

MILESTONES

The Task Force recommends that the State of New Jersey adopt a two-step milestone of a 75 percent reduction in air emissions below estimated 1990 levels by 2006 and an 85 percent reduction below 1990 levels by 2011. Looking forward, these milestones will require a greater than 50 percent reduction below estimated 2001 air emissions by 2006 and a greater than 65 percent below estimated 2001 levels by 2011. See Figures 1.5 and 1.6 below.

Figure 1.5

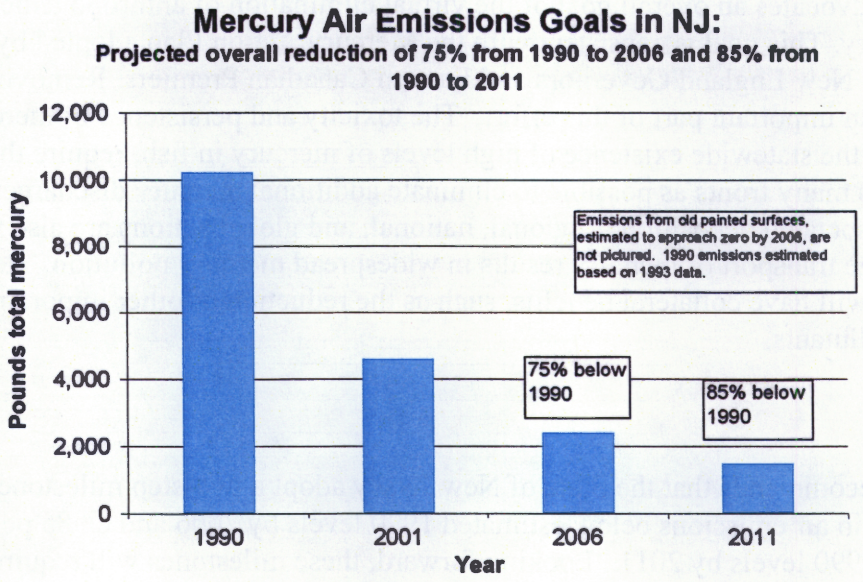
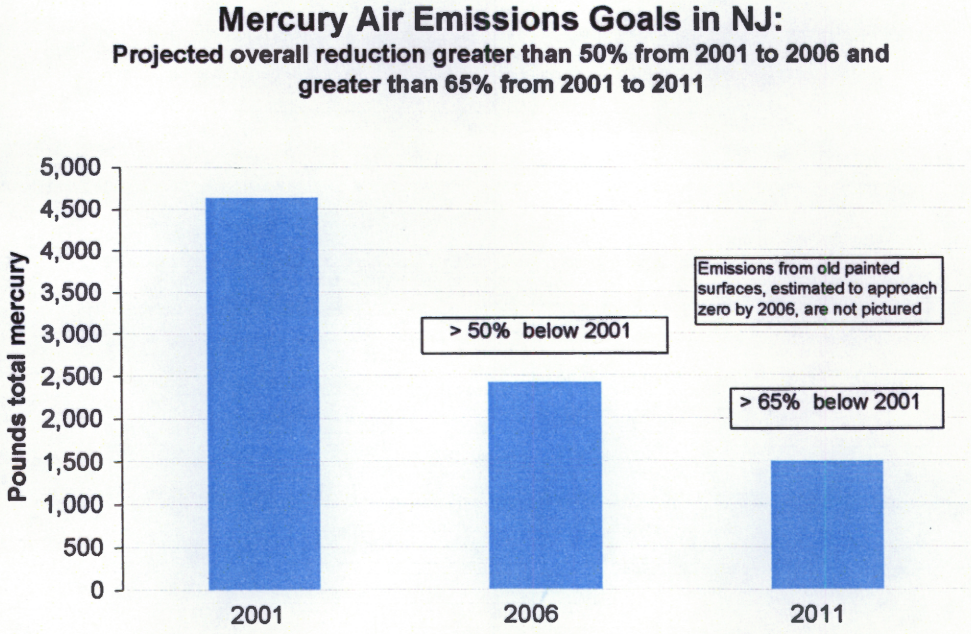


Figure 1.6



KEY RECOMMENDATIONS

The Task Force has found that numerous actions are needed to achieve the New Jersey air emissions reduction milestones. These milestones are based on the Task Force's assessment that realistic reduction of mercury from various sources can be achieved in New Jersey. Certain recommendations are considered key recommendations in that, if implemented, they could make large contributions to reductions in mercury uses or emissions and eventually lead to reductions of mercury in fish tissue. There is evidence from studies conducted in Florida that reducing air emissions can lead to reductions of mercury in fish tissue over a relatively short time period. Other key recommendations presented here are especially important in addressing critical knowledge gaps regarding mercury fate, transport, and exposure and in guiding public health outreach. The key recommendations are as follows (additional details and recommendations are provided in Volumes 2 and 3):

A. **Participate in and support regional, national, and global efforts to reduce mercury uses, releases, and exposures.** This is important to New Jersey because a significant portion of mercury in the State's environment originates from emissions elsewhere. Examples of efforts include the following: the Conference of the New England Governors' and Eastern Canadian Premiers, Northeast States for Consolidated Air Use Management (NESCAUM), Environmental Council of the States (ECOS) and U.S. Environmental Protection Agency (U.S. EPA) Mercury Action Plan.

B. **Remove mercury from products** and phase out sales of mercury-containing products for which there are reasonably available alternatives. In order to accomplish this, New Jersey should:
   1. Adopt legislation that reflects the provisions of the Mercury Education and Reduction Model Act prepared by the Northeast Waste Management Officials' Association (NEWMOA), as part of the New England Governors' Mercury Action Plan. This plan addresses mercury-containing products, such as thermometers, thermostats, switches (including those in motor vehicles and appliances), and fluorescent lights, and limits the sale of mercury to approved purposes.
   2. Develop effective outreach and education on the importance of removing mercury from products. County household hazardous waste programs should play a key role in this effort.
   3. Encourage phasing out the use of mercury-containing amalgams to the extent compatible with good dental practices, to further limit mercury releases to the environment.
   4. Use state purchasing and service contracts to reduce the purchase and use of products containing mercury, including motor vehicles containing mercury switches.
   5. Ensure that substitutes for mercury are not more hazardous than the mercury itself.
   6. Work with interstate organizations to assist in the development of federal legislation that minimizes the use of mercury in products.

C. **Reduce emissions of mercury from the production of electricity** consumed in New Jersey, including electricity generated by out-of-state sources. To accomplish this, New Jersey should:
   1. Promote energy efficiency with measures consistent with the NJDEP Greenhouse Gas Sustainability Action Plan.
   2. Promote the increased use of electric power from certified green sources including renewable sources and sources with low or zero mercury emissions.
   3. Require environmental information disclosure of mercury emissions per kilowatt-hour from all providers selling electricity in New Jersey consistent with The New Jersey Electric Discount and Energy Competition Act (EDECA) of 1999 (N.J.S.A. 48: 38).

D. **Significantly reduce air emissions from coal combustion**. To accomplish this, New Jersey should:
   1. Urge the U.S. EPA to rapidly develop and implement stringent limits on mercury emissions from coal combustion. These standards should include output-based performance limits (mg/MW-hr), which are applied to individual coal-fired power plants, in addition to national caps (tons/year), which are applied to the electric generation source category as a whole.
   2. Adopt State standards if, by December 2003, U.S. EPA does not proceed to promulgate and implement effective mercury limits on coal combustion.
   3. Work with interstate organizations to assist in the development of federal multi-pollutant legislation that limits mercury emissions as well as other pollutants.

E. **Significantly reduce air emissions from iron and steel and other secondary smelting industries.** To accomplish this, New Jersey should:
   1. Urge the federal government to require the rapid phase out of the use of mercury-containing products in new vehicles. Following the lead of other states, New Jersey should consider banning the sale of vehicles containing mercury products.
   2. Implement a phased strategy to reduce mercury contamination of scrap through elimination and separation measures. If, after a 3-year period, the source reduction measures do not achieve emission reduction goals, require the installation of air pollution control.
   3. Ensure that measures to reduce mercury contamination of scrap are developed through a cooperative process involving government agencies and affected industries, including automobile manufacturers, automobile recyclers, and those who crush, shred, or otherwise process scrap metal.
   4. Determine the amount of mercury emitted from secondary aluminum smelting and require reduction if significant.

F. **Ensure the minimization of mercury emissions from other sources.** To accomplish this, New Jersey should:
   1. **Medical Waste Incinerators** - Adopt the NEGA/ECP (New England Governors and Eastern Canadian Premiers) recommended emission limit for medical waste incinerators. All New Jersey medical waste incinerators already have achieved this level with pollution prevention measures. Adopting a limit will prevent backsliding and help provide an example to other jurisdictions.

2. **Sewage Sludge Incinerators** - Revise the State's sewage sludge mercury rules to reflect a phased reduction in mercury levels to meet the Task Force's goal of 2 ppm within 10 years. Consider a stack emission standard such as the New England Governors Association's recommended emission standard for sludge incineration facilities as an alternative to the final sludge concentration goal.
3. **Municipal Solid Waste Incinerators** – Consider revising the State's air pollution control regulation governing Municipal Solid Waste Incinerator (MSWI) emissions to include U.S. EPA's higher efficiency requirement for post-combustion emissions controls, thereby changing New Jersey's alternative limit based on efficiency from 80% to 85%. The 28µg/dscm primary requirement would remain the same.
4. **Other** - Develop methods to appropriately regulate and otherwise manage the disposal of discarded mercury-containing products, including fluorescent bulbs, dental amalgam waste, thermostats and switches.

G. **Expand and institutionalize routine monitoring for mercury in fish** from New Jersey waters through State-level programs.

H. **Actively encourage the federal government to initiate and maintain comprehensive monitoring and surveillance for mercury in commercial fish** and to require that information regarding the mercury content of fish be made readily available. If the federal government does not initiate nation-wide evaluation of commercial fish, New Jersey should, with other states in the region, monitor mercury in commercial fish.

I. **Expand and periodically evaluate the effectiveness of current outreach, advisories and education efforts** to reduce exposures to mercury of sensitive populations, subsistence fishermen, and others who consume large quantities of fish. To accomplish this, New Jersey should:
   1. Increase public awareness of the public health concerns regarding mercury in fish and the need to reduce the emissions and releases to the State's waterbodies.
   2. Expand outreach on fish advisories, particularly for sensitive populations, subsistence fishers, and others who consume large quantities of fish.

J. **Reduce exposures from cultural uses of mercury**. To accomplish this, New Jersey should:
   1. Complete research and evaluate available data on cultural uses and associated exposures.
   2. Provide outreach and education materials to communities and health professionals.
   3. Develop and implement appropriate legislation and regulations that limit the sale of elemental mercury, except for medical and other approved uses, reflecting the NEWMOA model legislation.

K. **Develop comprehensive mercury budgets for New Jersey watersheds that include inputs from air deposition, in order to develop appropriate total maximum daily loads (TMDLs).** To do this, New Jersey should:
   1. Utilize the most recent information developed through the U.S. EPA's pilot mercury TMDL development projects.

New Jersey State Library

2. Determine the relative mercury contribution to aquatic systems from various sources and from repositories in environmental media.

L. **Maintain and enhance a long-term air deposition monitoring system** that incorporates state-of-the-art detection limits and speciation to document temporal and spatial trends in mercury deposition.

M. **Address critical information gaps** concerning the quantities and chemical species of mercury emissions and releases, the fate and transport of mercury in the environment, and the exposure pathways. To accomplish this, New Jersey should:
   1. Upgrade procedures used in all monitoring programs to include state-of-the-art analytical methods to provide lower detection limits for mercury and mercury speciation.
   2. Employ a state-level, long-range dispersion model for mercury using the up-to-date emissions inventories including the inventory developed by the Mercury Task Force.
   3. Encourage federal agencies to expand existing national research on the ecological effects of mercury, particularly on piscivorous (fish-eating) fish, birds and mammals (particularly marine mammals).
   4. Identify demographic characteristics and exposure patterns of population groups in New Jersey that consume large quantities of fish.
   5. Consider establishing the mercury-contaminated sites in the Berry's Creek area as an Environmental Research Park, patterned on the National Environmental Research Park system. This could serve as a resource for studies and monitoring of the complex processes governing the fate and transport of mercury in both the terrestrial and estuarine environment.

N. **Support the development of effective methods of retiring and sequestering mercury** so that the chances of the eventual release of mercury to the environment are minimized.

O. **Develop improved environmental indicators** of the impact of mercury on New Jersey's environment. To accomplish this, New Jersey should:
   1. Expand and maintain a statewide ground water monitoring program for mercury.
   2. Develop and apply indicators of trends of mercury in environmental media, including air deposition, mercury concentrations in surface water, mercury entry into aquatic food chains, mercury levels in fish tissue, mercury levels in human tissue in the New Jersey population, and mercury levels in feathers of piscivorous birds nesting in New Jersey.

P. **To provide for the implementation of the recommendations in this report**, New Jersey should:
   1. Form within the New Jersey government, a multi-agency committee, including the Department of Environmental Protection, Department of Health and Senior Services, Department of Transportation and the Board of Public Utilities, to advocate the implementation of the recommendations and to report periodically to the Legislature and the Commissioner of the NJDEP on progress toward achieving the mercury milestones.

2. Establish the position of an environmental mercury coordinator in the NJDEP as has been done in other states.

Q. **Reduce mercury levels in fish and other biota.** Mercury concentrations in freshwater and estuarine fish in New Jersey should, at a minimum, be in compliance with the EPA's recent Surface Water Criterion of 0.3 μg/g methylmercury in tissue. This guidance value, aimed at protecting human health, may not be adequate to protect the health of the fish. Therefore mercury levels in surface water and fish tissue should achieve levels protective of aquatic life and of wildlife (the criterion for which is currently under development). Assessing this criterion requires the use of improved analytic methodologies that lower detection levels by at least an order of magnitude.

In addition to these key recommendations, the Task Force made five interim recommendations, which are included as an appendix at the end of this volume.

Summary of Findings

FORMS OF MERCURY IN THE ENVIRONMENT

Mercury occurs in a variety of forms which are all toxic to varying degrees. The forms or 'species' of mercury (Hg) are usually classified into the broad categories of organic and inorganic. They have different physical, chemical and toxicological properties. There are several forms of organic Hg. However, monomethylmercury, usually referred to simply as methylmercury (MeHg), is the most widespread organic form of Hg in the environment, and the form which poses the greatest threat to human and ecological health. It is formed by bacteria in aquatic environments from inorganic mercury. Another organic mercury compound, dimethylmercury plays an important role in the biogeochemical cycle of mercury in the ocean, but is too short lived from an exposure perspective.

The inorganic forms of mercury include elemental mercury (Hg^o) and also the salts of mercury. Of the mercuric compounds, mercuric sulfide (HgS) is the most stable of the common inorganic species and is essentially insoluble in water. It thus tends to function as a long-term sink for environmental Hg in soils, sediments and minerals. Those inorganic mercury compounds that are moderately soluble in water can contaminate surface and groundwater, and are largely responsible for the elevated levels of Hg in some private wells in areas of southern New Jersey.

Exposure to elemental mercury can occur from dental amalgams, in certain workplaces, in health care facilities, and occasionally in homes. Droplets of mercury are attractive to humans, and children have been known to bring mercury home to play with. The cultural practice of Santeria can also result in household exposures to elemental mercury. Breakage of thermometers and spills from gas meters during their removal are infrequent, but important sources of mercury exposure. When such spills occur it is important that they be cleaned up quickly avoiding dispersion of the material. In ambient air, Hg^o vapor in the atmosphere is subject to long range transport. Some fraction of atmospheric Hg^o is eventually oxidized to Hg(II) through atmospheric processes. Once converted to the Hg (II) form, the Hg is subject to relatively rapid deposition, either by precipitation or as dry deposition. Air deposition constitutes a major source of mercury to New Jersey's environment.

OCCURRENCE OF MERCURY IN ENVIRONMENTAL MEDIA

Understanding exposure pathways is essential for estimating and reducing risk. A pathway begins at the source of the pollutant, continues through an environmental medium (air, water, soil, food), enters a receptor's body through inhalation, ingestion, or through the skin, reaches the blood stream, and is eventually distributed to the critical or target organ where it can exert its toxic effect.

