REPORT

PROJECT ON GOVERNMENT OVERSIGHT

A Partial Approach to Clean-Up:

EPA Mishandles Superfund Investigations

June 25, 2002 | pogo.org

PROJECT ON GOVERNMENT OVERSIGHT
1100 G St. NW Suite 500
Washington, DC 20005
202-347-1122 | www.pogo.org

A Partial Approach to Clean-Up:

EPA Mishandles Superfund Investigations

June 25, 2002

1100 G Street, NW, Suite 500
Washington, DC 20005
(202) 347-1122
E-mail: pogo@pogo.org
www.pogo.org

Table of Contents

Appendices

Appendix A: Letter from David A. Ullrich, Acting Regional Administrator, U.S. EPA Region 5, to Concerned Citizens of Lake Township, October 21, 1998.

Appendix B: "An SAB Report: Review of EPA's Approach to Screening for Radioactive Waste Materials at a Superfund Site in Uniontown, Ohio," U.S. Environmental Protection Agency, Science Advisory Board, (EPA-SAB-EC-94-010, September 1994).

Appendix C: Memorandum from National Ombudsman Robert J. Martin to Region 5 Administrator Francis X. Lyons: "Industrial Excess Landfill Case/Preliminary National Ombudsman Recommendations," October 20, 2000.

Appendix D: Letter from Dr. Mark Baskaran, Wayne State University, to Chris Borello, Concerned Citizens of Lake Township, October 16, 2001.

Appendix E: "Record of Decision Industrial Excess Landfill Superfund Site, Uniontown, Stark County, Ohio," U.S. Environmental Protection Agency, (EPA/ROD/R05-89/098, July 1989).

Appendix F: Maps of Industrial Excess Landfill: Figure 1 Monitoring Well Locations, Figure 2 IEL Alternate Water Supply and Residential Wells.

Exhibit 22 of IEL Groundwater Flow Patterns from "Comments on the Existing Public Record for the Industrial Excess Landfill for the Revision of the 1989 Existing Record of Decision," by Bennett & Williams Environmental Consultants, Inc., April 12, 1999.

Appendix G: Lautenberg, Frank R., Chairman, and Dave Durneberger, Ranking Minority Member, "Lautenberg-Durenberger Report on Superfund Implementation: Cleaning Up the Nation's Cleanup Program," Senate Subcommittee on Superfund, Ocean and Water Protection, May 1989.

Appendix H: Letter from Resnikoff, RWMA, to U.S. EPA, July 1, 1993.

Appendix I: Ohio EPA Data on Tritium Levels at IEL

Appendix J: Letter from M. Resnikoff, RWMA, to Ohio EPA, April 14, 1993.

Appendix K: Letter from Dr. Mark Baskaran, Wayne State University, to Chris Borello, Concerned Citizens of Lake Township, September 27, 2001.

Appendix L: E-mail communication from Arjun Makhijani to Lois Chalmers, "Re: Tritium – Naturally Occurring," February 5, 2002.

Appendix M: Testimony of Dr. Robert K. Simon, Beltz v. Hybud Equipment, No. 1993-CV-720, Stark County, OH, 1994.

Appendix N: Eyewitness Accounts from Liz and Harlan McGregor, April 8, 1999; Rex Shover, February 6, 1999; and Jim Shover, March 2, 1999.

Appendix O: Letter from Elaine B. Panitz, MD, FACP, FACPM, to Assistant Director for Public Health Practice at ATSDR, December 1, 1992.

Appendix P: "Revised and Supplemented Report of Investigation by the United States of America Regarding Certain Statements by Charles M. Kittinger," U.S. v Industrial Excess Landfill, Inc., U.S. District Court for the Northern District of Ohio, Eastern Division.

Appendix Q: "Recap of IEL Customers," compiled by DOJ Investigators; "IEL 'Military' Dump Tickets," compiled by DOJ Investigators; and "Industrial Excess Landfill, Inc., Daily Reports," July 8, 1969; August 4, 196X; August 25, 1969; October 26, 1970.

Introduction

The handling of the Industrial Excess Landfill (IEL), a Superfund site in Uniontown, Ohio, has been a source of contention between the community and the U.S. Environmental Protection Agency (EPA) for over 20 years. Under the terms of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as Superfund, the EPA is charged with addressing both the release and the substantial threat of a release of a hazardous substance into the environment.[1] Rather than fulfilling its mandate, however, the EPA has only grudgingly responded to the concerns of the people in this community and has essentially dismissed their concerns with no explanation for the problems that appear to afflict them. For over two decades, residents living near the site, represented by Concerned Citizens of Lake Township and American Friends Service Committee, have actively engaged the EPA over the quality of the characterization of the site, the accuracy of background data for various chemicals and radioactive materials, the methods used to test for contaminants, and the EPA's invalidation or dismissal of test results indicating the presence of radioactive contaminants at levels of concern. Although the community has raised several concerns regarding IEL, this report will focus specifically on the EPA's efforts to accurately characterize the potential for radioactive contamination of the site.

So far, results have been inconclusive as to whether or not radioactive contamination exists at IEL and several experts agree that further testing is required to find out. This report investigates the EPA's contradicting claims that the site has been adequately characterized. This site is only one example which serves to illustrate an apparent tendency at the EPA to give more weight to PRPs' financial considerations than to favoring remedies that are the most protective of human health and the environment. Illustrating this bias is EPA's general practice of allowing the parties suspected of polluting a site (known as Potentially Responsible Parties or PRPs) to perform the sampling and analysis of that site. The EPA states that "[a]llowing the PRPs to conduct groundwater sampling is not unusual and has been done at many other Superfund sites like IEL. In fact, having PRPs conduct and pay for sampling activities is actually the strongly preferred method of conducting business in the Superfund program," (Appendix A). This practice inherently taints the entire process, however, leaving the impression that the EPA has been "captured" by the industry it is intended to monitor. After all, those polluting companies have a financial interest in coming up with clean results lest they have to foot the bill for an extensive clean-up of a site. POGO is focusing on the IEL case in order to investigate the success of the EPA's Superfund program in accomplishing its mission.

---

[1] United States Code, Title 42, Chapter 103, Subchapter 1, Section 9604(a)(1)(A).

Background

The IEL Superfund site is located in Uniontown, Ohio, about 10 miles southeast of Akron. From 1966 to 1980, the landfill accepted industrial wastes which contaminated the soil and groundwater at the site. As a result of the extensive contamination and proximity to homes, the Environmental Protection Agency placed IEL on the National Priorities List (NPL), meaning it was one of the country's most contaminated sites. The companies identified by the EPA as PRPs include B.F. Goodrich Company, Goodyear Tire & Rubber Company, Bridgestone/Firestone, Inc., and GenCorp.

In 1989, the EPA issued a Record Of Decision (ROD) outlining an aggressive clean-up plan designed to prevent the further spread of contaminants which would include a protective cap and a pump-and-treat system. The cost of this remedy, in 1997 dollars, was estimated at $25.9 million. After the release of the ROD, further studies meant to fine-tune the remedy were conducted. In 1997, the PRPs took over the performance of those studies and, based on their data, the EPA issued an amendment to the ROD in March 2000. The amended ROD substituted a passive plan, called "monitored natural attenuation," relying on rain water to cleanse the soil, for the original pump-and-treat design but retained a cap. The cost of this remedy, in 1997 dollars, was estimated at $13.6 million. Now, the EPA is attempting to replace the cap portion of the remedy to a process called "phytoremediation," planting vegetation to absorb toxins, which will reduce the cost again to approximately $7 million, in 2002 dollars.

"Monitored natural attenuation" and "phytoremediation" are processes by which a site is naturally corrected, without human intervention, within a time frame that is reasonable. While phytoremediation and natural attenuation can be effective methods for addressing some sites, justification for such a remedy requires extensive site characterization and specific conditions. Selecting phytoremediation and natural attenuation at sites where unfavorable conditions exist could result in uncontrolled contaminant release. The decisions to formulate the original remedy and then change it without adequate site characterization came under considerable criticism from outside experts, Uniontown residents, and Congressional representatives.

Numerous illnesses occurring near IEL, which typically tend to be caused by radiation, and eyewitness accounts of suspicious disposals at the landfill, raised the public's concern of possible radiation contamination at the site. The EPA was skeptical because no indication of an illegal disposal of radioactive materials at the landfill had been found during its records search. However, public pressure from the Uniontown community finally forced the EPA to test for radiation in the early 1990s. Throughout the 1990s up to the present, the EPA has maintained that test results have shown no sign of disposal of radioactive materials at IEL.

But according to experts hired by a community group, Concerned Citizens of Lake Township (CCLT), and independent scientists, the EPA sampling and testing has actually been inconsistent and inconclusive at best. The problems have included the decision by the EPA to limit its testing to groundwater instead of the much more rigorous method of testing soil core samples; background wells that are too few in number and too close to the landfill to be untainted by the site; and the invalidation or dismissal of results indicating the presence of elevated levels of radiation, with seemingly weak justification by the EPA.

Of primary concern is the fact that much of the data has been highly inconclusive – neither indicative of the presence *nor* absence of radioactive contaminants. Yet, the EPA consistently interprets this data as proving the absence of such contamination and insists that it has found no indication of radioactive contaminants at IEL. With test results unable to credibly rule out radioactive contamination, such a vast array of anecdotal information, and some high level test results, as well as an unacceptable level of risk if the EPA is wrong, the EPA appears biased in its assessment of the site. Even when the former owner of IEL came forward last year with information of buried nuclear materials at the site, the EPA was skeptical and its year-long investigation failed to seriously investigate his allegations.

Site Investigation

There have been numerous and varied problems with the EPA's handling of IEL. From the very beginning, unsubstantiated assumptions based on record searches and information requests seem to have clouded the judgement of EPA officials handling the IEL case. Because this initial record search did not uncover any indication of unauthorized disposal of radioactive contaminants at IEL, the EPA has stated that it does not consider it likely that such contaminants are present. Yet the very fact that such a disposal would have been unauthorized, and in fact illegal, imply that record searches are not likely to be fruitful. This initial assumption contributed to the selection of groundwater monitoring over soil core surveys and a less robust method of testing than may have otherwise been chosen. Other problems include the inadequate determination of background levels of radiation, inadequate characterization of the site, and questionable accuracy of the tests. Though EPA has noted in the past that IEL has undergone more radiological testing than any other Superfund site, disputed methods and results of these tests has cast doubt on the EPA's conclusions about radiological contamination at the site.

Community concerns led the EPA's Office of Solid Waste and Emergency Response to request that the Science Advisory Board (SAB) conduct a review of EPA's procedures at IEL. The SAB is part of the EPA and serves as a technical peer review panel. It established an *ad hoc* panel to conduct its review of IEL (Appendix B, p.8). The SAB's report stated that, "... the [groundwater] tests performed were appropriate and adequate to detect the occurrence of radionuclides," (Appendix B, p.4). This statement has repeatedly been used by the EPA to support its selection of testing methods and the resultant conclusion that there is no widespread problem of radiation at IEL. However, SAB's seemingly positive statement regarding the groundwater program was not without conditions. The SAB's full finding said that only with the implementation of various recommendations made by the SAB, would the program be adequate. These recommendations included increasing the number of background wells and testing for radiation at least once a quarter until successive quarterly samples produce a constant level of gross alpha and beta that is close to background.[2] The EPA followed none of SAB's recommendations, and in fact no sampling or testing for radiation occurred between 1993 and 2000. Yet the EPA continues to claim that the SAB supports its groundwater program.

There has also been an investigation into the handling of the site by the EPA's National Ombudsman. The Ombudsman program, among other things, handles complaints from citizens and industry, undertakes formal investigations, and takes part in dispute resolutions.[3] The Ombudsman, in his preliminary findings, recommended that oversight and additional characterization of the site was necessary, and that the EPA should include trenching of the site to obtain a more complete picture of contamination at the landfill and the establishment of a "comprehensive monitoring network off-site and performance of microbial studies ... to further understand the impact of potential migration of wastes to nearby homes and drinking water wells," (Appendix C, p.13).

Looking in the Wrong Place

There are three general approaches available to test for the presence of radioactive contamination at a site: ground surveys, groundwater monitoring, and soil core samples. Ground surveys are used routinely for initial screening and only detect radiation near the ground's immediate surface. Once a site has become overgrown with vegetation, it is difficult and often infeasible to use this method. Groundwater monitoring is effective at detecting the presence of soluble radioactive materials if they are both leaching into the groundwater and the concentrations are high enough so that they can be distinguished from background concentrations. The third option, soil core sampling, is more effective at identifying smaller quantities of immobile wastes than groundwater monitoring, but only if the core borings encounter those wastes, which is often difficult if the wastes are not spread over a wide area (Appendix B, pp.11-12).

There are several concerns with the way in which the EPA determined which of these approaches to use. The EPA has stated that, based on studies it has performed, groundwater monitoring is the best way to find radioactivity at IEL if it exists there and that it is sufficient to properly characterize the waste buried at IEL. The EPA's own SAB, however, disagreed. The EPA used two scientific studies to support its selection of a groundwater monitoring program rather than a soil core sampling program – one demonstrating the infeasibility of the core monitoring program and the other supporting the adequacy of groundwater monitoring. However, according to the SAB, both reports "include technical flaws and provide no clear evidence that groundwater monitoring is more sensitive in detecting the presence of radioactive material in the landfill than would be a soil core

---

[2] Other recommendations include a protective wet-weather survey to monitor seepage points near the landfill during or following storm events, including a proactive search for contaminants where they are most likely to be found; also a full accounting of dissolved and particulate phase radioactivity. *An SAB Report*, pp. 2-3.

[3] http://www.epa.gov/earth100/records/a00154.html, 2 May 2002.

sampling program," (Appendix B, p.2). The SAB goes on to state, "[i]t certainly does not follow that the network of wells would detect the radiation with high probability if enough waste had been dumped to cause a threat to human health. ... The Panel recognizes that both of these reports are based on a large number of assumptions that have not been validated for the IEL site," (Appendix B, pp.18-19).

Furthermore, as mentioned earlier, groundwater monitoring is only effective if the material being monitored is both soluble and leaching into the groundwater at high enough concentrations to be detected. However, some radioactive contaminants, such as plutonium tend to adhere to surfaces such as soil, sides of containers, and filter paper (Appendix D). One would therefore not expect to find plutonium concentrations through groundwater testing, even if it existed at the site. The EPA has insisted that trying to find radioactive contamination by soil core sampling would be like "trying to find a needle in a haystack,"[4] and that the cost to sample soil cores from the entire 30 acres, in dollars, time, and possible exposure to toxic chemicals of the field workers and local citizens, is unacceptably high (Appendix B, p.17). Contrary to this assessment, however, outside scientists familiar with IEL are emphatic about the need to implement a soil coring program in addition to groundwater monitoring. These experts have stated on numerous occasions that, because some contaminants are not soluble, testing only groundwater for radiation will not give an accurate measurement of what radioactive contaminants may be buried at the site. By their assessments, groundwater testing is not an adequate methodology to properly characterize radiation at IEL. A soil core survey of the entire site may not be necessary. Anecdotal information from eyewitnesses, historical aerial photos of lagoon pits, and the location of wells that have consistently shown elevated levels of radiation point to much smaller areas that may be appropriate for a limited soil core sampling program.

Tainted Background Wells?

Although a groundwater monitoring program without a soil core survey may not be adequate to detect radiation at IEL, groundwater monitoring can yield useful results if it is implemented properly. Before groundwater monitoring can even begin, it is important to determine the natural levels of chemicals and radiation that would have existed at a location had the contamination not been there. This is called the background[5] concentration. This data is used as the control against which data from the site can be compared so that the site-related contaminants can be distinguished. If "background" wells are tainted by the same contaminants as the site being tested, those wells do not give an accurate representation of the background concentration. This point cannot be overemphasized. Without an accurate measurement of background concentrations, any comparison of site samples

---

[4] United States Environmental Protection Agency, Office of Public Affairs, Region 5, *Questions and Answers About the Industrial Excess Landfill Superfund Site*, December 1992, p. 6.

[5] Background includes man-made radiation that is ubiquitous, such as that from atmospheric fallout from nuclear weapons testing and accidents such as Chernobyl.

will be skewed. Background data should be gathered from the local groundwater aquifer, close enough to the site to be from the same soil and rock formation, but far enough away not to be effected by site contaminants (Appendix B, pp.13-14). Several background wells over a large area are necessary to determine what is truly background.

During its initial investigation of IEL, the EPA found that surface water from the landfill travels to Metzger Ditch, which creates the eastern boundary of the landfill (Appendices E & F). Additionally, the United States Geological Survey found that the groundwater flow pattern at IEL is radial which creates a complicated hydrogeological system, making it difficult to determine what areas have been affected by contaminants from IEL. This finding emphasizes the need for extensive sampling and testing to determine the true background of the area.

At IEL, the EPA uses only two background wells. One of the background wells is about 1000 feet north of the northeastern corner of the site, and the other is immediately adjacent to the eastern bank of Metzger Ditch. Those two wells are the source of background data for groundwater despite the conclusion by outside scientists and the EPA's own SAB that the wells are not sufficient to reliably characterize background conditions. Even if the groundwater flow was uncomplicated, the SAB recommends five to ten wells at intermediate and varying distances from the site to adequately determine background. The SAB stated in its report on IEL that "the two wells are clearly inadequate for characterizing background," (Appendix B, p.14).

The groundwater flow pattern at IEL creates uncertainty about what direction the groundwater will carry contaminants, and therefore about which wells are affected. Furthermore, in 1989, the EPA stated that samples of surface water, sediment, and soil associated with Metzger Ditch indicated that site-related contaminants discharge into the ditch (Appendix E). The possibility that these contaminants have similarly affected the background well next to Metzger Ditch is too significant to be ignored. The SAB declared data from that well to be "particularly suspect" because of the groundwater flow pattern at the site and the well's proximity to the landfill (Appendix B, p.14). If the background wells are affected by site contaminants, contaminated groundwater will appear to be "natural" for the area, and therefore not actionable, when compared with background levels. A larger data set is necessary to give a reliable and scientifically credible characterization of background radionuclide conditions (Appendix B, p.14).

The EPA has ignored the SAB's concerns, and argues that it has correctly designated only the two wells as background wells and that it has adequately determined background concentrations of radioactive materials. Despite contradictory findings by the EPA's own scientists, it has refused to construct and test additional background wells.

Botched Tests by the EPA and PRPs

To determine whether there is radioactive contamination at IEL, the EPA screened groundwater from monitoring wells and residential wells for general radioactive parameters.[6] As mentioned earlier, it is essential to have an accurate basis for comparison in order to determine whether or not radioactive contaminants are present. It is no less important to have proper collection and analysis of the samples being tested. If the procedure for handling samples is not followed or is only inconsistently followed, the results would be highly unreliable. If wells are not sampled the same way each time, results cannot be compared to each other – either from the same well over time or from different wells across area and time.

Unfortunately, according to the EPA itself, there have been an inordinate number of errors and inconsistencies that cast enormous doubt on the accuracy of testing results from IEL. For example, as mentioned earlier, both of the studies which were pivotal in selecting groundwater monitoring over soil core sampling, were highly criticized by the SAB. Furthermore, the company that conducted one of the tests, the PRC Corporation, was then contracted by the EPA to collect the first seven rounds of samples at IEL. Serious errors were made by PRC Corp. during the collection of samples at IEL including broken chains of custody,[7] inappropriate filtering of samples from residential wells, failure to record the volume of water passed through filters and the dry weight of the collected solids of filtered samples,[8] failure to record the number of filters used on a number of samples, and the collection of samples in plastic containers which were to be tested for tritium. Instead of hiring a new contractor to collect samples, the EPA continued to use PRC Corp. at IEL. In 1997, responsibility for the collection of samples was handed over to the PRPs, who have an obvious vested interest in the outcome of the tests. The company hired by the EPA to oversee the tests is PRC Corp. (now known as Tetra Tech), the very company that had made so many mistakes in the past when working for the EPA. After taking over sample collection, the PRPs also made mistakes which may skew the results, such as inadequate purging of wells prior to sampling, the failure to immediately preserve samples for plutonium testing with acid, and the use of plastic containers for samples which were to be tested for tritium.

Furthermore, the analysis of these samples has often been questionable. In 2000, a Department of Justice criminal probe revealed that analysts at an EPA lab in Chicago may have manipulated test results to benefit polluters in approximately a thousand cases, including several Superfund sties. One

---

[6] The general radioactive parameters are gross alpha, alpha spectroscopy, gross beta, gamma spectroscopy, tritium, and Carbon-14. Alpha spectroscopy is done when the gross alpha exceeds a set level, and is a more specific analysis to determine the type and level of radioactive material in the groundwater.

[7] The chain of custody is the system by which samples are constantly monitored to ensure that they are not tampered with.

[8] "The failure to record the volume of water passed through the filter and the dry weight of collected solids for filtered samples at the IEL site was such that a full accounting of the dissolved and particulate concentrations of radioactive constituents could not be made." *An SAB Report*, p. 22.

of those sites was IEL. Regardless of the Justice Department's investigation, the EPA reasoned that the test results were still usable since the analysts implicated in the scandal were only part of the team that analyzed the IEL samples. Additionally, inappropriate standards have been used to analyze some of the samples for radioactive contamination at IEL and have been criticized by outside scientists. The Minimum Detectable Activity (MDA) is the level of each contaminant that will be tested for at a site. Amounts of radiation in groundwater below this level are not detected. If the MDA levels are set too high, potentially harmful levels of radiation will remain undetected. When testing reveals a gross alpha level above a certain level[9] federal regulations require a more specific analysis of individual contaminants. On a number of occasions, the MDA set for gross alpha at IEL was higher than the level at which federal regulations mandate such a breakdown. More problematic is the fact that there have even been occasions when the MDA level at IEL was set above the Maximum Contaminant Level,[10] the level which the EPA considers hazardous to human health and safety. When testing reveals a gross beta level above a certain level[11] federal regulations require a more specific analysis of individual contaminants.[12] EPA failed to do this full characterization and identification of gross beta during the early rounds of testing.

In addition to these mistakes, however, there are the larger problems of procedures and standards that have been approved by the EPA, but that outside scientists believe may not be protective of human health and the environment. Such procedures and standards include the filtering of monitoring well samples and the use of PRPs to conduct the investigation.

The method consistently used for testing at IEL has been EPA's "Gross Alpha and Gross Beta Radioactivity in Drinking Water." This method contains an inherent bias because it is intended to test drinking water. Therefore, it allows the filtration of sediment from the samples of groundwater, thereby increasing the likelihood of underestimating, or missing completely, any man-made radiation such as plutonium that tends to adhere to sediment or soil. Although the EPA states that the regulations require filtration to be done,[13] several experts disagree with the EPA's use of the method at this site. The SAB also found this to be a problem, stating that, "EPA does not address radioactivity in suspended sediment, [making it] difficult to address whether or not the levels observed in the filtrate are within background levels,"(Appendix B, p.15).

The EPA's use of PRPs to conduct the investigation of a site is a systemic problem that potentially taints the clean-up of every Superfund site. A 1989 report from the Chairman and Ranking Member

---

[9] 5 pCi/L

[10] 15 pCi/L

[11] 50 pCi/L

[12] *United States Code of Federal Regulations*, 40 CFR 141.26 (b)(4)(i).

[13] United States Environmental Protection Agency, Office of Public Affairs, Region 5, *Questions and Answers About the Industrial Excess Landfill Superfund Site*, December 1992, p. 8.

of the Senate Subcommittee on Superfund, Ocean and Water Protection found, among other things, that statistically, the involvement of the PRP's led to cheaper remedies that did not necessarily protect health and safety. The report stated, "Enforcement lead sites (those sites where EPA is seeking to make potentially responsible parties assume cleanup costs) rely more on so-called containment (e.g. preventing the movement of rather that [sic] detoxifying) of contamination and less on treatment (including the most permanent types of treatment) than sites designated for public funding. This data raises the disturbing possibility that EPA, in an effort to achieve settlements or to compel responsible parties to pay for cleanups, may be sacrificing health and environmental standards required by the law," (Appendix G, pp.10-11). This study was done at a time when regulations required the EPA to lead the investigations of Superfund sites, but to negotiate settlements with the PRPs. Current practice within the EPA allows much deeper involvement by the PRP's, even allowing them to conduct the very tests which help determine the remedy. One can only assume that more involvement by the PRPs would only exacerbate the problem cited in the Subcommittee's 1989 report. The PRP's inclination to minimize both current and future costs is to be expected. It is the EPA's job to protect the public from this conflict.

At IEL specifically, when the PRPs took over sampling in 1997, they did not perform any sampling or testing for radiation until August 2000. After only one round of radiation testing, the EPA accepted the PRPs decision to drastically reduce the number of wells to be tested for radiation from 50 to 7. Unfortunately, the wells that were dropped from testing included several that were found to have elevated levels of radiation in the past.

Findings of Radiation

Both the EPA and the Ohio EPA (OEPA) have collected groundwater samples for radiochemical analyses. Even with all the errors, inconsistencies in sampling, and questionable methods and standards, there have been findings of radioactive materials at IEL from the beginning – all of which have been discounted by the EPA and the PRPs.

At IEL, gross alpha concentrations have been consistently elevated, sometimes as much as tens of times higher than background well measurements for the rest of the county (Appendix H); gross beta has been elevated during numerous sampling rounds in a number of wells (as recently as May 2001), but has been consistently higher in two wells in particular; uranium has been found in various wells during every round; plutonium, which is man-made, has been found during several sampling rounds in various wells; and tritium and technicium-99, two other man-made radioactive contaminants, have been found in several wells. However, none of these findings have been given any credence by the EPA. The gross alpha and gross beta readings have been attributed to turbid water samples and naturally occurring radionuclides. The uranium findings have been dismissed as being background concentrations. Plutonium, a man-made radionuclide, has been found a number of times and dismissed for various reasons: in 1990, the findings were invalidated; in 1991 and 1992 the EPA found traces of plutonium in deep groundwater that were said to be at only marginally detectable concentrations, which the EPA declared to be inconclusive; in November 2000, plutonium was found in deep groundwater in the background well next to Metzger Ditch, and the EPA said the concentration must be a background level because it was found in a background well; plutonium was detected in two other wells during the November 2000 round, but again the EPA found them to be inconclusive. There have also been several findings of tritium, another man-made radionuclide, at levels above federal drinking water standards that were deemed invalid by the EPA. However, the OEPA found numerous tritium levels well above background that were validated (Appendix I). Because these were not above the drinking water standards, however, the EPA has concluded that it is not consistent with a public health concern. The technicium-99, yet another man-made radioactive contaminant, that was found was dismissed, again because it was not above the drinking water standard and therefore not considered to be of concern.

Other scientists take a different view of the findings that the EPA has dismissed so readily. For example, the OEPA's measurement for gross alpha from a shallow well in August 1992 was 140 times background measurements for the rest of the county. According to one outside scientist, measurements of that magnitude cannot be due to naturally occurring radioactivity (Appendix J). After analyzing November 2000 results, a second outside scientist concurred that there is man-made radiation present at the landfill, saying specifically that the uranium results "can either be due to bad data or there is some serious contamination of non-natural uranium ..." (Appendix K).

Scientists also differ from the EPA regarding the findings of plutonium. Upon review of the November 2000 results, Dr. Mark Baskaran found the concentration of plutonium in the groundwater at IEL to be about 1000 times higher than that found in surface waters such as lakes, rivers, or oceans, indicating that the plutonium present at IEL is "most likely derived from one or more local sources," (Appendix D) rather than from atmospheric fallout. The mere fact that the plutonium was found in groundwater as opposed to surface water indicates that it is most likely not due to atmospheric fallout. He also found the amount of measurement uncertainties, the EPA's statistic estimating the accuracy of test results, associated with the plutonium concentrations to be "ridiculously high." He stated that any academic institution where there is any active environmental radioactivity research being conducted would be able to improve upon that precision by 100 to 1000 times (Appendix D).

On several different occasions, validated groundwater test results from the OEPA showed elevated levels of tritium, including levels up to 6,600 pCi/L. According to Dr. Arjun Makhijani, concentrations of "300-4000 picocuries per liter in groundwater can be regarded as of anthropogenic [man-made] origin, provided that the measurements are reliable," (Appendix L). While these levels are not direct evidence of harmful levels of radiation, because tritium is rarely found naturally in groundwater, they can be viewed as evidence of site-related radioactive contamination (Appendix B, p.15). Because technicium-99 is also man-made radiation, its very presence in groundwater from the landfill can also be viewed as evidence of site-related radioactive contamination.

Additionally, in response to two testing rounds that were invalidated by the EPA, an outside expert reviewed the methods of one of the labs which EPA blamed for the invalidation. He found that, while the methods used by the lab were different from those used by the EPA, they were not wrong and that the results were "no more invalid" than those from the EPA's own labs (Appendix M, p.51).

Anecdotal Evidence

Several witnesses have testified to seeing U.S. military vehicles entering and leaving IEL, some with radiation markers (Appendix N). Each witness reported strikingly similar accounts of suspicious U.S. Army activity at IEL in the late 1960s and the early 1970s. Of the four eyewitness accounts discussed here, two have extensive experience in recognizing radiation symbols, and a third is the former owner and operator of the landfill.

In a notarized statement to the EPA, Liz and Harlan McGregor of Uniontown, swore to seeing "many army trucks come into the landfill in the early 1970s. ... [The trucks] were loaded with 50-100 stainless steel canisters on flatbed trucks. [The] canisters had hazardous markings on them....The tankers would come in all through the night and dump." A decade later a U.S. Army engineer visited their home in Uniontown to inspect the premises without explanation.

Rex Shover, a second eyewitness, served on the Uniontown Volunteer Fire Department from 1958 to 1976. In a sworn affidavit dated February 6, 1999, Mr. R. Shover stated that during his time as a volunteer fireman, he "personally saw tanker trucks carrying radioactive insignia enter the Industrial Excess Landfill late at night after the landfill was closed." Mr. R. Shover also asserted that his firefighter training included the labeling of radioactive materials. "I am familiar with and can recognize placards and labels used for radioactive materials."