Methylmercury

Fish consumption is the only significant pathway of environmental human exposure to MeHg. The potential exists for significant exposure particularly to young children and toddlers through soil ingestion if MeHg per se (or other forms of organic Hg) is discharged directly to the soil. MeHg in soil can also be a significant source of MeHg in aquatic systems. Little attempt has been made to identify MeHg in plants grown on Hg contaminated soil. To date, only trace levels of MeHg have been found in air. Few investigations of the presence of MeHg in drinking water have been undertaken. Data from wells with largely inorganic Hg contamination in New Jersey show only trace quantities of MeHg.

Inorganic Mercury

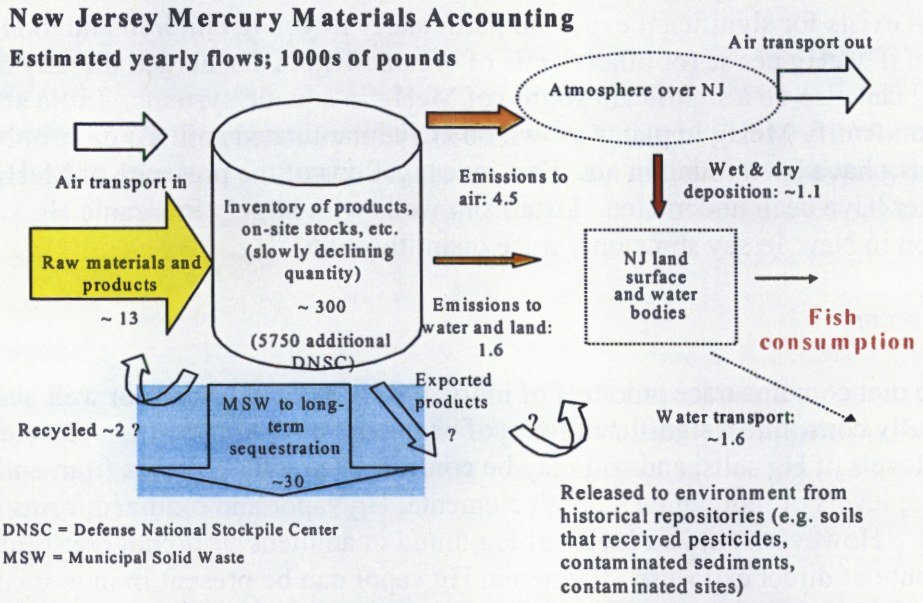
Although the diet contains trace amounts of inorganic Hg salts, they are not well absorbed, and do not generally constitute a significant route of exposure. Soil may contain elevated background levels of Hg salts, and soil may be contaminated with Hg salts from anthropogenic activity. Trace levels of inorganic Hg, both elemental Hg vapor and oxidized forms are found in ambient air. However, ambient levels of Hg found in ambient air do not constitute a significant route of direct exposure. Elemental Hg vapor can be present in indoor environments due to spills, or intentional application. Very little elemental Hg in indoor environments is required to pose a health hazard from inhalation. Inorganic Hg in drinking water has been observed in some locations particularly in shallow wells. While such contamination is largely due to Hg salts, some elemental Hg has been observed in such cases. Elemental Hg volatilized from water during showering may result in significant exposure under some circumstances.

SOURCES, FATE, AND TRANSPORT

Mercury has long been used in commerce in a variety of products and applications, and it is an inherent contaminant of fossil fuels. There is ample evidence that global mercury deposition rates and background atmospheric concentrations have increased significantly over the past 150 years. In one study, mercury accumulation rates in Great Lakes sediments were found to have increased by factors ranging from 50 to over 200 times from pre-industrial to modern times. Even in relatively remote areas, mercury accumulation rates appear to be 3 or more times higher now than before the Industrial Age. It is estimated that anthropogenic emissions are between 3600 and 4500 metric tons (8 to 10 million pounds) per year. The anthropogenic portion represents from 67% to greater than 75% of the yearly total global input, which also includes emissions from geologic sources and repositories of anthropogenic Hg in environmental media.

A materials accounting estimate for New Jersey has been developed. Figure 1.7 depicts yearly flows in thousands of pounds where estimates are possible. Flow quantities, represented by arrows in the figure, represent one year's flow. In this figure, mercury inputs to the State in the form of raw materials and products, and outputs in many forms, including air emissions, direct releases to water and land, and transport to disposal facilities are shown.

Figure 1.7



Also shown in the materials accounting figure are inputs to the State from wet and dry deposition from the atmosphere, which is the route by which it is believed most mercury that eventually becomes biologically available enters our environment. This quantity is a function of the amount of mercury present in the atmosphere over New Jersey, and of the factors that lead to the conversion of this mercury into forms that are incorporated into precipitation or which are susceptible to dry deposition. This quantity is influenced by both in-state emissions and mercury transported into the state from elsewhere.

Also shown are arrows representing unknown or difficult to quantify fluxes of mercury. One such unknown flux is the release of mercury from historical repositories, which include the land surface and sediments and aquatic systems. Another flux that is difficult to characterize in a materials accounting context is the mercury in the atmosphere that flows across the State without depositing.

Figure 1.7 also provides the estimated inventory quantity. This includes mercury present in products and other items currently in use or storage, such as thermostats, thermometers, and dental amalgam. It is estimated that this inventory is slowly shrinking largely due to disposal of municipal solid waste (MSW) in landfills. The amount of Hg leaving this inventory is larger than the amount entering due to decreasing use of Hg in products.

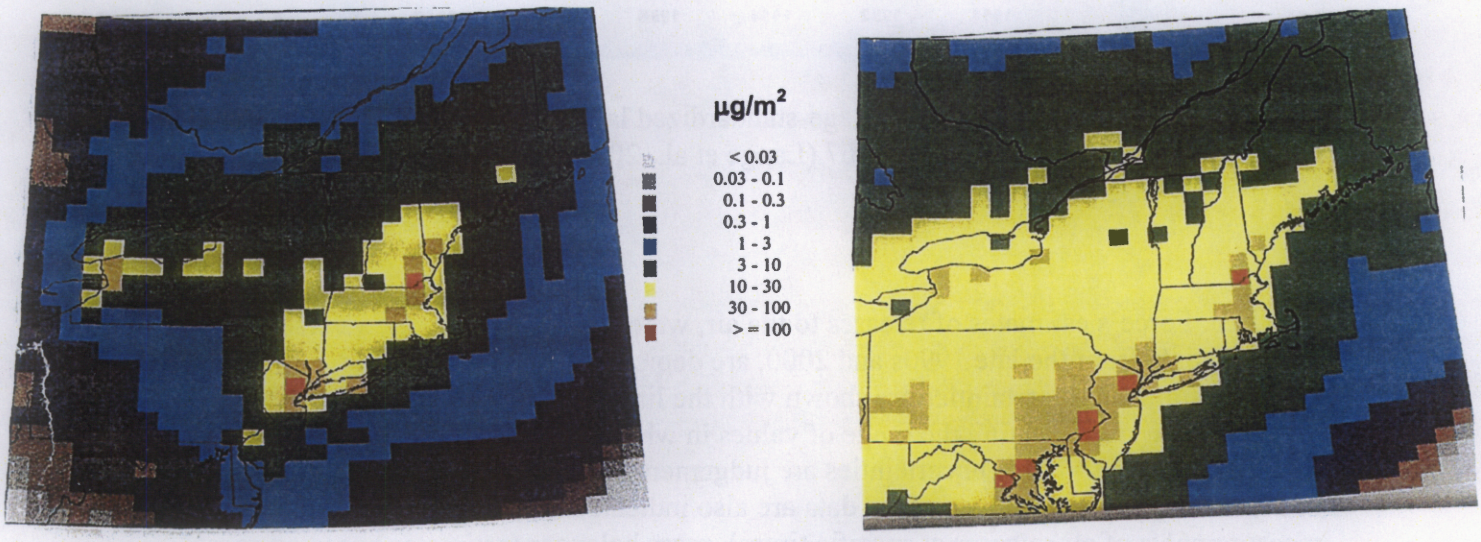
The inventory of mercury contained in products and substances in use is augmented by 2615 metric tons of mercury stored at the Defense National Stockpile Center (DNSC) in Somerville, NJ, one of four national mercury storage sites. This mercury is stored in flasks in a secure, monitored warehouse. A federal environmental impact study is underway, due in Spring of 2002.

Deposition from the atmosphere is important in the overall cycle. Hg deposition in New Jersey can come from local, regional or global sources. Existing data do not permit a definitive determination of how much of the mercury emissions from New Jersey sources are deposited locally. Some reports and models do provide some insight on the relative local and non-local share of deposition, however. It has been estimated that perhaps one third of U.S. emissions to the air are deposited within the U.S., with the remainder joining the global atmospheric pool. It is also estimated that 50% of total mercury deposition may be accounted for by local or regional sources (see Figure 1.8 below, which shows estimated deposition from both in-region sources and from all U.S. sources). National mercury deposition data, coupled with additional data generated by the NJ Atmospheric Deposition Network, provide evidence that wet deposition rates of mercury are higher near population centers, providing further indication that a significant portion of the total deposition quantity results from relatively local sources. Areas of high rainfall that are also close to population centers, such as South Florida, show the highest deposition.

Figure 1.8
Estimated Total Mercury Deposition in the Northeast from In-Region Sources and from All U.S. Sources.

Hg deposition from in-region sources

Hg deposition from all U.S. sources

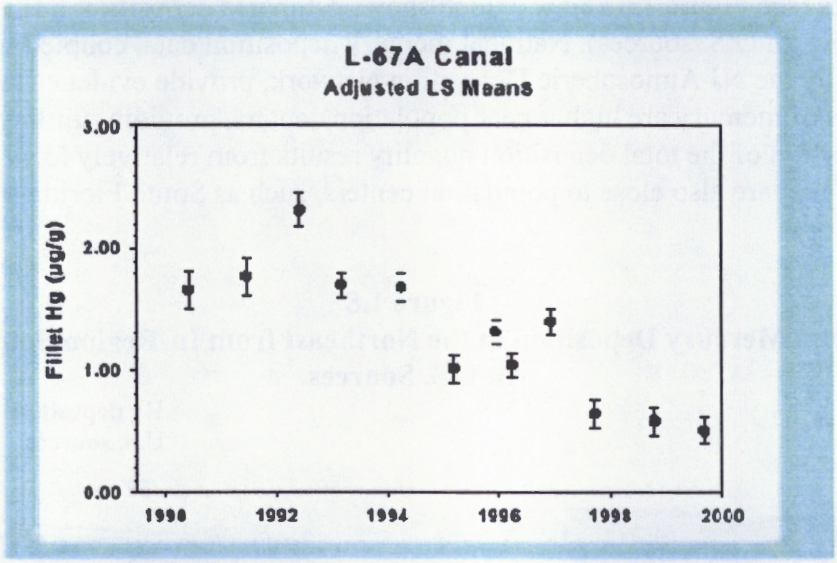


(Source: NESCAUM et al. Northeast States and Eastern Canadian Premiers Mercury Study - A Framework for Action. February 1998)

Recent research suggests that reductions of anthropogenic emissions of mercury will lead to significant reductions of Hg in aquatic species within a relatively short period of time. A Florida modeling study indicated that control of current mercury emissions could significantly alleviate the overall Everglades mercury problem within a decade or two and data on mercury levels in bass show a decline in the 1990's (Figure 1.9) following reduction of local emission. These data suggest that known emission reductions in sources such as waste incineration and painted surfaces taking place in the early- to mid-90s have led to relatively rapid declines in fish tissue concentrations. Other research suggests that, in the New York/New Jersey Harbor,

if inputs of fresh mercury should cease, concentrations of mercury in fish would decline by 50% within approximately 20 years.

Figure 1.9
Changes in Mercury Concentration in Tissue of Largemouth Bass in a Florida Everglades Location in Conjunction with Reductions of Emissions of Mercury from Local Sources



Mercury in fillets of age-standardized largemouth bass in Everglades Canal L-67 (Lange et al., 2000). Adjusted least square means.

The Task Force's estimates of releases to the air, water, and land from New Jersey sources, based on data from the late 1990s and 2000, are depicted in Figures 1.10 and 1.11. In these figures, estimated uncertainties are shown with the lines extending to the left and to the right of the source bar, representing the range of values in which the real value could reasonably be expected to occur. These uncertainties are judgements reflecting the Task Force's confidence in the numbers. The sources of the data are also indicated. These include stack tests (direct measurements of air releases at specific times), mass balances (estimates based on some measurements, e.g. concentration of mercury in crude oil multiplied by total quantity refined in NJ), or other, usually more subjective, methods such as engineering judgement. Individual sources categories of air emissions span a range of over 900 pounds per year for New Jersey iron and steel manufacturing facilities to nearly zero for some New Jersey sources such as medical waste incineration and wood combustion. The four largest source categories, based on relatively certain estimates, are iron and steel manufacturing, coal combustion, products not elsewhere listed (including broken fluorescent bulbs), and solid waste incineration.

Figure 1.10

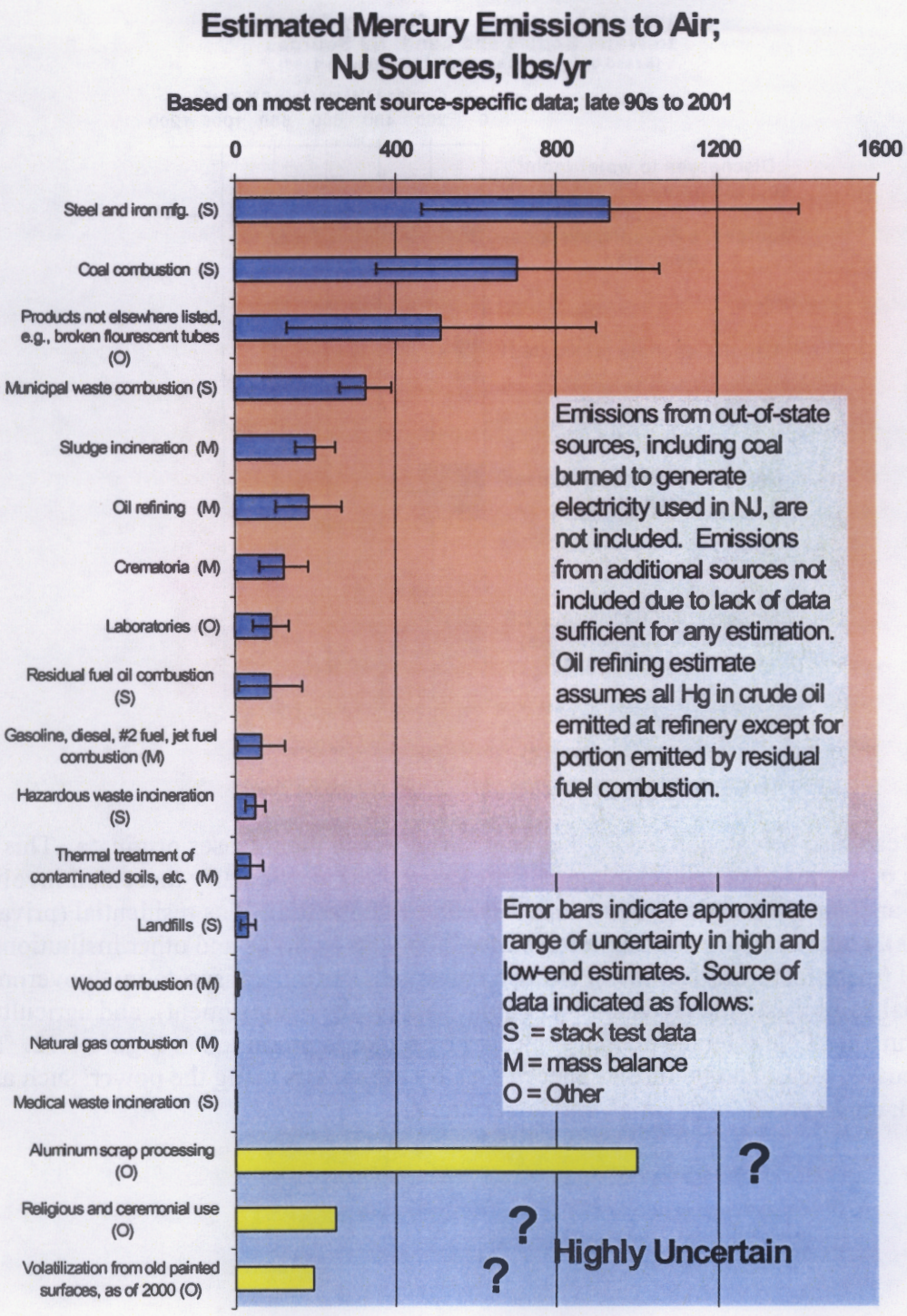
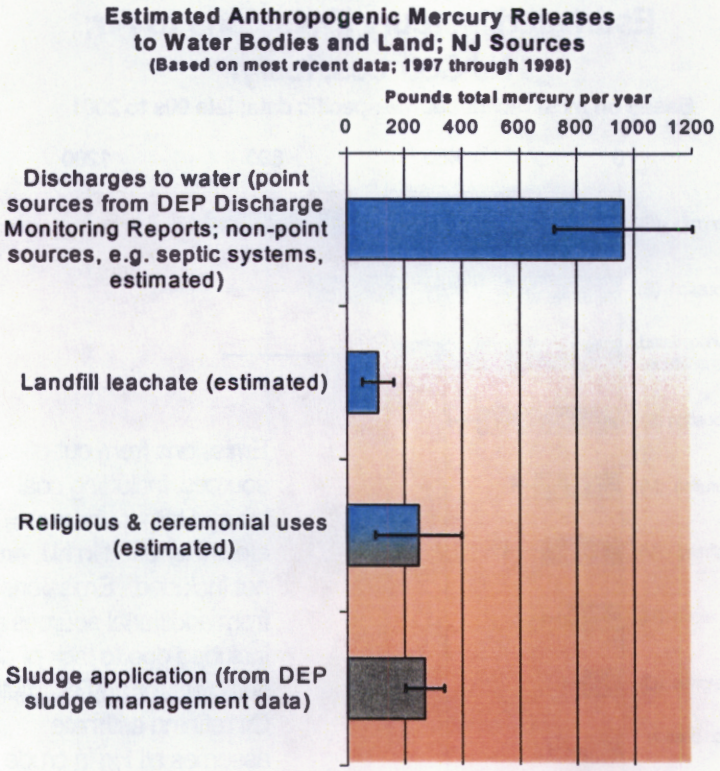

Estimated Mercury Emissions to Air;
NJ Sources, lbs/yr
Based on most recent source-specific data; late 90s to 2001
0
400
800
1200
1600
Steel and iron mfg. (S)
Coal combustion (S)
Products not elsewhere listed, e.g., broken flourescent tubes (O)
Municipal waste combustion (S)
Sludge incineration (M)
Oil refining (M)
Crematoria (M)
Laboratories (O)
Residual fuel oil combustion (S)
Gasoline, diesel, #2 fuel, jet fuel combustion (M)
Hazardous waste incineration (S)
Thermal treatment of contaminated soils, etc. (M)
Landfills (S)
Wood combustion (M)
Natural gas combustion (M)
Medical waste incineration (S)
Aluminum scrap processing (O)
Religious and ceremonial use (O)
Volatilization from old painted surfaces, as of 2000 (O)
Emissions from out-of-state sources, including coal burned to generate electricity used in NJ, are not included. Emissions from additional sources not included due to lack of data sufficient for any estimation. Oil refining estimate assumes all Hg in crude oil emitted at refinery except for portion emitted by residual fuel combustion.
Error bars indicate approximate range of uncertainty in high and low-end estimates. Source of data indicated as follows:
S = stack test data
M = mass balance
O = Other
?
?
?
Highly Uncertain

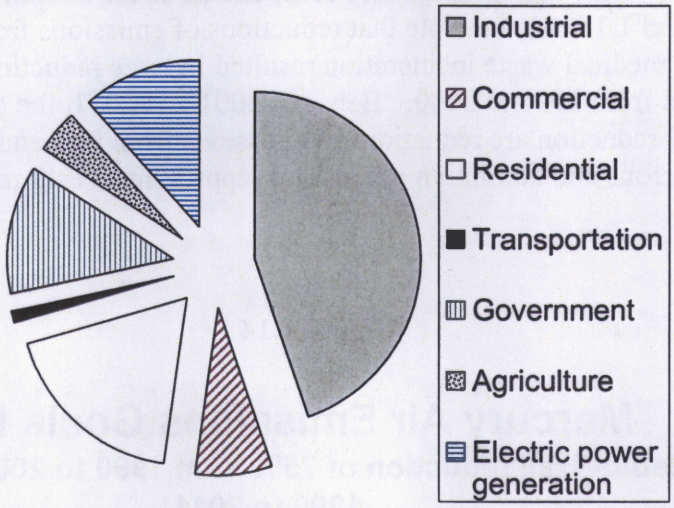
Figure 1.11



Releases can also be categorized by the sector from which the releases originate. This approach offers insight in developing reduction strategies, particularly those that involve outreach and communication. Source sectors can be characterized as residential (private dwellings), commercial (including retail stores, hospitals, schools and other institutions), industrial (manufacturing facilities), electric power generation, transportation, government (municipal solid waste management and public wastewater management), and agriculture. An apportionment of New Jersey mercury releases by sector is presented in Figure 1.12. The electric power sector can be further apportioned by the sectors using the power, such as industrial, commercial, residential, and government.

Figure 1.12

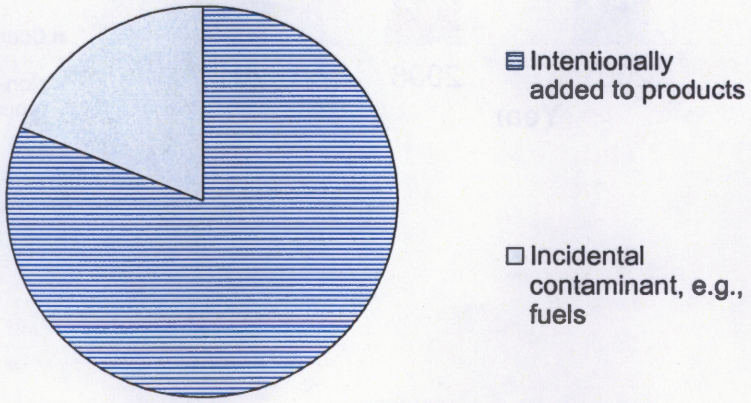
Estimated 1999 NJ Anthropogenic Mercury Releases to Air, Water, & Land; by Sector



Releases can also be organized by the origin of the mercury. There are two broad categories of origin. In one case, mercury can be intentionally added to a product or used directly in an intentional manner. Alternatively, mercury can be present as an unwanted contaminant in a product. Release may occur during use, or through breakage or disposal. A review of the mercury releases noted in Figure 1.12 suggests that approximately 80% of the mercury released from New Jersey sources is mercury intentionally added to products. See Figure 1.13.

Figure 1.13

Estimated 1999 NJ Anthropogenic Mercury Releases to Air, Water, & Land; by Origin of Mercury



CHANGES IN SOURCE QUANTITIES OVER TIME

Reduction goals discussed previously can be broken down into components representing the various sources. These individual source components of the overall reduction goals are shown in figures 1.14 and 1.15 below. Note that reductions of emissions from municipal solid waste incineration and medical waste incineration resulted in large reductions of total NJ emissions during the period from 1990 to 2000. Between 2001 and 2011, the greatest portions of the projected overall reduction are reductions in emissions from iron and steel manufacturing facilities, non-ferrous and aluminum processing (approximate estimate) and from coal combustion.

Figure 1.14

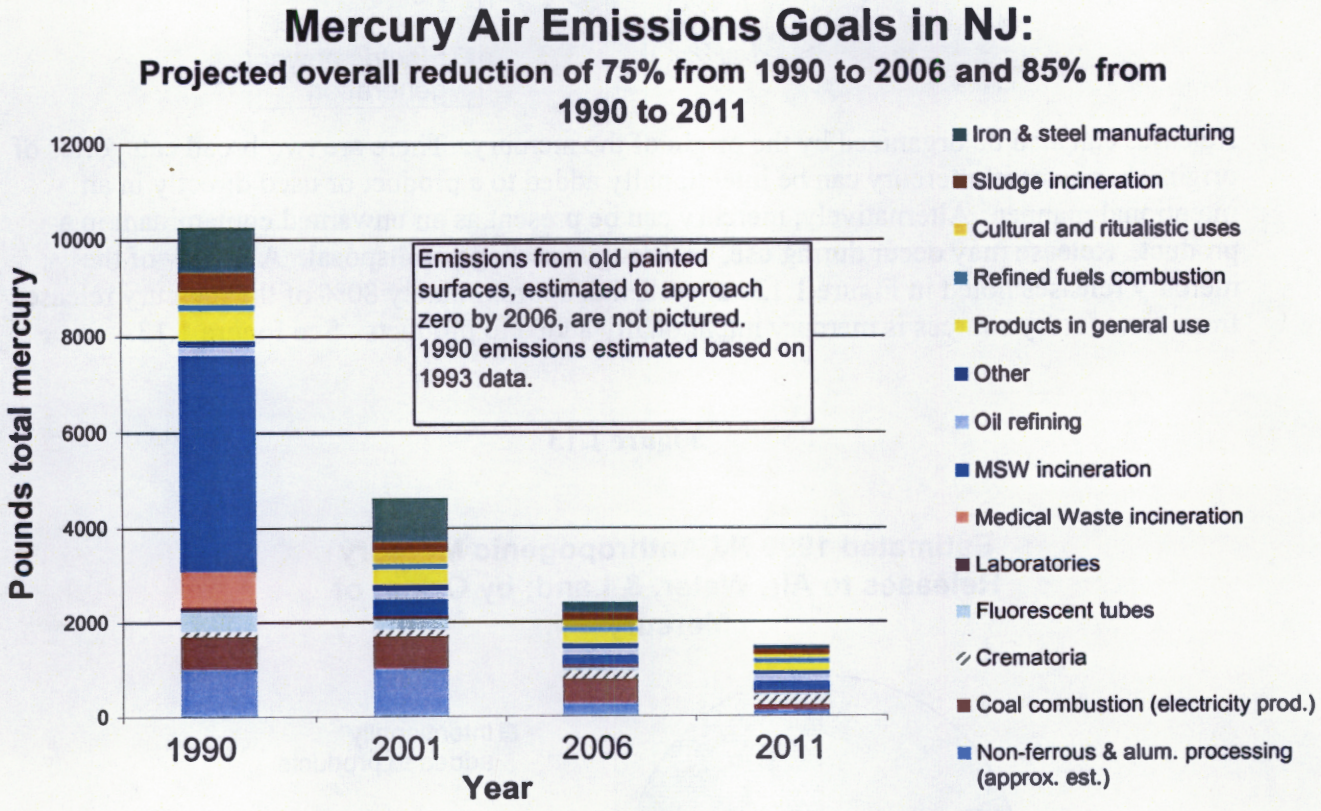
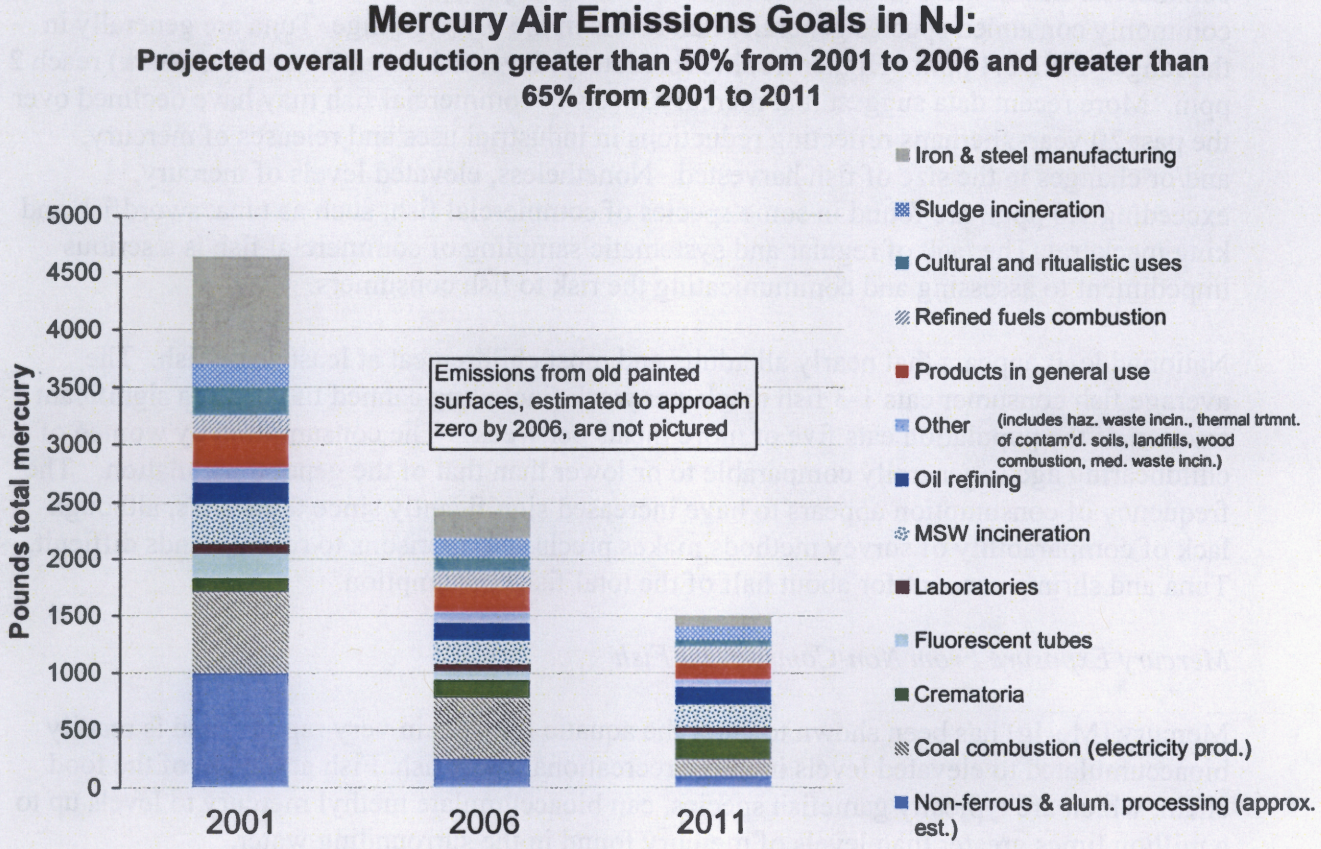


Figure 1.15



EXPOSURE PATHWAYS

Nationally, the most important source of exposure to mercury is the consumption of fish, although in certain areas of New Jersey, drinking and showering with water from private wells can be a significant source of mercury exposure. The extent of exposure from cultural uses of mercury is not known and such practices appear to be limited to specific communities. There is a long history of occupational exposure to mercury. Nationally, the most significant occupational exposures have ended, although limited exposure may continue in specific settings, most companies using or manufacturing mercurials have ceased these activities in the state. Dental amalgams and the pharmaceutical preservative Thimerosal may also be significant sources of exposure to individuals. The potential health implications of these latter exposures remain uncertain, and are largely beyond the scope of this Task Force.

Mercury Exposure from Commercial Fish

Based on data from the early 1970's, the average Hg concentration in muscle tissue in commercial fish in the U.S. intended for human consumption was 0.11 ppm, and the most commonly consumed species generally had levels in the 0.1-0.2 range. Tuna are generally in the range of 0.1-0.4 ppm. Higher trophic (predatory) level fish (e.g., Swordfish, Shark) reach 2 ppm. More recent data suggest that mercury levels in commercial fish may have declined over the past 20 years, perhaps reflecting reductions in industrial uses and releases of mercury, and/or changes in the size of fish harvested. Nonetheless, elevated levels of mercury, exceeding 1.0 ppm, are found in some species of commercial fish, such as tuna, swordfish and king mackeral. The lack of regular and systematic sampling of commercial fish is a serious impediment to assessing and communicating the risk to fish consumers.