At the IEL public meeting held in Uniontown on March 2, 1999, Mr. R. Shover read a letter on behalf of a third eyewitness, his brother Jim Shover, who now lives in California. In the letter, Mr. J. Shover stated that he had spent his youth in Uniontown and had been employed at IEL as a mechanic's helper in 1964 and 1965. Mr. J. Shover stated that, after joining the U.S. Navy in 1966, he often returned to Uniontown, and recalls seeing U.S. Army tanker trucks with radioactive material placards entering and leaving IEL on several occasions between 1966 and 1971. During his Navy career, Mr. J. Shover received training in nuclear warfare, industrial radiology, radioactive materials, and associated health problems in humans, and served on the Nuclear, Biological, and Chemical rapid response team, making him uniquely qualified to identify military vehicles and radiation symbols. He identified the trucks as "specially designed double-lined tankers designed to transport liquid radioactive waste material."

In addition, in 1992, the Agency for Toxic Substances and Disease Registry (ATSDR) requested health information regarding IEL from Dr. Elaine Panitz. In her response she stated, "the case of Patient #1 ... presents disturbing evidence that radiation (and possibly other carcinogens such as benzene, vinyl chloride, and chlorophenols) may be causing neoplasms [tumors] among residents surrounding the IEL site. The routes of exposure are likely to include ingestion (well water, fruits and vegetables), skin absorption (well water for bathing and washing clothes, as well as swimming or playing in marshy areas near IEL), and inhalation (radioactive dusts released from the landfill, radioactive gases released from contaminated ground and groundwater)," (Appendix O).

These eyewitness accounts coupled with the above medical opinion raise reasonable questions about the material buried at IEL as well as the EPA's strategy in investigating credible concerns from

Uniontown residents. During a recent year-long EPA investigation of the testimony of IEL former owner, Charles M. Kittinger, none of these eyewitness accounts were considered, even though the EPA itself had statements from each of them. This oversight casts considerable doubt on the notion that the EPA is attempting to find the truth.

Charles M. Kittinger, the owner of the IEL site from 1965 to 1972, went to EPA officials a year ago to admit that he had allowed the illegal disposal of nuclear materials by the U.S. Army at IEL. Since his disclosure, the EPA appears to have spent its resources attempting to discredit Mr. Kittinger and his allegations but has yet to determine the truth by a more thorough characterization of the site.

That significant time has passed since the incident obviously confuses the issue, raising questions as to the accuracy of witness accounts and 30 year old memories. This becomes a difficult obstacle in analyzing personal testimonies. This is to be expected. What is problematic is the inconsistency with which the EPA investigators use this fact. For example, while some statements from Mr. Kittinger's testimony are discredited due to "the possibility that his recollection of events has been colored," (Appendix P, p.7) others are taken at their most literal meaning, such as the exact size of the hole or the capacity of the trucks that carried the materials, which the government maintains cannot be accurate. By insisting that Mr. Kittinger's memory must be entirely accurate or entirely a fabrication, the investigators are able to dismiss facts and test results that may indicate something unusual. Under these parameters, no weight is given to evidence of a 1969 excavation site because it is 40 feet from where Mr. Kittinger indicated and 15 feet smaller than Mr. Kittinger had recalled (Appendix P, p.97). In another example, a remote sensing anomaly is found a mere 11 feet deeper than Mr. Kittinger said the containers of nuclear material were buried, and is therefore entirely dismissed (Appendix P, p.116). If it can be suggested that time has clouded Mr. Kittinger's memory of facts that the government wishes to deny, then time may also blur the memory of such specific details.

The government's conclusions that Mr. Kittinger's claims are unfounded are partly based on the lack of documentation of the alleged delivery of this nuclear material. However, if such an illegal operation had occurred, the involved parties would not likely be interested in keeping detailed records of their actions. By setting preposterous standards of proof for the investigation, it appears the EPA has ensured that it will not come up with an answer it doesn't want.

Even when there does appear to be some documentation, the investigators go out of their way to discredit the existing documents. At one point, the EPA's report of its investigation states that based on a review of the delivery tickets, no deliveries were made by the U.S. Army. It was not until the original draft of the report was completed and questions were raised on this point, that the EPA investigators admitted that no delivery tickets were reviewed that were dated prior to 1970 (Appendix P, p.16). Considering Mr. Kittinger's belief that the delivery was made in 1968 or 1969, though possibly 1971, it is not surprising that the investigation had not revealed corroborating documents.

When earlier tickets were later obtained and reviewed, corroborating evidence was discounted. Three entries in the delivery log (for which the delivery tickets are missing) were marked as deliveries from the "U.S. Army" (Appendix P, p.19, & Appendix Q). However, it is assumed by the investigators that what was actually meant was the U.S. Army National Guard, which does not have access to nuclear materials. Because the government has a clear interest in the outcome of the investigation, it is disingenuous to draw such favorable conclusions from inconclusive evidence.

The investigators spent considerable time analyzing the policies and regulations of the U.S. Army, the Army National Guard, the Department of Energy, and NASA, apparently in order to discount the theory that nuclear materials would have been disposed of by them at IEL. However, it can clearly be assumed, even without such analysis, that a strictly illegal act would not be permitted by any of these agencies' regulations. Therefore, the extensive analysis of these regulations seems to be nothing more than a diversionary tactic.

For the investigation, the government solicited experts to assist in the analysis of historical aerial photographs and to apply remote sensing technologies to the landfill. The investigation report itself states, "the limitations of both the aerial photo analysis and the remote sensing technologies must be acknowledged," (Appendix P, p.6). But even when using these limited methods, the investigators seem to intentionally overstate their case, drawing conclusions where none are warranted.

In the report's description of the aerial photo analysis, the investigators admit that the photographs are incomplete and "do not exclude the possibility that the hole Mr. Kittinger described existed," but only that the available photos cannot prove that it did. Even after admitting that the photos were inconclusive, however, the investigators use them to imply that Mr. Kittinger's allegations are false, stating, "the aerial photographs from the relevant time frame cast significant doubt on Mr. Kittinger's description of the hole," (Appendix P, p.6).

The investigators' analysis of the remote sensing technologies is similarly flawed. The entire test, designed by the investigators, relies on the assumption that the radioactive materials are buried apart from any other metal objects. Yet this assumption is in direct conflict with Mr. Kittinger's statements that the radioactive materials were buried near several junked cars. Given this contradiction, the report admits, this technology can tell "nothing about the presence or absence" of containers of nuclear material (Appendix P, p.113). Yet despite this flaw, the results from the test are continually used throughout the report to discredit Mr. Kittinger's claims.

The remote sensing test, in fact, did turn up the one result that may actually corroborate Mr. Kittinger's claims, yet the investigators attempt to explain it away. The report states that there is "one 'anomaly' that might be caused by stainless steel," which would be consistent with Mr. Kittinger's claims. Their defense against this startling evidence is to state that, "this anomaly could also be caused by other materials,"(Appendix P, p.7). Here again, inconclusive evidence, and even evidence that favors Mr. Kittinger's claims, is implied to favor their own case.

It is true that Mr. Kittinger's testimony raises more questions than it answers. The real failure of this investigation is not that it is unable to either prove or disprove Mr. Kittinger's claims, but that it is willing to brush these new questions aside without addressing them. The ultimate conclusions of the report are based on the failure to differentiate between evidence that does not definitively confirm

Mr. Kittinger's claims and evidence that proves Mr. Kittinger's claims false. Ultimately, the evidence is inconclusive. The EPA seems willing to assume that inconclusive results imply there is no nuclear material at the site, thereby possibly putting hundreds of lives at risk. EPA's National Ombudsman has called for extensive testing and site characterization which would give much more conclusive evidence than was gained through this investigation.

Conclusion

The Industrial Excess Landfill in Uniontown, Ohio, is one case study of the EPA's mishandling of Superfund sites. The overt influence of the polluters in Superfund clean-ups must be addressed to ensure that the EPA is adequately protecting human health and safety as well as the environment. Furthermore, the lack of community access or influence, particularly in comparison to that of the polluters, should be immediately rectified. It is, after all, the communities that have the most to lose from an inadequate clean-up, while it may be noted that the polluters have the most to gain by a cheap remedy. It is the responsibility of the EPA to remain unbiased and fairly remedy Superfund sites.

Recommendations

- ➢ Legislatively create a National Ombudsman's Office which is wholly independent of the EPA. The Office should be placed in either a White House office or as part of the Legislative Branch, perhaps attached to the General Accounting Office.

- ➢ All ongoing investigations into a site, such as those performed by the SAB or the National Ombudsman, must be completed, and the recommendations made available to the public prior to the implementation of a Record Of Decision.

- ➢ The Potentially Responsible Parties (PRPs) should *reimburse* the government for the cost of, rather than being allowed to initially pay for, a site-related investigation. The EPA should be prohibited from allowing PRPs to conduct investigations or testing.

- ➢ If the government continues to allow the PRPs to remain a part of the investigation of sites, it should allow and facilitate, through financial and other means, communities to hire qualified experts to take samples for analysis from the site. The data and recommendations resulting from a community-led investigation should be given equal weight as those submitted by the PRPs.

- ➢ The scientific validity of standards and procedures utilized by the EPA, such as the use of filtering, needs to be re-evaluated by an independent organization such as the National Academy of Science.

- ➢ Technical corrections or recommendations geared toward strengthening protections or addressing community concerns, such as those made by the Science Advisory Board (SAB) or the National Ombudsman's Office, that are not implemented by the EPA, must be justified and certified by the EPA Administrator.

Appendix A

Letter from David A. Ullrich
Acting Regional Administrator, U.S. EPA Region 5
to Concerned Citizens of Lake Township

October 21, 1998

OCT 21 1998

R-19J

Concerned Citizens of Lake Township
P.O. Box 123
Uniontown, Ohio 44685

Subject: Water Testing at Industrial Excess Landfill Superfund Site

Dear Concerned Citizens of Lake Township:

Thank you for your letter of September 27, 1998, expressing concern regarding the latest round of groundwater sampling at the Industrial Excess Landfill (IEL) Superfund site in Uniontown, Ohio. I would like to take this opportunity to respond to each of the issues you raised in your letter.

Issue: U.S. is no longer directly supervising the current round of sampling at IEL

The United States Environmental Protection Agency (U.S. EPA or the Agency) Region 5 office has provided adequate oversight of the September 1998 sampling event consistent with similar events at other Region 5 National Priorities List (NPL) sites. Every possible measure was taken to ensure this objective was met. Prior to actual field work, site sampling plans and other Quality Assurance Project Plan (QAPP)-related documents were prepared by the potentially responsible parties (PRPs) and submitted for review and approval by this office. Health and safety concerns were also discussed prior to starting field work at the site. Ross del Rosario, the remedial project manager (RPM) for IEL, was at the site for four (4) days during the survey (September 14-16 and 25). A representative from the Ohio Environmental Protection Agency (OEPA) was also present on certain days during sampling. Throughout the two and a half week survey, consultants under contract with U.S. EPA were present to observe the field activities and, if needed, report to U.S. EPA if there were problems/discrepancies noticed during the sampling. As an additional measure, the Agency made a decision to collect groundwater samples of its own for more than 20 monitoring wells and 6 residential wells located near the landfill.

Issue: PRPs are conducting sampling solely to support their position that natural attenuation is occurring, negating the need for an active pump and treat system. Tentatively Identified Compounds (TICs) are being overlooked by the PRPs.

This particular survey conducted by the PRPs covers much more than just sampling for indicator parameters that would prove that natural attenuation is occurring. As required under the approved site sampling plan associated with this round of sampling, the PRPs are required to sample and analyze for metals, volatile organics compounds (VOCs), and semivolatile organic compounds (SVOCs). This is in addition to the parameters connected with the work on natural attenuation. Consequently, a significant number of samples were taken during this round of sampling. The statement alleging that a double standard exists in favor of protecting the PRPs is simply not true. In a September 10, 1998 letter from Mr. del Rosario to Christine Borello of CCLT, it was explained that allowing PRPs to conduct groundwater sampling is not unusual and has been done at many other Superfund sites like IEL. In fact, having PRPs conduct and pay for sampling activities is actually the strongly preferred method of conducting business in the Superfund program.

For this sampling, appropriate measures such as reviewing and approving the PRP site sampling plan and other QAPP-related material were taken to ensure the work is conducted at a level consistent with previous sampling surveys performed by the Agency. In addition, data generated by the PRPs will be validated by U.S. EPA before it can be distributed and used by any interested party.

With regards to the sampling for TICs, U.S. EPA, with assistance from OEPA technical staff, evaluated what parameters needed to be included for this round of groundwater sampling at IEL. In the end, it was decided that analyses for TICs was not warranted based on previous sampling results. This determination was made prior to the PRPs' request, conveyed to U.S. EPA sometime in August 1998, for conducting sampling at the site. The notion that the Agency "let them off the hook" in conducting TIC testing is simply not true.

Issue: U.S. EPA should have insisted that the PRPs test for radiation during this sampling round

Insisting that PRPs conduct radiation sampling at IEL runs counter to the position the Agency has held since completing its radiation work in 1993. The Agency has maintained that, based on four valid rounds of sampling, the levels of radiation found at the site are indicative of background conditions. The Science Advisory Board (SAB), in its final report dated September 1994, concluded that the radiation work performed by U.S. EPA at IEL was adequate and appropriate to characterize the level of radiation at the site. The SAB findings were made after three public meetings were held to discuss the radiation data. Public input, including CCLT's, was solicited at these meetings prior to the SAB publishing its final report in 1994.

Nevertheless, in the spirit of cooperation, U.S. EPA extended an offer for limited radiation sampling following the format agreed to in 1997 (i.e., we will collect samples from 6-7 monitoring wells and have them shipped to the radiation laboratory designated by CCLT or another interested group. The cost of analyzing the samples will be the responsibility of the interested group). This offer was put in writing to CCLT, the Lake Township Trustees, and the American Friends Service Committee, in a letter dated August 27, 1998, from Mr. del Rosario. As far as this office is aware, the offer was not accepted by any party mentioned above.

Issue: Concerns about allowing Tetra Tech/PRC to participate in sampling activities at IEL given all the concerns documented over the years about this particular contractor

Descriptions of alleged improper actions by Tetra Tech/PRC during field activities at the IEL site include: 1) the use of plastic containers instead of glass jars for tritium 2) that Tetra Tech/PRC referred to "samples taken just a stone's throw from site boundaries" as background 3) that Tetra Tech/PRC wrote into the IEL workplan the "alcohol ignition procedure" which caused problems during the analysis conducted by Controls for Environmental Pollution (CEP) laboratory 4) that Tetra Tech/PRC made serious mistakes filling out chain of custody forms for radiation samples destined for analysis by CEP and 5) that Tetra Tech/PRC had mistakenly field-filtered the residential well water samples during the May and August 1992 sampling rounds..

This office has investigated the allegations against Tetra Tech/PRC and interviewed Agency personnel who were involved or had knowledge about a particular issue described above. We offer the following findings below. It is our understanding that most of the issues above have previously been brought to the Agency's attention by CCLT and had already been responded to by this office. Nevertheless, we are again providing this information for your benefit.

1) The allegation that plastic containers were improperly used in collecting groundwater samples for tritium is based on one of many comments generated by Mr. Greg Dempsey from U.S. EPA's National Air and Radiation Environmental Laboratory (NAREL) during the first round of radiation sampling at IEL in August 1990. However, the test results generated during this round of sampling were found unacceptable and eventually invalidated by U.S. EPA. This was primarily due to quality assurance/quality control (QA/QC) deficiencies attributed to the radiation laboratory contracted to analyze the samples. According to Mr. Dempsey, the problem with using plastic containers was corrected by Tetra Tech/PRC and implemented in subsequent rounds of radiation sampling at IEL. Therefore, any valid results from follow-up radiation sampling at IEL would have incorporated the use of glass containers for collecting groundwater samples for tritium.

2) The Region 5 office has contacted its Headquarters office about this issue in view of the involvement of Dr. Gordon Burley from the Office of Air and Radiation. At this time, Headquarters staff have been unable to locate any written documents concerning Dr. Burley's response on the subject. An examination of available records on that survey reveals that Tetra Tech/PRC played a minor role in a collaborative effort with U.S. EPA's NAREL and Emergency Response Team (ERT) during the comprehensive 1991 radon testing around the IEL site. Specifically, it was tasked with drilling exploratory boreholes and collecting soil gas and groundwater samples at the site . NAREL was responsible for performing the analysis of gas and water samples on-site, while ERT conducted work on the methane venting system (MVS).

3) Tetra Tech/PRC was not responsible for the problems encountered by CEP in conducting radiation analysis as it involves the "alcohol ignition procedure". In a letter dated April 6, 1998 from U.S. EPA's Office of Inspector General to Congressman Sawyer, it was explained that this procedure is part of the sample preparation process and was specified only for gross alpha/gross beta analyses, not for all radiochemistry analyses. Furthermore, this technique is described in Method #703 of "Standard Methods for the Examination of Water and Wastewater", 16th Edition, 1985. Whether this procedure was properly used during the analysis is a laboratory issue and does not involve Tetra Tech/PRC in any way.

4) This issue involves the December 1990 sampling event for radiation and the analysis of the collected samples by CEP. In our conversation with Mr. Dempsey, he did indicate that there were some errors in the way samples were handled by Tetra

Tech/PRC in the field during the December 1990 survey. However, Mr. Dempsey added that the problems associated with the field work was not the cause of the data, analyzed by CEP, to be eventually invalidated by U.S. EPA. Laboratory deficiencies attributed to CEP caused this invalidation to occur, according to Mr. Dempsey.

5) In the past, U.S. EPA had acknowledged the errors in filtering the residential well samples during the May and August 1992 sampling rounds for radiation. This issue has been well documented, with the latest correspondence on this subject being the April 30, 1998 letter, from Mr. del Rosario to Chris Borello. There had been two additional rounds of radiation sampling conducted subsequent to the May and August 1992 rounds. These subsequent sampling rounds correctly took unfiltered samples from the residential wells. Also, it is our recollection that OEPA had been taking unfiltered split samples on these same wells on all sampling rounds it was involved with since radiation sampling at IEL began. As you can see, there was a sufficient number of unfiltered residential well samples analyzed which were used by the regulatory agencies to come up with their conclusions.

We hope that the concerns you have raised have been satisfactorily explained in this response.

Sincerely yours,

Original signed by
Gail C. Ginsberg

David A. Ullrich
Acting Regional Administrator

cc: Tresha Tidwell, EPA-HQ
Mary Canavan

Appendix B

"An SAB Report: Review of EPA's Approach to Screening for Radioactive Waste Materials at a Superfund Site in Uniontown, Ohio"

U.S. Environmental Protection Agency, Science Advisory Board

September 1994

United States
Environmental
Protection Agency

Science Advisory Board
1400
Washington, DC

EPA-SAB-EC-94-010
September 1994

EPA

AN SAB REPORT: REVIEW OF EPA'S APPROACH TO SCREENING FOR RADIOACTIVE WASTE MATERIALS AT A SUPERFUND SITE IN UNIONTOWN, OHIO

PREPARED BY THE *ad hoc* INDUSTRIAL EXCESS LANDFILL PANEL OF THE SCIENCE ADVISORY BOARD

1. EXECUTIVE SUMMARY

The *ad hoc* Industrial Excess Landfill (IEL) Panel of the Science Advisory Board (SAB) has reviewed issues[1] related to the Agency's approach to screening for radioactive waste materials, using the IEL Superfund site in Uniontown, Ohio as a test case. Even though a specific site was investigated, the *ad hoc* Panel was asked to respond to a number of questions which addressed concerns that were applicable to Superfund sites in general. The Panel held three public meetings on July 20-21, 1993 (in Akron, Ohio), September 21-22, 1993 (in Washington, DC) and December 14, 1993 (in Uniontown, Ohio).

The Charge to the Panel asked: a) For screening purposes, what types of temporal and spatial sampling and analyses are sufficient to test a hypothesis that radioactive contamination is present? b) What radiological parameters, e.g., gross alpha plus alpha spectrometry, gross beta, gamma spectrometry, tritium, and carbon-14, are sufficient to determine the possible existence/extent of potential sub-surface radiological contamination? Are the methods employed by EPA for analysis of radioactive contamination adequate and appropriate for analyses of samples from hazardous waste sites? c) There are generic guidelines for sampling and analytic methods and chain of custody protocols to ensure that cross contamination or tampering with samples does not occur when dealing with radioactive contaminants. If appropriate, these guidelines may be modified on a site-specific basis depending on the characteristics of the site in question. What modifications are scientifically justified while still assuring accurate, precise and valid data? d) What factors need to be considered in the development and application of data validation criteria for evaluation of radioactive contaminants at hazardous waste sites? e) What practices and organizational changes could lead to improved credibility for the U.S. EPA and constructive public participation at hazardous waste sites with potential radioactive contamination?

The Panel has responded to its Charge as well as addressed other issues it felt warranted further attention. It should be noted that many of the Panel's conclusions and recommendations concerning issues such as sampling protocols, laboratory selection, data validation and verification, chain of custody, and risk communication should be taken broadly to apply to EPA's actions concerning Superfund sites in

---

[1] For a partial listing of the review materials available for the *ad hoc* Panel's review, please refer to Appendix A. This includes materials provided by the US EPA as part of the formal review process, as well as relevant listings from the Ohio EPA, which supplement the US EPA materials. Information on materials and comments from other sources, including other government agencies and interested parties is contained in the archives of the SAB.

general, and not just the Industrial Excess Landfill Superfund site in Uniontown, Ohio which is featured in this report.

1.1 Temporal and Spatial Sampling and Analyses

Principal methods for determining the presence of radioactive contamination at a site include ground surveys, ground water monitoring and soil coring studies. Ground surveys should be routinely conducted as an initial screening method, though they are only able to detect radiation near the immediate surface of a landfill. Furthermore, it is difficult or often infeasible to implement a ground survey at a site once it has become significantly overgrown with vegetation, as is the case at the IEL site. A groundwater monitoring program is effective at identifying the presence of soluble radioactive materials, since the goundwater provides as integrated measure of the materials in the landfill, but only if the resulting concentrations are high enough to be detected and are distinguishable from background concentrations in the area. Core sampling is more effective at identifying small quantities of immobile wastes, but only if the core borings encounter the wastes. If radioactive materials have been spread broadly over a wide horizontal area, then such an encounter is likely to occur with a limited and feasible number of core borings. However, if the waste is confined, then the probability of encounter is very low, unless an extraordinary (often infeasible) number of borings is made.

The scientific studies used by the Agency to support the selection of a ground water monitoring program, and not a soil core sampling program, are summarized in correspondence from EPA Region 5 Administrator Valdas Adamkus to Senator John Glenn (EPA, 1990[2]; EPA, 1991[3]). Each letter includes a technical report; the first demonstrating the infeasibility of the core monitoring program, the second supporting the adequacy of ground water monitoring. Both of these reports include technical flaws and provide no clear evidence that ground water monitoring is more sensitive in detecting the presence of radioactive material in the landfill than would be a soil core sampling program. However, the ground water monitoring program serves the additional purpose of protecting public health by allowing for corrective action, should radioactivity later be found to leak into the ground water. A groundwater monitoring program is thus an effective and appropriate method for determining both the

[2] EPA, 1990. Letter from EPA Region 5 Administrator Valdus Adamkus to Senator John Glenn, transmitting EPA's justification for not characterizing the waste material by soil core sampling with analysis for radionuclides. December 18, 1990.

[3] EPA, 1991. Letter from EPA Region 5 Administrator Valdus Adamkus to Senator John Glenn, transmitting EPA's ground water modeling report which was used to estimate the concentration of three potential radioactive sources downgradient from the IEL landfill at selected periods. March 25, 1991.

presence and potential health implications of radioactive contamination at a site such as IEL.

An effective groundwater sampling program requires the use of a sufficient number of monitoring wells to detect multiple possible pathways from the landfill, and a adequate number of properly located background wells to describe the distribution of naturally occurring radiation at the site. The background wells must be located at sufficient distances upgradient from the site to ensure that they have not been influenced by leakage from the site. Given the radial pattern of groundwater flow at the site identified by USGS, and the uncertainty this creates in identifying upgradient vs. downgradient wells, the two current background well clusters at the IEL site are not adequate to reliably characterize the background condition. More background wells are needed at moderate and further distances from the landfill. In addition, the Agency should consider a special monitoring program during or following storm events at seepage faces near the landfill. This type of sampling program involves a proactive search for evidence of contamination where it is most likely to be found, and has been effective at locating wastes which are periodically mobilized at other sites.

Despite these problems, we believe that EPA has looked hard for signs of radioactive contamination and has not found clear evidence to support a claim of past radioactive dumping. That does not imply that such dumping did not occur, only that presently there is little or no evidence for it. We see no basis for substantial additional radiation testing at the IEL site; however, it would be prudent after remediation to test a sample of the pump and treat water flow for radiation at least each calendar quarter until the successive quarterly samples have produced a constant level of near-basal gross alpha and beta activity.

With the recommendations presented above and additional recommendations discussed later concerning sampling methodology to provide a full accounting of both particulate and dissolved radiation, the current groundwater monitoring program is deemed adequate to indicate the presence of radioactive contamination at IEL and provide future protection for public health. However, should the Agency decide to consider a soil coring program, it should be recognized that it will likely be effective only for determining the presence of contamination which is widely spread over a significant horizontal area. Such a program should thus be limited to this particular objective, and be very limited in scope.

1.2 Radiological Parameters and Analytical Methods

The set of radiological parameters identified by EPA (gross alpha, alpha spectrometry, gross beta, gamma spectrometry, tritium, and carbon-14) is appropriate and sufficient for screening surveys to determine the possible existence and/or extent of potential sub-surface radiological contamination. If there is concern about possible radiological contamination at a particular site, then all available information should be reviewed (e.g., site characterization) to determine whether specific radionuclides might reasonably be expected at the site. Obviously, if it were known (or there were adequate reason to suspect) that specific radionuclides have been disposed of at the site, analyses for those contaminants should be conducted.

The analytical methods identified by EPA for radionuclide analyses at hazardous waste sites are time-tested and appropriate. Some of the documentation on procedures presented to the *ad hoc* Panel, however, is several years old and sometimes does not reflect recent advances. Therefore, we recommend that EPA remain cognizant of, and responsive to, advances in radiochemical procedures and analytical technology as they may apply to the characterization of hazardous waste sites for radiochemical materials.

1.3 Guidelines for Sampling

Guidelines for sampling and analytic methods and chain of custody protocols may be modified on a site-specific basis depending on the characteristics of the site in question. Very early in the characterization of a Superfund site we recommend that surface monitoring be undertaken using a survey monitor. Even though a surface survey likely will not detect any radioactive material at depths greater than several inches (depending on the amount of radionuclide present and the characteristics of radiation emitted), it will provide a helpful record of the pre-remediation state. During the remedial investigation one round of gross alpha and gross beta activity in the monitoring wells at the time the wells are investigated for other constituents would serve to establish whether special consideration should be given to radioactive deposits. The drinking water protocol as used at IEL, without separate determination of the activity in suspended solids, should suffice for this first determination. The cores collected at the time of the development of monitoring wells should be subjected to a simple radiological survey (with a Geiger-Mueller counter), and the results should be made a part of the remedial investigation record. If pump-and-treat is implemented at a site for non-radioactive clean-up and radioactive contamination is suspected, monitoring of the pump and treat flows for radioactivity for some period of time would be a necessary addition to any remedial plan. Such monitoring could reasonably be restricted to gross alpha and beta analysis.

1.4 Data Validation Criteria

The goal of any quality-oriented measurement program is to establish credibility and to maintain the quality of results within established limits of acceptance. A good laboratory that provides analytical services of high integrity will gain customer and public confidence. Meaningful and reliable results generated by the laboratory will also be legally defensible in a court of law. In order to achieve the goal of obtaining quality data, verification and validation must be carried out for the sample collection, analysis, and measurement processes.

Verification exercises should insure that: a) all contractual agreements, as outlined in the "Statement of Work" are in compliance for a given project; b) a pre-award audit of the laboratory is done by a team of experts before a contract is initiated; c) the lab is consistently performing well by submitting to the lab blind samples with known quantities of spikes disguised as real samples; d) the laboratory providing radiochemical analysis services must use agreed-upon and approved Standard Operating Procedures (SOPs), including software that is verified, validated and documented for approved instruments; and e) the equipment calibrations are performed using National Institute of Standards and Technology (NIST) traceable reference radionuclide standards.

Validation exercises include: a) reviewing the results and data from planning stages through sample collection, logging in, receiving, sample preparation, analysis, radiation measurements, calculation of results with associated propagated errors, and documentation; b) reviewing results of a given batch of samples along with quality control samples (Quality Control (QC) spiked samples, blanks, duplicates, blinds, etc.) for contractual requirements and technical correctness to validate the results; c) insuring that documentation is available if corrections are made and qualifiers added to the data (the same for rejected results); and d) reviewing all data to ensure that the data are of the level of accuracy and precision required, defensible, and complete.

1.5 Risk Communication

Good risk communication practices are vital to effective Superfund site management. Broadly construed, such practices entail: a) establishing an organizational structure that enables all stakeholders to inform, be informed and observe the risk assessment and management process; b) establishing some shared understanding of the goal of the risk assessment and management process; c) recognizing and respecting differences in language and searching for a common understanding of the site characterization; d) clearly specifying and agreeing on who has the authority and responsibility to make final decisions; and e) designating and agreeing on how differences will be arbitrated should that be necessary.

At the IEL site, both disagreements about prior knowledge and expectations about the site and disagreements about how to interpret new information have contributed to conflicting judgments about risk, and consequent differences in opinions between various stakeholders and EPA about appropriate management of the site. Conflicts are likely to continue until the public and the U.S. EPA find some common ground.

Invalidation and non-release of data from the first round of IEL sampling and the subsequent growth of suspicion and distrust provides an important object lesson. Data, once collected, should not be withheld. Even when results must be weighted with qualifying statements or even totally discounted, it is ultimately wise to release them. Obviously, appropriate qualifiers should accompany the data, just as the uncertainty terms should accompany data from radionuclide analyses. However, even with qualifiers, misuse or misinterpretation of the results should be anticipated. Nonetheless, the use of unreliable data is a less serious problem than the overall loss of credibility that results from apparent data suppression. This conclusion for the IEL experience is borne out by the much larger experience relating to radioactive discharges at sites operated by or for the Department of Energy (DOE).