Nationwide, it appears that nearly all adults and most children eat at least some fish. The average fish consumer eats 1-3 fish meals per week (including canned tuna), but a significant fraction of the population eats five or more meals per week. The consumption by women of childbearing age is generally comparable to or lower than that of the general population. The frequency of consumption appears to have increased significantly since the 1970's, although lack of comparability of survey methods makes precise comparisons to recent trends difficult. Tuna and shrimp account for about half of the total fish consumption.

Mercury Exposure From Non-Commercial Fish

Mercury (MeHg) has been shown to enter the aquatic food chain very rapidly, and is readily bioaccumulated to elevated levels in many recreational sport fish. Fish at the top of the food chain, which are typically gamefish species, can bioaccumulate methyl mercury to levels up to a million times greater than levels of mercury found in the surrounding water.

In 1984 and 1985, the U.S. Fish and Wildlife Service (USFWS) identified mercury concentrations in predatory fish species (e.g., trout, walleye, largemouth bass) that were at nearly twice the level in bottom dwelling species (e.g., carp, catfish and suckers). U.S. EPA's National Study of Chemical Residues in Fish (NSCRF) study found the mean mercury concentration in bottom feeding fish species to be generally lower than the concentrations found in top level predatory species. In addition, the study revealed that the majority of the elevated mercury concentrations were in fish collected from the northeastern states. A 1998 NESCAUM report on mercury concentrations in fish collected from northeastern states (including New Jersey) and eastern Canadian Provinces found that the top level sport fish species, such as walleye, chain pickerel, largemouth bass and smallmouth bass typically exhibited the highest mercury concentrations. Highest mercury concentrations were identified in a largemouth bass (8.94 ppm) and smallmouth bass (5.0 ppm).

The U.S. EPA's 2001 report, National Listing of Fish and Wildlife Advisories collected from 43 states provides a national mean mercury concentration for several predator and bottom feeding fish species. The national mean mercury concentrations for walleye, largemouth bass, smallmouth bass and brown trout were 0.52, 0.46, 0.34, and 0.14 ppm (wet weight) and 0.11, 0.11, and 0.09 ppm (wet weight) for carp, white sucker and channel catfish respectively.

Nationally, mercury accounts for the greatest number of fish consumption advisories issued by state agencies for recreational species of fish. U.S. EPA reports that almost 79 % of all the fish contaminant advisories issued were at least partly due to mercury contamination and that the number of states issuing mercury-related advisories has steadily risen. In 1993, a total of 899 mercury advisories had been issued from 27 states nationwide. In 2000, a total of 2,242 fish consumption advisories issued from 47 states due to elevated mercury concentration. The increase in mercury advisories is largely attributed to an increased awareness of mercury impacts in the aquatic environment and an increase in fish monitoring programs throughout the states.

HUMAN HEALTH EFFECTS AND TOXICOLOGY

The Task Force did not intend to undertake a new synthesis of the toxicology of mercury, but to provide a brief introduction and summary of the current state of knowledge. Significant uncertainties remain, and a full presentation of the available data and their accompanying uncertainties is beyond the scope of this report. More complete discussion and analysis can be found in several recent publications including:

- The National Research Council's Toxicological Effects of Methylmercury (NRC, 2000)
- The U.S.EPA's Mercury Report to Congress (U.S.EPA, 1997)
- The ATSDR's 1999 update of its Toxicological Profile for Mercury (ATSDR, 1999)
- The report of the National Institute of Environmental Health Sciences' Workshop on Scientific Issues Relevant to Assessment of Health Effects from Exposure to Methylmercury (NIEHS, 1998).

Methylmercury Neurodevelopmental Toxicity

It is clear that MeHg is a neurotoxin that can cause a range of developmental abnormalities in children exposed *in utero*. The critical question for assessing the impact of Hg on human health is whether, within the range of exposure associated with consumption of sport and commercial fish, there is a significant risk of adverse effects. There are now credible scientific data that indicate that at some currently encountered levels of fish consumption, significant risks can occur. These risks relate to subtle and population-based deficits in developmental performance, mostly within the range of "normal" performance. The current U.S. EPA Reference Dose (RfD) (essentially an estimate of the safe dose for the entire population including the most sensitive) for protection against such adverse effects (0.1 μg/kg/day) appears to be appropriate and protective. This value is based on an extensive scientific review by a committee of the National Academy of Sciences/National Research Council on which NJDEP was represented. This value is essentially identical to that recommended by the first New Jersey Mercury Task Force, and which forms the bases for New Jersey's current mercury fish advisories. Additional data from ongoing studies may further clarify this picture, but it is likely that uncertainties will remain for the foreseeable future.

Methylmercury Adult Toxicity

The former U.S.EPA RfD for MeHg (0.3µg/kg/day) was based on clinical neurological effects observed in adults. While this value has been superceded by the current RfD for developmental effects, it continues to be used to address the non-childbearing portion of the population. Current evidence suggests that more subtle neurological effects and/or non-neurological effects of MeHg may not be addressed by the "adult" RfD. Research, specifically addressing the potential for adverse effects at lower levels of exposure than those addressed by the "adult" RfD, are needed.

Inorganic Mercury

Salts of inorganic Hg primarily affect the kidney, but are not well absorbed by ingestion. Elemental mercury primarily affects the central nervous system, and is well absorbed by inhalation, but not by ingestion. Subtle neurological effects may occur with even low levels of exposure to elemental mercury making elemental mercury spills and intentional use of elemental mercury in residences potentially dangerous.

ECOLOGICAL EFFECTS OF MERCURY

Mercury compounds have been widely distributed in the environment. Due to the discharge and transport of mercury, organism exposure in aquatic and terrestrial ecosystems has resulted in the bioaccumulation of mercury. Mercury, primarily methylmercury, is quickly accumulated by aquatic biota, and methylmercury is the principal form of mercury that causes adverse effects. Biomagnification of mercury up the food chain is extensively documented, especially in aquatic systems: those predators at the top of the food chain accumulate the highest concentrations of mercury. Mercury accumulation by organisms has resulted in adverse effects ranging from death to sublethal effects. Mercury is a teratogen, and mutagen, and causes embryocidal, cytochemical, and histopathological effects. Ecosystem-level effects are not well characterized and additional study and data are needed to ascertain the impacts of mercury at this scale. Nonetheless, it is clear that fish-eating species, including birds, fish, and mammals, are especially at risk to the effects of mercury.

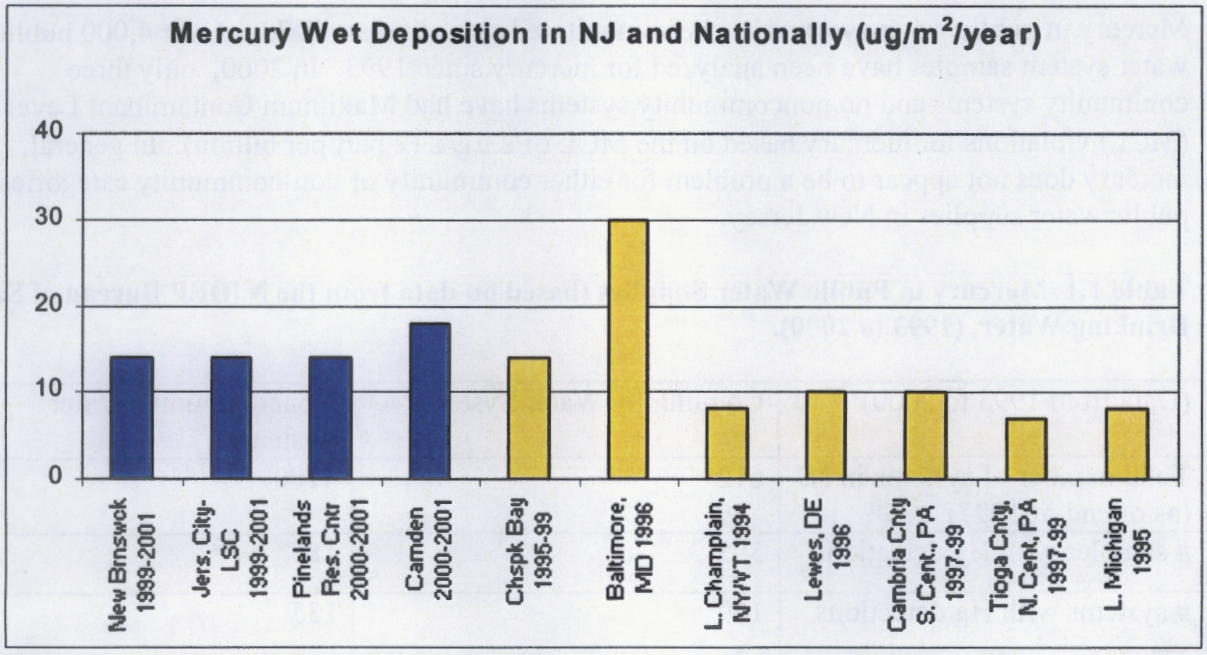
U.S. EPA developed a Water Quality Criterion (WQC) for mercury for the protection of wildlife (1.3 ng/L or parts per trillion) for surface waters of the Great Lakes. In addition, U.S. EPA has calculated a surface water wildlife criterion of 0.05 ng/L for methylmercury for protection of piscivorous mammals. These values are well below current Water Quality Criteria for the protection of aquatic life, and indicate that current surface water criteria may not adequately protect wildlife. Issuance of similar criteria should be considered for protection of wildlife nationally. In 2001, U.S. EPA issued its new surface water criteria of 0.3µg/g in fish tissue. The New Jersey Department of Environmental Protection is developing an implementation strategy for this new criteria.

OCCURRENCE AND IMPACT OF MERCURY IN NEW JERSEY'S ENVIRONMENTAL MEDIA

Mercury in Air

Mercury in ambient air in New Jersey does not pose a significant public health concern from inhalation. However, the deposition of airborne mercury onto surface water, and onto vegetation and soil, followed by transport to surface water, is the primary cause of mercury accumulation in aquatic biota. On the basis of preliminary data from the New Jersey Air Deposition Network, the deposition of mercury from the air to the surface from wet (precipitation) events is consistent with values reported elsewhere in the northeast, and is higher than the national average of 10 $\mu g/m^2$/year. See Figure 1.16 below.

Figure 1.16



Mercury in Groundwater in New Jersey

As a result of aggressive sampling of private wells undertaken by county governments in Atlantic, Ocean, and Gloucester Counties, mercury contamination in the Kirkwood- Cohansey aquifer in southern New Jersey has been identified and partially characterized. Depending on the county, between 1% and 13% of tested wells have been found with mercury concentrations exceeding the drinking water Maximum Contaminant Level of 2 µg/L (parts per billion). These results, however, are not based on random sampling and, therefore, do not permit conclusions about the overall occurrence of such exceedances. Based on studies conducted jointly by the NJDEP and the U.S. Geological Survey (USGS), it appears that this contamination results from human activity rather than natural sources. The great majority of the mercury is in the inorganic form as mercury salts. Approximately 10% of the mercury

appears to be present as elemental mercury. The exposure from affected wells has been reduced by connection of residences to community water systems when feasible, or through installation of in-home point-of-entry treatment (POET) systems.

In homes receiving ground water contaminated with mercury, there may be volatilization during showering. The potential for exposure varies depending on elemental mercury concentration, shower temperature, nozzle type, ventilation, and shower duration. Under some possible scenarios, elemental mercury vapor can exceed the safe dose corresponding to the U.S. EPA Reference Concentration (RfC) for mercury in air. There are currently insufficient data related to the extent of contamination of well water by Hg to estimate the number of individuals or households potentially exposed to such levels of Hg°. When POET systems are installed or alternate water sources used, such exposures can be reduced or eliminated.

Mercury in Public (Community and Non-Community) Water Supplies in New Jersey

Mercury in public water systems has been monitored since the late 1970s. Over 4,000 public water system samples have been analyzed for mercury since 1993. In 2000, only three community systems and no noncommunity systems have had Maximum Contaminant Level (MCL) violations for mercury based on the MCL of 2 µg/L (2 part per billion). In general, mercury does not appear to be a problem for either community or non-community categories of public water supplies in New Jersey.

Table 1.1 Mercury in Public Water Supplies (based on data from the NJDEP Bureau of Safe Drinking Water, (1993 to 2000).

(Data from 1993 to 2000)	Community Water Systems	Noncommunity Water Systems
Total number of systems in NJ (as of end of 1997)	612	4100
# samples with Hg detections	383	185
# systems with Hg detections	169	133
# systems with Hg > 2 µg/L in at least one sample	11	13
Average of detected levels, µg/L	0.76*	1.0*
Median of detected levels, µg/L	0.40*	0.33
Range of detected levels, µg/L	0.1 – 8.0	0.04 - 10

*The great majority of samples had Hg levels that were below the detection limit. Therefore the true average values are well below the average for the detected values.

Mercury in Freshwater in New Jersey

There are no systematic data on mercury in New Jersey lakes. Data on mercury levels in New Jersey freshwater streams are somewhat difficult to interpret due to changes over time in the number of sampling locations, as well as changes in the detection limit. Nonetheless, it appears that the occurrence of elevated mercury in New Jersey streams has decreased since the 1990-1994 period. The current data, do not, however, allow an assessment of the potential for ecological impact relative to chronic effects on aquatic life. The number of stations exceeding the surface water criteria of 0.14 µg/L decreased from 20% of 79 (1990-1994) to 0% of 82 (1997-2000). The reason(s) for the decline remain to be studied.

Table 1.2 Percent of Monitoring Stations Exceeding Mercury Surface Water Quality Criteria

Sampling Period	Number of Stations Sampled	Percent of Stations Exceeding the Chronic Aquatic Life Surface Water Criterion (0.012 µg/L total Hg)	Percent of Stations Exceeding Human Health Surface Water Criterion (0.14 µg/L total Hg)	Percent of Stations Exceeding the Acute Aquatic Life Surface Water Criterion (2.1 µg/L dissolved Hg)
1990-1994	79	Not reported	20%	not reported
1/95-9/97	81	a	6%	0%
10/97-10/00 [b]	114 (82 stations evaluated with method detection limit = 0.1 µg/l)	a	0% [c]	0%

a. Samples were analyzed as total recoverable Hg and the method detection limit was 0.1 µg/l. Therefore, the chronic aquatic life criterion could not be evaluated.
b. The method detection limit for the sampling period was 0.1 µg/L.
c. Based on 82 stations sampled 1998-1999 with a method detection limit of 0.1 µg/L.

Mercury in Estuarine and Marine Waters in New Jersey

In the Hudson-Raritan Estuary, the mercury levels in the water column were found to exceed (or nearly exceed) the ambient surface water quality criterion of 0.025 µg/L. Recent sampling has shown that while mercury did not exceed the water quality criterion in Raritan Bay, the mercury water quality criterion was exceeded in the Raritan River, Newark Bay, the Hackensack and Passaic Rivers. Mercury levels were 15-35 times higher than the water quality criterion in the Passaic River. In the Delaware Estuary, the total loading of mercury is approximately one order of magnitude lower than some other toxic substances (e.g., silver, chromium, copper, lead, zinc, and polycyclic aromatic hydrocarbons).

Mercury in Freshwater Sediments in New Jersey

Compared to surface and ground water, the database on mercury in sediments is very sparse. Based on limited data, mercury levels in lake and stream sediments in some locations in New

Jersey are within the range of North American background of 0.04-0.24 µg/g (ppm). However, at some locations where specific mercury discharges have occurred, mercury levels in sediment greatly exceed background. Additional assessments are needed of historic and current levels of mercury loadings to the sediments/soils on a statewide basis with a comparison to regional and local sources of mercury loadings.

Table 1.3 Total mercury concentration in stream sediments from the New Jersey Ambient Stream Monitoring Network.

	1990-1997	1998
Average	0.042 µg/g (ppm)	0.034 µg (ppm)
Median	0.02 µg/g	0.018 µg/g
Range	0.01-1.0 µg/g	<0.01-0.35 µg/g
No. of samples	168	22
No. of sites	73	22
Detection limit	0.01 µg/g	0.01 µg/g

Mercury in Marine and Estuarine Sediments in New Jersey

Elevated levels of mercury are found throughout the sediments of the Hudson-Raritan Estuary and in locations in the Delaware Estuary. In addition, there are well-documented sources of site-specific mercury contamination in estuaries including Berry's Creek and Pierson's Creek. Mercury in water, sediments, and biota has been identified as a chemical of concern in these estuaries and the NY-NJ Harbor Estuary Program (HEP) is conducting extensive monitoring as part of the Toxics Source Reduction Plans in NY and NJ to address this problem. At least 75% of the NY-NJ Harbor sediments exceeded the lower range of the concentration corresponding to a threshold for effects on biota (ER-L), and many exceeded the estimated mid-range concentration for the effects threshold (ER-M) as well.

Mercury in Soil in New Jersey

It appears that background soil concentrations of mercury in New Jersey are generally low, with levels in urban areas higher than those in suburban or rural areas. Based on a study conducted by NJDEP (Fields, et. al. 1993), mercury levels in surface soils in New Jersey ranged from <0.01 to 0.3 mg/kg except for urban soils and golf courses, where mercury level reached a maximum of 7.7 mg/kg. Median values were below 5 mg/kg except for the golf courses, where the median mercury level was 5 mg/kg. This may reflect historical use of mercury-containing pesticides. Although comparisons are difficult, background mercury levels in NJ soil appear to be roughly comparable to background levels measured in other states.

IMPACT OF MERCURY ON NEW JERSEY ECOSYSTEMS

Impacts of Mercury on Specific Sites in New Jersey

New Jersey contains several major mercury contaminated sites. These include Berry's Creek, Pierson's Creek, Du Pont Chemicals-Pompton Lakes Works, and the Passaic River Study Area.

These sites resulted from the improper disposal of large quantities of mercury used in on-site industrial processes. Mercury has persisted at these sites for decades and thus has posed the potential for long-term impact on the surrounding ecosystems. In general, however, additional study on the impact of the mercury contamination on biota is needed at these sites and at adjacent locations.

Mercury Occurrence and Levels in New Jersey Fish

Freshwater Fish: Mercury is a widespread and persistent contaminant in freshwater fish collected throughout the state. Concentrations exceeding 1.0 ppm have been found in higher trophic level fish, particularly Largemouth Bass and Chain Pickerel, in about 40% of the tested waterbodies. Some lakes in urbanized areas of the state which are subject to local mercury pollution had fish with elevated mercury levels, but some lakes in other areas with no local sources of mercury, such as the Pine Barrens, also had elevated levels. Mercury concentrations in lower trophic level fish are also elevated and are commonly in the range of 0.2 to 0.5 ppm. Thus, many tested water bodies exceed the recent surface water criterion value of 0.3 ppm in fish tissue promulgated by U.S. EPA (January 2001). Waters impacted by industrial or municipal discharge, poorly buffered waters with low pH (e.g. many of the lakes in the Pine Barrens), and newly created lakes, tend to have fish with elevated mercury levels.

Saltwater Fish: Fishing is a major recreational and economic activity in the estuarine, coastal and offshore waters of New Jersey. There are an estimated 1.2 million anglers who take about 4.5 million saltwater fishing trips per year, at a value of $1.2 billion. Data on mercury levels in saltwater in New Jersey are limited and mainly reflect estuarine rather than marine species. Based on the currently available data, most species have moderately elevated mercury concentrations averaging less than 0.25 ppm. Striped Bass and Tautog, however, may have mercury concentrations in the range of 0.5 to greater than 1.0 ppm.

Table 1.4 Distribution of Mercury Concentrations in Largemouth Bass and Chain Pickerel in New Jersey Waterbodies Sampled in 1992-94 & 1996-97 (ANSP, 1994a, 1999)

Average Mercury Concentration for each Species	Percent of Sampled Waterbodies			
	Largemouth Bass		Chain Pickerel	
	1992-94*	1996-97*	1992-94*	1996-97*
<0.07 ppm	0 %	0 %	0 %	0 %
0.08 - 0.18 ppm	16.0 %	20.0 %	6.0 %	25.0 %
0.19 - 0.54 ppm	56.0 %	45.5 %	53.0 %	31.5 %
>0.54 ppm	28.0 %	34.5 %	41.0 %	43.7 %

*1992-94 Data (55 Waterbodies Sampled), 1996-97 (30 Waterbodies Sampled)

Impacts of Mercury on New Jersey Fish

There are two basic approaches that can be taken to assess the impact of mercury in New Jersey waters on the fish in those waters. One approach can be referred to as a direct approach. This

involves making observations of fish health, survival, and performance as a function of their mercury exposure. The other approach can be referred to as an indirect approach. This involves comparing measured concentrations of mercury in water or in fish tissue to toxicity criteria for fish that were derived specifically for those media. This is a predictive or indirect approach.

Direct Assessment of Risk to New Jersey: There are very few data on the effects of mercury on New Jersey fish. Studies on Killifish from mercury contaminated estuarine/marine waters have demonstrated significant effects on many aspects of biology, behavior and viability, while a study of androgen levels in Largemouth Bass also showed the potential for significant reproductive impairment. Much more information is needed to draw general conclusions regarding the impact of mercury on fish health and reproductive capacity. These findings, however, raise concerns, and point out the need for research to examine the impact of mercury on the overall viability of fish in impacted NJ waterbodies.

Indirect Assessment of Risk to NJ Fish: Relatively low levels of Hg or MeHg can have chronic toxic effects on fish species. There are limited data for New Jersey waters. However, these data indicate the potential for chronic effects to fish in some waters of the State due to mercury. This potential is reflected in the exceedance of water quality criteria for chronic effects in both freshwater and saltwater fish. In particular, the NY-NJ Harbor area has exhibited mercury water concentrations above water quality criteria for effects on fish. Monitoring using more sensitive (i.e., lower detection limit) methods is needed to assess the levels of mercury in surface waters.

Impacts of Mercury on New Jersey Birds

Mercury levels in tissues, feathers, and eggs of several populations of New Jersey and New York Bight birds are close to or above levels anticipated to impair behavior, reproduction, growth and survival. Mercury was associated with developmental defects in Common Terns in the 1970's and high mercury levels are considered one of the stressors causing the decline of Common Loons. Mercury in the fish diet of Bald Eagles and Osprey appears to be elevated in the Delaware Bay region and may be a contributing factor to their potential lack of recovery in these regions.

Mercury in Other New Jersey Biota

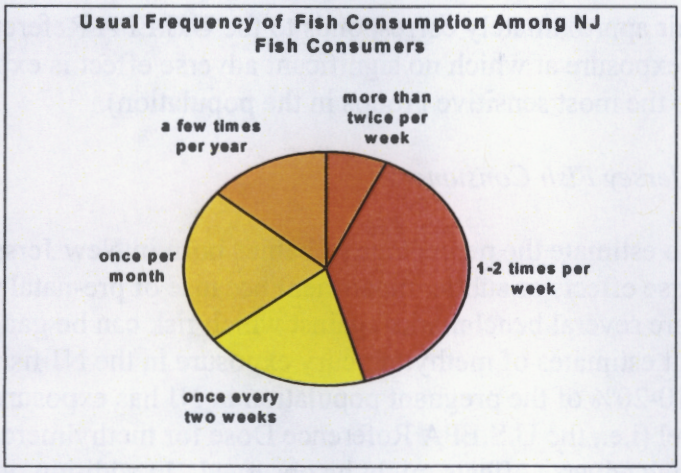
Very limited data on mercury exposure in plants and animals, other than birds and fish, are available. The data suggest that those mammalian species that are omnivorous, as opposed to herbivorous have elevated body burdens of mercury; however, data on carnivorous species in New Jersey are lacking. However, in the Everglades, some Panther deaths have been attributed to mercury poisoning. For reptiles, elevated levels are associated with the consumption of aquatic biota (fish and invertebrates). Information for evaluating the ecological risk implications of these isolated observations is lacking, and more information on mercury in these animals and in various plant species is needed.

IMPACT OF MERCURY ON PUBLIC HEALTH IN NEW JERSEY

Methylmercury Exposure from Fish Consumption in New Jersey

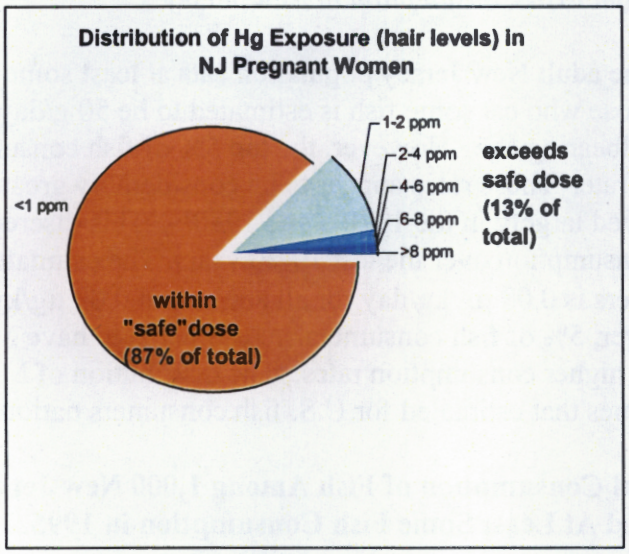
A very high proportion of the adult New Jersey population eats at least some fish. The mean fish consumption rate for those who eat some fish is estimated to be 50 g/day for all adults and 41 g/day for women of childbearing age. However, the top 5% of fish consumers eat fish at about three times this mean rate. These rates appear to be considerably greater than national consumption estimates derived largely in the 1970's and 1980's. This discrepancy may reflect a general increase in fish consumption over the last 10-20 years. The estimated mean daily MeHg dose for fish consumers is 0.08 μg/kg/day for all adults and 0.09 μg/kg/day for women of childbearing age. However, 5% of fish consumers are estimated to have MeHg exposures 3 times the mean dose, due to higher consumption rates. The distribution of MeHg exposures in New Jersey may be 1.5-3 times that estimated for U.S. fish consumers nationally.

Figure 1.17 Reported Usual Consumption of Fish Among 1,000 New Jersey Survey Respondents Who Reported At Least Some Fish Consumption in 1995.



The great majority of pregnant women in New Jersey appear to have low levels of exposure to Hg in general and to MeHg in particular. However, a small, but significant fraction of the pregnant population does have elevated exposures to MeHg from fish consumption. In general, African-Americans appear to have lower mercury levels than whites, and people with some college education appear to have lower mercury levels than those who did not complete high school. No data are available on mercury levels in people in NJ who regularly consume large amounts of fish.

Figure 1.18 Distribution of Total Hg in Hair from the Sample of NJ Pregnant Women.



(Note: 1 ppm mercury in hair approximately corresponds to the U.S.EPA Reference Dose for MeHg. This is the level of exposure at which no significant adverse effect is expected over a lifetime of exposure even to the most sensitive groups in the population).

Assessment of Risk to New Jersey Fish Consumers

There is no definitive way to estimate the percentage of babies born in New Jersey which could potentially experience adverse effects or subtle impairment because of pre-natal mercury exposure. However, there are several benchmarks against which risk can be gauged, and there are two studies which permit estimates of methylmercury exposure in the NJ fish-consuming population. It appears that 10-20% of the pregnant population in NJ has exposures which exceed a clear no-effect level (i.e., the U.S.EPA Reference Dose for methylmercury), and that 1-3% have exposures at which adverse effects might be observed. In addition, it appears that 5% of the general adult fish-consuming population in NJ has exposures which exceed a clear no-effect level for methylmercury (i.e., the previous U.S. EPA Reference Dose for adult health effects). These observations indicate that while the great majority of NJ fish consumers are at low risk from MeHg exposure, a small fraction of the population may have a significant level of risk. These exposure levels are comparable to those recently reported in the CDC/ NHANES IV assessment. None of these studies have targeted high-end consumers, people who deliberately eat large quantities of fish, often with 10 or more fish meals per week. In New Jersey, some adults and children eat sufficient amounts of fish to develop clinical signs of methylmercury poisoning.

Fish Consumption Advisories and Outreach in New Jersey

The NJDEP and NJDHSS have made significant effects to inform the public about new and existing fish consumption advisories for mercury and other contaminants in fish. Since

advisories alone do not reach or convince all fish-eaters, additional press briefings, press releases and communications through the media have been undertaken to further communicate the existence and purpose of fish consumption advisories to as wide a group of populations as possible. The main audience for most of this information is the pregnant population, women planning to be pregnant or with young children and the recreational anglers of the state. Bilingual brochures have been distributed to populations at risk, but many target populations speak neither English nor Spanish. Advisories are annually updated and are made available to fishing license agents for distribution to the angling public. In addition, warning signs are posted and maintained on affected waterways around the state. Reaching salt water anglers remains a problem since no fishing license is required, thereby removing one of the important information channels. Research studies continue to provide new approaches to communicating with the targeted populations and outreach programs provide a means of encouraging public involvement in the education and protection of the public from the exposure to toxic chemical contaminants. For commercial fish, limited national guidance or current information on mercury levels in commonly consumed species is available to assist consumers in making informed choices.

Fish consumption provides substantial health benefits. In order to avoid discouraging consumers from fish consumption in general, outreach information must be carefully structured and worded to distinguish between low mercury fish and high mercury fish and to encourage the increased consumption of the former, especially by high-risk individuals.

Residential Exposure to Methylmercury in New Jersey

In at least one location in Hoboken, New Jersey, residents in an apartment building created from a former mercury vapor lamp factory were exposed to significant levels of mercury which appear to have resulted in adverse health effects in those exposed at the highest levels. The families have been evacuated and the building was found permeated with mercury and has been condemned. It is important that former industrial sites being converted into residential units be fully inspected for the presence of hazards like mercury before renovations begin.

In homes receiving ground water contaminated with mercury, there may be volatilization of elemental mercury during showering or cooking. The potential for exposure varies depending on the fraction of the total mercury which is present as elemental mercury, total mercury concentration, water temperature, nozzle type, ventilation, and exposure duration. Under some exposure scenarios the safe dose corresponding to the U.S. EPA Reference Concentration (RfC) for elemental mercury would be exceeded. There are currently insufficient data relating to the extent of contamination of well water by mercury to estimate the number of individuals or households potentially exposed to such levels of elemental mercury.

INDICATORS OF INPUT, ACCUMULATION, AND IMPACT OF MERCURY ON NEW JERSEY'S ENVIRONMENT

Indicators provide a critical tool for assessing environmental quality and for evaluating trends in environmental quality. This is especially important in conditions of environmental change

such as those which are anticipated to result from reductions in mercury emissions in New Jersey and nationally. New Jersey already has in place an extensive indicator program under its National Environmental Performance Partnership System (NEPPS) and Strategic Planning processes. Useful indicators of the impact of mercury on New Jersey's environment are achievable for air deposition, mercury concentration in surface water, mercury entry into aquatic food chains, mercury levels in fish tissue, mercury levels in human tissue in the New Jersey population, and mercury levels in feathers of piscivorous birds nesting in New Jersey. All of these indicators have the strong potential to reflect relatively short-term changes in the entry of mercury into and movements through the New Jersey environment at various levels of environmental organization, and so are useful in gauging the efficacy of ongoing management efforts. Except for air deposition data generated from the current New Jersey Air Deposition Network, these indicators need to be developed, and require appropriate analytical assessment and program investments.

THE IMPACT OF MERCURY ON TOURISM AND RECREATION IN NEW JERSEY

The Task Force found no clear evidence that the issuance of fish advisories or the rising public concern about mercury have had a major influence on freshwater or salt water fishing.

To provide information on the potential impact of mercury contamination and mercury advisories on tourism and recreation in New Jersey, the Task Force commissioned a survey of charter and party boat captains in New Jersey.