1.6 Radioactive Materials at the IEL Site

Although not part of the stated charge to the Panel, it is clear that one of the important issues which the *ad hoc* Panel needed to address is the possibility of radioactive contaminants at the Industrial Excess Landfill. Historical evidence for such presence is limited to anecdotal reports of "midnight dumping" at the site by vehicles alleged to have been marked with radiation symbols. Disposal records and a search of the records of the identified landfill users have not indicated the probability of disposal of radioactive materials. In addition, the available analytical data do not indicate that radioactive contamination is present at the IEL site as a result of disposal at the site. While there are a small number of analytical values that are unexpectedly high relative to the associated uncertainty estimates, the occurrence of such high values follows a pattern that appears more characteristic of analytical errors or accidental contamination in the laboratory than of a positive identification of the occurrence of radioactivity at a field site.

While significant evidence of contamination is not found in the current data, neither is it possible from these data to preclude the possibility that some radioactive contamination is present. Indeed, it is not now (and never will be) possible to unequivocally establish the absence of contamination. The current groundwater monitoring, with the recommended modifications of including more background wells, full accounting of dissolved and particulate phase radioactivity, and a proactive wet-weather survey, is adequate for the intended radioactive screening and protection of public health. Should this program conclude that there is no evidence of contamination, ongoing radiological screening of area drinking water and groundwaters pumped as part of the site remediation plan would then be adequate over the longer term. If the Agency elects to supplement the program with additional soil core sampling, it should be of limited scope, aimed only at detecting the presence of a widely dispersed waste. While some screening effort to detect radioactive contamination should continue, the current lack of evidence of contamination is such that no further delay in planned remediation is warranted. This additional monitoring should thus be conducted in concert with planned efforts to remediate the confirmed chemical hazards present at the site.

— Agency should limit core sampling that is concentrated in an area!

Some screening should continue (rads) but go ahead w/ remediation!

2. INTRODUCTION

2.1 Charge to the Panel

The Agency's Office of Solid Waste and Emergency Response (OSWER) requested that the Science Advisory Board (SAB) conduct a review of issues related to screening criteria and procedures for radioactive waste materials at Superfund sites, using the Industrial Excess Landfill Superfund Site in Uniontown Ohio as a test case. The SAB established an *ad hoc* panel to conduct this review. In general, at hazardous waste sites where radioactive contamination is suspected, EPA first performs a screening round of sampling. If the screening round data indicate that there is a problem, the Agency performs more extensive investigations. If the screening round data indicate no radiological contamination, further radiological testing is eliminated. What kind of sampling and analytic protocol is adequate to determine the presence/extent of soil and groundwater contamination at a site which may incorporate radioactive wastes? The specific items of the Charge were:

a) For screening purposes, what types of temporal and spatial sampling and analyses are sufficient to test a hypothesis that radioactive contamination is present?

b) What radiological parameters, e.g., gross alpha plus alpha spectrometry, gross beta, gamma spectrometry, tritium, and carbon-14, are sufficient to determine the possible existence/extent of potential sub-surface radiological contamination? Are the methods employed by EPA for analysis of radioactive contamination adequate and appropriate for analyses of samples from hazardous waste sites?

c) There are generic guidelines for sampling and analytic methods and chain of custody protocols to ensure that cross contamination or tampering with samples does not occur when dealing with radioactive contaminants. If appropriate, these guidelines may be modified on a site-specific basis depending on the characteristics of the site in question. What modifications are scientifically justified while still assuring accurate, precise and valid data?

d) What factors need to be considered in the development and application of data validation criteria for evaluation of radioactive contaminants at hazardous waste sites?

e) What practices and organizational changes could lead to improved credibility for the U.S. EPA and constructive public participation at hazardous waste sites with potential radioactive contamination?

To address this charge, the *ad hoc* Panel reviewed a specific site where sub-surface radioactive contamination could be present, the Industrial Excess Landfill (IEL) Superfund site in Uniontown, Ohio. Citizens residing near the IEL site were concerned that radioactive wastes had been illegally disposed at the site. Administrator Reilly tasked Mr. Thomas Grumbly, President of Clean Sites, Inc., to perform an independent evaluation of the Agency's management of the IEL site, with emphasis on the radiation sampling being conducted. His report (Grumbly, 1992)[4] to the Administrator contained several recommendations. With respect to radiation sampling, Grumbly recommended that the Agency request that the Science Advisory Board (SAB) perform specific tasks to resolve data analysis issues at the IEL site. Although these issues arose from this one site, they are of concern to other Superfund sites at which radioactive contamination is suspected and could be used to develop generic guidelines for dealing with such sites. Past, present, and anticipated activities and data collected at this location were used as source materials for the *ad hoc* Panel in its deliberations.

2.2 Panel Review Process

On July 27, 1992, the Science Advisory Board was asked by Richard Guimond, Deputy Assistant Administrator for the Agency's Office of Solid Waste and Emergency Response (OSWER) to consider a review of radiological sampling and data validation issues at Superfund sites where contamination by radiological wastes is suspected. To do this, Mr. Guimond asked that the Board conduct a site-specific review using the Industrial Excess Landfill (IEL) Superfund Site in Uniontown, Ohio. After discussion, the Board agreed to take on this site-specific review as a test case to determine if such reviews were a good use of the Board's resources and if such a review could provide useful input to the Agency's management of Superfund sites in general. The Board formed an *ad hoc* subcommittee to perform this review, using several SAB Members and Consultants with pertinent expertise.

The Panel held three public meetings. The first was held in Akron, Ohio on July 20-21, 1993. This was a two-day meeting with an evening session on July 20th devoted to public comment. Although public comment at SAB meetings is normally

---

[4] *Report to the Administrator United States Environmental Protection Agency - Concerning the Industrial Excess Landfill Superfund Site, Uniontown, Ohio.* Thomas P. Grumbly, President, Clean Sites, Inc. March 4, 1992. 38 p.

arranged in advance of the meeting, this public comment period was designed (and advertised) to permit walk-in commentors. A total of four members of the public provided comments. The bulk of the meeting was devoted to presentations by representatives of the US Environmental Protection Agency (USEPA), Ohio Environmental Protection Agency (Ohio EPA) and the Agency for Toxic Substances and Disease Registry (ATSDR) concerning site background and procedures used.

The second meeting was held in Washington, DC on September 21-22, 1993. The primary purpose of this meeting was to lay out the volumes of material (data, procedural documents, correspondence, comments, etc) concerning the IEL site so that the Panel members could review them publicly and obtain guidance from USEPA and Ohio EPA Staff concerning the materials. The public was also invited to participate and did so actively. Following this meeting, Panelists were provided with copies of those documents they identified as requiring further study. The Chairman assigned questions from the Charge to each panelist for discussion at the next meeting.

The third meeting was held on December 14, 1993 in Uniontown, Ohio. This meeting was designed to obtain additional public comment and to discuss responses to the questions in the Charge.

In January 1994, a working paper describing the responses to the Charge was developed by the Chairman and SAB Staff based on comments provided by the Panelists. A brief discussion of the progress of the project was presented to the SAB Executive Committee at its public meeting on January 27, 1994. A telephone conference link at that meeting was provided for the USEPA Region V, Ohio EPA and the Concerned Citizens of Lake Township (CCLT), a local citizens group from the Uniontown, Ohio area. The Executive Committee reviewed the final draft report of the *ad hoc* Panel subsequently through its vetting process (that is, by appointing a subset of its members to review and approve, on behalf of the Executive Committee, any subsequent edits to the final Panel report).

3. RESPONSE TO THE CHARGE TO THE *ad hoc* PANEL

3.1 Temporal and Spatial Sampling and Analyses

~~Charge~~ Question a): For screening purposes, what types of temporal and spatial sampling and analyses are sufficient to test a hypothesis that radioactive contamination is present?

3.1.1 General Findings

There are three principal types of studies that can be conducted to test for the presence of radioactive contamination at landfills: a) ground surveys; b) ground water monitoring; and c) soil coring studies.

a) Ground Surveys - Ground surveys involve a walkover of the site with simple monitoring equipment, such as a scintillation or a Geiger-Mueller counter, to check for gross radiation emissions. This type of survey is only effective for detecting significant radiation sources near the surface, typically in the top several inches (depending on the amount of radionuclide present and the characteristics of radiation emitted). It is likely to miss contamination which is buried at greater depths. Despite this high "false negative" characteristic of the ground survey, it should be conducted at all suspect sites since it is relatively quick and inexpensive, and can identify major, near surface contamination. Thus, while a negative ground survey (i.e., one that detects no radiation) does not preclude the presence of radioactive material at the site, it is a worthwhile first step in any investigation.

b) Ground Water Monitoring - Ground water monitoring involves sampling subsurface waters at or near the site to test for the presence of gross radiation and/or specific radionuclides. Therefore it can be used to assess the presence of radioactive contamination in a landfill, so long as this material is leaching into the ground water at the site and the resulting concentrations in monitoring wells are high enough to be distinguished from background levels. Ground water monitoring is particularly appropriate for testing whether there has been any off-site migration of radioactive material from a landfill that could lead to exposure of the surrounding population.

Two approaches can be taken to sampling ground water for the presence of radionuclides, involving different temporal and spatial strategies. The first is the standard approach for ground water monitoring at Superfund sites, whereby a number of fixed monitoring wells are placed at locations in the aquifer, upgradient and downgradient of the site. Wells are sampled on a periodic basis, typically once every three months. This type of routine ground water monitoring program is designed to test for long-term, major impacts on the aquifer. The second approach involves specific studies designed to search for possible radioactive contamination when and where it is more likely to occur. For instance, monitoring during, or immediately following, storm events could detect intermittent contamination as it is mobilized and transported. These studies can focus on particular locations near the site where surface or subsurface water is present that has recently traveled through the landfill such as springs or seepage points along slopes down-gradient from the landfill. These types of special study have not normally been conducted at Superfund sites, but have been proven effective in identifying sources of contamination at sites with known radioactive waste problems.

c) Soil Corings - The third general approach for identification of radioactive contamination at landfills involves soil corings. Borings are drilled into the landfill on a predetermined grid or using a directed search strategy. The soil corings and/or landfill gases in the borehole are tested for gross radiation and, if necessary, specific radionuclides. Soil coring studies are directed at determining whether radioactive materials are present in the landfill, rather than whether off-site migration has occurred. If radioactive materials are present in small, confined volumes, it is difficult to detect their presence unless a dense, often prohibitively expensive search grid is used. If however, radioactive materials are present in a more diffuse (e.g., horizontally spread) pattern, then relatively rapid and efficient detection can be expected. A negative result in a soil coring study can thus be used to preclude the presence of such a diffuse, wide spread waste, but not the presence of a small, confined waste.

3.1.2 Adequacy of Information to Characterize Background Concentrations at the IEL Site

Prior to considering the adequacy of the information used to establish background concentrations of radionuclides and indicators of radioactivity in ground water for comparison with measured values at IEL, it is important to recognize the two principal, but very different reasons for making such a comparison. The first is to determine whether the measured levels of radioactivity at IEL are significantly different from those found at other locations, and as a result of this difference, pose a public health concern. The second is to determine whether there is any evidence that leakage from the site has impacted the local ground water, resulting in concentrations that are measurably higher than would have been present had the site never existed.

The principal information presented by the Agency to establish ground water background concentrations include data from:[5]

a) The USGS Regional Aquifer System Analysis (RASA) database, which includes a number of samples from northern Ohio.

b) The US Geological Survey's (USGS) intensive studies of ground water in Lucas, Sandusky, and Wood counties, located in northwestern/ northcentral Ohio; and

c) The US EPA National Inorganics and Radionuclides Survey (NIRS), which addresses radionuclides in water supplies taken from ground water, including 27 samples from Ohio;

d) The US EPA Environmental Radiation Ambient Monitoring System (ERAMS), which represents data from finished drinking water systems, including five sampling stations in Ohio;

Since none of these datasets involve samples from the groundwater from near the IEL site, they can be used as part of a public health evaluation, but not for rigorously determining whether leakage from the IEL site has affected the local aquifer. To provide an indication of whether ground water monitoring wells at IEL are detecting levels of radioactivity significantly higher than would have been measured had the landfill not existed, background data are needed that can serve as an estimate of, or surrogate for, this "no-landfill" condition. This can only be accomplished using data sampled from the local ground water aquifer, close enough to ensure that the same geologic formation is captured, with similar soil and rock types contributing to the natural radioactivity, yet far enough away to ensure that the background wells are not themselves impacted by leakage from the site. This is not an easy task, and multiple wells are required to capture and determine the magnitude of the natural variability from one location to another, and to allow an assessment of whether levels in one or more of the background wells are too dissimilar to those in the rest of the assumed background set to safely ascribe this difference to natural variation. If so, consideration can then be given to the decision to remove the suspected wells from the background set, and initiate further studies to determine

---

[5] See items 18.b), 18.c), 18.d) and 18.e) of the USEPA listing in Appendix A.

whether leakage from the site may have in fact reached these locations. To provide this type of information and flexibility for sequential evaluation and reassessment, at least four or five (though preferably on the order of 5-10) background wells are needed at intermediate and varying distances from the site. To the extent that the regional ground water flow is adequately characterized, the large majority of the background wells should be located upgradient of the site (a few background wells may be located downgradient, though at significant distances from the site).

The ground water monitoring plan for the IEL site currently includes two well clusters designated as background monitoring wells (MW): MW20, immediately east of the Metzger Ditch boundary, screened at shallow, intermediate, and deep depths; and MW12, approximately 1000 feet north of the northeast corner of the landfill, screened at intermediate and deep depths. Even if the ground water flow patterns at the landfill were simple and predominantly from east to west, these two wells, alone, would not be adequate to characterize the mean and variability of background radionuclide concentrations for estimating the "no-landfill" condition, based on the criteria given above. Given the complex, partly radial nature of ground water flow at the IEL site, as described in the recent USGS report (USGS, 1993)[6], the two wells are clearly inadequate for characterizing background[7]. Data from MW20 are particularly suspect, given the site flow patterns and immediate proximity of the well to the site[8]. Data from MW12 may be appropriate for inclusion in the background dataset, but this could only be determined through collection of data at a number of other offsite wells which are located at different orientations and distances relative to the site. A reliable, scientifically credible characterization of the mean and variability of the background radionuclide conditions at the site, for comparison with data collected within and immediately adjacent to the site, will require such a larger dataset. It may be possible to gather such data from existing residential wells.

Currently lacking an adequate background dataset at the site for rigorous comparison with the monitoring well samples, the previously cited datasets can be used for a preliminary evaluation and exploration of public health concerns. ERAMS

---

[6] United States Geological Survey (USGS), Water Resources Division, 975 West Third Street, Columbus, OH 43212-3192. Report to Ms. Linda Kern, Remedial Project Manager, Region 5, USEPA. *Review of water-level data and interpretations by PRC Environmental Management, Inc., in two reports: (1) Draft Ground Water Modeling Report, Industrial Excess Landfill Site, Uniontown, Ohio (U.S. EPA, 1992), and (2) Preliminary Remedial Design - Industrial Excess Landfill Site, Uniontown, Ohio, Draft Report, Volume I, Chapters 1-10 and Appendix A (U.S. EPA, 1993).* Document dated August 13, 1993.

[7] Due to site constraints which prevented installation of additional background monitoring wells, MW 12 and MW20 were supplemented with two irrigation wells east of the IEL landfill and several residential wells some distance from the site.

[8] The usability of the MW20 cluster and other off-site wells for both chemical and radiochemical background data will be discussed by the Technical Information Committee and decided based on the conclusions in USGS (1993).

provides an extensive data base on radioactivity in drinking water. While some are near nuclear facilities, others are not. Comparing the radioactivity levels in the residential wells around the IEL site to the levels observed in ERAMS, there is no evidence of unusual concentrations in the residential wells. There are occasional slightly elevated readings, in monitoring wells, most often in the gross beta counts at ~~shallow~~ depths. However, the average of all gross beta counts at shallow monitoring wells is 10 pCi/L, which is not out of range relative to the ERAMS data. In comparing ERAMS data to IEL data, it is important to note that the ERAMS figures are averages of data over four quarters. Therefore, they are less likely to show occasional high values than the measurements on single samples such as available at IEL. One well, #14S, does have somewhat elevated beta counts during all four rounds, although the observed levels are not at all alarming as the counts are not high relative to possible background levels.

The information provided by EPA does not address radioactivity in suspended sediment, so it is more difficult to address whether or not the levels observed in the filtrate are within background levels. There is one high reading at monitoring well #4S during the May 1992 round of measurements. The gross beta reading is 358 pCi/sample or a 157 pCi/gram, which in either case makes it the highest observed value. With the information at hand, one cannot say whether or not these values should be considered unusual. Certainly they are not evidence of substantial radioactive contamination (i.e., a consistent pattern, continuous in time and space, of concentrations that are well (>2 standard deviations) above the detection limit or regional background, whichever is higher).

There was one extremely high tritium reading of 1×10^6 pCi/L reported once at a residential well, which is 50 times the current Federal drinking water standard.[9] This reading, if correct, could not plausibly be due to background radiation. However, repeated retesting of the water from this well has failed to produce any high tritium levels, which suggests that this anomalous measurement was faulty.

While no other tritium measurements were above the drinking water standard, there were several other measurements that were somewhat elevated, and while not direct evidence for harmful levels of radiation, could be viewed as evidence of past radioactive contamination. When considering whether the occasional elevated measurements provide evidence of radioactive dumping, it is essential to consider how often such measurements would be obtained if there had been no radioactive dumping at the site. Many hundreds of radiation measurements have been made on IEL water,

[9] The current Federal Drinking Water Standard for tritium is 20,000 pCi/L.

and considering the difficulties in measuring radiation accurately, the observed levels do not support the contention of past dumping of radioactive waste.

We offer several suggestions in future Superfund site characterization activities. The Panel heard that there is no mechanism for lessons learned at one site to be widely disseminated to other sites. The obvious outcome will be a repetition of errors whether in approach or interpretation. With the current trend toward increased public participation in decision-making on environmental management issues, agencies such as EPA need to learn from errors and incorporate those lessons into future efforts.

It is the Panel's feeling that site characterization guidance by EPA should be more process oriented and less prescriptive. A sense of reliance on procedures and prescriptions has pervaded the presentations to the IEL panel. Site characterization planning and conduct should be based on iterative examinations of the site dynamics. Hydrogeology at the IEL site does not appear to be especially complex.

Eastward flow from the site toward Metzger's Ditch should be expected at some elevation from even the simplest examination. A topographic map would suggest that any surface flow that occurred would be eastward. Interflow (lateral flow in the unsaturated zone during periods of high infiltration) could be presumed to follow the surface contour. An eastward slope to the water table shown by USGS (1993) implies some eastward flow even in the saturated zone. Characterization ought to address the lateral extent of such flow (e.g., does it terminate at Metzger's Ditch?) and the depth to which it occurs. Screening for the presence of radioactive contaminants should have included sampling of seeps along the west bank of Metzger's Ditch adjacent to the IEL site.

3.1.3 Adequacy of Methods used to Evaluate the Effectiveness of Possible Core Sampling and Ground Water Monitoring Programs

The methodology used by the Agency to assess the potential of a core sampling program to detect radioactive contamination was evaluated by reviewing documents which were attached to letters sent to Senator John Glenn by EPA Region 5 Administrator Valdas Adamkus (EPA, 1990; EPA, 1991).

One of these documents (EPA, 1990) examines the probability of detecting a 10-cubic yard waste source as a function of the number of corings. In this exercise, it is assumed that the probability that each core detects the radioactive waste is equal to this 10-cubic yards divided by the volume of the landfill. The detection probability for many corings is then computed from the binomial probability, assuming each coring is independent. The coring program is thus assumed to be random, and completely nonsequential. The resulting calculations indicated only a 0.22 probability of detection with 50,000 boreholes. The technical assumptions of this calculation are wholly inappropriate for a real core sampling program, and the estimate is thus flawed. The problem with this calculation is the assumption that the ratio of volume of contaminated waste to volume of landfill gives the probability of a single core containing radioactive waste. The problem with this assumption is that it attempts to calculate this probability without making any assumptions about the geometry of the waste. It is easy to see that such an approach is doomed to failure by comparing two possible configurations of a given volume of waste. In the first, suppose the waste is spread out over a thin horizontal layer. In this case, it would be relatively easy to detect it with vertical boreholes. On the other hand, if the same volume of waste is located within a narrow vertical shaft, then it is obviously much harder to detect. For example, suppose there is a single source that is literally a cube with volume 10-cubic yards and one face parallel to the ground. Then a triangular lattice of boreholes spaced 2.15 yards apart will necessarily intersect the source. To cover 30 acres in this manner requires about 36,000 boreholes. Suppose, however, that this same 10-cubic yards of waste is in the shape of a box with vertical dimension 0.1 yards and other dimensions of 10 yards. Then a triangular grid spaced 10 yards apart will necessarily intersect the waste. Such a grid requires about 1670 cores. When the source, if one exists, is assumed to be in a particular section of the landfill, then the number of holes required goes down proportionately.

On the other hand, the calculations reported on in the middle of page 2 of EPA (1990) are much more appropriate. However, even these seem somewhat pessimistic. Consider detecting a single unshielded source. If cores are put on a triangular lattice, which is the most efficient possible, then to ensure that every point in a 30-acre plot is within 4 feet of the center of a borehole requires about 31,000 holes. Since an unshielded source must have some physical extent and the borehole itself has a positive width, using the 4 foot distance is reasonable. Even so, the cost of 31,000 boreholes, in dollars, time and possible exposure to toxic chemicals of field workers and nearby residents, would be unacceptably high compared with the alternative strategy of ground water surveillance.

It is obvious that the ability to detect a radiation source by coring depends critically on the horizontal extent of the source. It is true that a single shielded source of little horizontal extent would be difficult to find even if one had a general idea as to where such a source might be. However, even a moderate amount of horizontal spreading of the source makes the detection problem much easier.

A second report on ground water monitoring (EPA, 1991) is more detailed and complex, using ground water models to evaluate the likelihood of plume detection. On the basis of the studies presented in this reference, EPA concluded that, "U.S. EPA is confident that the extensive groundwater and soil gas testing that is planned at IEL will identify any contamination that may exist at levels of concern." However, the studies show no such thing. What they show is that under some range of assumptions about the nature of the contamination and using a simple model for the hydrogeology of the site, that the exposure of any one individual will be very small. They also show that under these same assumptions, the chances of the network of wells detecting radiation from radioactive waste at the site may not be large. It certainly does not follow that the network of wells would detect the radiation with high probability if enough waste had been dumped to cause a threat to human health. This may in fact be true, but the analyses presented, even if correct, are only indirectly related to this question of interest.

The reports themselves have serious problems. In particular, Section 5 of the follow-up Final Report on the Probability of Detection of Hypothetical Radiochemical Contamination of Groundwater at the Industrial Excess Landfill (PRC, 1991)[10] is in error. Specifically, the assumption that the event of one well overlapping the plume being independent of the other wells overlapping the plume is incorrect. It is easy to visualize this by looking at Figure 2 of that document and noting that if the plume overlaps MW-18 it cannot overlap MW-6. Moreover, it is straightforward to do the correct calculation that takes into account this lack of independence by directly calculating the fraction of the time the plume overlaps at least one monitoring well. The effect of this error is to give a lower probability of the wells detecting the radiation than would the correct calculation.

Another problem with this study (PRC, 1991) is that the probabilities are based on what might happen at a single point in time, rather than what would happen over some schedule of monitoring times. The effect of using a more realistic monitoring schedule is unclear. If there are multiple releases or if the interval between monitoring times is small relative to the movement of the plume, the model used in EPA (1991) could underestimate the probability of detection. Again, it would have been straight-forward to do a simulation study that would have taken into account possible monitoring schedules.

---

[10] PRC, 1991. *Final Report on the Probability of Detection of Hypothetical Radiochemical Contamination of Groundwater at the Industrial Excess Landfill - Uniontown, Ohio.* March 11, 1991. Prepared for the U.S. EPA by PRC. Submitted as an attachment to EPA (1991).

The part of this study (PRC, 1991) that attempts to model total exposure of an individual is hard to judge because of its critical dependence on assumptions about the nature and amount of radioactive waste. However, unless the estimates of possible levels of radioactive waste at the site are much too low, it is hard to see how the simulated exposures could be off by more than an order of magnitude or so. One possible problem is that for a highly mobile radionuclide, a slow and steady release could lead to a considerably higher lifetime exposure than an instantaneous large release. However, since the simulated exposures in excess of background are small in comparison to the background exposures, the threat to human health is likely to be negligible if levels of contamination are as low as presumed in this study. The Panel recognizes that both of these reports are based on a large number of assumptions that have not been validated for the IEL site.

In summary, the studies EPA (EPA, 1990; EPA, 1991) carried out to support ground water monitoring rather than coring are poorly done and should not be used as models for future studies. Nevertheless, for a coring program to have a substantial probability of detecting radioactive contamination not found by ground water monitoring, it is necessary that the radioactive waste has considerable horizontal extent, but does not contaminate the ground water during the times ground water monitoring is done.

3.2 Radiological Parameters

Charge Question b): What radiological parameters, e.g., gross alpha plus alpha spectrometry, gross beta, gamma spectrometry, tritium, and carbon-14, are sufficient to determine the possible existence/extent of potential sub-surface radiological contamination? Are the methods employed by EPA for analysis of radioactive contamination adequate and appropriate for analyses of samples from hazardous waste sites?

The set of radiological parameters identified in the charge is appropriate and sufficient for screening surveys. In addition, all available information should be reviewed to determine if specific radionuclides might reasonably be expected at a site. Obviously, if it is known (or there is adequate reason to suspect) that particular radionuclides have been disposed of at a site, analyses for those contaminants should be conducted. In cases such as IEL where there was no indication of the presence of specific radionuclides, the use of the set of screening analyses listed in the charge was appropriate.

3.2.1 Laboratory Analytical Methods

a) Gross alpha analyses are relatively rapid and low-cost. They are semi-quantitative methods that will detect unusual levels of high atomic weight radionuclides from both naturally occurring and anthropogenic sources. Principal naturally occurring nuclides are the isotopes of uranium and thorium, and radium-226. The most commonly encountered anthropogenic alpha emitters in the environment are isotopes of plutonium, Pu-239 and Pu-240 from atmospheric weapons tests and Pu-238 from reentry and atmospheric burnup of an isotopic power source. Americium-241 is also present in global fallout as a product of plutonium-241 decay. All of the alpha emitters identified above occur in the global environment so that there is a "background" level to be expected.

b) Alpha spectrometric analyses to determine which specific alpha emitters are present are both quantitative and labor-intensive, hence expensive. Such analyses are poor screening tools but form a very important adjunct to the gross alpha analyses. Where gross alpha results exceed a previously selected threshold, alpha spectrometry should be applied. Identification of specific alpha emitters is important a) to assist in the recognition of excess contamination and its sources; and b) for radiological risk assessment.

c) Gross beta analyses are also relatively rapid and low-cost, semi-quantitative methods that will assist in detecting the presence of a large number of radionuclides that are not found by gross alpha measurements. Common naturally occurring beta emitters include radium-228 and potassium-40. Anthropogenic beta-emitters in the environment are the fission products from atmospheric weapons tests and include cesium-137, strontium-90, and others. Where gross beta results exceed a previously selected threshold, an evaluation should be carried out to determine the principal contributors to the high value. Results of gamma-ray spectrometry may identify the contributors (e.g. cesium-137) or specific radionuclide analyses may be required for beta-emitters that do not reveal themselves by emitting gamma-rays (e.g. strontium-90).

d) Gamma-ray spectrometry is a relatively low-cost quantitative method suitable for screening for a large number of radionuclides and can be applied to large-volume samples. Naturally occurring environmental radionuclides typically identified by gamma-ray spectrometry are potassium-40, members of the uranium and thorium decay series, and beryllium-7 produced in the atmosphere by cosmic rays. Anthropogenic gamma-emitters that are widespread are cesium-137 and cobalt-60. More rarely gamma spectrometry will detect cesium-134, iodine-131, manganese-54, and antimony-125. Computer-based data reduction methods in general use for gamma spectrometry, when applied to environmental samples, can result in a large number of tentative radionuclide identifications (false positives). Naturally occurring gamma emitters produce gamma rays at energies that may lead to these tentative identifications but analysts familiar with environmental samples can identify the interferences. Therefore, it is exceedingly important that an experienced analyst participate in the data verification and validation to ensure that proper qualifiers are affixed.

e) Tritium and Carbon-14 analyses are appropriate as screening methods because tritium and carbon-14 are relatively common radionuclides and none of the preceding tests will indicate their presence. Each of them has a naturally occurring background level which has been significantly elevated by global fallout. Tritium and carbon-14 are also candidates for screening gas-phase samples since they may be present in gaseous components such as water vapor, tritium gas, or organic compounds. In fact, gas-phase monitoring can be an extremely sensitive test for the presence of these nuclides.

3.2.2 Analytical Methods and Procedures

The analytical methods identified by EPA for radionuclide analyses at hazardous waste sites are time-tested and appropriate. Some of the documentation on procedures presented to the *ad hoc* Panel, however, is several years old and sometimes does not reflect recent advances. Therefore, we recommend that EPA remain cognizant of, and responsive to, advances in radiochemical procedures and analytical technology as they may apply to the characterization of hazardous waste sites for radiochemical materials. An interagency approach involving EPA, DOE, and possibly the Department of Defense (DOD) might be appropriate.

Radiochemical analyses, although potentially highly reliable and accurate, require painstaking attention and effort from the analyst. For such analyses to be reliable it is necessary that the analyst be trained and experienced not only with the procedures and instruments being used but also with the matrix types (soil, water, tissue) being analyzed. Experienced analysts are familiar with specific interference problems and can either avoid them or at least recognize and make qualifying notations.

Data reporting for radioactive components should include the propagated counting error terms identified either as 1-sigma or 2-sigma level of confidence. Good practice reporting also includes the minimum detectable activity (MDA) value for the nuclide and sample. Consideration of these confidence parameters is essential to any responsible interpretation of results and either reporting or interpretation that does not take the confidence estimates into account should be discounted as not credible.

3.2.3 Field Sampling and Analytical Methods

Sampling protocols and media need to be defined after the purpose for screening is clear. is essential that the goals of the screening be clearly established and agreed upon in the earliest stages of planning. Whether to filter water samples or not depends on the questions posed for the screening test. For example, filtered waters will provide the best estimate of transport of contaminants by water. If direct personnel exposure is of greater interest, unfiltered tap water is probably more appropriate to analyze. On the other hand, unfiltered water samples taken from unlined wells are likely to contain large volumes of suspended matter that does not represent either transport or personnel exposure. To detect the presence of contaminants that are very insoluble, such as thorium or plutonium isotopes, analyses of particulate phases are much more sensitive than analyses of filtered water.

If samples are to be filtered and analyses of the material that is filtered out are to be made, it is important to record the volume of water passed through the filter and to determine the dry weight of the collected solids. It should be assumed that investigators examining the data will want to be able to compute particle bound radionuclide concentrations both per unit volume of water filtered and per unit mass collected on the filter. Investigators must exercise caution to ensure that comparisons among samples are made on like samples, that is filtered water to filtered water, etc. The failure to record the volume of water passed through the filter and the dry weight of collected solids for filtered samples at the IEL site was such that a full accounting of the dissolved and particulate concentrations of radioactive constituents could not be made. This should be corrected in the future.

3.3 Guidelines for Sampling and Analytic Methods

Charge Question c): There are generic guidelines for sampling and analytic methods and chain of custody protocols to ensure that cross contamination or tampering with samples does not occur when dealing with radioactive contaminants. If appropriate, these guidelines may be modified on a site-specific basis depending on the characteristics of the site in question. What modifications are scientifically justified while still assuring accurate, precise and valid data?

3.3.1 Considerations for other Superfund Sites in the Future

The experience at the IEL site is an indication that the standard procedures used for Superfund sites in terms of site characterization are inadequate in the face of concerns of the surrounding community. With the hindsight of the IEL experience it is possible to suggest measures that could have dealt with situations where there is concern about possible radioactivity on site.

Very early in the characterization of a Superfund site it is recommended that a surface monitoring be undertaken using a survey monitor. At other sites (Love Canal) measurements were made at 10 meter or 20 meter centers, recorded in microrads/hour. For example, at Love Canal values between 6 and 40 microrads/hour were recorded, and a few soil samples exceeded background levels of cesium-137 levels of 30 pCi/gram. Even though a surface survey will not detect radioactive material at depths greater than a foot or so, it will provide a helpful record of the pre-remediation state.

During the remedial investigation one round of gross alpha and gross beta activity in the monitoring wells at the time the wells are investigated for other constituents would serve to establish whether special radioactive deposits exist. For this first determination, the drinking water protocol as used at IEL for the residential wells, without separate determination of the activity in suspended solids should suffice. The cores collected at the time of the development of monitoring wells should be subjected to a simple radiological survey; and the results should be made a part of the remedial investigation record. Such survey monitors are used whenever radioactive materials are used in a laboratory.

In the case of the Industrial Excess Landfill, much of the concern of the surrounding community has been focused on the possibility that unknown amounts of radioactive materials may have been deposited at some time during the active operation of the landfill. This concern has resulted in considerable efforts to characterize the landfill in terms of the levels of radioactivity on-site and in the immediate surroundings. Routine measurements were made of the levels of radioactivity in the boring cores of the monitoring wells to assure the radiological protection of the field personnel, and a number of rounds of samples of water at different depths in the monitoring wells were analyzed. Analyses were made for gross alpha and beta activity, as well as tritium and carbon-14 activity. Where higher activities were encountered the contributions by a number of specific isotopes were determined with alpha and gamma spectroscopy. The initial rounds of sampling and analysis suffered from imperfections in the chain of custody of the samples and questions about counting methodologies, and these imperfections led to the invalidation of the results from these initial rounds.

In retrospect it would have been desirable if the processes of contracting and validation had been better coordinated. The appropriate use of protocols designed specifically for drinking water characterization for the characterization of a hazardous waste site also has led to confusion. Once a breakdown in the chain of custody occurs it is often difficult to ascertain precisely where the breakdown occurred, and it becomes difficult to rely on the results of such a study. From the records of the early rounds of IEL testing it is not always possible to determine from which well and at what depth a sample was drawn. Based on our observations, it is extremely unlikely that samples from another site found their way into the analysis of the first rounds. Nevertheless, any unusual findings could not be interpreted with confidence, nor could they be compared with values in another round of sampling. It is also not possible to determine whether any unusual values were lost in the early rounds. The invalidation decision thus becomes necessary and inevitable when breakdowns in the chain of custody occur, and USEPA was correct in invalidating such rounds. It should be noted that although the first rounds could not be validated, the round that was available for review did not contain any readings that were so high as to give reasons for serious concern.[11]

3.4 Criteria for Data Validation

Charge Question d): What factors need to be considered in the development and application of data validation criteria for evaluation of radioactive contaminants at hazardous waste sites?

The goal of any quality-oriented measurement program is to establish credibility and to maintain the quality of results within established limits of acceptance. A good laboratory that provides services of high integrity will gain customer and public confidence. Meaningful and reliable results generated by the laboratory will also be legally defensible in a court of law. In order to achieve the goal of obtaining quality data, verification and validation must be carried out for the sample collection, analysis, and measurement processes.

---

[11] Only one complete round of invalid results were available for review (December 1990 data from Controls for Environmental Pollution). The only results that were available for review from the August 1990 round of invalidated data were the carbon-14 results. The other results of the August 1990 round were returned to the laboratory after the data was declared invalid by EPA.

3.4.1 Recommendations for Verification

a) The Agency shall verify that ALL contractual agreements, as outlined in the "Statement of Work" are in compliance for a given project. It is essential to verify that the Performance Evaluation (PE) samples for the radionuclides-of-interest for the desired matrices are performed by the vendor laboratory and that the reported results on the PE samples are well within the agreed upon limits of accuracy and precision.

b) A pre-award audit of the laboratory shall be done by a team of auditors (including a radiochemist and a Quality Control (QC) specialist) before a contract is initiated.

c) The Agency shall verify that the lab is consistently performing well by submitting to the lab blind samples with known quantities of spikes disguised as real samples unknown to the lab, and by reviewing the results on a periodic basis.

d) The laboratory providing radiochemical analysis services must use agreed-upon and approved Standard Operating Procedures (SOPs) . The lab must also use software that is verified and validated and documented for approved instruments. Calibrations of equipment are performed using National Institute of Standards and Technology (NIST) traceable reference radionuclide standards. The laboratory shall also meet the prescribed Minimum Detectable Activity (MDA) for each radionuclide.

3.4.2 Recommendations for Validation

a) Radiochemical analysis data are validated by reviewing the results from planning stages through sample collection, logging in, receiving, sample preparation, analysis, radiation measurements, calculation of results with associated propagated errors, and documentation.

b) Results of a given batch of samples should be reviewed along with quality control samples (QC spiked samples, blanks, duplicates, blinds, etc.) for contractual requirements and technical correctness to validate the results.

c) If corrections are made, add qualifiers to the data and document. If results are rejected, a statement of explanation must be included in the document as to why the results are rejected.

d) Finally, ALL data must be reviewed to ensure that the data are of the level of accuracy and precision required, defensible, and complete.

3.5 Communicating Risk

Charge Question e): What practices and organizational changes could lead to improved credibility for the U.S. EPA and constructive public participation at hazardous waste sites with potential radioactive contamination?

Good risk communication practices are vital to effective Superfund site management. Broadly construed, such practices entail: a) establishing an organizational structure that enables all stakeholders to inform, be informed and be knowledgeable of the risk assessment and management process; b) establishing some shared understanding of the goal of the risk assessment and management process; c) recognizing and respecting differences in language and searching for a common understanding of the site characterization; d) clearly specifying and agreeing on who has the authority and responsibility to make final decisions; and e) designating and agreeing on how differences will be arbitrated should that be necessary. In Mr. Grumbly's words, USEPA needs a credible process, without which little can be accomplished.

A detailed evaluation of how the communication of risks did or did not occur in the IEL situation serves to point out the weaknesses of the Agency's risk communication process and how it may be improved. At IEL, both differences in prior knowledge and expectations about the site, as well as disagreements about how to interpret new information have contributed to conflicting judgments about risk, and consequent differences in opinions among various stakeholders about appropriate management of the site. Conflicts are likely to continue until the public and the Agency find some common ground.

3.5.1 Information

In 1990 the EPA established the IEL Technical Information Committee (TIC) as part of the Record of Decision (ROD) for the IEL site to ensure the continued active participation of the community in the characterization and remediation of the site. Members of the TIC include local clergy, local elected officials, representatives from the Concerned Citizens of Lake Township (CCLT) and their technical experts, members from the community at large, representatives for the potentially responsible parties, and members of the various agencies involved at the site. Although, the TIC has met at least 13 times, the Panel cannot judge the breadth of participation by the public or various groups of the TIC. The Agency has also provided two Technical Assistance Grants (TAG) totalling $100,000 to CCLT to fund the hiring of technical experts, become educated on the issues, provide the financial resources to inform and solicit opinions and support from of the community at large, and impact the decision-making process at the site. In spite of these efforts the citizens do not consider that their concerns have been adequately considered and dealt with.

In 1989 the Agency for Toxic Substances and Disease Registry (ATSDR) recommended that a computerized system for storage, retrieval, and spatial analysis of all pertinent environmental and demographic information gathered at IEL be made available for use by all interested parties (ATSDR, 1989). In communicating with the interested parties, it is important to present the raw data in an aggregated manner that is clear and understandable so as to provide comprehensive insights into site implications. Even in the case of the Panel, it was only during the latter portion of it's review that the IEL sample data was available in a format that was relatively easy to use.[12] Graphic information and clearly labelled tables including the relevant standards and background (comparison) information are very useful. This kind of system should be provided at all sites, if feasible, from the time that data are first collected. Use of such a system (on a personal computer) could be facilitated at advisory committee meetings, or by appointment with the EPA site manager. Such a system would also enable EPA to more easily prepare and produce graphic and tabular data presentations for the community.

USEPA needs to address what people know and what they need and want to know. Grumbly (1992) states clearly in his report[13] that EPA has been slow to respond to legitimate concerns from the community around IEL. He attributes this to a desire in the beginning to treat IEL as a standard site with a standard solution. Subsequently, EPA has been more responsive to the Uniontown community.

According to Grumbly (1992) "Almost all of the technical experts employed by the state and the EPA believe that there are no significant hot spots, based upon inferences from data. Accordingly, while it may be highly probable that no hot spots

---

[12] The scope of the IEL radiochemical characterization project has been large. Data presentation in a timely fashion in a format preferred by the Panel may not have been a failure on the part of any agency but rather a consequence dictated by the timing of the inquiry and the shorter timetable on which the SAB Panel members were conducting their inquiry. Nevertheless, the Panel still felt that data must be presented in a format that is clear and understandable to all readers, particularly those with the least technical expertise.

[13] Grumbly, 1992. Op-Cit. Pg. 9.

exist, it is not a fact."[14] Expert perceptions of risk differ significantly between scientists from different fields of risk. Independent of field research, risk perceptions are significantly associated with the type of institution in which a scientist is employed (Barke and Jenkins-Smith, 1993).[15] Maharik and Fischoff (1993)[16] predict that individuals within any group with strong prior commitments will be less responsive to evidence. Hence, it is very unlikely that concerns of the community will be adequately addressed or resolved after testing or sampling has already taken place. The information seeking and sharing process has to be one that the community finds legitimate and agrees to in advance; the community needs to be in the process.

Testing - in this case, sampling - is information seeking. The community has a set of concerns that relate to the tasks of information seeking, which are not necessarily the concerns EPA has. It is better to deal with these concerns BEFORE one deals with testing, and to design protocols that respond to those concerns in as much as the involved agencies are willing to understand what those concerns are. A formal advisory board, such as the TIC that EPA eventually implemented at IEL, is probably more appropriate than a completely negotiated settlement, to enable EPA to deal with the range of concerns up front. Disputes based on uncertainty cannot be ignored, and are unlikely to be resolved by reaching consensus. EPA is likely to gain legitimacy and credibility if it deals with such disagreements up front and directly, to try to reduce the gaps between parties. Dialogue with and outreach to the larger community is essential. The effectiveness of an advisory committee might be improved by (1) taking steps to ensure the independence of the advisory committee from the sponsor (EPA), (2) trying explicitly to have the committee be representative of the community (which EPA appears to have done, to some extent, although they state that active participation of non-Agency representatives other than those from the CCLT ceased several years ago), and (3) considering the use of an independent facilitator or mediator (Lynn and Busenberg, 1994).[17]

---

[14] Grumbly, 1992. Op Cit. Pg. 12.

[15] Barke, R.P. and H.C. Jenkins-Smith, 1993. *Politics and Scientific Expertise: Scientists, Risk Perception, and Nuclear Waste Policy.* Risk Analysis, vol. 13, No. 4., pp 425-439.

[16] Maharik, M. and B. Fischoff, 1993. *Risk Knowledge and Risk Attitudes Regarding Nuclear Energy Sources in Space.* Risk Analysis, Vol. 13, No., 3, pp 345-353.

[17] Lynn, F. and G. Busenberg, 1994. *Citizen Advisory Committees and Environmental Policy: What we know, what's left to discover.* Dept. of Environmental Sciences and Engineering, School of Public Health, University of North Carolina at Chapel Hill. June 1994.

Even those unfamiliar with risk communication are likely to agree that much new, often complex and technical information is created and disseminated in the risk management process. This fundamental aspect of risk communication can create serious gaps in trust and credibility if it is mishandled. At IEL, this has happened. Lack of trust in EPA was fueled by the invalidation of two consecutive rounds of sampling for radioactive contamination and the non-release of the data gathered, followed by the slow release of subsequent data in a format that discouraged comparisons and contextual interpretations. It is also unfortunate that reanalyses in the earlier data focused on false positives, with much less discussion of possible false negatives.

EPA has in several circumstances at IEL used hypothetical models. Poor communication practices can contribute to the impression that such models are being used inappropriately as "evidence" by the Agency. For example:

> *A very conservative, hypothetical analysis performed by the National Air and Radiation Environmental Laboratory, dated January 29, 1991, concluded that even if 100 drums of uranium sludge, like that found at the Department of Energy facility in Fernald, Ohio, were buried at IEL, the maximally exposed individual would receive an amount of radiation equal to that received by an average individual in about one hour from natural background. This would correspond to a little less than a lifetime risk of* 10^{-7}.[18]

The hypothetical model referred to here makes many assumptions (e.g., location of sludge) that could be challenged. In this context it would be appropriate to present some form of uncertainty analysis that acknowledges the effects of those assumptions. Also, risk comparisons are among the most alluring and potentially damaging mechanisms used to try to explain risks. Comparison on a single dimension (such as severity of harm) may invoke comparisons on other dimensions of risk (such as voluntariness or controllability).

Technicalities are best explained promptly by acknowledged experts with a firm grasp of the facts, the uncertainties about the facts, any preconceptions the recipients of the information hold, and an understanding of good communication practices. However, only the best experts are likely to understand the uncertainties well, and of them only a handful are likely to have learned what kinds of beliefs may prevail among non-experts. Rarer yet is such an expert who also understands the basics of good

---

[18] Statement to the SAB *ad hoc* Panel on September 21, 1993 by Norman R. Neidergang, Associate Division Director for the Waste Management Division, Region 5, USEPA.

communication. Communication efforts are likely to fail if they are not informed by a thorough empirical characterization of the beliefs and knowledge held by those living near the site. Close collaboration between managers, communicators, technical specialists, and the public at an early stage can help overcome these likely deficits: in the case of conflicts, facilitation may help.

Appendix C

Memorandum from National Ombudsman Robert J. Martin
to Region 5 Administrator Francis X. Lyons:
"Industrial Excess Landfill Case/Preliminary
National Ombudsman Recommendations"

October 20, 2000

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

October 20, 2000

MEMORANDUM

TO: Francis X. Lyons
Regional Administrator

FROM: Robert J. Martin RJM
National Ombudsman

SUBJECT: Industrial Excess Landfill Case / Preliminary National Ombudsman Recommendations

SUMMARY

I am writing to submit my preliminary recommendations in connection with my investigation of the Industrial Excess Landfill in Uniontown, Ohio (IEL). The investigation has been comprised of nearly two years of review of documents from the Administrative Record, meetings and consultations with EPA regional staff, with citizens, with representatives of Congress, state, and local governments and with representatives for the responsible parties for the IEL site. A public hearing was also held last year in Uniontown, Ohio, at which I heard witnesses on the record with respect to IEL matters. A transcript of that hearing is attached for your review. I have also reviewed the work of the U.S. EPA Inspector General, the U.S. EPA Science Advisory Board and the independent report of Clean Sites Inc. as part of my deliberations.

In view of the need to make timely decisions regarding the disposition of waste at the IEL site; my recommendations at this juncture of the case only address the principal issue of whether the protection of human health and the environment in compliance with laws and regulations necessitate that the IEL site be further characterized.

My considered presumption is that the IEL site should be further characterized by EPA in order to protect the long-term health and environment of the public and that EPA. Before proceeding to further implement the remedy embodied within the Amended Record of Decision announced this past March, a technical working group should be convened with representation from the EPA Environmental Response Team, EPA Region V, the Ohio Environmental Protection Agency, the Trustees of Lake Township and their technical advisors, Concerned Citizens of Lake Township and their technical advisors as well as the Responsible parties and their technical advisors.

I offer to chair the Technical Working Group with you, if you so accept. I intend to convene the technical dialogue within 60 days from the issuance of these preliminary recommendations in Uniontown, Ohio. Prior to convening the Technical Working Group, I will submit interrogatories to the parties based upon additional technical review of the record and, if necessary in my discretion, on-the-record interviews with some or all of the parties. This 60 day period will also serve to allow for extensive public comment on the preliminary recommendations. By March 1, 2001, I will issue a Draft Final Report, which will contain a broader set of recommendations and will hold a final public hearing on the record to gather the views of the public. Until the Ombudsman Final Report, my preliminary recommendation should be considered rebuttable presumptions, that is, initial findings that can be overturned upon the showing of sufficient proof.

AUTHORITY

The Office of Ombudsman was established by the Congress within Section 2008 of the Resource Conservation and Recovery Act. Section (a) of the law authorized the Ombudsman to "receive individual complaints, grievances, and requests for information submitted by any person with respect to any program or requirement under this Act." Subsection (b) authorized the Ombudsman to "make appropriate recommendations to the Administrator." EPA established the Office in 1986 pursuant to the Congressional mandate. Following sunset of the mandate in 1989, EPA decided to make the Office of Ombudsman and its functions permanent because "Congress has chosen this solution for dealing with such problems in the hazardous waste programs EPA administers." (See, Hazardous Waste Ombudsman Handbook at pg. 1-1.)

Thus, "[b]oth the statutory language and its legislative history confirm the importance Congress places on the public assistance function of the Office of Ombudsman. By centralizing these functions in the Office of Ombudsman, Congress intended to improve EPA's responsiveness to the public with respect to the increasingly complex RCRA and Superfund programs . . . . the charge of the Ombudsman to provide assistance with problems, complaints, or grievances, is an extremely broad one." (See, Handbook at pg. 2-2,3.) Notably, the authority and framework of the Office of Ombudsman did not originate with EPA; EPA merely elected to make permanent an institution which the Congress had required in the law and for which the mandate had expired.

Affected citizens represented by Concerned Citizens of Lake Township, joined by the Project on Government Oversight and the Northeast Ohio Friends Service Committee, petitioned for National Ombudsman intervention at the IEL site in 1998. Following a denial for Ombudsman intervention by the Administrator that year, Congressman Thomas Sawyer (D., OH.) joined the request for intervention. EPA thereafter sanctioned National Ombudsman intervention at the IEL site. Congressman Ralph Regula (R., OH.) Has also joined in the request of citizens for National Ombudsman intervention at the IEL site.

BACKGROUND AND HISTORY

IEL, located in Lake Township, Stark County, Ohio, is a National Priorities List (NPL) site. The site is located on Cleveland Avenue, immediately south of the community of Uniontown and about 10 miles southeast of Akron, Ohio. The 29.9-acre site was used as an open-pit sand and gravel mine until 1966 when it was converted to a landfill for disposing of a wide variety of wastes. The landfill was closed in 1980 (CDM Federal Programs Corporation (CDMFPC) 1988).

Metzger Ditch forms the eastern boundary of the site. A chain-link fence delineates the western boundary between the landfill and residential and commercial property located along Cleveland Avenue. A combination of chain-link and barbed-wire fences defines the boundary between the site and residential and commercial property to the north and south. The site is accessible to pedestrians on the northeast, east, and southeast boundaries.

The site is situated on the eastern side of an elongated hill or ridge with an estimated on-site relief of 60 feet. Most of the surface slopes to the east and southeast. Surface-water runoff from the site drains into Metzger Ditch. An off-site pond is located across Cleveland Avenue from IEL, but it is not connected with Metzger Ditch or any known drainage pathway from IEL.

IEL is a former sand and gravel quarry. The resultant excavation was converted into a landfill. From 1966 to 1980, an estimated minimum of 780,000 tons of waste (including at least 1 million gallons of wastes) were disposed of at the site. The disposal rate for chemical waste increased to a maximum of 11,000 gallons/day in 1972. Up to 60,000 barrelfuls were emptied onto the site with the contents of 75% of these of unknown composition. Also unknown was the amount of hazardous wastes disposed of in drums at the site.

The site has been the subject of community complaints and regulatory investigations since 1971. In response to community complaints, the Stark County Board of Health issued a prohibition against the dumping of chemical wastes in 1972. In 1980, because of public concern and because the facility had reached its volumetric maximum capacity, the landfill was closed by means of a consent agreement ordered by the Stark County Court of Common Please (CDMFPC, 1988). The site was then covered with a mixture of granular material from the site and "clayey overburden" from a nearby area. Finally, it was seeded.

Concerns about the generation and migration of methane gas from the landfill were expressed before it was closed. Investigations had revealed that methane was migrating off the site. Monitoring for methane was initiated in homes adjacent to the site. The landfill owner had installed an on-site, a passive gas-vent system with ground flares to help mitigate methane migration.

In 1984, EPA and the Ohio Environmental Protection Agency (OEPA) conducted investigations at the site. In January of that year, ATSDR reviewed analytic results from samples of drinking water from private wells located "approximately 100 yards from Industrial Excess Landfill" and concluded that "the concentration of the compounds found is such that consumption of the water does not pose an undue health risk." ATSDR recommended additional monitoring to determine "if and when the water quality becomes such that the water should not be used for human consumption" and sampling to determine background water quality for that area.

In December 1984, OEPA's investigations revealed high on-site concentrations of methane, lateral migration of methane from the landfill, and air methane concentrations in the crawl spaces of the houses adjacent to the site that were up to 100% of the lower explosive limit (LEL). In response to the problem, the EPA Region V Emergency Response Team (ERT) installed an active methane-venting system (MVS) at the site between 1985 and 1987 to control migration of methane. This system was located on the northern, western, and southern edges of the site. EPA proposed in 1984 that IEL be placed on the NPL and began the RI/FS in 1985. Vented gases were initially burned with a candle-flare system, which was later replaced with a ground-flare system.

In March 1986, ATSDR reviewed air-monitoring data from the trace atmospheric gas analyzer for samples taken from ambient air, air at the landfill, and surrounding Uniontown residences. Vinyl chloride was found in an air sample from the backyard of one residence, and vinyl chloride and benzene were found in samples from 10 monitoring wells. ATSDR concluded that:

> the concentrations of volatile organic chemicals do not represent a significant public health threat; however . . . benzene and vinyl chloride are known to cause cancer at higher exposure levels . . . . Because any additional exposure of the public to these chemicals is

undesirable, and these chemicals occur in a pattern typically seen at many landfills, immediate steps should be taken to determine if there is a continuing presence of these chemicals and any trend of increasing levels in houses . . . . In the absence of continuous monitoring and data on continuing ambient levels of these chemicals it is not possible to quantify the risk from exposure to the identified substances. Given this data, a more accurate assessment of the potential public health impact of the substances and guidance on emergency action levels could be provided.

Subsequently, ATSDR comments in July 1986 on the air-monitoring results suggested problems with the quality of the data. These comments indicated that the observed contaminant levels were mostly "at levels . . . reported as common in the published literature," and most likely represented volatile organic compounds (VOCs) found in common household products. Further monitoring was recommended to determine if the contaminants represented migration from the landfill.

ATSDR reviewed the results of groundwater sampling in February 1987 and concluded that:

Several priority pollutants were detected in groundwater collected from residential wells located in the vicinity of the Industrial Excess Site near Akron, Ohio. Most of these appear to be artifacts caused by contamination of the samples. The only potential health threat from organic chemicals appears to be due to 5 µg/L of vinyl chloride found in one well. Appropriate action should be taken to reduce the exposure to vinyl chloride or rule out its presence. Fifteen of the wells show sodium concentrations at or above the 20mg/L level of concern for people on low sodium diets.

The Health Assessment Coordination Activity (HACA) and Emergency Response Branch (ERB) of ATSDR reviewed additional sampling data from well water in February 1987. Samples from three houses showed vinyl chloride levels in excess of the EPA proposed maximum contaminant level (PMCL) of 1 µg/L. A sample from one of these houses had previously shown a vinyl chloride level of 5 µg/L in the data on well water reviewed by ATSDR in January 1987. The EPA Office of Drinking Water (ODW) stated that the presence of vinyl chloride at these levels posed an unacceptably high excess lifetime risk of cancer from vinyl chloride exposure by the ingestion of drinking water and recommended an alternative supply of drinking water for the houses affected. In response to a consultation request from EPA Region V, HACA and ERB recommended an alternative water supply for all uses at the three houses where samples of well water showed vinyl chloride in excess of the EPA PMCL. The EPA Region V ERT installed in-home air strippers to remove the vinyl chloride.

In response to concerns about the direction of flow for contaminated groundwater, ATSDR enlisted the assistance of the U.S. Geological Survey (USGS) in late 1987. The USGS evaluation was completed in October 1988 and is incorporated in the appendices of the ATSDR report. Also in 1987, EPA prepared a Focused Feasibility Study (FFS) addressing the need for alternative water supplies for residences having wells with endangered water supplies. From the FFS, EPA selected an alternative water-supply system for some of the residences immediately west and northwest of the site. A Record of Decision for provision of alternative water supplies was signed in September 1987.

In June 1988, the ATSDR Epidemiology and Medicine Branch (EMB) released a final technical-assistance report to the Ohio Department of Health (ODOH) on measurements of VOCs in whole blood for 13 of 16 nearby residents who previously had obtained such measurements privately. In this report, ATSDR concluded that:

> The VOC test results were within established norms for all but two participants. These two had high levels of tetrachloroethene. Also reported was the presence of a 6-carbon, 14-hydrogen compound. The level of this compound could not be quantified because of the absence of laboratory validation standard materials.

In the report, ATSDR further stated that:

> A follow-up of the two participants with high tetrachloroethene levels was done by the

Ohio Department of Health. Neither participant wanted to discuss potential exposure sources because each was sure that exposure was due to the landfill.

The EPA Proposed Remedial Alternative was released for public comment on December 21, 1988. The remedial alternative proposed by EPA, Region V, for the IEL site at that time included (1) installation of a multilayered cap that meets the specifications of the Resource Conservation and Recovery Act of 1976 (RCRA cap), (2) expansion of the MVS and (3) groundwater collection via extraction wells and treatment of the collected groundwater by air stripping, carbon absorption, and "flocculation/sedimentation/filtration." The proposed collection of groundwater was expected to lower the water table under the landfill contents, effecting an "indirect containment" of the landfill contents. Treatment was to be discontinued when discharge criteria of the Clean Water Act were met for the effluent. However, groundwater extraction with discharge to Metzger Ditch would continue in perpetuity. A fence was also to be installed; and property would be acquired on the north, west, and south edges of the site. Monitoring will also be conducted.

On March 24, 1989, ATSDR notified EPA Region V by telephone of a new public health conclusion and recommendation concerning off-site migration of soil-gases at IEL (the verbal discussion was confirmed in a July 13 letter to Basil G. Constantelos, USEPA from Mark M. Bashor, ATSDR, Appendix A). Also on July 7, ATSDR was verbally informed by EPA of a recent detection of high concentrations of methane gas at a location 10 feet beyond the western boundary and 40 feet east of an adjacent residence. A final Remedial Investigation (RI) report was released by EPA in July 1988.

On July 17, 1989, EPA signed a Record of Decision (ROD) mandating a slightly modified version of the above described remedy. EPA also acknowledged the ATSDR concern for persons living or working on properties adjacent to IEL and offered immediate temporary relocation for those persons. EPA announced that acquisition proceedings for the adjacent properties identified in the ROD would begin immediately.

EPA Region V decided on March 1, 2000 to forego the requirements of the original

Record of Decision that provided for treatment of groundwater and the establishment of a RCRA Subtitle C cap over the landfill facility at the IEL site in favor of a strategy of natural attenuation of the groundwater and a RCRA Subtitle D cap over the landfill facility.

ISSUES

Several citizens have long maintained that characterization of the IEL site has not been adequate. Their concerns resulted in three reviews of the IEL site which have been helpful. One such review was performed by the EPA Office of Inspector General (OIG) on April 6, 1998 at the request of Congressman Sawyer and "concluded that there was no indication of wrongdoing by EPA or Ohio EPA employees involved with IEL." and that "prior reviews respond to the identified issues" so that "additional OIG review of the adequacy of the ongoing Superfund cleanup of IEL" would not be warranted.

It is more useful, therefore, to focus upon the reviews of Clean Sites Inc. and the EPA Science Advisory Board. Referrals will be made to the EPA Inspector General or the EPA Criminal Investigation Division, as appropriate, if citizens should present further complaints sounding in wrongdoing.