A minority of party and charter boat captains interviewed reported that advisories in general did hurt their business to a greater or lesser degree. The Boat Captain Survey was not able to evaluate the accuracy of these reports. Reporting that advisories affected business, however, was consistent mainly for those captains who fished for bluefish in the waters of the northern part of the state. It is notable that although bluefish have moderately elevated levels of mercury, there is no mercury-based advisory for bluefish. There are, however, PCB-based advisories for bluefish in the waters of northern New Jersey (i.e., the Harbor Estuary). Furthermore, captains who fished for species with more elevated levels of mercury and which have been highlighted in the press as posing a potential health hazard (i.e., shark, tuna), did not tend to identify advisories as affecting their business. Although this survey cannot rule out a small impact from fish consumption advisories in general on the recreational fishing industry in New Jersey, it seems unlikely that mercury-based advisories in particular have any major impact on the industry.

Volume II of the New Jersey Mercury Task Force Report contains greater detail on the exposure and impact of mercury in the environment. Volume III contains further information on the sources of mercury to New Jersey's environment.

APPENDICES

I. Administrative Order 1998-08 and Original Task Force Membership List

II. Mercury Task Force Participants

III. Mercury Task Force Subcommittee Members

IV. Mercury Task Force NJDEP Participants

V. Mercury Task Force Interim Recommendations

A. November 14, 1998 letter from Dr. Michael Gochfeld to NJDEP Commissioner Shinn on recommendations to strengthen the environmental component of Bill A-10 on energy restructuring

B. July 17, 1998 Task Force meeting where the New England Governors' resolution 23-2 regarding the virtual elimination of mercury was endorsed.

C. December 11, 1998 letter from Dr. Michael Gochfeld to NJDEP Commissioner Shinn on recommendation for an amendment to the Pollution Prevention rules

D. January 11, 1999 letter from Dr. Michael Gochfeld to Governor Whitman to strengthen the environmental component of Bill A-10 and the urging of the Task Force for mercury to be explicitly on the list of substances for which disclosure will be required

E. July 6, 2001 letter from Dr. Michael Gochfeld to Commissioner Shinn recommending support of the New England Governors' resolution regarding retirement and stockpile management of mercury

VI. Presentations at Task Force Meetings

VII. Acronyms

APPENDIX I
Administrative Order 1998-08

State of New Jersey
Christine Todd Whitman *Governor*
Department of Environmental Protection
Division of Science, Research and Technology
P.O. Box 409
Trenton, NJ 08625-0409
Robert C. Shinn, Jr. *Commissioner*

ADMINISTRATIVE ORDER 1998-08

I, Robert C. Shinn, Jr., Commissioner of the New Jersey Department of Environmental Protection, pursuant to the authority of N.J.S.A. 13: 1 B-3, hereby establish a task force to be known as the Mercury Pollution Task Force.

It is recognized that mercury contamination compromises public health and the health of the ecosystem. It is persistent, mobile, and subject to bio-magnification in food chains, factors which make environmental exposure to this contaminant a significant human health risk. In New Jersey, mercury contamination has resulted in the issuance of fish consumption health advisories across the state for certain freshwater fish. New Jersey's efforts to address issues related to mercury contamination are reflected in the state's National Environmental Performance Partnership Agreement; this task force adds to and builds upon that commitment.

The reduction of Mercury contamination should be an additional component to our efforts to reduce the transport of ozone and its precursors from out of state sources, and be a major part of our continuing efforts to meet the standards of the Clean Air Act.

For the foregoing reasons, I am directing the task force to undertake a thorough examination of Mercury transport and deposition issues and to develop a mercury pollution reduction plan for New Jersey. This examination should include an analysis of the potential sources of mercury devolution into the environment.

The mission of the task force is to develop a mercury pollution reduction plan for New Jersey. The Task Force is directed to complete the following tasks:

1. Review the current science on: a) impacts of mercury pollution on public health and ecosystems; and b) mercury deposition, transport, and exposure pathways.
2. Inventory and assess current sources of mercury pollution to the extent feasible, including both in-state and regional sources of mercury pollution.

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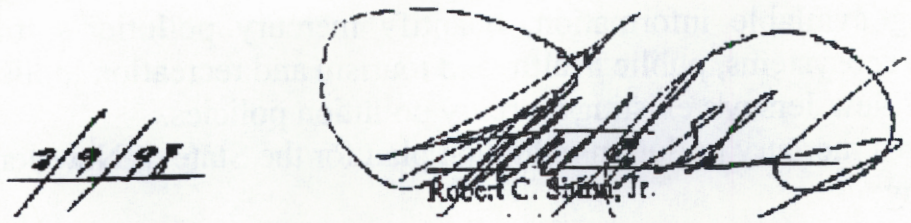
3. Utilizing available information, quantify mercury pollution's impact on New Jersey's ecosystems, public health, and tourism and recreation industries.
4. Review New Jersey's existing mercury pollution policies.
5. Develop a mercury pollution reduction plan for the State of New Jersey, including:
   A) Recommend mercury emission controls and standards for in-state sources, including: coal fired generators; hazardous waste incinerators; sludge incinerators; hospital waste incinerators; and for other sources deemed necessary by the task force. In recommending controls and standards, the task force will explore renewable energy and alternative fuels to mercury emitting fuels now in use, and review innovative and low cost emission reduction strategies available in various industrial sectors.
   B) Provide timely interim recommendations, as feasible, prior to completion of the task force's overall mission, to the New Jersey Department of Environmental Protection, New Jersey Board of Public Utilities, other state agencies, interstate agencies, and the federal Environmental Protection Agency regarding mercury pollution, mercury pollution controls and standards and the relationship of energy deregulation to mercury pollution.

Within the NJDEP, mercury is addressed in a multi-media approach by nine separate divisions, resulting in an overall program of considerable expertise. Therefore, I am directing that the task force take full advantage of the resources and expertise that the department has brought to bear on this important issue.

The task force shall be comprised of the following representatives appointed by the Commissioner of the Department of Environmental Protection (except as otherwise noted) and who shall serve at the pleasure of the Commissioner, from the following areas:

New Jersey Department of Environmental Protection: 1
New Jersey Board of Public Utilities: 1 (appointed by the President of the BPU).
New Jersey Department of Health: 1 (appointed by the Commissioner of the DOH).
Recognized public interest groups: 4
Hospital waste incinerators: 1
Co-Generation power electric generators: 2
Sewerage sludge incinerators: 1
Refineries/refinery products: 1
Hazardous waste incinerators: 1

Date



Coal fired electric generators: 3 (1 from each generator)
Fresh water fishing organization: 1
Saltwater fishing organization: 1
At large citizen members: 4

I direct that the Task Force be administered by the Department, and that the Division of Science and Research within the Office of Environmental Planning and Science and the Office of Air Quality Permitting within the Office of Environmental Regulation as well as other necessary department resources be made available to the mission as set forth herein.

The Task Force may provide timely interim recommendations as feasible, to the Office of Commissioner of the Department of Environmental Protection, prior to the completion of the task force's overall mission. The Task Force shall report its final findings and recommendations to the Commissioner within 12 months of the date of the organizational meeting of the task force, at which time the Task Force shall terminate.

The Task Force shall meet regularly as it may determine, and shall also meet at the call of the chairperson.

A majority of the membership of the Task Force shall constitute a quorum for the transaction of Task Force business. Action may be taken, including the issuance of any findings, recommendations or reports, (interim or final), at any meeting of the Task Force only by the affirmative vote of a majority of the full membership of the Task Force.

This ORDER shall take effect immediately and shall supercede Administrative Order 1997-14 enacted December 15, 1997.

ADMINISTRATIVE ORDER 1998-08
Original Mercury Pollution Task Force Membership

NJDEP Representative: Leslie McGeorge

DHSS Representative: Jim Blumenstock

BPU Representative: Brian Beam

Public Interest Group Representatives:
Dolores Phillips, Center for the Environment and Public Health Policy
Ashok Gupta, Natural Resources Defense Council
John Guinan, NJ Public Interest Research Group
Nevil Cohen, INFORM

Coal-fired Generators:
Eric Svenson, PSE&G
Dan Cunningham, Conectiv
Michael Jones, U.S. Generating

Independent Power Producers:
Steve Gabel, Gabel Associates for Independent Energy Producers of New Jersey

William Potter, Potter & Dixon

Hospital Waste Incinerators:
Chris LaBianco, NJ Hospital Association

Sewage Sludge Incinerators:
Robert Dixon, Gloucester County Utilities Authority

Refineries/Refinery Products:
Robert A. Morris, P.E., REM, The Coastal Corporation

Hazardous Waste Incinerators:
Keith Michels, Safety-Kleen (Bridgeport), Inc.

Freshwater Fishing Organization:
Tom Fote, NJ Sportsmens Federation/Jersey Coast Anglers Association

Saltwater Commercial Fishing Organization:
Captain Nelson Beideman, Blue Water Fisherman's Association

Public Members:

Michael Gochfeld, MD, Ph.D., EOHSI/UMDNJ, Task Force Chairman
Henry Cole, Ph.D., Henry S. Cole & Associates, Inc.
Robert Tucker, Ph.D., Director, Research Professor, Rutgers University
Valerie Thomas, Ph.D., Center for Energy and Environmental Studies, Princeton University

APPENDIX II
Mercury Task Force Participants

Mercury Task Force Members

Original Administrative Order Members	Official Replacements	Other Active Participants
NJDEP Representative *Leslie McGeorge		William Baker, EPA Region 2, Air
DHSS Representative *Jim Blumenstock		Andy Bellina, EPA Region 2, RCRA
BPU Representative *Brian Beam		Eric Vowinkel, USGS
Public Interest Group Representatives *Dolores Phillips, Center for the Environment and Public Health Policy		Jerry Marcus, Two Bridges Sewerage Authority
Ashok Gupta, Natural Resources Defense Council		Priscilla Hayes, Rutgers University, NJ Solid Waste Policy Group
John Guinan, NJ Public Interest Research Group	Jasmine Vasvada, NJPIRG	
Nevil Cohen, INFORM	Susan Goodwin, Alicia Culver, *Janet Cox, INFORM	
Coal-fired Generators: Eric Svenson, PSEG	*Betty Jensen, PSEG (resigned)	
Dan Cunningham, Conectiv (resigned)		
Michael Jones, U.S. Generating		
Independent Power Producers: *Steve Gabel, Gabel Associates for Independent Energy Producers of New Jersey		Russ Like, Gabel Associates

Original Administrative Order Members	Official Replacements	Other Active Participants
William Potter, Potter & Dixon (resigned)		
Hospital Waste Incinerators: Chris LaBianco, NJ Hospital Association		
Sewage Sludge Incinerators: *Robert Dixon, Gloucester County Utilities Authority		
Refineries/Refinery Products: *Robert A. Morris, The Coastal Corporation (resigned)		
Hazardous Waste Incinerators: *Keith Michels, Safety-Kleen (Bridgeport), Inc.		
Freshwater Fishing Organization: *Tom Fote, NJ Sportsmens Federation/Jersey Coast Anglers Association		
Saltwater Commercial Fishing Organization: Captain Nelson Beideman, Blue Water Fisherman's Association		
*Michael Gochfeld, MD, Ph.D., EOHSI/UMDNJ, **Task Force Chairman**		
Henry Cole, Ph.D., Henry S. Cole & Associates, Inc.		

(resigned)

*Robert Tucker, Ph.D.,
Stoney Brook-Millstone
Watershed Association

*Valerie Thomas, Ph.D.,
Center for Energy and
Environmental Studies,
Princeton University

*** Participating members within the past year.**

APPENDIX III

New Jersey Mercury Task Force
Subcommittee Members

Impacts Subcommittee
Dr. Michael Gochfeld, Co-Chair
Alan Stern, Co-chair

Nelson Beideman
James Blumenstock
Tom Fote
Leslie McGeorge
Robert Tucker
Eric Vowinkel

NJDEP:
Gary Buchanan
James DeNoble
Mary Downes-Gastrich
Joann Held
Mike McLinden
Eileen Murphy
Bruce Ruppel

Sources Subcommittee
Robert Morris, Co-chair
Mike Aucott, Co-chair

William Baker
Brian Beam
Andy Bellina
Henry Cole
Janet Cox
Dan Cunningham
Robert Dixon
Steve Gabel
John Guinan
Ashok Gupta
Priscilla Hayes
Betty Jensen
Michael Jones
Chris LaBianco
Russ Like

Jerry Marcus
Keith Michels
Dolores Phillips
William Potter
Eric Svenson
Valerie Thomas

NJDEP:
Sunila Agrawal
Tim Bartle
John Castner
Bob Confer
Randy England
Ken Frank
William O'Sullivan
Tony Pilawski
Sue Shannon
Tom Sherman
Mike Winka

New Jersey State Library

APPENDIX IV
Mercury Task Force
NJDEP Participants

Division of Science, Research and Technology
Mike Aucott, Co-chair Sources Subcommittee
Alan Stern, Co-chair Impacts Subcommittee
Gary Buchanan
Mary Downes-Gastrich
Randy England
Eileen Murphy
Bruce Ruppel
Sue Shannon
Mike Winka

Air Quality Permitting
Sunila Agrawal
Joann Held
William O'Sullivan

Pollution Prevention
Mike McLinden

Division of Water Quality
Tony Pilawski

Site Remediation Program
Jim DeNoble

Division of Solid & Hazardous Waste
Tim Bartle
John Castner
Bob Confer
Ken Frank
Tom Sherman

APPENDIX V

Mercury Task Force Interim Recommendations

A. November 14, 1998 letter from Dr. Michael Gochfeld to NJDEP Commissioner Shinn on recommendations to strengthen the environmental component of Bill A-10 on energy restructuring.

B. July 17, 1998 Task Force Meeting. The Mercury Task Force generally endorsed resolution 23-2 recommendations of the New England Governors and Eastern Canadian Premiers Mercury Action Plan, which includes the virtual elimination of the discharge of anthropogenic mercury.

C. December 11, 1998 letter from Dr. Michael Gochfeld to NJDEP Commissioner Shinn on recommendation for an amendment to the Pollution Prevention rules. This interim recommendation requested that the Department lower its Community Right-to-Know through put reporting threshold for mercury from 10,000 lbs./yr. Lowering the reporting threshold to 100 lbs./yr. would have provided the Department with more refined estimates regarding mercury usage and environmental releases. The Department began moving forward with the Task Force recommendation, however, EPA proposed its Persistent Bioaccumulative Toxic (PBT) substance rule in January 1999 and adopted an even lower 10 lbs./yr. reporting threshold for mercury later that year. The federal TRI amendments were automatically adopted by reference by the New Jersey Community Right To Know and Pollution Prevention Programs. Covered New Jersey facilities are now required to submit annual mercury throughout and release data if they use mercury in excess of 10 lb./yr.

D. January 11, 1999 letter from Dr. Michael Gochfeld to Governor Whitman to strengthen the environmental component of Bill A-10 and the support of the Task Force for mercury to be explicitly on the list of substances for which disclosure will be required

E. July 6, 2001 letter from Dr. Michael Gochfeld to Commissioner Shinn recommending support of the New England Governors' resolution regarding retirement and stockpile management of mercury

APPENDIX V
A. November 14, 1998 letter

E O H S I

ENVIRONMENTAL AND OCCUPATIONAL HEALTH SCIENCES INSTITUTE

University of Medicine & Dentistry of New Jersey
Department of Environmental and Community Medicine
EOHSI Building---170 Frelinghuysen Road
Piscataway, NJ 08854
Phone 732-445-0123 X627 FAX 732-445-0130
email "gochfeld@eohsi.rutgers.edu"

To: Commissioner Robert C. Shinn, Jr.
New Jersey Department of Environmental Protection

From: Michael Gochfeld
Chair, Mercury Pollution Task Force

Date: November 14, 1998

Re: Recommendations to strengthen the environmental component of Bill A-10 on Energy Restructuring

---

As you are aware, on March 9, 1998 an administrative order established the Mercury Pollution Task Force to provide recommendations to NJDEP on a mercury pollution reduction plan for New Jersey. The Task Force was directed to complete four tasks, one of them to provide timely interim recommendations (prior to completion of the task force's overall mission), to the New Jersey Department of Environmental Protection, New Jersey Board of Public Utilities, other state agencies, interstate agencies, and the federal Environmental Protection Agency regarding mercury pollution, mercury pollution controls, and standards and the relationship of energy deregulation to mercury pollution.