The Clean Sites review, submitted on March 4, 1992, in general, found that many of the site characterization issues presented by citizens were "well founded and deserve action." Clean Sites found, in particular, that "[t]he conduct of testing, contracting, analysis and information release has been flawed in several major respects during the remedial design process. These flaws must be corrected if trust is to be restored." (See, Clean Sites Report, Finding Number 3). According to the Clean Sites review, such flaws included "significant data gaps" that meant the Region "could not know for sure whether so called 'hot spots' really existed" leading to the conclusion that "while it may be highly probable that no hot spots exist, it is not a fact." Accordingly, Clean Sites found that "the post-ROD testing has become more than usually important at IEL."

Going further than Clean Sites, the EPA Science Advisory Board in the Final Report of the ad hoc Industrial Excess Landfill Panel submitted on October 6, 1994 noted that "[t]he experience at the IEL site is an indication that the standard procedures used for Superfund Sites in terms of site characterization are inadequate in the face of concerns of the surrounding community." This is substantiated by a review of the Records of Decision (1987, 1989, and as amended in March, 2000) which suggest that little or no landfill waste characterization was undertaken in accordance with requirements as set forth under CERCLA, NCP, and EPA guidance. The NCP (40 CFR, Part 300, March 8, 1990, p. 8847) specifies "that the lead agency shall characterize the nature and threat posed by the hazardous substances and hazardous materials and gather data necessary to assess the extent to which the release poses a threat to human health or the environment or to support the analysis and design of potential response actions by conducting, as appropriate, field investigations to assess the following factors." Seven factors are presented on this issue within the NCP. The third is of particular importance when conducting a mandatory field investigation necessary to support an appropriate cleanup alternative. The third factor provides the following information must be obtained: "The general characteristics of the waste, including quantities, state, concentration, toxicity, propensity to bioaccumulate, persistence, and mobility." In light of the fact that very large amounts of wastes (both liquids and solids) were disposed at IEL, without characterization of the entire site, no determination can be made about the future [potential] threat of releases from "hot spots" or specific points of burial. For example, a localized area where drums of unknown substances were buried may deteriorate over time such that the contents may be released. For this reason, CERCLA and the NCP require definitive analysis of sites known or suspected to pose a threat to human health or the environment.

The Science Advisory Board also noted that the initial rounds of sampling for radiation at the IEL suffered from "imperfections in the chain of custody of the samples and questions about counting methodologies," among other matters, the Science Advisory Board astutely observed that "[f]rom the records of the early rounds of IEL testing it is not always possible to determine from which well and at what depth a sample was drawn . . . . Any unusual findings could not be interpreted with confidence, nor could they be compared with values in another round of sampling. . . . [t]he invalidation decision thus becomes necessary and inevitable when breakdowns in the chain of custody occur, and USEPA was correct in invalidating such rounds" SAB Report at pg. 23-24.

Technically qualified citizens have also registered concerns regarding the characterization of the IEL site. Mr. James Titmas, a civil and sanitary engineer who served as an expert witness for the U.S. Department of Justice to recreate the footprint of wastes from synthetic rubber production during WWII, observed that:

> The fundamental problem appears to include a massive underestimation of the IEL by the EPA. This began on day one, and continues today. Without adequate core sampling there has not been a complete assessment of the amounts and kinds of waste. Without identifying the true groundwater background, there has been no comprehensive evaluation of the limits of the contaminated underground water, the rate or directions of movement. Without a containing cap over the IEL, there has ben no measurement of the amount or types of gas emerging from the landfill or moving laterally under a frozen surface.

See notes for Robert Martin, EPA, Uniontown, Ohio meetings. January 25, 1999.

Clean Water Action observed the need to undertake additional test bores in the northeast corner of the IEL site and the Ohio EPA commented in 1991 that "the magnetometry and ground penetrating radar (GPR) studies were not completed in that area." Dr. Theodore Magel, a former scientist associated with the Manhattan Project, testified in a written statement at the Ombudsman hearing last year that further characterization was needed, in general, and for core drilling, in particular. See, Hearing Record pg 49-52.

Concerns were also brought forward in the Hearing about the effectiveness of natural attenuation as a remedy at IEL for groundwater contamination. Mr. Thomas Shalala, an industrial hydrogeologist, testified that "We already have groundwater contamination. [t]he groundwater has been impacted so [you're] going to have a mounding effect up gradient of the landfill that's going to push the groundwater through the landfill down gradient of the landfill. You have I don't know how many active pumping wells for residential purposes that's literally going to pull that stuff down gradient and you're not going to have any barrier control and that's the number one buzz word of EPA is that you must maintain control of your plume and there is no control of the plume here. You can put an 80 foot cap on but you still have groundwater contamination and you're not controlling the plume. That's all I have." See, Hearing Record, pg. 101-104.

EPA Guidance for the use of natural attenuation at Superfund sites a s a remedy, in general, establishes that a high level of site characterization is needed to support a comprehensive evaluation of natural attenuation as a remedy, as opposed to the kind of information needed to support an active remediation. See; OSWER Directive 9200. 4-27. Issued November 1997. The Directive reads in pertinent part:

> Demonstrating the efficacy of this remediation approach likely will require analytical or numerical simulation of complex attenuation processes. Such analyses, which are critical to demonstrate natural attenuation's ability to meet remedial action objectives, generally require a detailed conceptual site model as a foundation[11]. Site characterization should include collecting data to define (in three spatial dimensions over time) the nature and distribution of contamination sources as well as the extent of the groundwater plume and its potential impacts on receptors. However, where monitored natural attenuation will be considered as a remedial approach, certain aspects of site characterization may require more detail or additional elements. For example, to assess the contributions of sorption, dilution, and dispersion to natural attenuation of contaminated groundwater, a very detailed understanding of aquifer hydraulics, recharge and discharge areas and volumes, and chemical properties is required. Where biodegradation will be assessed, and acceptors present in the groundwater, the concentrations of co-metabolites and metabolic by-products, and perhaps specific analyses to identify the microbial populations present.

The findings of these, and any other analyses pertinent to characterizing natural attenuation processes, should be incorporated into the conceptual model of contaminant fate and transport developed for the site.

Mr. Shalala noted the absence of such microbial studies in testimony last year. See, Hearing Records, pg. 101-104. EPA Region V in its Responsiveness Summary earlier this year observed that microbial studies had not yet been performed to support the natural attenuation remedy, but that they could be performed in the future.

Factors to be considered in tandem with the adequacy of the characterization of the IEL site are the nearness of homes to the site which rely upon wells for drinking water and the potential multiplicity of off-specification wastes in the landfill. For example, it is possible that drinking water wells are at a level (40 ft.) with the deposition of waste in the IEL site. The U.S. Geological Survey has found that groundwater flows radially from the site. Thorough characterization of IEL, therefore, is extremely important to long-term protection of human health and the environment.

Further characterization should occur in two areas: the landfill itself and the groundwater. On the landfill, in view of safety concerns about sinking multiple boreholes and recognizing that surficial analyses may have been done, it may be more realistic to undertake limited excavation where a number of test pits or trenches are implemented to more fully evaluate contamination. For the groundwater, the EPA Guidance on Natural Attenuation should be followed, which would include performance of microbial studies.

It should be noted that this additional characterization work can proceed on a parallel course with the Performance Monitoring Plan for groundwater now being implemented with appropriate technical oversight from the Lake Township Trustees. The construction of trenches on-site and the placement of a comprehensive monitoring well network off-site are not inconsistent with technical plans of the Trustees to develop a groundwater contingency plan; to further investigate gases that may be spreading off-site (including a possible upgrade of the methane gas venting systems); full analysis of the contents of above ground barrels and nearby structures as well as testing for tritium on the site.

RECOMMENDATION

The EPA Environmental Response Team should provide oversight and coordination for additional characterization work on the IEL Site that would involve: (1) trenching the site to allow for a more complete analysis of contamination and, (2) establishing a comprehensive monitoring network off-site and performance of microbial studies to fulfill the EPA Guidance on Natural Attenuation and to further understand the impact of potential migration of wastes to nearby homes and drinking water wells. This work should be implemented in tandem with the work being done by the Region, the Trustees and Responsible Parties.

RECOMMENDATION

EPA Region V should assist the National Ombudsman in convening a Technical Working Group within 60 days to openly and jointly address technical issues at the IEL site. Representation should include the Region, the National Ombudsman, the Environmental Response Team, the Ohio EPA, the Lake Township Trustees and their technical advisors, and the Concerned Citizens of Lake Township and their technical advisors, as well as the Responsible Parties and their technical advisors.

CONCLUSION

Several years ago, Clean Sites Inc. noted in their review that "the non-scientific signs of real problems should have been readily apparent and should have triggered the highest quality Agency effort." Several years later, many citizens in the Uniontown community do not feel that enough is known about the IEL site or that they have had any meaningful involvement in the course of planned remediation for the site. As the EPA Science Advisory Board has found:

> The information seeking and sharing process has to be one that the community finds legitimate and agrees to in advance, the community needs to be in the process. . . . Dialogue with and outreach to the larger community is essential. . . . Communication efforts are likely to fail if they are not informed by a thorough empirical characterization of the beliefs and knowledge held by those living near the site.

In view of the findings of Clean Sites and the SAB regarding the need for adequate site characterization and meaningful citizen participation, therefore, these preliminary Ombudsman Recommendations should be adopted to ensure further remedial progress at the IEL site.

Attachment:
January 30, 1999 Transcript Public Hearing

cc: Tim Fields
Mike Shapiro, Titles
Doug Ballotti, Region V Ombudsman
Lake Township Trustees
EPA Environmental Response Team
Concerned Citizens of Lake Township
Mr. Paul Wolford

Appendix D

Letter from Dr. Mark Baskaran, Wayne State University
to Chris Borello, Concerned Citizens of Lake Township

October 16, 2001

WAYNE STATE UNIVERSITY
MARK M. BASKARAN PH.D.
ASSOCIATE PROFESSOR
DEPARTMENT OF GEOLOGY
0224 OLD MAIN
DETROIT, MI 48202

16 October 2001

Ms. Chris Borello
President
Concerned Citizens of Lake Township
P. O. Box 123
Uniontown, OH 44685

Subject: Examination of the data and associated information on the radionuclide problem in the Industrial Excess Landfill Superfund site.

Dear Ms. Borello,

Thanks for faxing me the letter from Dr. William Muno, Director, Superfund Division of the EPA Region 5. I carefully read that letter and I would like to discuss couple of major points that I disagree on the content of the letter. To set the record clear, 0.28 pCi/L and 0.21 pCi/L of plutonium in the environmental samples are very high. To put these numbers in perspective, the total global fallout (from 1952 to 1980's) of Pu in Houston, Texas was estimated to be 0.20 pCi/cm^2. If this entire amount were dumped into a lake or ocean waters, in a depth of 200m, the expected Pu concentration would be 0.01 pCi/L. This is based on the following assumptions: a) All the Pu is mixed uniformly; b) There is no removal of Pu from the water column. This will be the total Pu concentration (particulate + dissolved + colloidal). Herewith I give the concentrations of Pu in several natural water samples and the pertinent references:

Lake Ontario ~0.0003 pCi/L (0.3 fCi/L) – Farmer et al. (1973)-

Great Lakes (1973 to 1976): ~0.0005 pCi/L – Alberts and Wahlgren (1981)- Environmental Science and Technology 15, 94-98.

Hudson River - ~0.0004 pCi/L – Simpson et al. (1980) – In: Transuranic elements in the Environment. W.C. Hanson (ed.), DOE/TIC-22800, 684-690.

Narragansett Bay, RI – 0.0007 pCi/L (0.7 fCi/L) – Santschi et al. – 1980 – Pu in coastal marine environments. Earth and Planet Science Letters 51, 248-265.

Savannah River – 0.0001 pCi/L (Olsen et al. 1989- Environmental Science Technolology 23, 1475-1481.

Northwest Atlantic Ocean (380 m) – 0.0006 pCi/L (Cochran et al. 1987, Earth and Planetary Science Letters 84, 135-152)

Greenland and Barents Sea surface water – 0.00035 pCi/L (Holm et al. 1986 – Earth and Planetary Science Letters 79, 27-32.

As you can easily see, the Pu concentration in the groundwater samples in the IEL superfund site is about 1000 times higher than other natural water systems. These natural water systems, such as Lakes, Rivers and marine waters have received their Pu from atmospheric fallout (either direct fallout or subsequently leached from continents). Now, what makes some parties to say this 0.28 pCi/L is low and background level is something I do not understand. If there is any presence of Pu in groundwater, then, it is most likely derived from one or more of the local sources.

Regarding the drinking water limit by EPA for the gross alpha, nobody expects Pu isotope to contribute significantly to that level. Indeed, the major players for the gross alpha are ^{238}U, ^{234}U, ^{226}Ra, and ^{222}Rn. Most other nuclides are quite insignificant. The importance of Pu in the ground water comes because of its high toxicity and its source to the groundwater. As I had mentioned in one of my earlier correspondences, most likely this Pu is derived from a local source, as opposed to the global fallout. If this Pu is derived from a local source, then, obviously there must be much higher levels of Pu in the soil above the water table. In my opinion, the truth must be found by a systematic investigation on this and adjoining aquifer systems.

In order to address the major issue on the quality of the data, we need the following information: a) How much water sample was used; b) Methodology of sample collection; c) What spike was used to assay Pu isotopes, d) What was the alpha detector background in the regions of interest and how long the sample was counted; e) What was the chemical efficiency; f) blank levels with the reagents. I will explain each one of these in detail below.

a) <u>Size of the water sample:</u> Normally, we use several hundred to thousand liters of water samples in the field. We do employ various techniques to preconcentrate the water sample in the field. These are routine methods and the environmental radiochemists have been using these techniques over the past 3-4 decades. For example, during our Arctic Ocean expedition in 1998 and 2000 (sponsored by the National Science Foundation), we filtered close to 100,000 liters of water samples at various depths for radionuclide analysis. For the ground water study, I would imagine to use at least 200-liter samples (for example, see the Pu work on the groundwater samples from the Nevada Test Site, Kersting et al. 1999- Nature, January 7th, 1999 issue). If an agency wants to prove that there is no Pu in this ground water site in order to fulfill the requirement to do some radiation measurements, then, they can collect very small volume of sample and get it measured in some place and they probably will get results what they want to hear. **If we are really interested in finding 'the truth' on this matter, then, the sample collection, handling, and analytical procedures must follow the methods that are peer-reviewed, and accepted by the scientific community.**

b) <u>Methodology of Sample collection:</u> Many of the radionuclides of concern belong to a class called 'particle-reactive.' What this term means is that these nuclides have a very strong affinity to particle surfaces, including the walls of the container and the filter paper used. These nuclides include all plutonium isotopes, thorium and lead isotopes, among others. Uranium and radium are less particle-reactive. **If one is really interested in measuring the Pu concentration in water sample,** then, the sample must be acidified immediately after collection. This will prevent Pu adsorbing onto the wall container We have conducted several experiments to investigate the affinity of particle-reactive radionuclides onto low- and high-density polyethylene containers (e.g., Baskaran et al. 1992- Geochimica et Cosmochimica Acta 56, 3375-3388). **To know the truth (if there is any Pu in the ground water samples or not) prior to any filtration, the samples must be acidified immediately after collection and the total Pu (particulate + dissolved + colloidal) must be determined.** It is pertinent to point out that in the Pu study on the ground water samples collected from Nevada Test Site, Kersting et al. (1999) found that >99% of the Pu were associated with colloidal and particulate fractions and only <1% of the total Pu was found as dissolved phase. Kersting et al study also indicated that Pu is not immobile in groundwater system and it has moved about 1 3 km in about 29 years (~0.4 ft/day, assuming a constant velocity).

c) <u>What spike was used to determine Pu concentration:</u> Normally, this is not an issue, as most of the labs use Pu-242 obtained from National Institute of Standards and Technology and the Pu-242/Pu-239.240 ratios are certified. However, we need to make sure what spike was used and the level of Pu-239,240 present in that spike.

d) <u>Detector background and counting time:</u> Since most of the analysis was done by alpha spectroscopy, it is very critical that we know the background of the alpha detector that is used for the work. For example, we always use detectors with extremely low background, as low as 0.006 counts per hour in each of the regions of interest for Pu isotopes. Since the errors on the final concentration value of the sample depends on all these factors, high background in the detectors will lead to higher propagated error on the activity. Another most important factor is the counting time in the alpha spectrometer. It appears that the commercial labs (including NAREL counted for 30 hours and depending on the sample size, this counting time may be inadequate. When we were investigating if any of the dumped nuclear reactors in the marginal seas of Russia started leaking Pu into the water, we counted some of the samples for about 2weeks to get better precision. At least 100 counts in each of the peaks of Pu-239,240 and Pu-242 will lead to an error of about 30% (2-sigma error, using NIST Pu-242 standard). Instead of doing too many samples, it may be worthy to select a few samples and count them for long time and get high precision numbers. **The goal should be that these data should be of the quality to be publishable in a peer-reviewed, international professional journal.**

e) <u>Chemical Efficiency factor:</u> One should be able to obtain at least 40% chemical yield on these samples. Since Pu radiochemistry is fairly straight forward, this should not be a problem. However, one need to watch out for this factor, as poor chemical efficiency will result in higher uncertainty on the data.

f) <u>Blank Level of the Reagents:</u> Invariably, our blank levels are below the detection limit and thus, the blank level was never an issue for us. However, if glassware/Teflonwares are not cleaned properly (in boiling nitric acid, etc), residual Pu can cross-contaminate the sample and data will become highly unreliable.

I am not privy to the information pertaining to the issues (a) through (f) raised above. However, the uncertainty associated with the Pu concentration reported for this site is ridiculously high. Our University or any other academic institution where there is any active environmental radioactivity research is going on can improve the precision by 100 to 1000 times. **I think that is where the ultimate answer lies for this puzzle.**

On another related issue, you had mentioned about measuring Pu on a gravel-soil sample by acid-leaching technique. Since all the Pu on a gravel or soil is absorbed (as opposed to lattice-bound), normally we carry out acid leaching technique to remove the adsorbed Pu. If we use a fairly strong acid (such as one molar hydrochloric acid or nitric acid or stronger concentration), we will leach a major portion of the absorbed Pu in the first leach itself. In the second leach, most of the Pu will be leached out and there won't be any Pu left for subsequent leaching. Thus, it would be simply a waste of time to leach a soil or gravel third time for any Pu determination, as we won't have any leftover Pu. If some one is trying to prove that there is no Pu on the third or fourth or fifth leach, in my opinion, they are wasting their time and they are not supposed to get any Pu.

As my summary, **'truth finding mission' involves a systematic scientific research to determine if there is any Pu in any of the groundwater samples.** The data that will be generated should be publishable in a professional, peer-reviewed journal. The data thus obtained should be reproducible by any environmental radiochemist in academia around the world.

I hope this assessment helps you to move forward with this issue. Please feel free to contact if you have any additional questions. I can also be reached by e-mail. Baskaran@chem.wayne.edu

With best regards,

M. Baskaran

Mark Baskaran

References:

Baskaran, M., P. H Santschi, G. Benoit and B. D. Honeyman. 1992. Scavenging of thorium by colloids in seawater of the Gulf of Mexico. Geochimica et Cosmochimica Acta 56, 3375-3388.

Kersting, A. B., D. W. Efurd, D. L. Finnegan, D. J. Rokop, D. K. Smith, and J. L. Thompson (1999) Migration of plutonium in groundwater at the Nevada Test Site. Nature 397, 56-59.

Appendix E

Record of Decision Industrial Excess Landfill Superfund Site
Uniontown, Stark County, Ohio

U.S. Environmental Protection Agency

July 1989

INDUSTRIAL EXCESS LANDFILL

Site Information:

Site Name: INDUSTRIAL EXCESS LANDFILL
Address: UNIONTOWN, OH

EPA ID: OHD000377911
EPA Region: 05

Record of Decision (ROD):

ROD Date: 07/17/1989
Operable Unit: 01
ROD ID: EPA/ROD/R05-89/098

Media: SOIL SEDIMENT GROUNDWATER AIR

Contaminant: VOCS, BENZENE, PCE, METHANE GAS, PAHS, METALS

Abstract: THE 300-ACRE INDUSTRIAL EXCESS LANDFILL SITE IS IN UNIONTOWN, STARK COUNTY, OHIO. SEVERAL HUNDRED RESIDENCES ARE WITHIN A HALF MILE OF THE SITE, AND ALL RESIDENCES AND BUSINESSES IN THE UNIONTOWN AREA RELY ON GROUND WATER FROM PRIVATE WELL SUPPLIES. SURFACE WATER AT THE SITE FLOWS TO METZGER DITCH WHICH IS LOCATED ALONG THE EASTERN BORDER OF THE SITE. THE SITE WAS OPERATED AS A MIXED INDUSTRIAL AND REFUSE LANDFILL FROM 1966 UNTIL 1980. LARGE AMOUNTS OF FLY ASH AND LIQUID WASTES INCLUDING LATEX AND SPENT ORGANIC SOLVENTS WERE DISPOSED OF IN THE LANDFILL BETWEEN 1968 AND 1972. TO PREVENT THE SPREAD OF CONTAMINANTS ASSOCIATED WITH THESE WASTES, SEVERAL EMERGENCY ACTIONS HAVE BEEN UNDERTAKEN. IN 1986 AN ACTIVE METHANE EXTRACTION SYSTEM WAS INSTALLED TO PREVENT THE OFFSITE MIGRATION OF EXPLOSIVE LEVELS OF METHANE GAS. IN APRIL 1987 EPA INSTALLED AIR STRIPPERS IN EIGHT RESIDENCES AND TWO BUSINESSES DUE TO THE PRESENCE OF LOW LEVELS OF VOLATILE ORGANIC COMPOUNDS. IN SEPTEMBER 1987 EPA SIGNED A RECORD OF DECISION (ROD) TO PROVIDE AN ALTERNATE WATER SUPPLY TO 100 HOMES WEST OF THE SITE TO ENSURE

THAT THE COMMUNITY RECEIVED SAFE DRINKING WATER WHILE THE FINAL REMEDIAL ACTION FOR THE SITE WAS IMPLEMENTED. THIS ROD REPRESENTS THE FINAL REMEDIAL ACTION FOR THE SITE AND ADDRESSES THE SOURCE AREA, GASES GENERATED WITHIN THE SOURCE AREA, AND CONTAMINATED GROUND WATER. THE PRIMARY CONTAMINANTS OF CONCERN AFFECTING THE SOIL, SEDIMENTS, AND GROUND WATER ARE VOCS INCLUDING BENZENE, VINYL CHLORIDE, AND PCE; OTHER ORGANICS INCLUDING CARCINOGENIC PAHS; AND METALS. AIR CONTAMINATION BY METHANE GAS IS ALSO PRESENT AT THE SITE.

THE SELECTED REMEDIAL ACTION FOR THIS SITE INCLUDES INSTALLING A MULTILAYER RCRA CAP OVER THE SITE TO PREVENT SURFACE WATER INFILTRATION; EXPANDING THE EXISTING METHANE VENTING SYSTEM TO ACCOMMODATE THE POTENTIAL INCREASE OF LANDFILL GAS DUE TO THE CAP; EXTRACTING AND TREATING APPROXIMATELY 256 MILLION GALLONS OF CONTAMINATED GROUND WATER BY AIR STRIPPING, CARBON ADSORPTION, AND FLOCCULATION/SEDIMENTATION/FILTRATION TO ACHIEVE COMPLIANCE WITH CLEAN WATER ACT NPDES DISCHARGE CRITERIA FOR SURFACE WATER DISCHARGE; CONTINUING THE PUMPING OF GROUND WATER TO MAINTAIN A LOWERED WATER TABLE AND PROTECT GROUND WATER FROM ADDITIONAL CONTAMINATION BY THE LANDFILL; TREATING SURFACE WATER FROM PONDS AT THE SITE, IF NECESSARY; AND DREDGING SEDIMENT FROM THE PONDS AND DITCH AND INCORPORATING THEM UNDER THE CAP; MULTIMEDIA MONITORING; AND INSTITUTIONAL CONTROLS RESTRICTING FUTURE USE OF THE SITE. THE ESTIMATED PRESENT WORTH COST FOR THIS SELECTED REMEDIAL ACTION IS $18,548,000, WHICH INCLUDES AN ESTIMATED ANNUAL O&M COST OF $440,000.

Remedy: THIS REMEDIAL ACTION IS THE FINAL ACTION FOR THE INDUSTRIAL EXCESS LANDFILL, INC. (IEL) SITE. IN SEPTEMBER 1987, US EPA SIGNED A RECORD OF DECISION FOR PROVISION OF AN ALTERNATE WATER SUPPLY TO APPROXIMATELY 100 HOMES NEAR IEL WHOSE DRINKING WATER IS AFFECTED OR THREATENED BY CONTAMINANTS FROM IEL. THIS FINAL REMEDIAL ACTION ADDRESSES THE WASTE DISPOSAL AREA AND THE LANDFILL GAS GENERATION AND GROUNDWATER CONTAMINATION ASSOCIATED WITH THE WASTE DISPOSAL AREA. THE REMEDY ADDRESSES THE PRINCIPAL THREATS POSED BY IEL BY ISOLATING AND CONTAINING WASTES WITHIN THE LANDFILL, EXPANDING THE EXISTING METHANE VENTING SYSTEM FOR THE COLLECTION AND FLARING OF LANDFILL GAS, AND BY EXTRACTING AND TREATING CONTAMINATED GROUND WATER BENEATH AND NEAR THE LANDFILL. ADDITIONAL STUDIES OF LANDFILL GAS GENERATION AND POTENTIAL MIGRATION, SURFACE STABILITY AND HYDROLOGY, AND HYDROGEOLOGIC CHARACTERISTICS AND CONTAMINANT FATE AND TRANSPORT MUST BE CONDUCTED DURING THE DESIGN PHASE OF THE REMEDY TO COLLECT APPROPRIATE INFORMATION FOR DESIGN OF THE VARIOUS TREATMENT AND CONTAINMENT SYSTEMS.

THE MAJOR COMPONENTS OF THE IEL REMEDY INCLUDE;

* INSTALLATION OF A RCRA SUBTITLE C COMPLIANT CAP OVER THE ENTIRE SURFACE OF THE LANDFILL WITH SURFACE WATER DRAINAGE CONTROL AND DISCHARGE;
* EXPANSION OF THE EXISTING METHANE VENTING SYSTEM;
* EXTRACTION AND TREATMENT OF CONTAMINATED GROUNDWATER BENEATH AND NEAR THE LANDFILL UNTIL CLEANUP LEVELS ARE ACHIEVED;
* PUMPING OF GROUNDWATER TO MAINTAIN THE WATER TABLE LEVEL BENEATH THE BOTTOM OF THE WASTES IN IEL IN ORDER TO PROTECT GROUNDWATER FROM ADDITIONAL CONTAMINATION BY THE LANDFILL;
* INSTALLATION OF FENCING AROUND THE PERIMETER OF THE SITE;
* USE RESTRICTIONS ON FUTURE USE OF THE SITE PROPERTY; AND
* MONITORING OF THE CAP, GROUND WATER EXTRACTION AND TREATMENT SYSTEM, AND METHANE

VENTING SYSTEM TO ENSURE THE REMEDY IS EFFECTIVE.

Text: Full-text ROD document follows on next page.

Text:

FORMERLY THE SITE OF A SAND AND GRAVEL MINING OPERATION, IEL WAS OPERATED AS A MIXED INDUSTRIAL AND REFUSE LANDFILL FROM 1966 TO 1980, WHEN IT WAS ORDERED CLOSED. DURING OPERATION, THE LANDFILL ACCEPTED AN ASSORTMENT OF HOUSEHOLD, COMMERCIAL, INDUSTRIAL (SLUDGES, LIQUIDS, AND SOLIDS) AND CHEMICAL WASTES. LARGE AMOUNTS OF FLYASH WERE ACCEPTED AT IEL FROM 1966 UNTIL AT LEAST 1972. MOST OF THE LIQUID INDUSTRIAL WASTES, INCLUDING LATEX, SPENT ORGANIC SOLVENTS, AND OFF-SPEC PRODUCT FROM THE RUBBER INDUSTRY, WERE DUMPED BETWEEN 1968 AND 1972. BASED ON INTERVIEWS WITH THE FORMER OWNER AND DEPOSITIONS OF VARIOUS OPERATORS, IT APPEARS AS IF MOST OF THE LIQUID WASTE DISPOSAL OCCURRED ON THE NORTHERN ONE-THIRD OF THE LANDFILL. THE METHOD OF DISPOSING OF THESE LIQUIDS WAS DIRECT DUMPING ON THE GROUND, EITHER IN A LAGOON OR MIXED WITH OTHER WASTE. IN 1972, THE STARK COUNTY BOARD OF HEALTH ORDERED THE CESSATION OF LIQUIDS WERE DISPOSED OF AFTER THAT DATE. GENERAL ORGANIC MATERIAL, INCLUDING WASTE FROM THE GENERAL PUBLIC, WA DISPOSED OF AT IEL THROUGHOUT ITS OPERATION.

DUE TO PUBLIC CONCERN, AND BECAUSE THE SITE WAS APPROACHING ITS VOLUMETRIC LIMIT, THE LANDFILL WA ORDERED CLOSED IN 1980. APPROXIMATELY 80 TO 85 PERCENT OF THE SITE IS UNDERLAIN WITH WASTE. DEPTHS OF LANDFILLING RANGED FROM 60 FEET AT THE NORTHWEST CORNER, TO ONLY SEVERAL FEET ALONG THE EAST AND SOUTH PORTIONS OF THE SITE. SUBSEQUENT TO CLOSURE, THE SITE WAS COVERED WITH A SANDY, GRAVELLY SOIL AND SEEDED. THE SITE DOES NOT HAVE AN IMPERMEABLE CAP OR LINER.

B. CERCLA REMOVAL ACTIVITIES:

IN OCTOBER 1984, THE IEL SITE WAS PROPOSED FOR INCLUSION ON US EPA'S NATIONAL PRIORITIES LIST (MPL) OF ABANDONED OR UNCONTROLLED HAZARDOUS WASTE SITES ELIGIBLE FOR INVESTIGATION AND CLEANUP UNDER THE SUPERFUND PROGRAM. A WORK ASSIGNMENT WAS ISSUED ON DECEMBER 26, 1984, FOR A COMPREHENSIVE REMEDIAL INVESTIGATION/FEASIBILITY STUDY AT THE SITE.

A REMEDIAL INVESTIGATION, COMPRISED OF SEVERAL PHASES OF FIELD WORK WAS CONDUCTED BETWEEN 1985 AND 1988. DURING THE REMEDIAL INVESTIGATION, SURFACE SOILS, SUBSURFACE SOILS, AND SEDIMENTS, SOIL GAS, AND GROUND WATER SAMPLES WERE COLLECTED AND ANALYZED. THE REMEDIAL INVESTIGATION REPORT, DETAILING THE RESULTS OF THE INVESTIGATION, WAS PUBLISHED IN JULY 1988. A FEASIBILITY STUDY, WHICH EXAMINED AND EVALUATED REMEDIAL ALTERNATIVES FOR IEL, WAS RELEASED FOR PUBLIC COMMENT ON DECEMBER 21, 1988. THE PUBLIC COMMENT PERIOD ENDED JUNE 1, 1989.

WHILE THE RI/FS WAS CONDUCTED, SEVERAL ACTIONS WERE TAKEN AT IEL BY US EPA. IN EARLY 1986, AN ACTIVE METHANE EXTRACTION SYSTEM WAS INSTALLED ON THE SITE BY US EPA'S EMERGENCY RESPONSE TEAM, IN ORDER TO PREVENT THE OFF-SITE MIGRATION OF EXPLOSIVE LEVELS OF METHANE GAS TO ADJACENT HOMES. THE METHANE VENTING SYSTEM (MVS) CONSISTS OF A SERIES OF EXTRACTION WELLS WHICH COLLECT LANDFILL GAS FROM DEPTHS OF ABOUT 40 FEET, AND DIRECT IT TOWARD A CENTRAL POINT WHERE THE GAS IS THEN FLARED. FOR THE MOST PART, THE MVS HAS EFFECTIVELY PREVENTED OFF-SITE GAS

SAMPLES TAKEN IN LATE JUNE AND EARLY JULY 1989 INDICATED OFF-SITE MIGRATION OF METHANE. ADJUSTMENTS IN THE OPERATION OF THE MVS QUICKLY CORRECTED THE PROBLEM.

DURING APRIL 1987, US EPA'S EMERGENCY RESPONSE TEAM ALSO INSTALLED AIR-STRIPPERS IN 8 RESIDENCES AND 2 BUSINESSES, IN RESPONSE TO THE PRESENCE OF LOW LEVELS OF VINYL CHLORIDE AND OTHER VOLATILE ORGANICS IN SEVERAL DRINKING WATER WELLS. THE LEVELS OF VINYL CHLORIDE OBSERVED IN 3 WELLS EQUAL OR EXCEED THE MAXIMUM CONTAMINANT LEVEL (MCL) FOR VINYL CHLORIDE OF 2 PARTS PER BILLION (PPB).

ON SEPTEMBER 30, 1987, US EPA SIGNED A RECORD OF DECISION TO PROVIDE ALTERNATE WATER TO 100 HOMES LOCATED WEST (DOWNGRADIENT) OF THE IEL SITE. THIS AREA INCLUDES THOSE HOMES AND BUSINESSES WHOSE GROUNDWATER IS CURRENTLY CONTAMINATED BY THE SITE, AND THOSE WHO MAY BE AFFECTED PRIOR TO THE IMPLEMENTATION OF THE FINAL SITE REMEDY. THE DECISION IS CONSIDERED TO BE ONE PART, OR AN OPERABLE UNIT, OF THE OVERALL SITE REMEDY. THE POTENTIALLY RESPONSIBLE PARTIES (PRPS) FOR THE IEL SITE WERE ORDERED TO DESIGN AND CONSTRUCT THE ALTERNATE WATER SYSTEM. DESIGN HAS BEGUN AND THE SYSTEM IS EXPECTED TO BE ON LINE BY SUMMER OF 1990.

C. CERCLA ENFORCEMENT ACTIVATES:

US EPA ISSUED NOTICE LETTERS TO THE IEL OWNER/OPERATOR'S AND FIVE GENERATORS OF HAZARDOUS SUBSTANCES DISPOSED OF AT IEL IN APRIL 1985, REQUESTING THESE PRPS TO CONDUCT THE RI/FS FOR IEL. NEGOTIATIONS WERE NOT SUCCESSFUL AND US EPA INITIATED A FUND-FINANCED RI/FS.

IN AUGUST 1987, US EPA ISSUED NOTICE LETTERS TO 10 PRPS, ASKING THEM TO SUBMIT A GOOD FAITH PROPOSAL FOR THE DESIGN AND CONSTRUCTION OF THE ALTERNATE WATER SUPPLY OPERABLE UNIT. NEGOTIATIONS WERE UNSUCCESSFUL AND NONE OF THE PRPS SUBMITTED A GOOD FAITH PROPOSAL. CONSEQUENTLY, IN DECEMBER 1987, US EPA ISSUED A SECTION 106 UNILATERAL ORDER TO THE TEN PRPS, ORDERING THEM TO IMPLEMENT THE OPERABLE UNIT. IN JANUARY 1988, FOUR OF THE PRPS BEGAN TO COMPLY WITH THE ORDER.

IN MARCH 1989, US EPA ISSUED A GENERAL NOTICE LETTER TO 12 PRPS, REQUESTING THEM TO IMPLEMENT THE FINAL REMEDY OUTLINED IN THE IEL PROPOSED PLAN. IN MAY 1989, US EPA ISSUED SPECIAL NOTICE LETTERS TO 15 PRPS FOR THE IEL FINAL REEDY, ESTABLISHING THE STATUTORY 60-DAY PERIOD FOR SUBMITTAL BY THE PRPS OF A "GOOD FAITH PROPOSAL" TO CONDUCT THE FINAL REMEDIAL ACTION. DURING THE 60-DAY PERIOD, THE MORATORIUM WILL BE EXTENDED AN ADDITIONAL 60 DAYS.

#CRH

III. COMMUNITY RELATIONS HISTORY

US EPA AND OEPA HAVE CONDUCTED EXTENSIVE COMMUNITY RELATIONS ACTIVITIES AT THE SITE. THE COMMUNITY NEAR IEL HAS BEEN VERY INVOLVED IN SITE

ACTIVITIES THROUGHOUT THE SUPERFUND PROCESS. A COMMUNITY GROUP, CONCERNED CITIZENS OF LAKE TOWNSHIP (CCLT), RECEIVED THE FIRST TECHNICAL ASSISTANT GRANT (TAG) IN THE NATION. US EPA AND OEPA HAVE PUBLISHED MANY FACT SHEETS, SPONSORED SEVERAL PUBLIC MEETINGS, AND HELD NUMEROUS AVAILABILITY SESSIONS TO KEEP THE COMMUNITY INFORMED OF THE IEL ACTIVITIES.

IN ACCORDANCE WITH CERCLA SECTION 113, US EPA PUBLISHED A NOTICE IN A LOCAL NEWSPAPER IN MID-DECEMBER 1988 ANNOUNCING THE AVAILABILITY OF THE IEL FS AND PROPOSED PLAN, THE DATE AND TIME OF THE AVAILABILITY SESSIONS AND PUBLIC MEETING, AND THE DURATION OF THE PUBLIC COMMENT PERIOD. THE ANNOUNCEMENT ALSO INCLUDED A BRIEF ANALYSIS OF THE PROPOSED PLAN AND ALTERNATIVE PLANS THAT WERE CONSIDERED.

A 120-DAY PUBLIC COMMENT PERIOD FOR THE IEL FS WAS ESTABLISHED FROM DECEMBER 21, 1988 UNTIL APRIL 19, 1989. THE COMMENT PERIOD WAS SUBSEQUENTLY EXTENDED UNTIL JUNE 1, 1989. THE LENGTH OF THE PUBLIC MEETING WAS HELD ON MARCH 29, 1989 IN UNIONTOWN, OHIO IN ACCORDANCE WITH CERCLA SECTION 117. A TRANSCRIPT OF THE MEETING IS CONTAINED IN THE IEL ADMINISTRATIVE RECORD. THE RESPONSIVENESS SUMMARY CONTAINS A RESPONSE TO EACH OF THE SIGNIFICANT COMMENTS, CRITICISMS, AND NEW DATA SUBMITTED IN WRITTEN ORAL PRESENTATIONS. THIS RECORD OF DECISION SERVES AS THE STATEMENT OF THE BASIS AND PURPOSE OF THE SELECTED FINAL REMEDIAL ACTION FOR IEL.

#SRRA

IV. SCOPE AND ROLE OF THIS RESPONSE ACTION

THIS RECORD OF DECISION ADDRESSES THE FINAL REMEDIAL ACTION FOR THE IEL SITE. THE ACTION ADDRESSES THE PRINCIPAL THREATS AT THE SITE, THE 30-ACRE WASTE DISPOSAL/SOURCE AREA AND GASES GENERATED WITHIN THE SOURCE AREA, AND CONTAMINATED GROUNDWATER.

THE RECORD OF DECISION (SEPTEMBER 1987) FOR PROVISION OF ALTERNATE WATER TO APPROXIMATELY 100 RESIDENCES NEAR THE LANDFILL WILL ENSURE SAFE DRINKING WATER IS AVAILABLE TO THE COMMUNITY NEAR THE LANDFILL BEFORE FULL IMPLEMENTATION OF THE FINAL REMEDIAL ACTION.

#SSC

V. SUMMARY OF SITE CHARACTERISTICS

A. EXTENT OF SOURCE:

WASTE MATERIALS WERE DISPOSED OF THROUGHOUT THE ENTIRE AREA OCCUPIED BY THE LANDFILL. PRIOR TO THE START OF THE RI, IT WAS KNOWN THAT LANDFILLING OF HOUSEHOLD, COMMERCIAL, AND INDUSTRIAL WASTES OCCURRED OVER APPROXIMATELY 80 TO 85 PERCENT OF THE SITE PROPERTY. MANY OF THESE INDUSTRIAL WASTES ARE CONSIDERED HAZARDOUS BY CURRENT STANDARDS. FIGURE

3 SHOWS THE AREA OF THE LANDFILL WHICH IS ESTIMATED TO BE UNDERLAIN BY BURIED WASTES. AT THE IEL SITE, WASTE MATERIALS TYPICALLY WERE BURIED IMMEDIATELY ADJACENT TO THE PROPERTY LINE. DURING THE INSTALLATION OF MVS MONITORING WELLS, BURIED WASTES ALSO WERE NOTED IN AN OFF-SITE AREA BEHIND THE TIRE SHOP LOCATED CLOSE TO THE NORTHWEST CORNER OF THE SITE.

DUE TO THE VARYING TOPOGRAPHY AT THE SITE, THE DEPTH OF THE FILL RANGES FROM APPROXIMATELY 60 FEET AT THE NORTHWEST CORNER OF THE SITE TO SEVERAL FEET ALONG THE SOUTH AND EAST PORTIONS OF THE SITE. WASTES WERE NOT DISPOSED IN THOSE AREAS WHERE THE WATER TABLE WAS ONLY SEVERAL FEET BELOW THE GROUND SURFACE (THE TOPOGRAPHICALLY LOW EASTERN PORTION OF THE PROPERTY).

ALONG WITH THE LANDFILLING OF SOLID WASTES, SUBSTANTIAL QUANTITIES OF LIQUID WASTE WERE DUMPED ONTO THE GROUND EITHER FROM 55-GALLON DRUMS OR FROM TANKER TRUCKS. THESE LIQUIDS TYPICALLY WERE MIXED WITH FLYASH OR DRY REFUSE ALSO DISPOSED OF AT THE SITE. TABLE 1 LISTS THE CHEMICALS KNOWN TO BE TAKEN TO IEL. TABLE 2 LISTS THE CHEMICALS FOUND IN SAMPLES FROM DRUMS EXCAVATED DURING INSTALLATION OF THE MVS. IN ADDITION, WITNESSES HAVE DESCRIBED THE DISPOSAL OF WHAT THEY BELIEVE HAD BEEN SOLVENTS AND INDUSTRIAL CHEMICALS, WHICH WERE VOLATILE AND/OR HAD FOUL ODORS. ACCORDING TO A PAST EMPLOYEE, ONLY THOSE DRUMS WHICH COULD NOT BE EMPTIED OF THEIR CONTENTS WERE LANDFILLED. OTHERS WERE TYPICALLY EMPTIED AND RETURNED TO THE GENERATOR. WHILE IT IS POSSIBLE THAT LIQUID FILLED DRUMS MAY HAVE BEEN DISPOSED OF AT THE LANDFILL, THE INFORMATION PROVIDED B Y THE PAST EMPLOYEE SUGGESTS THAT THIS WOULD HAVE BEEN A RARE OCCURRENCE.

B. RI RESULTS:

THE RESULTS OF THE RI CONDUCTED AT THE IEL SITE INDICATE THE FOLLOWING:

* THE MOST EXTENSIVE BODY OF CONTAMINATED MATERIALS CONSISTS OF THE WASTES AND WASTE-SOIL MIXTURES IN THE LANDFILLED PORTIONS OF THE SITE. THESE WASTE MATERIALS WERE COVERED WITH CLEAN SOIL DURING THE SITE'S CLOSURE.

* SAMPLING INDICATES THAT SURFACE SOIL CONTAMINATION ON THE SITE OCCURS AT TWO SMALL LEACHATE SEEP AREAS. THERE WAS ALSO AN AREA JUST OUTSIDE THE SITE'S PROPERTY LINE WHICH EXHIBITED POLYCYCLIC AROMATIC HYDROCARBONS (PAHS). CLEAN SOIL MATERIALS, AS PLACED ON A PORTION OF THE SITE BY US EPA'S EMERGENCY RESPONSE SECTION FOLLOWING THE INSTALLATION OF THE MVS, COVERED THIS OFF-SITE PAH CONTAMINATED AREA.

* OFF-SITE CONTAMINANT MIGRATION POSING A THREAT TO PUBLIC HEALTH AND THE ENVIRONMENT IS ASSOCIATED WITH THE GROUNDWATER.

SAMPLING OF PRIVATE RESIDENTIAL AND ON-SITE/OFF-SITE MONITORING WELLS HAS SHOWN GROUNDWATER TO BE CONTAMINATED WITH VOLATILE AND SEMI-VOLATILE

ORGANICS AND TOTAL METALS. THE MOST HIGHLY CONTAMINATED MONITORING WELL EXHIBITED A CONCENTRATION OF 400 PPB OF ASSORTED HAZARDOUS SUBSTANCE LIST (HSL) VOLATILE AND SEMI-VOLATILE ORGANIC COMPOUNDS AND A TOTAL OF 2,000 PPB OF TENTATIVELY IDENTIFIED ORGANIC COMPOUNDS (TICS). COMPOUNDS OF GREATEST CONCERN FOUND IN THE MONITORING WELLS INCLUDE BENZENE AND 1,2-DICHLOROETHANE. VINYL CHLORIDE WAS FOUND IN THREE PRIVATE WELLS LOCATED DOWNGRADIENT FROM THE LANDFILL. BARIUM LEVELS ALSO EXCEED THE MAXIMUM CONTAMINANT LEVEL (MCL) AS STIPULATED BY THE FEDERAL SAFE DRINKING WATER ACT (SDWA). NICKEL IS PRESENT AT HIGHER THAN AMBIENT WATER QUALITY CRITERIA (AWQC) LEVELS IN EIGHT DOWNGRADIENT RESIDENTIAL WELLS. THE RESULTS FROM ONE SAMPLING ROUND SHOWED ELEVATED LEAD LEVELS IN SOME OF THE RESIDENTIAL WELL SAMPLES. DATA OBTAINED FROM SEVERAL PREVIOUS AND SUBSEQUENT SAMPLING EVENTS AT THESE HOMES HAVE NOT SHOWN ANY EVIDENCE OF ELEVATED LEAD LEVELS. THEREFORE, THE SET OF ANALYTICAL DATA EXHIBITING THESE ELEVATED LEAD LEVELS IS CONSIDERED TO BE AN ANOMALY WHICH IS NOT TRULY REPRESENTATIVE OF SITE CONDITIONS.

GROUNDWATER CONTAMINATED WITH VOLATILE AND SEMI-VOLATILE ORGANIC COMPOUNDS AND METALS EXISTS BENEATH AND DOWNGRADIENT OF THE LANDFILL. BASED ON MONITORING AND RESIDENTIAL WELL SAMPLING, THIS CONTAMINATION

HAS BEEN SHOWN TO EXTEND SEVERAL HUNDRED FEET DOWNGRADIENT (WEST) OF THE SITE. FIGURE 4 SHOWS THE EXTENT OF INORGANIC AND ORGANIC CONTAMINATION PLUMES BASED ON DATA FROM MONITORING AND RESIDENTIAL WELLS. THIS SAMPLING HAS ALSO SHOWN THAT THE GROUND WATER CONTAMINATION IS PRESENTLY CONFINED TO THE SHALLOW PORTIONS OF THE SAND AND GRAVEL AQUIFER.

ORGANIC AND INORGANIC CONTAMINATED SOILS AND SEDIMENTS EXIST AT SCATTERED LOCATIONS ON THE LANDFILL PROPERTY. THE LOCATIONS INCLUDE TWO AREAS WHERE LEACHATE SEEPS HAVE BEEN NOTED AND IN THE SEDIMENTS OF THE ON-SITE PONDS.

METZGER DITCH FLOWS SOUTHWARD ALONG THE EAST SIDE OF THE LANDFILL AND CONTINUES SOUTHWEST BEYOND THE SOUTHERN BOUNDARY OF THE SITE. SAMPLES OF SURFACE WATER, SEDIMENT, AND SOIL ASSOCIATED WITH METZGER DITCH INDICATE THAT SITE RELATED CONTAMINANTS HAVE DISCHARGED INTO THE DITCH, BUT AT CONCENTRATIONS DETECTED TO DATE WHICH DO NOT POSE A RISK TO HUMAN HEALTH OR THE ENVIRONMENT.

CONTAMINANTS OF INTEREST ARE THE CHEMICALS WHICH HAVE BEEN DETECTED IN THE SITE MEDIA AND WHICH CAN BE ASSOCIATED WITH WASTE DISPOSAL ACTIVITIES AT THE SITE. TABLES 3 THROUGH 5 SUMMARIZE THE CONCENTRATIONS OF THE CONTAMINANTS OF INTEREST DETECTED IN SOIL, GROUNDWATER AND LANDFILL GAS.

#SSR

VI. SUMMARY OF SITE RISKS

AS PART OF THE RI AT IEL, A PUBLIC HEALTH EVALUATION (PHE) WAS CONDUCTED TO ASSESS THE POTENTIAL IMPACT ON THE PUBLIC HEALTH AND THE ENVIRONMENT

FROM THE RELEASE OF HAZARDOUS SUBSTANCES FROM THE SITE. AS PART OF THIS PROCESS, QUANTITATIVE RISKS ASSESSMENTS WERE MADE FOR THE SOILS, GROUNDWATER, AND AIR EXPOSURE PATHWAYS AT THE LANDFILL.

THE PHE NOTES THE FOLLOWING CONTAMINANTS OF INTEREST AND RESPECTIVE MEDIA AS POSSIBLY PRESENTING AN UNACCEPTABLE RISK AT IEL, (WHERE "UNACCEPTABLE RISK" IS DEFINED AS A GREATER THAN 10(-6) EXCESS LIFETIME CANCER RISK OR A HAZARD INDEX FOR A CRITICAL EFFECT SUBGROUP EXCEEDING ONE):

- UNDER THE ASSUMED TRESPASSING SCENARIO, THE UPPER BOUND EXCESS LIFETIME CANCER RISKS ASSOCIATED WITH SOIL CONTACT (INCLUDING INGESTION) EXCEED THE 10(-6) LEVEL FOR CHILDREN (2 X 10(-6)) AND ADULTS (3 X 10(-5)) UNDER THE PLAUSIBLE MAXIMUM CASE, BUT NOT FOR THE AVERAGE CASE. THE RISK IN ALL CASES IS ATTRIBUTABLE TO CARCINOGENIC PAHS WHICH WERE FOUND IN SURFACE SOIL SAMPLES OUTSIDE THE SITE BOUNDARY. IT DOES NOT APPEAR THAT THESE CONTAMINANTS ARE RELATED TO WASTE DISPOSAL ACTIVITIES AT THE SITE. THIS AREA IS PRESENTLY COVERED WITH CLEAN FILL WHICH MITIGATES THE THREAT TO PUBLIC HEALTH FROM DIRECT CONTACT. FOR NONCARCINOGENIC EFFECTS, HAZARD INDICES ARE ALL LESS THAN ONE, FOR BOTH ON-SITE SOILS AND OFF-SITE SOIL ANALYZED.

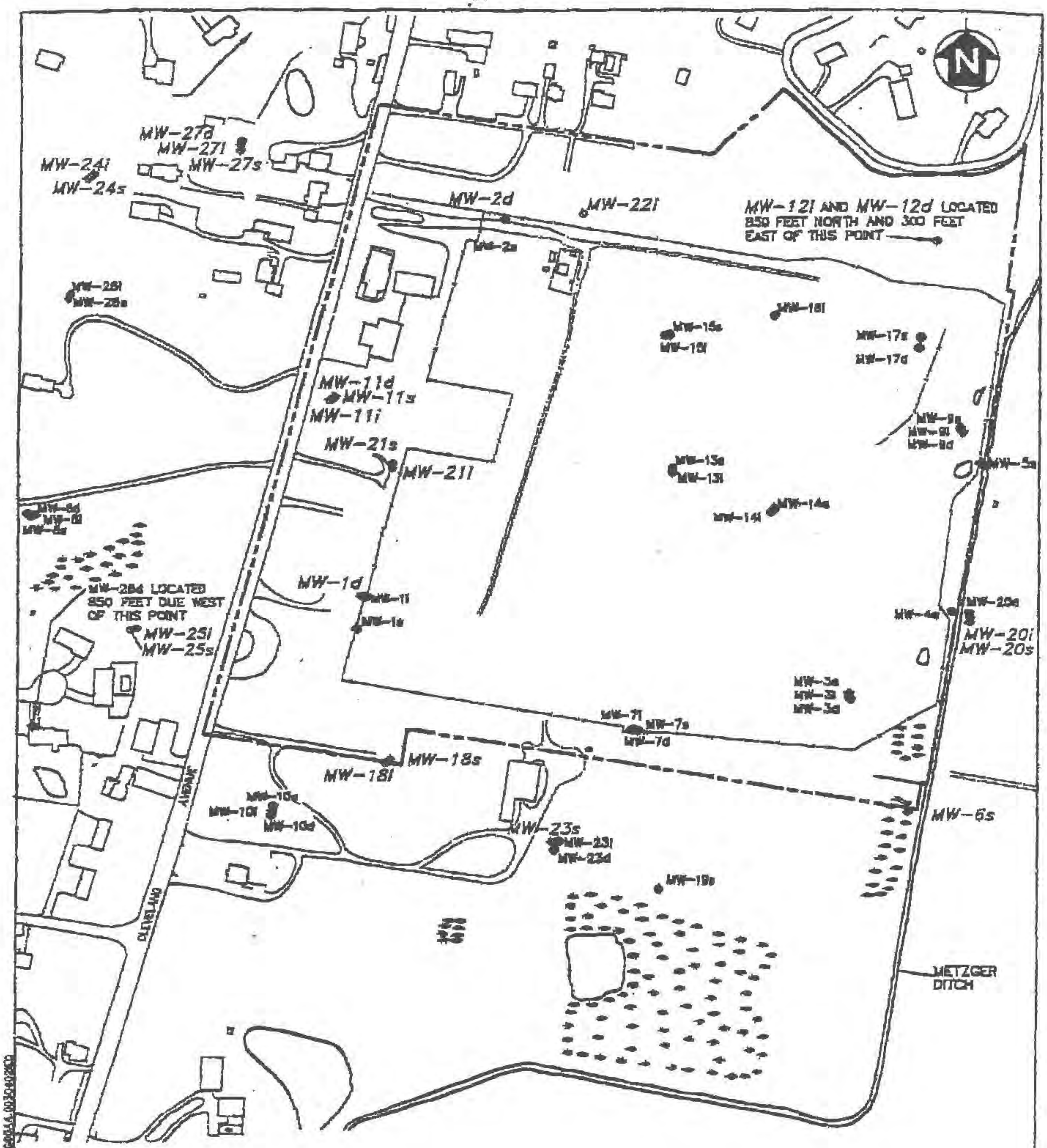
- LONG-TERM (LIFETIME) CONSUMPTION OF GROUNDWATER CONTAINING MAXIMUM MEASURED LEVELS OF LANDFILL-DERIVED CARCINOGENS EXCEEDS THE 10(-6) RISK LEVEL. THE RISKS ARE ASSOCIATED WITH

Appendix F

Maps of Industrial Excess Landfill:
Figure 1 Monitoring Well Locations
Figure 2 IEL Alternate Water Supply and Residential Wells

Exhibit 22 of IEL Groundwater Flow Patterns from
"Comments on the Existing Public Record for the
Industrial Excess Landfill for the Revision of the
1989 Existing Record of Decision,"
by Bennett & Williams Environmental Consultants, Inc.

April 12, 1999



LEGEND

● MW-20s MONITORING WELL LOCATION AND NUMBER

● *MW-20s* LOCATION AND NUMBER OF MONITORING WELL SAMPLED SEPTEMBER 1998

s=SHALLOW WELL
i=INTERMEDIATE WELL
d=DEEP WELL

SITE BOUNDARY

FENCE

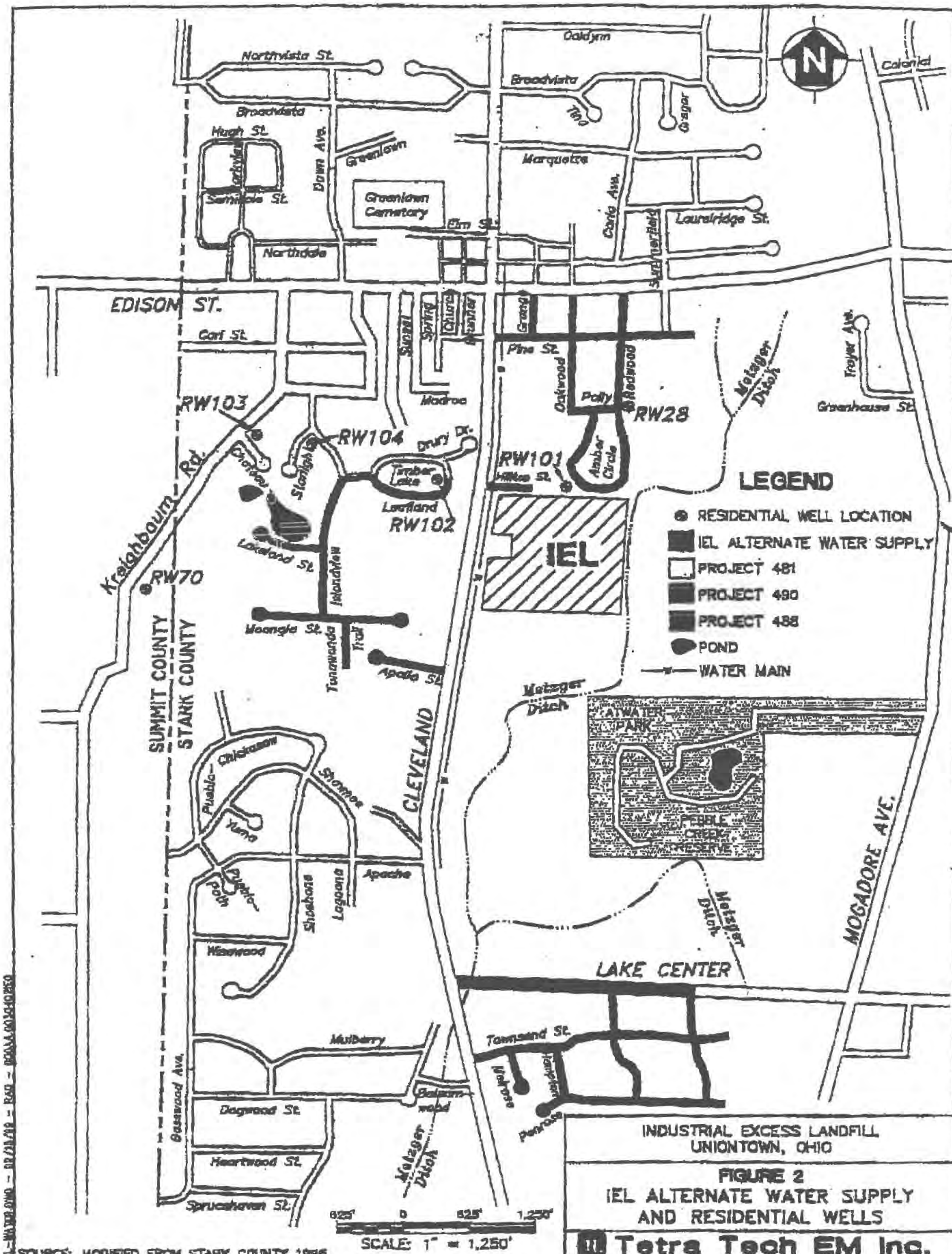
MARSHY AREA

150' 0 150' 300'
SCALE: 1" = 300'

INDUSTRIAL EXCESS LANDFILL
UNIONTOWN, OHIO

FIGURE 1
MONITORING WELL LOCATIONS

Tetra Tech EM Inc.