On April 27, 1998, the first set of interim recommendations on energy restructuring was presented to you. At this time, I am pleased to forward to you additional recommendations of the Mercury Pollution Task Force on A-10, the bill for energy restructuring. These suggested modifications to the legislation are intended to reduce inputs of mercury and other air pollutants to New Jersey's environment, without interfering with the primary purpose of restructuring.

As you are also well aware, certain forms of electric generation have inherent environmental impacts associated with them. Nationally, mercury emissions from electric power plants, primarily coal-fired power plants, account for approximately one-third of the known total of anthropogenic air emissions of mercury from presently quantified stationary point sources (EPA, 1997, Mercury Study Report to Congress, Vol. II, EPA-452/R-97-004, Table 5-1). Electric power consumed by New Jersey's public, business, industry and government comes from a

variety of in-state and out-of-state generating, some located hundreds of miles away and upwind of New Jersey's borders.

The Mercury Pollution Task Force believes that as the New Jersey Legislature is considering legislation to restructure the electric utility industry to provide full retail choice, the Administration and the Legislature need to ensure that New Jersey's air quality is not degraded, that reduction of emissions of mercury and other pollutants is encouraged, and appropriate market incentives are established to stimulate energy efficiency and the development of clean and mercury-free renewable electric generation.

The Mercury Pollution Task Force has specific consensus recommendations at this time for the Administration and Legislature to consider incorporating in Assembly Bill A-10.

These involve the insertion of Section 38 a. (3) (environmental disclosure):

> "Mercury emissions shall be added to this supplier disclosure in the shortest possible time, not to exceed 'eighteen months of the start of full retail choice- Within [twelve] 12 months of the enactment of this legislation, the Board in consultation with the NJDEP shall determine the availability of publicly reported data from electric power generators to US. EPA and other state and federal agencies concerning their emissions of mercury from electric power generators in North America. Within 18 months of the enactment of this legislation but no sooner than the Board's determination of the availability of publicly reported data on mercury emissions from electric power generators, the Board, in consultation with the NJDEP, shall require an electric power supplier or basic generation service provider, to include mercury emissions among the pollutants to be reported to the consumers in the manner specified in 38 a. (2). In the event that such data on mercury emissions from electric power generators are not publicly available, the Board in consultation with NJDEP shall establish default mercury emission values to be used by electric power suppliers or basic generation service providers in calculating the mercury emissions associated with the energy they generate or purchase".
>
> The Task Force very much hopes that you will be able to encourage the legislature to incorporate these changes.
>
> We expect to have additional comments and suggestions on this matter.
>
> I should add that there was strong sentiment expressed about reducing the delay in disclosure to the shortest possible time frame.
>
> On behalf of the task force, I am available to discuss any questions or concerns. I hope that you will be able to join us at our January or February meeting.

APPENDIX V
B. NGECP Resolution
July 17, 1998

State of New Jersey

Christine Todd Whitman
Governor

Department of Environmental Protection

Robert C. Shinn, Jr.
Commissioner

MEMORANDUM

TO: Robert C. Shinn, Jr., Commissioner

FROM: Leslie McGeorge, Director, DSR
Bill O'Sullivan, Administrator, AQP

SUBJ'ECT: Northeast Governors/Eastern Canadian Premiers
Mercury Resolution and Action Plan (June 7-9, 1998)

DATE: July 27, 1998

Attached you will find copies of:
Resolution 23-2 (Resolution Concerning Mercury and Its Impact on the Environment)
as signed during the June 7-9, 1998 Northeast Governors/Eastern Canadian Premiers Conference. This Resolution has an Action Plan (also enclosed). You may recall that New Jersey and New York (through invitation) have assisted with the development of this Resolution and Action Plan.

We anticipate that the Director of the New England Governor's Conference will be sending a letter to Governor Whitman (and New York's Governor Pataki) requesting support and possible endorsement of the resolution (Note: reference to collaborate with New Jersey on p.5 of the Mercury Action Plan). We have asked that you be notified in advance of such correspondence being sent to the Governor's office.

Copies of the mercury-related documents, along with a presentation on the Action Plan, were provided to members of NJDEP's Mercury Pollution Task Force at their June 19, 1998 meeting. They were urged to review the documents to ensure that New Jersey's proposed plan is informed by this regional resolution and plan. At the July 17, 1998 meeting, they discussed a general endorsement of the regional approach articulated in the Mercury Resolution (23-2) and Action Plan. We recommend that you or Governor Whitman also generally endorse the mercury resolution and plan, pointing out that New Jersey is somewhat more stringent for Municipal Solid Waste Incineration (all units covered sooner), and that we are supportive of the use of the New Jersey 28 ug/m^3

mercury limit in their strategy. We would be happy to discuss the mercury resolution further with you at your convenience.

c: Bob Tudor, Assistant Commissioner, Office of Environmental Planning and Science
Gary Sondermeyer, Assistant Commissioner, Environmental Regulation
Randy England, DSR
Joann Held, AQP

APPENDIX V
C. December 11, 1998 letter

E O H S I

ENVIRONMENTAL AND OCCUPATIONAL HEALTH SCIENCES INSTITUTE

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OCCUPATIONAL HEALTH DIVISION

December 11, 1998

Robert C. Shinn, Jr., Commissioner
New Jersey Department of Environmental Protection
Office of the Commissioner
P.O. Box 402
Trenton, NJ 08625-0402

Dear Commissioner Shinn:

The Mercury Pollution Task Force is charged with developing a mercury pollution reduction plan to lower the levels of mercury, a bioaccumulative contaminant, in New Jersey's environment. In order to develop this plan, the administrative order establishing the Mercury Pollution Task Force directs the task force to "inventory and assess current sources of mercury pollution to the extent feasible, including both in-state and regional sources of mercury pollution." The Task Force recognized its charge to inventory sources of mercury as well as the need for addressing additional sources of mercury, which are not being reported at the current threshold level. There are a number of mercury sources for which the Task Force has little or no information, so it is important to capture these users and potential sources of mercury releases to New Jersey's environment.

During the November 13, 1998 Mercury Pollution Task Force meeting, the Task Force made a motion and voted 10-3 in favor of the following interim recommendations for Pollution Prevention rules

> **"The Mercury Pollution Task Force recommends as an amendment to the Pollution Prevention rules to lower the throughput reporting threshold of mercury to 100 lbs., and if feasible, establish an environmental release reporting threshold of two lbs./year."**

BACKGROUND:

Throughput Reporting Threshold

The Mercury Pollution Task Force understands that New Jersey's Pollution Prevention and Right-To Know rules currently have a throughput reporting threshold of 10,000 lbs./year for covered TRI (Toxic Release Inventory) facilities for each covered substance. The Mercury Pollution Task Force recommendation calls for a 100 lbs./year throughput reporting threshold for mercury (or mercury compounds) when the annual quantity, which is manufactured, processed or otherwise used at the facility greater than or equal to 100 lbs./year.

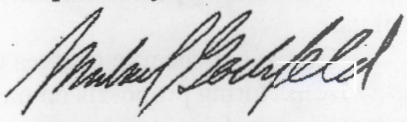
Release Reporting

The Mercury Pollution Task Force would like the NJDEP to examine whether the NJDEP has the authority to establish an additional release reporting threshold for mercury. This release reporting would include all mercury releases to the air, water, on-site disposal, and off-site transfer, which are equal to or greater than 2 lb./year. The Department's Air Quality Permitting Program uses a release threshold of two lbs./ year as stated in N.J.A.C. 7:27-8, which sets out the reporting thresholds for HAPs (Hazardous Air Pollutants). The Task Force recognizes that this second part of the recommendation may not be feasibly addressed through Pollution Prevention rules.

ADDITIONAL MERCURY POLLUTION TASK FORCE REQUEST:

In order to gather information on industries outside of SIC codes currently covered by the Pollution Prevention program, the Mercury Pollution Task Force also requests that the NJDEP Office of Pollution Prevention and Permit Coordination provide information to the Task Force on possible reporting strategies for mercury users that are not currently captured through regulations.

Respectfully submitted,



Michael Gochfeld, MD, Ph.D.
Mercury Pollution Task Force Chair

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E O H S I

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OCCUPATIONAL HEALTH DIVISION

January 11, 1999

The Honorable Christine Todd Whitman
Governor
State House
Trenton, NJ 08625

Dear Governor Whitman:

As you are aware, last spring DFP Commissioner Robert Shinn issued an Administrative Order establishing a Mercury Task Force. It is my privilege to chair that Task Force and to work with a dedicated group of Task Force members from many different sectors, as well as the excellent NJDEP support staff from several divisions. It has truly been a learning experience for all of us.

One of our specific charges was to examine the possible impacts of the then nascent energy restructuring proposals on mercury pollution of New Jersey's environment. Since a substantial part of our mercury comes from regional sources west of us, changes in electricity generation potentially will have a significant impact on New Jersey's air quality. Commissioner Shinn expressed to me his commitment to working on a regional basis to protect environmental quality, and mercury pollution is a prime example of a regional pollutant subject to long distance transport.

The Task Force addressed restructuring with great interest, and it was especially gratifying to me, to have the representatives of the utility (PSEG) and of environmentalist groups (NRDC) work together in crafting proposed wording to incorporate environment safeguards into the legislation. The attached recommendations were forwarded to the Commissioner in November.

I realize that developing such a complex piece of legislation is no easy task, but would be particularly unfortunate if our state which has invested so heavily in improving its environment, should produce a restructuring system that does not adequately protect future air quality.

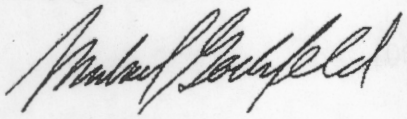
Since some of the Task Force's suggestions are not in the draft legislation voted out of Committee last week, the Task Force, at its regular meeting last Friday, voted that I forward to you the recommendations that we believe should be incorporated into the bill which we understand is in the process of being amended and finalized.

I am respectfully attaching the original recommendations. Specifically, the Task Force strongly urges that mercury---one of our most significant toxic pollutants---be explicitly added to the list of substances for which disclosure will be required.

Since a major environmental issue is the development of renewable energy sources, it would also be desirable to empower the NJDEP to take the lead in developing renewable energy, putting New Jersey where it should be, in the forefront of this important environmental and economic development.

On behalf of the Task Force, I hope you will undertake to strengthen the environmental protection components of the restructuring legislation. Thank you for your attention.

Respectfully submitted,



Michael Gochfeld, MD, Ph.D.
Task Force Chair

cc: Commissioner Robert Shinn
Deputy Commissioner Judy Jengo
Deputy Commissioner Mark Smith

Attached: November 14, 1998 Recommendations to Commissioner Shinn for strengthening the environmental component of Bill A-10 on Energy Restructuring

E 0 H S I

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OCCUPATIONAL HEALTH DIVISION

July 6, 2001

Robert C. Shinn, Jr., Commissioner
New Jersey Department of Environmental Protection
401 East State Street
P.O. Box 402
Trenton, NJ 08625

Dear Commissioner Shinn:

As chair of New Jersey's Mercury Task Force, I am writing about action taken by the New England Governors/Eastern Canadian Premiers (NEG/ECP). Although New Jersey is not part of the New England Governors Conference, the State has been invited and continues to participate in the NEG/ECP Mercury Action Plan discussions. On April 20, 2001, the NEG/ECP signed a resolution regarding retirement and stockpile management of mercury (copy attached). The resolution requests the Department of Defense not to sell stockpiled mercury until the development of a comprehensive strategy to manage and ultimately retire stockpiles of mercury is completed.

When you created the Task Force by signing Administrative Order 1998-08, the Task Force was charged to inventory and assess current sources of mercury pollution, in addition to providing timely interim recommendations to the New Jersey Department of Environmental Protection. The Task Force has reviewed and endorsed this resolution, finding it pertinent to the mercury stored at the Department of Defense Depot in Somerville. Our interim recommendation is for you to support this resolution.

Please feel free to contact me for further information at 732-445-0123, extension 627 or email address Gochfeld@eohsi.rutgers.edu

Very truly yours,

Michael Gochfeld, M.D., Ph.D.
Chair, Mercury Task Force

Attachment: NEG/ECP Resolution

C: Leslie McGeorge, NJDEP Assistant Commissioner Environmental Planning & Science
Cathy Tormey, NJDEP Assistant Commissioner Compliance & Enforcement
Randy England, NJDEP Division of Science, Research & Technology
Sue Shannon, NJDEP Division of Science, Research & Technology

New Jersey State Library

APPENDIX VI

Presentations at Mercury Task Force Meetings

March 27, 1998

Energy Deregulation and Mercury Implications

NJDEP Plan on Energy Issues – John Elston, NJDEP - Air Quality Management (AQM)

Proposed Resolution on Electric Utility Restructuring - Ashok Gupta, Natural Resources Defense Council

Draft of Mercury Emissions Inventory – Bill O'Sullivan, NJDEP Air Quality Permitting (AQP)

Mercury in Ground Water and Related Sources – Eileen Murphy, NJDEP Division of Science, Research & Technology (DSRT)

Mercury in Fish and Consumption Advisories – Bruce Ruppel, NJDEP-DSRT

April 17, 1998

Mercury in Fish – Bruce Ruppel, NJDEP-DSRT

Risk Assessment and Fish Advisories – Alan Stern, NJDEP-DSRT

Ecological Impacts of Mercury – NJDEP Division of Fish & Wildlife (DFW)

Source Information from NESCAUM (Northeast States for Coordinated Air Use Management) Report – Joann Held, NJDEP-AQP

Berry's Creek Update – Rick Gimello, NJDEP Site Remediation Program (SRP)

Right To Know Information – Randy England, NJDEP-DSRT

May 8, 1998

Industrial Right to Know Information – Randy England, NJDEP-DSRT

Relationship of Strategies/Emission Controls for Reduction of Mercury and Other Air Pollutants – Bill Baker, U.S. EPA and Bill O'Sullivan, NJDEP-AQP

Ecological Impacts of Mercury (Bioindicators) - Dr. Gochfeld, EOHSI

Contents, Conclusions and Recommendations of NESCAUM Report – Joann Held, NJDEP-AQP

June 19, 1998

Electric Industry Restructuring Proposal - Steve Gabel, Independent Energy Producers of NJ

Mercury in Sludge: NJDEP Residuals Management Program – Anthony Pilawski, NJDEP Bureau of Pretreatment and Residuals (BPR)

Mercury Emissions from Sludge Incineration: NJDEP Stack Test Data – Mike Aucott, NJDEP-AQM

Handouts on Health Effects Review - Alan Stern, NJDEP-DSRT

Overview of New England Governors Association (NEGA) Mercury Reduction Action Plan – Randy England, NJDEP-DSRT

Summary of Potential Mercury Contamination Reduction Strategies – Minnesota Pollution Control Agency and Committee of States – Mike Winka, NJDEP-DSRT Office of Innovative Technology (OIT)

Task Force Input for Mercury Section of New Jersey Performance Partnership Agreement - Leslie McGeorge, NJDEP-DSRT

Report on New Publications - Dr. Gochfeld, EOHSI

July 17, 1998

Update on Sludge Incineration - Mike Aucott, NJDEP-AQM

Minnesota's Strategy Evaluation Approach - Mike Winka, NJDEP-DSRT/OIT

Task Force Comments on Strategic Plan and Performance Partnership Agreement - Joann Held, NJDEP-AQP

"Greening" Hospitals Report - Dr. Michael Gochfeld, EOHSI

August 7, 1998

Review of Comments on PPA Document - Leslie McGeorge, NJDEP- DSRT

Review of Previous Mercury Task Force Report Recommendations – Randy England, NJDEP-DSRT

Minnesota's Strategy Evaluation Approach – Mike Winka, NJDEP-DSRT/OIT

Source Separation Program – Mike Winka, NJDEP-DSRT/OIT

Mercury Emission Estimates for Hazardous Waste Incinerators - Keith Michels, Safety-Kleen, Inc.