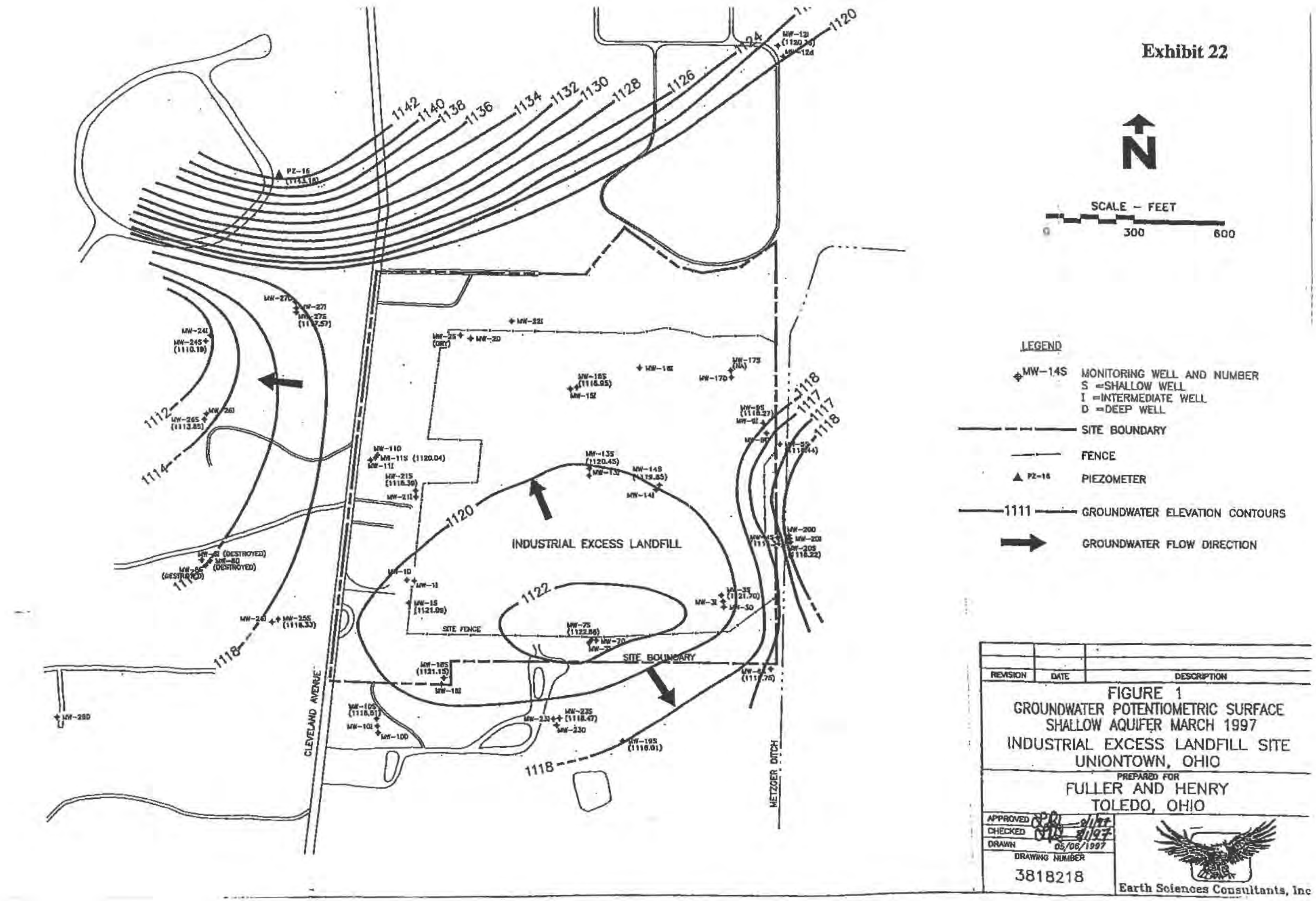


INDUSTRIAL EXCESS LANDFILL
UNIONTOWN, OHIO

FIGURE 2
IEL ALTERNATE WATER SUPPLY
AND RESIDENTIAL WELLS

Tetra Tech EM Inc.

Exhibit 22


N
SCALE - FEET
0
300
600
LEGEND
MW-14S MONITORING WELL AND NUMBER
S =SHALLOW WELL
I =INTERMEDIATE WELL
D =DEEP WELL
SITE BOUNDARY
FENCE
PZ-16 PIEZOMETER
1111 GROUNDWATER ELEVATION CONTOURS
GROUNDWATER FLOW DIRECTION
INDUSTRIAL EXCESS LANDFILL
CLEVELAND AVENUE
METZGER DITCH
SITE FENCE
SITE BOUNDARY
1142
1140
1138
1136
1134
1132
1130
1128
1126
1124
1120
1122
1118
1117
1114
1112
REVISION
DATE
DESCRIPTION
FIGURE 1
GROUNDWATER POTENTIOMETRIC SURFACE
SHALLOW AQUIFER MARCH 1997
INDUSTRIAL EXCESS LANDFILL SITE
UNIONTOWN, OHIO
PREPARED FOR
FULLER AND HENRY
TOLEDO, OHIO
APPROVED
CHECKED
DRAWN
05/06/1997
DRAWING NUMBER
3818218
Earth Sciences Consultants, Inc

Appendix G

Lautenberg, Frank R., Chairman,
and Dave Durneberger, Ranking Minority Member

"Lautenberg-Durenberger Report on Superfund Implementation:
Cleaning Up the Nation's Cleanup Program"

Senate Subcommittee on
Superfund, Ocean and Water Protection

May 1989

LAUTENBERG-DURENBERGER REPORT ON SUPERFUND IMPLEMENTATION:

CLEANING UP THE NATION'S CLEANUP PROGRAM

A REPORT FROM

FRANK R. LAUTENBERG
CHAIRMAN

DAVE DURENBERGER
RANKING MINORITY MEMBER

SENATE SUBCOMMITTEE ON SUPERFUND, OCEAN
AND WATER PROTECTION

May 1989

TABLE OF CONTENTS

ADDITIONAL COPIES/STAFF CONTACTS

Additional copies of the Report may be obtained by writing to or calling the Senate Subcommittee on Superfund, Ocean and Water Protection: Hart 408, Washington, D.C. 20510; (202) 224-6691.

Substantive inquiries to Majority staff concerning the Report should be directed to Mr. Seth Mones at (202) 224-8552. Substantive inquiries to Minority staff initially should be directed to Mr. Jimmie Powell at (202) 224-2376.

PREFACE FROM SENATOR LAUTENBERG

During 1987, the Subcommittee on Superfund and Environmental Oversight began to examine the Environmental Protection Agency's (EPA) implementation of the reauthorized Superfund program. In addition, to the five hearings the Subcommittee held in the last Congress,[1] I directed staff to continue to examine and monitor Agency efforts to implement the program. With the advent of the new Congress, and the formation of the Subcommittee on Superfund, Ocean and Water Protection, Senator Durenberger, the Subcommittee's Ranking Minority Member and I, directed staff to prepare a report on the results of the investigation that had been conducted.

This Report summarizes the findings of our hearings and continued investigations, and offers numerous recommendations to respond to the issues that have been identified. We are issuing this Report now to provide a framework and set of goals for the oversight that we plan to continue in the 101st Congress. My hope is that prior to any future hearings on or examination of the program, Members of our Subcommittee, the Environment and Public Works Committee, and the general public will have some

---

1 For the complete hearing record of the Subcommittee, see Hearings before the Subcommittee on Superfund and Environmental Oversight, two volumes (S. Hrg. 100-261, parts 1-2), U.S. Goverment Printing Office 1987, 1988. (These documents are hereafter referred to as "Hearing Records.")

perspective on the types of issues we examined in the previous Congress.

We are also releasing this Report with several major developments in the Superfund program in mind. One such development became clear during the Committee's confirmation hearing with William Reilly. He indicated in response to questions I had raised over Superfund implementation that he was inititating a 90-day review of the Superfund program. I hope that the findings and recommendations in this Report will be of value not only to the Members of the Environment and Public Works Committee and the public in evaluating the Superfund program, but also to the Agency during and after its review in developing a comprehensive approach to improving Superfund implementation. At my direction, in order to keep the Agency informed about the substance of the Report prior to its release and completion, my staff has discussed our findings and recommendations with EPA staff, including those involved with the 90-day review, throughout the drafting of the Report.

In addition, currently pending are the proposed revisions to the National Contingency Plan (NCP), the master regulatory proposal for implementing Superfund. This proposal raises some important and fundamental issues, which are addressed in this Report. We intend to request that EPA view the relevant portions of this Report as our formal comments on the proposed revisions currently being considered to the NCP, as well as to proposed revisions to the Hazard Ranking System, the system which is used to determine whether sites must be added to the National Priorities List.

Although this Report is critical of past problems in the Superfund program, it is issued in the spirit of constructive criticism. Past failures and unmet expectations continue to be problems if we do not admit and learn from them. By the same token, yesterday's mistakes can form the basis of tomorrow's breakthroughs.

My goal is to identify problems so that we can improve implementation, not merely dwell on previous abuses or missed opportunities. In that spirit, the method that has been used in this Report is one of combining the various findings that have been made about the program with recommendations on ways to respond to such findings.

This approach is an extension of the one I began in our December 1987 hearing, when I offered EPA my so-called 16-point plan, consisting of a number of recommendations on improving Superfund implementation. Since that hearing I have continued to monitor EPA's follow-up on these initial recommendations, which were designed to improve Superfund implementation. EPA has reported progress in a number of the areas raised by the December plan, as well in other program areas. The Report attempts to acknowledge such progress, and to give a fair account of Agency achievements generally.

While there were often strong divisions between Congress and the previous Administration over the implementation of our environmental laws, I look forward to working with the new Administration to build a strong partnership between the Congress and the Executive branch for environmental protection generally and Superfund in particular. I hope this Report will be a useful contribution to this effort.

I acknowledge the assistance from EPA headquarters and regional staff in gathering information used in this Report. The willingness of many Agency staff to assist in providing information and data, often within short deadlines, was essential to the oversight effort. I also acknowledge the contribution of the many witnesses who participated in the Subcommittee's hearings over the past several years, including staff from both the Office of Technology Assessment and General Accounting

Office, both of which have been of significant assistance to the Subcommittee's examination of the Superfund program.

Frank R. Lautenberg
Chairman, Subcommittee on
Superfund, Ocean and Water
Protection

I. EXECUTIVE SUMMARY

A. OVERVIEW: NEED TO CLEANUP THE CLEANUP PROGRAM, NOT THE CLEANUP LAW.

This Report was prepared pursuant to the directive of Frank R. Lautenberg, Chairman, and Dave Durenberger, Ranking Minority Member of the Subcommittee on Superfund, Ocean and Water Protection, of the Senate Committee on Environment and Public Works, both of whom were Conferees during the 1986 Reauthorization. The Report is being published to assist the public, the Congress, and the Administration in better undertanding some of the major issues and opportunities facing the Superfund program.

Building upon the Subcommittee Chairman's 16-point Superfund implemenation improvement plan released in a December 1987 hearing, the Report analyzes the implementation of the Superfund program since the 1986 Reauthorization. This examination indicates that while some progress has been made, in the areas of training, contracting reforms, and increases in raw numbers of remedial activities and some enforcement activities, for example, the program continues to fail to meet expectations and in most cases actual statutorily mandated deadlines.

This conclusion suggests that current evaluations of Superfund are not really assessments of the law that Congress wrote, but of the version of it that the past Administration has chosen to implement. While the process of compromise arguably prevents any law from perfectly articulating its goals, this Report is grounded on a continuing firm belief that were the law to be implemented as written the many problems documented here would not have occurred. Accordingly, as the title of the Report suggests, the fundamental conclusion of this examination is that what needs to be cleaned up now is the nation's cleanup program, not its cleanup law. This summary highlights some of the specific findings and recommendations supporting this conclusion.

B. POOR DEADLINE COMPLIANCE

The 1986 Reauthorization (SARA) responded to the slow pace and abuses of the original Superfund law by imposing numerous deadlines for achieving Agency action. Congress viewed these deadlines as essential for the successful implementation of the law, and as was the case with much of the Reauthorization, established these deadlines with input from EPA itself.

Yet, as of March 31, 1989, EPA had missed 65% of the deadlines imposed by SARA. Such missed deadlines include failing to revise the the National Contingency Plan (the Superfund master regulation), and to promulgate a rule amending the Hazard Ranking System, the system used to determine whether sites should be placed on the NPL. EPA's recent projections suggest that these fundamental rules to implement the 1986 Reathorization law will not be issued until early 1990, over three years after the five year Reauthorization was enacted. EPA also failed to meet the January 1, 1989 deadline for completing site inpections, the final measures taken in determining whether sites should be placed on the cleanup list.

These are not only three examples of missed deadlines, but of deadlines that have clear environmental consequences. No one sensibly can deny that delays in listing sites on the NPL, establishing the regulatory framework for implementing the program, or modifying the system for determining whether sites should be listed at all, delays and hampers the effective operation of the Superfund program. In addition, EPA's failure ever to submit the statutorily required annual reports (the first was required in January 1988, and the second was due in January 1989) to Congress on Superfund implementation impedes Congressional and public oversight of the program. The Report recommends procedures aimed at increasing Agency awareness and adherence to the many deadlines of the law, and calls on the new Administration to set priorities and budget requests in a way that assures compliance with legally mandated deadlines.

C. ILLEGAL AND INCONSISTENT CLEANUP APPROACHES

EPA persists in an illegal approach to groundwater cleanup standards and in its general approach to cost considerations in choosing cleanup solutions. As the proposed revisions to the National Contingency Plan (NCP) show, the Agency has attempted to institutionalize the noncompliance with the legal mandate to apply the most stringent standards to groundwater cleanup as well as adherence to a clearly improper use of cost and cost-benefits analysis in selecting cleanup remedies generally. In addition, the cleanup selection process has been plagued by inconsistency, failure to learn from past mistakes, and lack of substantiation of cleanup solutions prior to their use at sites.

Noting some progress, such as EPA's development of a clearinghouse for cleanup technologies, the Report calls for the emergence of true national leadership by EPA in the cleanup selection process, as well as abandonment of the illegal groundwater and cost approaches mentioned above.

D. REGIONAL VARIATION IN DECISIONS TO LIST SITES

Inconsistency also is apparent in the so-called pre-remedial process, the stage where it is determined whether sites will be placed on the Superfund cleanup list. Significant variation exists among EPA's regional offices, with some Regions screening sites from inclusion on the Superfund list at much higher rates than others. This inconsistency may well have created a troubling, unequal approach to environmental protection, an approach that makes a citizen's health and safety depend on where he or she lives. The Report calls on EPA to make a full determination of what has accounted for such inconsistency, and to take steps to achieve a nationally stringent approach to this process.

E. AN EXCEPTION THREATENING TO SWALLOW THE LAW

Another lurking problem in the pre-remedial stage is EPA's recently articulated expansion of the so-called "deferral policy." This is a policy that would prevent sites from being placed or maintained on the Superfund cleanup list if they could be addressed by other federal or state programs, or by responsible parties. This policy, which is spelled out in EPA's proposed revisions to the National Contingency Plan (the Superfund master regulation), threatens to undermine the Superfund program, and with it the health and environmental goals Superfund serves.

Deferral of sites with rankings sufficient for inclusion on the Superfund cleanup list, could deprive these sites of the many comprehensive requirements and authorities applied at other Superfund sites. These requirements and authorities include Superfund's stringent cleanup standards, health provisions, citizen grants program, and rigorous enforcement provisions. EPA's attempt to limit the size of the Superfund list through a deferral policy threatens to be an exception capable of swallowing a good portion of the law. The Report accordingly recommends the rejection of this proposal.

F. INEFFICIENCIES IN LONG-TERM CLEANUPS

The long-term cleanup program, the so-called remedial program is also examined. The Report notes a number of inefficiencies in the program ranging from uneven flow of the fundamental cleanup decisions (so-called Records of Decision) to the generally slow pace of the various cleanup steps. Following up on the Subcommittee Chairman's 16-point plan from December 1987, the Report notes some EPA attempts to respond to these previous recommendations, through continued efforts to streamline different phases of the cleanup program. The Report calls for continued commitment to such approaches and for an evaluation of the results of such attempts.

G. DELAYS AND RED TAPE FOR CITIZEN GRANTS

Another significant problem since Reauthorization has occurred in the citizens grants program, known as the "Technical Assistance Grants" program. Created with the 1986 amendments, this program allows citizens affected by Superfund sites to obtain grants of up to $50,000 to retain technical advisors to help them understand the complexities such sites pose. The technical assistant can play a vital role in explaining the technical issues that typcially arise at sites, as well as analyzing the governmental proposals for addressing such issues.

EPA delays in issuing the necessary implementing regulation prevented the program from becoming operational until 1988. Making matters worse, with the help of the Office of Management and Budget, the interim implementing regulation created numerous unnecessary impediments to the effective operation of this program. As of February 3, 1989 only 13 grants have been awarded, despite the fact that we currently have 1163 sites on the Superfund cleanup list.

H. SUPERFUND STAFF TURNOVER AND TRAINING

Turnover has also plagued the Superfund program. Turnover rates for the Superfund program continue to exceed those not only for the rest of federal government, but also for other programs at EPA. The latest data from EPA suggests that Superfund turnover was on the rise from FY '86 to FY '88. Continued and increasing turnover undermines the continuity and effective operation of the program, creating problems in assuring that experienced personnel are available to handle the complex legal, technical, and administrative tasks Superfund poses. EPA is to be commended for taking the Subcommittee Chairman's concern over this issue seriously, with a particular emphasis on the Subcommittee Chairman's December 1987 recommendation for enhanced training as a part of the solution to responding to the EPA's manpower problems.

EPA is on the right track with its newly proposed measures to enhance job advancement, salary opportunities, and training for its front-line removal and remedial site managers (so-called Remedial Project Mangers and On Scene Coordinators). The Report recommends that EPA move forward not only to institutionalize these programs, but also to expand them to include additional types of Superfund staff, also subject to high turnover. The Agency should also consider ways to link its investment in Superfund training to encouraging long-term employee commitments.

I. UNDERUTILIZATION OF TOUGH ENFORCEMENT TOOLS

A recurring question since the enactment of Superfund is whether the Agency is using the law's very tough enforcement tools to compel those who are legally liable for Superfund contamination to pay for its cleanup. As is explained in the Report, these tools, whose foundation is strict, joint and several liability, (e.g. liability for complete site cleanup costs without regard to fault or to how much of the contamination a party actually created) range from unilateral administrative orders, treble damages, penalties, injunctive relief, to legal actions for recovering cleanup costs. While some increased use of enforcement tools has occurred during the last several years (e.g. increases in FY '88 unilateral administrative orders and number of Superfund judicial cases), the Agency has generally underutilized its full range of enforcement tools.

Since Reauthorization, EPA, for example, referred only three unilateral cases (e.g. cases where no settlement has been reached) to compel remedial reponse (e.g. the "big ticket" cleanup construction work) to the Department of Justice. This statistic underscores that increases in both administrative and judicial activities by EPA have been primarily skewed to either noncoercive or relatively lower cost site activities, such as removals. Post-SARA enforcement activities relating to the more expensive long-term remedial design/action site activities consist primarily of administrative or judicial formalization of settlement agreements. The Report calls for greater utilization of these tough enforcement tools.

J. INEFFICENCIES IN AND PHILOSOPHICAL IMPEDIMENTS TO ENFORCEMENT

EPA typically points out that it has increased the amount of costs being paid for by responsible parties through settlements. FY '88 resulted in more settlements than in any prior year. While settlements have a role to play, EPA must realize that Congress did not intend the word "Enforcement" to be synonymous with the term "Settlement." Settlements are not a substitute for using the coercive enforcement tools noted above. In fact, willingness to use coercive enforcement tools not only forces responsible parties to undertake or finance cleanups, it also tends to enhance EPA's ability to achieve settlements that are truly protective of health and environment. If private parties know that EPA will issue orders as well as initiate and refer unilateral cases, EPA's strength at the bargaining table would increase.

Nonetheless, EPA has not demonstrated a sufficient willingness to try to bring settlement negotiations to closure or to enhance its negotiating position by bringing enforcement actions, such as issuing administrative orders, during negotiations. In fact, in a significant number of settlement negotiations, EPA has allowed negotiations to continue beyond the time period the Agency itself deems acceptable. Some settlement negotiations drag on, even though the Agency's own guidance materials suggest EPA's concern that protracted negotiations, even if successful, add unnecessary delays to beginning cleanup work.

K. ENVIRONMENTAL PROTECTION QUESTIONS RAISED BY THE ENFORCEMENT PROGRAM

Another apparent problem with the Enforcement program is that it may not be producing proposed cleanup remedies that are as permanent as remedies being proposed for sites funded by the federal government. This is particularly troubling given EPA's emphasis on settlements. EPA's data for FY '87 and FY '88 indicates that Enforcement lead sites (those sites where EPA is seeking to make potentially responsible parties assume cleanup costs) rely more on so-called containment (e.g. preventing the movement of rather that detoxifying) of contamination and less on treatment (including the most permanent types of treatment) than sites designated for public funding. This data raises the disturbing possibility that EPA, in an effort to achieve settlements or to compel responsible parties to pay for cleanups, may be sacrificing health and environmental standards required by the law.

EPA Enforcement staff, when consulted on this finding, began a preliminary analysis of the data. EPA staff examined the differential between containment and treatment remedies for FY '88. According to EPA staff, most of the differences on this question could be explained by sound technical reasons. The Report notes, however, that EPA's analysis has not yet been completed for differences found in the rates of choosing the most permanent forms of treatment for FY '88 or to the questions raised about FY '87 data.

The Report also indicates that staff of the Office of Technology Assessment (OTA) were also consulted and asked for a preliminary analysis of this issue. Contrary to EPA's preliminary analysis, the requested OTA staff preliminary analysis suggested that technical reasons alone could not explain the differences between the Enforcement and publicly funded sides of the program. Given the significant differentials of the data itself, and given at least the debatability over EPA's preliminary findings, the Report calls on EPA to complete its analysis, and to do so in a manner that shows that sites posing comparable environmental problems are handled with similar environmental protectiveness, regardless of whether they are part of the publicly funded or Enforcement program.

L. INADEQUATE FEDERAL OVERSIGHT OF STATES USING FEDERAL SUPERFUND DOLLARS

The Report also examines the questions raised by state use of federal Superfund dollars. EPA's Inspector General through 33 audits from FY '85-FY '87, as well as testimony before the Subcommittee documented significant problems with EPA oversight of states using Federal dollars to conduct Superfund activities. Many states are failing to comply with EPA requirements, and EPA has generally failed to oversee and prevent such noncompliance. The Inspector General's summary report from March 1988 indicates that EPA is taking steps to improve its oversight. Continued vigilance and commitment to managing federal funds is needed.

M. OVERHAULING THE CONTRACTING PROCESS

A final area the Report examines is the Superfund contracting process. The Subcomittee Chairman's December 1987 recommedations included a call for systems to increase competition and efficiency in both the emergency and long-term cleanup programs. To its credit EPA has moved forward with reform mechanisms, but slippage has occurred in this effort.

In addition, it is not clear whether the Agency's contracting reforms are actually yielding the greater competition and efficiency they are designed to achieve. EPA must evaluate these reforms with this question in mind.

The Office of Technology Assessment (OTA) and the General Accounting Office (GAO) have recently raised other questions about Superfund contracting. OTA has questioned whether there is an overreliance in the Superfund program on contractors, and whether such contractors are being managed effectively. While the overreliance question is important, the fundamental implication of the OTA report is that EPA must better manage its manpower, whether that workforce consists of contractors or Agency personnel.

The GAO report highlights a number of weaknesses in EPA's system to prevent conflicts of interest by Superfund contractors. Given the large numbers of such contractors, and the weaknesses GAO identifies, conflicts of interest could pose a significant threat to the proper operation of Superfund. Accordingly, the Report endorses GAO's recommendations, which include making conflicts compliance a part of regularly performed contractor performance reviews, providing required documentation of conflicts cases, and giving EPA staff and contractors more specific guidance for avoiding conflicts.

N. ORGANIZATION OF REPORT

The Report discusses the contracting and other Superfund issues summarized above with the goal of providing solutions. As the Chairman and Ranking Minority Member have noted, the goal of the Report is to point out problems so that they can be addressed. The Report's organization is consistent with this approach. After beginning by summarizing both the relevant oversight activities and providing an overview of the Superfund program, the Report discusses in a recommendation-oriented manner the primary issues investigated since the enactment of the Superfund Amendments and Reauthorization Act of 1986 (SARA).

Each major issue area is examined in a separate chapter. As is outlined in the Table of Contents, the chapters are organized by topic. Following each topic heading, are the relevant findings that have been developed over the last several years of investigation. Accompanying each group of findings are recommendations (which for reference purposes are sequentially numbered throughout the Report) on how to address the issues or problems the findings raise. All the findings and recommendations from each chapter are then summarized together in the final chapter on Conclusions.

Appendix H

Letter from Resnikoff, RWMA
to U.S. EPA

July 1, 1993

766-
1202

RADIOACTIVE WASTE MANAGEMENT ASSOCIATES

July 1, 1993

Mr. John Perrecone
Community Relations Coordinator
US EPA Region
77 West Jackson Blvd
Chicago, IL 60604-3590

Dear Mr. Perrecone:

On behalf of Concerned Citizens of Lake Township, we request that the EPA perform core sampling of the IEL landfill site in Uniontown, Ohio to determine the radionuclides buried at the site. Because of the high radiation gross α and gross β readings in on- and off-site shallow monitoring wells and the possibility that all radionuclides present at the site may not yet have reached the monitoring wells, it is important to know if radioactivity has been disposed of at the IEL site before engineering designs are finalized.

In an April 14 letter to Ms. Julie Corkran, OEPA (enclosed) we stated that the gross α concentrations reported by OEPA and NAREL for May 1992 were about 10 times higher than background well measurements for Stark County. But, OEPA's gross α concentrations for August 1992 were about 140 times background gross α measurements for Stark County, while deep monitoring well measurements at the site were at background levels. This indicates to us that natural uranium or radioactivity is not the source of these high gross α readings; some radioactive materials must have been brought to the site. Perhaps we needn't remind you that some of the shallow monitoring wells are located several hundred feet off the IEL site.

We have concluded that core samples should be taken to precisely determine the nature of radioactive materials at the IEL site. It is not sufficient to simply have monitoring well data because radionuclides generally have differing mobilities. Some radiouclides may be in solution while others may adhere to soil more readily. This difference is usually expressed in terms of distribution or retardation coefficients. Thus, some radionuclides may not yet have reached monitoring wells.

As one example of this phenomena, at the Maxey Flats site, tritium was first seen in monitoring wells, but more recently strontium-90 has been detected. If remediation at the Maxey Flats site did not take place, we would expect cesium-137 to be detected at monitoring wells at some later time. Fortunately at Maxey Flats, we know what materials were buried and readings have been taken of the trench leachate. This may not

212-620-0526

Marvin Resnikoff, Ph.D. • Senior Associate

306 West 38th Street, Room 1508 • New York, New York 10018 • Telephone (212) 629-5612

FAX 212-620-0518

be the case at IEL. Under an EPA TAG grant we are serving as Technical Consultant to Maxey Flats Concerned Citizens on the Superfund remediation of the site.

EPA Region 5 has argued that core samples are not necessary because monitoring wells serve the same or more useful purpose. We agree that monitoring wells show what radioactivity is in solution and reach the monitoring wells. But monitoring wells do not show what radionuclides, with retarded mobility, have not yet reached the wells. That is, monitoring wells only show what is in solution and has reached the wells today. When the EPA puts into effect its remediation plan, additional radionuclides may enter the treatment system. We would like to more carefully plan for such eventualities at this stage and avoid any future surprises.

EPA Region 5 has also argued that upwards of 10,000 core samples may be required to systematically determine the contents of the IEL landfill. We disagree. If the source is distributed, then few core samples would be required. But in any case, the geographical extent may be limited. Information developed in the court case, Marie Desario v. Industrial Excess Inc. before Judge John Haas, Stark County Common Pleas Court this past February indicates that only 3 acres, not 30 acres, should be examined. The areal extent is the Northwest corner, not directly along Cleveland Ave, but from the blower house to the stream. This area corresponds to the area that local residents observed radioactive dumping in the '60's.

If core samples confirm or expand upon what is being observed in off-site monitoring wells, the baseline risk assessment must be redrawn to include the risk due to the presence of radionuclides. Further, we want the engineering design to take this information into account. It makes no sense to start up the treatment system and not treat all carcinogenic material present at the site. While we realize that Region 5 would like to proceed in an expeditious manner with the engineering design, these are matters which must be decided at this stage and should have been determined at the Remedial Investigation phase. If Region 5 is guessing wrong about radioactivity at the site, and the present data does appears to contradict EPA's statements regarding the presence of radioactivity, in the long run the remediation process will be more protracted and more expensive.

cc: C Borello
R Alvarez
H Cal

Sincerely yours,

Dr. Marvin Resnikoff

2nd
CCLT'S TAG
advisor

Appendix I

Ohio EPA Data on Tritium Levels at IEL

STOMER BETZ LABORATORIES, INC.
TENTION SUSAN OVERBECK
ADDRESS 9669 GROGANS HILL RD.
CITY THE WOODLANDS, TX 77380
W.O. NO. 92-12-040

REPORT OF ANALYS

ater Gross Alpha/Beta, Gamma, Tritium — TYPE OF ANALYSIS
97807 — CUSTOMER ORDER NUMBER
12/08/92 — SAMPLES RECEIVED

stomer ntification		Date Collected	Type of Analysis	pCi/l
1204555	(27-S)	12/02/92	Gross Alpha	<3.3
			Gross Beta	5.7±2.3
			H3	6665±2636
			Cs137	<14
			K40	<317

Item 1, continued

December 1992

Sample I.D.	Laboratory I.D.	Tritium (pCi/L)	MDA
RW 42	C1202517	411 ± 230	341
RW 48	C1202521	386 ± 223	332
RW 52	C1201513	403 ± 237	354

March 1993

Sample I.D.	Laboratory I.D.	Tritium (pCi/L)	MDA
MW 17-S	D0305501	761 ± 329	500

Item 1

In two instances, analysis for tritium yielded relatively higher values and correspondingly higher two sigma error reports. Ohio EPA requested that TMA provide (i) the Minimum Detectable Activity (MDA), and (ii) any additional information available for these two samples that would increase our understanding of the higher error reports.

			MDA (pCi/L)
(a)	Laboratory I.D.	C1204555	
	Sample I.D.	MW 27-S	
	Date Collected	12/2/92	
	Tritium	6666 ± 2636 pCi/L	4790
(b)	Laboratory I.D.	C1214529	
	Sample I.D.	MW 17-S	
	Date Collected	12/9/92	
	Tritium	3313 ± 949 pCi/L	1460

TMA indicated that "the higher than normal two (2) sigma errors reported for the two tritium analyses in item 1 (Sample I.D. MW 27-S and MW 17-S) was due to quenching in the sample, which reduced the counting efficiency from 20% to 5%."