Source Separation Program - Mike Winka, NJDEP-DSRT/OIT

Update on Sludge Incineration - Mike Aucott, NJDEP-AQM

September 11, 1998

Energy Restructuring - Dolores Phillips, Center for Environment and Public Health Policy, and John Guinan, PIRG

Mercury Emission Data by Sources – Bill O'Sullivan, NJDEP-AQP

Discussion of EPA Document, Background Information on Mercury Sources and Regulations - Keith Michels, Safety-Kleen

Pollution Prevention Briefing on Mercury – Melinda Dower, NJDEP Office of Pollution Prevention and Permit Coordination (OPPPC)

Religious and Ceremonial Uses of Mercury – Mike Aucott, NJDEP-AQM

October 9, 1998

Ambient Water Monitoring – Leslie McGeorge, NJDEP-DSRT

Surface Water and Sediment Monitoring – Tom Vernam, NJDEP-Water Monitoring Management (WMM)

Groundwater Network – Mike Serfes, NJDEP-DSRT New Jersey Geological Survey (NJGS)

Mercury in Public and Private Water Supplies – Judy Louis & Eileen Murphy, NJDEP-DSRT

Overview of Models Used to Describe Mercury Fate and Transport – Joann Held, NJDEP-AQM and Betty Jensen, PSE&G

Discussion of EPA Document, "Developing a Virtual Elimination Strategy for Mercury" - Keith Michels, Safety-Kleen, Inc.

November 13, 1998

Atmospheric Deposition – Stu Nagourney, NJDEP-DSRT

Available Options for Mercury Source Data Collection – Melinda Dower, NJDEP-OPPPC

A-10 Recommendations Letter to Commissioner Shinn - Dr. Gochfeld, Environmental and Occupational Health Sciences Institute (EOHSI)

Contaminated Sediments Sources and Impacts – Jennifer DiLorenzo, NJ Commerce and Economic Growth Commission, Maritime Resources

Private Wells in Kirkwood-Cohansey Aquifer – Leslie McGeorge, NJDEP-DSRT

December 11, 1998

Groundwater Update – Eileen Murphy, NJDEP-DSRT

EPA and DOE Air Quality Conference: Mercury, Trace Elements and Particulate Matter - Joann Held, NJDEP-AQP

EPA Partnership with American Hospital Association: Mercury Waste Reduction- Chris LaBianco, NJ Hospital Association

January 8, 1999

Mercury in Dental Practices and Waste Materials -
Bill Prentice, Director of Governmental Affairs, NJ Dental Association
Jim Murphy, NJDEP-BPR

Senate Bill 1267 on Fish Advisory - Jim Blumenstock, Department of Health and Senior Services

Source Reduction: Mercury Product Recycling - Mike Winka, NJDEP-DSRT/OIT

Emissions & Generation Resource Integrated Database (E-GRID)- Keith Michels, Safety-Kleen, Inc.

February 19, 1999

U.S. EPA Draft Mercury Action Plan - Randy England, NJDEP-DSRT

European Mercury Regulations and Technology - Gerald Hofman, STEAG Company

Mercury Products Recycling - Bob Romano, Comus International

Mercury-containing Products Conference Summary - Mike Winka, NJDEP-DSRT/ OIT

NJDEP Proposal on Mercury Lamps - Mike Winka, NJDEP-DSRT/OIT

Mercury in Groundwater -Leslie McGeorge, NJDEP-DSRT

Summary of State Activities - Eileen Murphy, NJDEP-DSRT

County Perspective from Health Officers - Pat Diamond, Atlantic County; Don Schnieder, Gloucester County; Bob Ingenito, Ocean County

Energy Restructuring Legislation Update - Mike Winka, NJDEP-DSRT/OIT

Relating Sustainability Concepts to Mercury Task Force - Joann Held, NJDEP-AQP

March 12, 1999

Review of NJDEP Comments on EPA Draft Mercury Action Plan - Randy England, NJDEP-DSRT

Update on Florida Emission Advisory - Randy England - NJDEP DSRT

Update on Task Force Recommendations on Pollution Prevention Rules and NJDEP comments on U.S. EPA PBT proposal (Mercury Threshold Reporting) - Melinda Dower, NJDEP-OPPPC

The Atmospheric and Aquatic Cycles of Mercury - William Fitzgerald, University of Connecticut

April 9, 1999

Religious and Ceremonial Uses of Mercury – Arnold P. Wendroff, Columbia University

Task Force Discussion with NJDEP Commissioner Robert C. Shinn, Jr.:

Task Force Charge, Progress and Interim Recommendations - Leslie McGeorge, NJDEP-DSRT

Impacts to Health and Ecological Systems - Dr. Gocheld, Task Force Chair and Alan Stern, NJDEP-DSRT

Sources of Mercury in the Environment - Bob Morris, The Coastal Corp. and Mike Aucott, NJDEP-AQM

Proposed Contents of Report and Public Release - Dr. Gochfeld and Leslie McGeorge

May 14, 1999

Department of Health and Senior Services (DHSS) Follow Up to Religious and Ceremonial Uses of Mercury From Discussion at April 1999 Meeting - Jim Blumenstock, DHSS

New ATSDR Minimal Risk Level for Mercury - Alan Stern, NJDEP-DSRT

Proposed Regional Mercury Limit for Medical Waste Incinerators – Mike Winka, NJDEP-DSRT/OIT

June 11, 1999

Sources Subcommittee Meeting – Mark Carney, PG&E Generating

July 16, 1999

NJ Release Reduction Goal: Air and Water - Leslie McGeorge, NJDEP-DSRT

Mercury in Sludge

Research Needs for Land Applied Sludge – Mary Jo Aiello, NJDEP-BPR

Characterizing Mercury Content of Sludge for Incineration – Mary Jo Aiello, NJDEP-BPR

Testing Incinerated Sewage Sludge – Bill O'Sullivan, NJDEP-AQP

Characterizing Mercury Content of Sludge for Land Application – Mike Aucott, NJDEP-AQM

Outreach and Education – Sue Shannon, NJDEP-DSRT

August 13, 1999

Analytical Methods for Water - Eileen Murphy, NJDEP-DSRT

Collection of Mercury-containing Household and Hazardous Waste – Fred Stanger, Association of New Jersey Household and Hazardous Waste Coordinators

September 24, 1999

Mercury in the Environment Conference Sponsored by Air & Waste Management Association - Joann Held, NJDEP-AQP

Natural Gas Regulators – Sheryl Telford, PSE&G

Goal Setting Recommendation and Discussion - Leslie McGeorge, Alan Stern, Mike Aucott, Mike Winka, NJDEP-DSRT

October 8, 1999

NY State Suit Against Mid-West Coal Power Plants – John Elston, NJDEP-AQM

Linking NJ Source Inventory with Regional-Global Sources – Leslie McGeorge, NJDEP-DSRT

November 19, 1999

Linking NJ Inventory with Regional and Global Sources – Leslie McGeorge, NJDEP-DSRT & Joann Held, NJDEP-AQP

Current Mercury Data from the NJ Atmospheric deposition Network – Mike Aucott, NJDEP-DSRT

Mercury Recycling – Bruce Lawrence, Bethlehem Apparatus

December 10, 1999

Follow-up from November's Meeting Presentation on Mercury Recycling - Mike Aucott, NJDEP-DSRT

Regional Draft Model Legislation on Mercury in Waste - Mike Winka, NJDEP-DSRT/OIT

January 14, 2000

Briefing on NEWMOA meeting on Draft Model Legislation for Mercury in Waste - Robin Heston, NJDEP Division of Solid and Hazardous Waste (DSHW)

Review of "Mercury Falling" Report from Natural Resources Defense Council - Betty Jensen, PSE&G

February 18, 2000

NJDEP Comments on Draft Mercury in Waste Model Legislation - Mike Winka, NJDEP-DSRT/OIT

Collection System for Mercury Devices: Thermostats - Mike Winka, NJDEP-DSRT/OIT

Mercury Environmental Progress Briefing to NJDEP Management Team - Leslie McGeorge, NJDEP-DSRT

March 10, 2000

Clean Air Council Public Hearing Task Force Presentation on April 12, 2000 - Dr. Gochfeld, EOHSI

Task Force Suggestions for EPA's Mercury Research Agenda - Dr. Gochfeld, EOHSI

Briefing on Mercury, Toxics Release Inventory and Air Toxics Conference - Betty Jensen, PSE&G and Joann Held, NJDEP-AQP

Mercury Environmental Progress Briefing to NJDEP Management Team - Leslie McGeorge, NJDEP-DSRT

Continuous Emissions Monitoring for Mercury Using Plasma Emission Spectroscopy - Philip Efthimion

Minamata, Japan - Dr. Gochfeld, EOHSI

May 12, 2000

Mercury Environmental Progress Briefing to NJDEP Management Team - Leslie McGeorge, NJDEP-DSRT

Clean Air Council Public Hearing Presentation from the Task Force – Dr. Michael Gochfeld, EOHSI

Overview of Conference: Coordinating Mercury Reduction Programs: A Meeting of National and Local Program Officials - Mike Aucott, NJDEP-DSRT

U.S. EPA/American Hospital MOU- Andy Bellina, EPA Region 2, RCRA

Management of Dredged Materials -
Introduction - Mike Aucott, NJDEP-DSRT
Larry Baier, NJDEP Office of Dredging and Sediment Technology (ODST)

June 23, 2000

Impacts of Dredging and Dredged Materials - Mike Aucott, NJDEP-DSRT and Bill Baker, EPA Region 2, Air

Air Deposition - Mike Aucott, NJDEP-DSRT

July 21, 2000

National Research Council Report on the Toxicological Effects of Methylmercury - Alan Stern, NJDEP-DSRT

Possible Mercury Releases in Dredging Operations - Mike Aucott, NJDEP-DSRT

Task Force Recommendations Associated with Energy Restructuring - Mike Winka, NJDEP-DSRT/OIT

August 18, 2000

Task Force Recommendations Regarding Dredging - Mike Aucott, NJDEP-DSRT

September 22, 2000

Coal Discussion - Mike Aucott, NJDEP-DSRT

October 13, 2000

Review of Workshop: Scientific Perspectives on Mercury Management in the Hudson-Delaware Region presented by Society of Environmental Toxicology and Chemistry (SETAC) - Leslie McGeorge, NJDEP-EP&S

Review of NESCAUM Report: Environmental Regulation and Technology Innovation Controlling Mercury Emissions from Coal-fired Boilers, September 2000- Sunila Agrawal, NJDEP-AQP

December 1, 2000

Mercury-related Aspect of Surface Water Quality Standards Rule Proposal - Leslie McGeorge, NJDEP-EP&S

Draft Sources Subcommittee Recommendations - Mike Aucott, NJDEP-DSRT

January 5, 2001

Review of ECOS Conference - Leslie McGeorge, NJDEP-EP&S; Bill O'Sullivan, NJDEP-AQP; Sue Shannon, NJDEP-DSRT

EPA Mercury Research Plan - Andy Bellina, EPA Region 2

Summary of EPA Methylmercury Water Quality Criteria - Gary Buchanan, NJDEP-DSRT

Outreach to Iron and Steel Industry - Leslie McGeorge, NJDEP-EP&S

EPA Mercury in Coal Decision - Bill O'Sullivan, NJDEP-AQP

February 9, 2001

Video Clip from 60 Minutes Program on Fish Consumption - Alan Stern, NJDEP-DSRT

Mercury Emission Limit Options for Coal Discussion of Recommendations - Bill O'Sullivan, NJDEP-AQP

Ritualistic Uses of Mercury - Andy Bellina, EPA Region 2, RCRA

March 16, 2001

Report on ECOS Mercury Resolutions and Workshop - Leslie McGeorge, NJDEP Environmental Planning and Science (EP&S)

Proposed Bill to Ban Mercury-containing Thermometers - Michael Gochfeld, EOHSI

Iron and Steel Presentation - Paul Waxmonsky, U.S. Pipe and Foundry

Iron and Steel Industry Recommendations - Bill O'Sullivan, NJDEP-AQP and Mike Aucott, NJDEP-DSRT

Aluminum Scrap Processing Industry Recommendations - Bill O'Sullivan and Mike Aucott

April 20, 2001

NJ Bill to Ban Mercury-containing Thermometers - Dr. Gochfeld, EOHSI and Leslie McGeorge, NJDEP-EP&S

INFORM's Meeting with Assemblyman Sires - Janet Cox, INFORM

Senator Leahey Bill for FDA Action - Bill Baker, EPA Region 2 Air and Alan Stern, NJDEP-DSRT

Iron and Steel Issues - Tomasz Wesolowski, Co-Steel Inc., Toronto, Ontario
Michael Murphy, Co-Steel Raritan, Perth Amboy
Paul Waxmonsky, U.S. Pipe and Foundry Co., Burlington
Timothy Panaski, Griffin Pipe Products, Florence
Daniel Yadzinski, Atlantic States Cast Iron Pipe Company, Phillipsburg

May 11, 2001

NJ Bill to Ban Mercury-containing Thermometers - Leslie McGeorge, NJDEP-EP&S

Federal Mercury Legislation - Mike Aucott and Alan Stern, NJDEP-DSRT

Iron and Steel Follow-up Discussion on Write-up, Recommendations and Inventory - Sunila Agrawal, NJDEP-AQP and Mike Aucott, NJDEP-DSRT

June 15, 2001

NJDEP Comments on NJ Bill to Ban Mercury-Containing Thermometers - Leslie McGeorge, NJDEP-EP&S and John Hazen, NJDEP Legislative Affairs

U.S. EPA Workshop on Ritualistic Uses of Mercury - Andy Bellina, EPA Region 2, RCRA

Mercury Storage in Somerville, NJ - Michael Gochfeld, EOHSI

Update on Northeast Governors/Eastern Canadian Premiers Conference - Randy England, NJDEP-DSRT

July 13, 2001

Mercury-containing Products - Mike Aucott, NJDEP-DSRT and Mike Winka, NJDEP-DSRT/OIT

Mercury Storage in Somerville, NJ - Allan Edwards, NJDEP Release Prevention Element
Robert Kotch, NJDEP Bureau of Discharge Prevention
Larry Schmidt, NJDEP Office of Coastal Planning & Program Coordination

August 24, 2001

Mercury Management Environmental Impact Statement Presentation - Kevin Reilly, Environmental Management for the Defense National Stockpile Center

September 14, 2001

ECOS Mercury Resolutions - Leslie McGeorge, NJDEP-EP&S

Report Review - Mike Gochfeld, EOHSI; Alan Stern and Mike Aucott, NJDEP-DSRT

September 28, 2001

Executive Summary and Recommendations - Mike Aucott and Alan Stern, NJDEP-DSRT

APPENDIX VII

Acronyms

µg /L	microgram per liter
ATSDR	Agency for Toxicology and Disease Registry
DNSC	Defense National Stockpile Center
ECOS	Environmental Council of States
EOHSI	Environmental and Occupational Health Sciences Institute
HEP	Harbor Estuary Program
Hg	Mercury
Hg(II)	Inorganic mercuric
Hg^{++}	Inorganic mercuric
Hg^{o}	Elemental mercury
Hg_p	Particulate mercury
HgS	Mercury Sulfide
MCL	Maximum Contaminant Level
MeHg	Methylmercury
Mg/MW-hr	Milligram per milliwatt hour
MSWI	Municipal Solid Waste Incinerators
NEGA/ECP	New England Governors Association- Eastern Canadian Premiers
NEPPS	National Environmental Performance Partnership System
NESCAUM	Northeast States for Coordinated Air Use Management
NEWMOA	Northeast Waste Management Officials' Association
ng/L	nanograms per liter
NJBPU	New Jersey Board of Public Utilities
NJDEP	New Jersey Department of Environmental Protection
NJDHSS	New Jersey Department of Health and Senior Services
NJDOT	New Jersey Department of Transportation
NRC	National Research Council
NSCRF	National Study of Chemical Residues in Fish
PCBs	Polychlorinated biphenyls
POET	Point of entry treatment
ppb	Part per billion
ppm	Part per million
ppt	Part per trillion
PSE&G	Public Service Electric & Gas

RfC	Reference Concentration
RfD	Reference Dose
TMDL	Total Maximum Daily Load
U.S. EPA	United States Environmental Protection Agency
UMDNJ	University of Medicine and Dentistry of New Jersey
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WQC	Water Quality Criterion