Panel members also requested reports of the MDAs for each of the following tritium analyses:

May 1992

Sample I.D.	Laboratory I.D.	Tritium (pCi/L)	MDA (pCi/L)
MW 23-D	C0514526	597 ± 260	412
MW 28-D	C0515521	304 ± 182	278
MW 17-D	C0515523	366 ± 190	287
MW 27-S	C0514520	1358 ± 382	601
RW 48	C0515526	363 ± 189	285

Appendix J

Letter from M. Resnikoff, RWMA
to Ohio EPA

April 14, 1993

RWMA

RADIOACTIVE WASTE MANAGEMENT ASSOCIATES

April 14, 1993

Ms. Julie Corkran
Division of Emergency and Remedial Response
Ohio EPA
2110 E. Aurora Road
Twinsburg, OH 44087-1969

Dear Ms. Corkran:

After comparing OEPA and NAREL data and methods for measuring gross α at the IEL landfill, we have the following observations which may be helpful. Both NAREL and OEPA's May 1992 measurements and particularly OEPA's August 1992 measurements convince me that radioactive materials exist at the IEL landfill and must be accommodated in the remedial design.

The methods for measuring gross α in water by NAREL and OEPA, through TMA Eberline, are almost identical. Both employ EPA method 900.0 for measuring gross α in water. At your suggestion, we spoke directly with staff at TMA Eberline. The major difference is that NAREL filters the samples in the field (which can be subject to some uncertainty), then separately measures gross α for the filtrate and solute while TMA Eberline, the subcontractor for OEPA, measures the sample directly without filtering it beforehand. The OEPA and NAREL: results nevertheless appear to be comparable. If you look at the attached Table 1, well MW-27s, you'll note the State's results for May 1992 are 25 pCi/l, compared to NAREL's 35.1 pCi/l. The NAREL results are obtained by adding the radioactivity in the filtrate divided by 3.8 (to convert one gallon to one liter) to the radioactive concentration in solute, as shown in Table 2. MW-27S is at least 200 feet off-site, on the other side of Cleveland Ave.

At the meeting, you and Dr. Broadway indicated that false positives may occur by not first filtering the samples. This seems to be somewhat of a red herring. You'll note, for well MW-27s, that NAREL's solute reading is 33.6 pCi/l compared to OEPA's 25 pCi/l and that the filtrate accounts for less than 4% of the above 35.1 pCi/l total. These results are generally ten times higher than background well measurements for Stark County.

Since, as you see from Table 1, NAREL and OEPA's results are comparable, we now have some confidence that OEPA's August 1992 readings will be confirmed by NAREL. OEPA gross α measurements in MW-27S for August 1992 are 140 times

Marvin Resnikoff, Ph. D. • Senior Associate

306 West 38th Street, Room 1508 • New York, New York 10018 • Telephone (212)629-5612

background measurements for Stark County. Gross α measurements 140 times background cannot be due to naturally occurring radioactivity, as the ATSDR health physicist also agreed. Since the deep wells, such as MW-27D, do not have high gross α levels, the high gross α concentrations in surface wells cannot be due to natural uranium sources at the site. Some radioactive source must have been brought to the site.

We are concerned about the excessive length of time for Region 5 and NAREL to report radiation measurements. While we wait for NAREL to report their August 1992 results, the design plans continue apace. If the design plans have to be amended when it is 60% or 90% complete, this may mean considerable delay in remediating the site. Based on the present measurements by OEPA and NAREL, we are convinced that radioactivity exists on the site and that any remediation plans must take this into account.

As I mentioned at the March 10 meeting, in addition to measurements from monitoring wells, [redacted]. If the source is a distributed source, few core samples are required. If the source of off-site radioactivity is one or many point sources, core sampling will be difficult, but not impossible since, based on recent court testimony and anecdotal information, one can limit the area of interest.

In the 19 years I have worked on radioactive waste and landfill issues, including considerable experience with the federal EPA, I have never encountered this quite perplexing denial and attitude by Region 5. Generally the federal EPA is more flexible, but Region 5 is reluctantly backing into any admission that radioactivity exists on the site. Why?

I'd appreciate any comments you have and thank the OEPA for your cooperative approach to resolving problems at the IEL landfill.

cc: R Alvarez
C Borello
H Cole

Best,

Marvin Resnikoff

Table 1. IEL Landfill
Gross Alpha

Monitoring Well	OEPA Groundwater Aug 92 (pCi/L)	OEPA Groundwater May 92 (pCi/L)	NAREL May 92 (pCi/L)
BH-21S	225		
MW-17S	143		
MW-17D	2	<2.7	-0.64
MW-23S	193		3.54
MW-24S			63.24
MW-25S	118		26.2
[redacted]			
MW-27D	<2	<2.7*	1.32
RW-42	<3.5		0.84
RW-49	3.5	<3.5	1.67
RW-52	5.1		9.11
RW-64	2.1		0.48

*tritium levels in 20D, 23D and 27D are 1429, 1421, 1426 pCi/l resp.

Table 2. IEL Landfill
Gross Alpha

NAREL Monitoring Well	May 92 Groundwater (pCi/L)	Filtrate (pCi/sample)	Solute + Filtrate (pCi/L)
MW-1S	0.49	4.27	1.61
MW-1I	0.52		0.52
MW-1D	-0.93	1.00	-0.67
MW-2D	-0.86	1.60	-0.44
MW-3I	3.72	1.97	4.24
MW-3D	1.88		1.88
MW-4S	7.72	143.20	45.40
MW-5S	-0.48	5.90	1.07
MW-6S	0.71		0.71
MW-7S	1.36	0.09	1.38
MW-7I	0.71	0.39	0.81
MW-7ID	1.43	0.04	1.44
MW-7D	1.96	1.38	2.32
MW-8S	2.62	27.70	9.91
MW-8I	-0.76	0.42	-0.65
MW-8I	2.98	0.73	3.17
MW-8D	1.44		1.44
MW-8D	0.53	0.13	0.56
MW-9S	-0.47		-0.47
MW-9I	-0.94	0.72	-0.75
MW-9D	0.00	5.09	1.34
MW-10S	0.48	23.20	6.59
MW-10I	0.68	1.78	1.15
MW-10D	2.47		2.47
MW-11S	-0.24	27.20	6.92
MW-11I	0.76	0.19	0.81
MW-11D	0.44	6.15	2.06
MW-12I	3.46	27.90	10.80
MW-12D	1.20	34.40	10.25
MW-13S	3.82	8.88	6.16
MW-13SD	2.77	5.30	4.16
MW-13I	2.15	0.28	2.22
MW-13ID	1.23	0.37	1.33
MW-14S	1.19	40.80	11.93
MW-14I	-0.52	1.43	-0.14
MW-15S	0.51	3.66	1.47
MW-15I	2.09	4.84	3.36
MW-16I	0.55	2.81	1.29
MW-17D	-0.64		-0.64
MW-18S	-0.27		-0.27
MW-18I	1.67		1.67
MW-19S	0.24	26.60	7.24

MW-20S	0.24	0.34	0.33
MW-20I	-0.47	0.44	-0.35
MW-20ID	2.36	0.24	2.42
MW-20D	-0.47	1.63	-0.04
MW-21S	1.01	0.29	1.09
MW-21I	0.45	34.00	9.40
MW-22I	1.42	0.58	1.57
MW-22ID	0.71	0.31	0.79
MW-23S	1.26	8.65	3.54
MW-23I	0.98	0.66	1.15
MW-23D	6.34	4.84	7.61
MW-24S	60.00	12.30	63.24
MW-24I	0.84	1.45	1.22
MW-25S	26.20		26.20
MW-25I	1.01	0.43	1.12
MW-26S	0.50	1.17	0.81
MW-26SD	1.06	0.62	1.22
MW-26I	6.30	24.30	12.69
MW-27S	[illegible]	6.82	35.13
MW-27I	1.71	0.37	1.81
MW-27D	1.01	1.18	1.32
MW-28D	-0.25	1.66	0.19
RW-42	0.77	0.26	0.84
RW-46	1.68	-0.05	1.67
RW-52	8.34	2.91	9.11
RW-64	0.23	0.94	0.48

Appendix K

Letter from Dr. Mark Baskaran, Wayne State University
to Chris Borello, Concerned Citizens of Lake Township

September 27, 2001

WAYNE STATE UNIVERSITY
MARK M. BASKARAN PH.D.
ASSOCIATE PROFESSOR
DEPARTMENT OF GEOLOGY
0224 OLD MAIN
DETROIT, MI 48202

27 September 2001

Ms. Chris Borello
President
Concerned Citizens of Lake Township
P. O. Box 123
Uniontown, OH 44685

Subject: Examination of the data and associated information on the radionuclide problem in the Industrial Excess Landfill Superfund site.

Dear Ms. Borello:

Thanks for faxing me the radionuclide data and other pertinent information on the radionuclides in the Industrial Excess Landfill (IEL), a Superfund site. From this information that you have provided to me, it appears that there is some serious concern among the public that radioactive material from the Dayton's now-closed Mound Laboratory, once part of the Federal Government's nuclear weapons complex, could have gone into the Uniontown dump.

Before going further on commenting the radionuclide data, let me state few facts on the distribution of Uranium-thorium series radionuclides and plutonium in the environment. Uranium and thorium series radionuclides are very common throughout the environment and the concentration of these nuclides varies widely. For example, in groundwater, the concentration of uranium varies over 1-4 orders of magnitude. The same thing is true with several other daughter products. However, the atomic ratio of U-238/U-235 (or the activity ratio) is a universal constant. Any deviation from this constant value indicates there is some 'non-natural' uranium that has been added to the environment. As you might know, the nuclear industry has gone after U-235 and there is a large amount of depleted uranium (depleted with respect to U-235, meaning that U-238/U-235 ratio will be higher than the natural value) or enriched uranium (enriched with respect to U-235, meaning that the U-238/U-235 ratio will be lower than the natural value). In the case of plutonium (Pu) isotopes, all the plutonium is derived from anthropogenic activity. From the weapons testing since 1952, a large amount of plutonium was released in to the atmosphere, which eventually came back to the surface of the earth. This bomb fallout-derived plutonium is seen in the soils all over the continent, in lakes, glaciers, and ocean. The Pu is highly particle-reactive, with distribution coefficient ranging from 10^4 to 10^7 cm^3 g^{-1}. What this means is that if we put some Pu in the soil, most of the Pu will get adsorbed onto the soil particles and very little can undergo vertical movement. In addition, the atomic and activity ratios of Pu have been utilized to trace the sources of Pu in the environment.

With this background information, I would like to move forward with my comments on the data that you faxed to me. It is a very serious issue if we find 0.28 or 0.21 pCi/L of total Pu in the groundwater. Firstly, most likely this Pu is derived from a local source, as opposed to the global fallout. If this Pu is derived from a local source, then, obviously there must be much higher levels of Pu in the soil above the water table. In my opinion, the truth must be found by a systematic investigation on this and adjoining aquifer systems. Secondly, the concentration of Pu in other natural water systems (such as ocean water, lake water, river water, etc) is 2-4 orders of magnitude lower than the value reported here. These natural water systems are open to the atmosphere and hence got their share of global atmospheric fallout. Thirdly, if we find Pu at 92 to 190 feet down from the earth surface in groundwater system, most likely that Pu must have been derived from a local source, rather than leaching from soils (fallout Pu) in the surface. Finally, comparing the groundwater Pu concentration with those in the soil is meaningless. We have conducted several researches along this line and published a series of articles in peer-reviewed journals.

I quickly looked at the data presented in the spreadsheet that you faxed (Table 3, November 2000 Sampling Event Data Summary). The following seems to be serious issues:

i) MW-01D – Total Pu concentration of 0.28 pCi/L. If this is a real value, what is the source of Pu to this groundwater system? Is it possible that a large amount of Pu was dumped above the water table in this site?

ii) MW—011 – Total Pu concentration of 0.21 pCi/L. Same as i).

iii) MW-01D – U-235 concentration of 0.16 pCi/L as compared to U-234 concentration of 0.34 pCi/L. In most groundwater, U-234 concentration is higher than U-238. Under such a circumstance, U-238/U-235 activity ratio will be likely less than 5. In natural uranium, the ratio must be 21.76. If this data is accurate, then, it is very likely that there could be some enriched uranium above the water table.

In addition to this, the data reported by the Cohen Associates (dated June 23, 1992), indicate the following:

i) Ra-226 concentration of 76.1 pCi/L. This is more than an order of magnitude higher than the drinking water limit set by EPA.

ii) The U-238/U-235 activity ratio is 10.78 (±1.33), which is significantly different than the natural U value of 21.76. This discrepancy can either be due to bad data or there is some serious contamination of non-natural uranium from the nuclear material dumped in the IEL.

The data reported by Beta Laboratories, Inc indicate the following:

i) There is some measurable amount of Co-60 (<30.3 pCi/L). Ac-227 level is excessively high. This is derived from U-235 (via Pa-231) and hence it appears there might be a large amount of non-natural uranium adjacent to the groundwater-sampling site.

ii) Presence of high level of Th-227 also indicates there could be significant amount of U-235 (U-235 decays to Pa-231 which decays to Th-227 and so on).

iii) Presence of Cs-137 also appears to be evident. All these data point out either all these data are bad or there is some serious problem in this area.

My overall evaluation of the documents that you have provided is that this area must be investigated thoroughly with a completely independent agency and all the future analysis must be carried out in an academic setting, where the precision could be improved by 1-3 orders of magnitude. For example, our precision on Pu analysis is about 2 orders of magnitude better than the data reported. For U-atomic ratio determination, the analysis must be carried out in a thermal ionization mass spectrometry facility (similar work was carried out in groundwater samples collected near Sandia National Laboratory in Albuquerque in New Mexico on my recommendation). It is very important that the truth is found out on this very important issue.

I hope this assessment helps you to move forward with this issue. Please feel free to contact if you have any additional questions. I can also be reached by e-mail: Baskaran@chem.wayne.edu

With best regards,

M. Baskaran

Mark Baskaran

Appendix L

E-mail communication from Arjun Makhijani
to Lois Chalmers,
"Re: Tritium – Naturally Occurring,"

February 5, 2002

Subject: Tritium - naturally occurring
Date: Tue, 05 Feb 2002 13:10:34 -0500
From: Lois Chalmers / IEER <lois@ieer.org>
To: danni@pogo.org
CC: arjun@ieer.org, Lisa Ledwidge <ieer@ieer.org>

To: Danielle Downing, Project on Government Oversight. (202-347-1122)

Danni:

Here is a short statement from Arjun. With a quote from Eisenbud which cites UNSCEAR!
Lois

Naturally occurring tritium is very scarce. "The natural concentration of tritium in lakes, rivers, and potable waters was reported to have been 5-25 pCi L-1 (185-925 Bq m-3) prior to the advent of weapons testing (UNSCEAR, 1982)."* One would expect to find much less tritium in groundwater than in surface water.

Tritium in groundwater is almost entirely man-made in origin. A concentration of 300-4000 picocuries per liter in groundwater can be regarded as of anthropogenic origin, provided that the measurements are reliable. Detection of tritium at low levels is difficult and the sensitivity of laboratory procedures can vary a great deal.

Arjun Makhijani. Feb. 5, 2001

*Merrill Eisenbud, Thomas Gesell. *Environmental Radioactivity: From Natural, Industrial and Military Sources*. 4th ed. (San Diego: Academic Press, 1997). p. 182.

--
Ms. Lois Chalmers
Librarian
Institute for Energy and Environmental Research (IEER)
6935 Laurel Avenue, Suite 204
Takoma Park MD 20912 U.S.A.
Phone: 1-301-270-5500; Fax: 1-301-270-3029
e-mail: lois@ieer.org
website: http://www.ieer.org

Environmental Radioactivity

From Natural, Industrial, and Military Sources

FOURTH EDITION

Merril Eisenbud
Professor Emeritus
New York University Medical Center
Nelson Institute of Environmental Medicine
New York, New York

Thomas Gesell
Health Physics Program
Department of Physics
Idaho State University
Pocatello, Idaho

ACADEMIC PRESS
San Diego · London · Boston · New York · Sydney · Tokyo · Toronto

Academic Press
a division of Harcourt Brace & Company
525 B Street, Suite 1900, San Diego, California 92101-4495, USA
http://www.apnet.com

Academic Press Limited
24-28 Oval Road, London NW1 7DX, UK
http://www.hbuk.co.uk/ap/

Library of Congress Cataloging-in-Publication Data

Environmental radioactivity / edited by Merril Eisenbud, Thomas F. Gesell. – 4th ed.
p. cm.
Includes bibliographical references and index.
ISBN 0-12-235154-1 (alk. paper)
1. Radioactive pollution. I. Eisenbud, Merril. II. Gesell, Thomas F.
TD196.R3E597 1997
363.1'79–dc20 96-41834
CIP

PRINTED IN THE UNITED STATES OF AMERICA
97 98 99 00 01 02 QW 9 8 7 6 5 4 3 2 1

Contents

3 mrem y^{-1} (30 μSv y^{-1}) to the skeletal tissues of the body and 1 mrem y^{-1} (10 μSv y^{-1}) to the soft tissues (NCRP, 1987a).

Tritium a radioactive isotope of hydrogen, is formed from several interactions of cosmic rays with gases of the upper atmosphere (Suess, 1958). Tritium exists in the atmosphere principally in the form of water vapor and precipitates in rain and snow. Like ^{14}C, it is produced in thermonuclear explosions, and this has increased the atmospheric content of tritium in a manner that will be discussed in a subsequent chapter. The natural production rate of ^{3}H is estimated (NCRP, 1979) to be about 0.19 atom cm^{-2} s^{-1}, corresponding to a steady-state global inventory of about 26 MCi (9.6 × 10^{5} TBq).

The natural concentration of tritium in lakes, rivers, and potable waters was reported to have been 5–25 pCi L^{-1} (185–925 Bq m^{-3}) prior to the advent of weapons testing (UNSCEAR, 1982). The annual absorbed dose from tritium of natural origin is estimated to be about 1 μrem y^{-1} (0.01 μSv y^{-1}) uniformly distributed in all tissues (NCRP, 1987a).

The other nuclides formed from cosmic-ray interactions with the atmosphere may be potentially useful as tracers for studying atmospheric transport mechanisms, but relatively few observations have been reported.

NATURAL SOURCES OF EXTERNAL IONIZING RADIATION

The dose received from external sources of ionizing radiation originates from cosmic rays and from γ-emitting radionuclides in the earth's crust. UNSCEAR (1988) estimated the external annual effective dose equivalent from all naturally occurring radiation in "normal" parts of the world to be 0.36 mSv y^{-1} (36 mrem y^{-1}) from cosmic sources and 0.41 mSv y^{-1} (41 mrem y^{-1}) from terrestrial radiation. For the United States, the estimates are 0.27 mSv y^{-1} (27 mrem y^{-1}) for cosmic sources and 0.28 mSv y^{-1} (28 mrem y^{-1}) from terrestrial radiation (NCRP, 1987a).

Solon *et al.* (1958) and later Beck (1966) and Beck and de Planque (1968) made extensive measurements of the natural γ-radiation background in a number of cities throughout the United States. The data of Solon *et al.* were about 30% higher than those reported by Beck, probably because of the greater effect of fallout during the period when their measurements were made. The techniques used by Beck and associates permitted differentiation between fallout and natural radiation. This was not possible at the time Solon *et al.* made their measurements because γ spectrometry was not yet practical for use in the field.

The mean dose rate in the 124 locations measured by Solon and coworkers (1958) was 81 ± 20 mrad y^{-1} (0.81 ± 0.2 mGy y^{-1}), compared to the Beck (1966) mean of 61 ± 23 mrad y^{-1} (0.61 ± 0.23 mGy y^{-1}) at 210 locations. Solon *et al.* showed that their data were well correlated with barometric pressure, indicating the effect of cosmic sources of radiation. The data gathered by Beck at the principal cities where measurements were made are summarized in Fig. 6-7.

TERRESTRIAL SOURCES OF EXTERNAL RADIATION

The terrestrial sources of γ radiation are ^{40}K and nuclides of the ^{238}U and ^{232}Th series. If the concentrations of these three nuclides in soil are known, the dose can be estimated, using methods developed originally by Hultqvist (1956) and further developed by Beck (1972). The absorbed dose in air, 1 m above soil having unit concentrations of the three nuclides, is given in Table 6-19. If these data are adjusted for the typical concentrations of the three nuclides in soil (NCRP, 1975c), it will be found that ^{232}Th and ^{40}K each contribute 10–12 mrad y^{-1} (0.1–0.12 mGy y^{-1}). The absorbed dose above various kinds of rocks is given in Table 6-20. According to Kohman (1959), the similarity of dose rates from the various isotopes listed in Table 6-20 is a coincidence arising from the fact that these isotopes happen to be present in rocks in amounts that are approximately inversely proportional to their specific activities.

The external γ radiation from radionuclides in the earth's crust is thus influenced by the kind of rock over which the measurements are made. The actual doses to people cover a somewhat narrower range owing to the fact

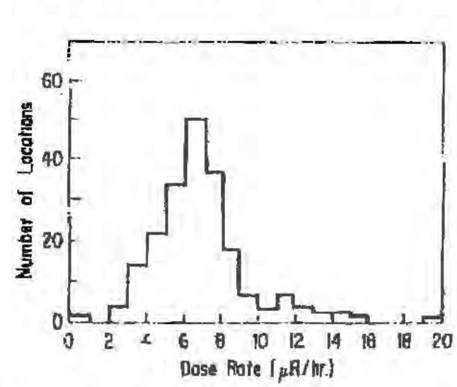


FIGURE 6-7 Frequency distribution of the γ dose rate from natural emitters at 210 different locations in the United States. [From Beck (1966); reproduced from *Health Physics*, **12**, by permission of the Health Physics Society.]

Appendix M

Testimony of Dr. Robert K. Simon
Beltz v. Hybud Equipment, No. 1993-CV-720
Stark County, OH

1994

PLAINTIFF'S EXHIBIT 3

The State of Ohio,)
) SS:
County of Stark.)

IN THE COURT OF COMMON PLEAS

Donald E. Beltz, Administrator)
of the Estate of Blanton B.)
Beltz, Deceased,)
)
Plaintiff;)
)
vs.) No. 1993CV00720
) Judge Haas
Hybud Equipment Corporation,)
et al.,)
)
Defendants.)

- - - -

Deposition of ROBERT K. SIMON, Ph.D., a Witness herein, taken as if under cross-examination before Debra A. Butzer, a Notary Public within and for the State of Ohio, at the offices of Squire, Sanders & Dempsey, 4900 Society Center, Cleveland, Ohio, commencing at 10:30 A.M., Tuesday, January 25, 1994, pursuant to notice and stipulations of counsel, on behalf of the Defendant Goodyear Tire & Rubber Company, Bridgestone/Firestone, Inc., and Loral Corporation.

- - - -

Dr. Simon's depo excerpts

[redacted]

A. Well, I think, again, we could sort of classify those in the areas of my expertise, if you have no objection.

One, in terms of the exposure assessment, and particularly since my site visit yesterday, I have the opinion that this is an uncontrolled hazardous waste site that is active at the present time, is not closed, it is an open site, in my opinion, it is a site that is most probably leaking, and I say that in reference not only to potential radioactivity but other chemicals, that was improperly closed in '81 according to what I consider proper hazardous waste closure guidelines, and a site that needs definite assessment and should not be capped in the approach that EPA is presently planning to take for this particular site.

In the terms of chemistry, my interpretation of the quarterly, if you will, samples that are being assessed by the Scientific Advisory Board that are being conducted by Ohio EPA, US EPA, with their NAREL laboratory, and have been conducted by other contract laboratories, my opinion is

[redacted]

[redacted]

earlier in the morning which was less than .01 millirems per hour, which was outside of the McNamara & Freeman offices. So there was some deviation from background in the area of barrels that contained samples at that particular location.

Throughout the rest of the site, I really did not detect anything of an airborne nature above background.

Q. Okay. How did you use this meter? Did you hold it down to the ground or above the ground, or how does that work?

A. It's actually a hand-held Geiger-Muller counter, and the way it works is that it has access channels on the left side of the meter that one holds near the object which will pick up beta, basically, or gamma and x-rays, and then if you hold the meter essentially away from the object, it will not pick up the Beta at all and pick up the gamma and the x-rays.

So basically it was a hand-held meter that I was surveying around the barrels, so essentially the .3 readings were essentially when you were close to the barrels you were picking up this radioactivity.

[redacted] [redacted] [redacted]

[redacted]

Q. So apparently -- I don't want to jump to any conclusions, but it sounds to me like the barrels are emanating some sort of radioactivity?

A. It's possible. All that I can say at this point is it's possible.

Q. Okay. Do you know whose barrels they were or what was in them?

A. The description of the barrels from Doctor Corkran was that these contained the, quote, "waste water" which emanated during the actual drilling of the wells on site, and this was the waste water from the washings of the drill bits, the auger bits, et cetera, that had been drilled down into the ground to make the holes for the wells, and rather than wash this particular sediment or soil which was down in the depths of the site onto the surveys, they essentially held the auger, if you will, over the barrels and washed it off, I'm assuming with distilled water, methanol or acetone, some type of solvent, they washed off the auger bits into the barrels. So that's what that particular waste barrel contained according to Doctor Corkran.

[redacted] [redacted]

[redacted]

Q. Okay. Do you know where these holes were drilled in the site?

A. I would say yes, certainly the particular well casings are quite visible. They are on a perimeter inside of the fenced area of the site, essentially running around the entire perimeter, and then there are wells, and we saw some of them yesterday, that are outside of the site, in the residential areas surrounding the four sides of the site.

Q. Uh-huh.

A. So the wells are visible.

Q. Okay. To your knowledge, did Doctor Corkran indicate that there was some record that had been made of which barrel contained waste water from which well site, or were they mixed together?

A. She didn't specifically go through that yesterday and we didn't try to do that yesterday.

My observation of the barrels is I hope somebody has a record, because they were pretty well unmarked barrels, stored out in the weather, not, in my opinion, properly contained and preserved for further testing.

[redacted]

[redacted]

So I hope somebody somehow has marked these barrels, but I didn't see marks or numbers or designations personally on the barrels and she did not discuss that.

Q. Do you have some idea of how many barrels we're talking about here?

A. I would guess approximately a hundred. There was one major storage area of barrels. There were four or five barrels that were somewhat west, into the central area from the main cache of barrels, and then there were a few barrels down towards the central -- excuse me; the other four or five barrels were somewhat east of that location, and then there were several barrels that looked like they were empty, although I couldn't be totally positive, that were down in an indentation of the fence on the central west side of the site, closer towards Cleveland Avenue or Cleveland Road, which is the road addressing the site.

Q. The north/south road on the west side of the site?

A. Yes.

Q. All right. Were there barrels to the east of

[redacted] [redacted]

[redacted]

the central cache also -- did they also give off this radioactivity at the rate of .3 millirems per hour?

A. I really didn't get much reading in that area --

Q. Okay.

A. -- so I wouldn't want to classify it as above background.

Q. And was Doctor Corkran's representation that that's all these barrels contained, was this waste water from cleaning the auger bits, or was --

A. That was her description of what they contained.

Q. All right. As an industrial hygienist, what is the amount of millirems per hour or rems per hour that people are permitted to be exposed to in the course of work, for example, on an eight-hour time-weighted average?

A. Well, I think sort of the guideline that one doesn't like to see exceeded is about four millirems per year as a dose, although that's going to vary significantly depending on whether it's alpha, beta, gamma radiation, et cetera, and also what types of isotopes, if

[redacted] [redacted]

[redacted]

A. I've reviewed their data file, and when you review their data file, you know, I can follow what they're doing. They made deviations and variations in procedures, in how they handled their samples in their laboratory, that are different than the way EPA handled their samples, but they're not wrong procedures. They may have made dilutions of samples to make measurements or they may have had more than, let's say, for example, 100 milligrams of solid residue in the plant check that was counted because they wanted to get more sensitivity for a particular tritium analysis. That doesn't mean that the experiment is invalid; what it means is that the experiment was done differently.

So my review of the CSP data is that they did a reliable job in terms of measuring the radioactivity, while they may not have followed all the rules and regulations that EPA would prescribe to how to handle those samples. So, yes, I have done an assessment and I don't find any problems with the way they carried out their work.

Q. All right. Is there some special significance

[redacted]

[redacted]

to the CEP results that you don't find with the NAREL results?

A. Well, what the CEP results say, number one, is that there's excessive radioactivity coming off this site. So the first thing that's significant is they add to the other results that we are getting now from the NAREL, the '92, '93 readings. That's really not different. We do have, however, some oscillations to some rather high readings in some of the CEP, some million picocuries per liter in certain samples, and as somebody looking at trends for exposure, I find those quite significant and I find the fact that they were reporting them very important, because the NAREL folks tend to consider those kind of readings outliers and outside of some standard deviation type of response to what they would anticipate the readings to be, and then they say "Well, this is an outlier, we won't consider that result." So I think the CEP results are important to show us a sort of scan or an output of the site radiochemically, whereas NAREL is, in my way, trying too hard not to be investigators, they're trying to be

[redacted]

compliance monitors. And my opinion, as I said, I think, at the beginning of this deposition, is this is definitely not a site for compliance monitoring. This is an open site that needs to be really opened up, if you will, and explored as to what really happened in the past and is going on at the present time, and the NAREL approach to some type of ground water compliance monitoring is very inappropriate. And so that's why to me the CEP data is very important.

As Doctor Resnikoff pointed out in his memo, for example -- and I recall these as the 23 and 27 shallow wells -- on all four of the quarterly monitorings previous to '93 these wells had been quite contaminated with the plutonium, with uranium, with beta radiation, and yet all of the sudden the PRC slash NAREL group just stopped monitoring these wells without any explanation, yet they were two of the highest contamination levels.

I think this is not investigative chemistry, this is compliance monitoring, and I think that's the biggest difference between CEP and NAREL.

[redacted]

would assume the production facilities would be, trying to cure these products, number one, and to try to use this type of research in many different stages of development, that, as I said earlier, the generation of a lot of beta energy into a large number of tire products, materials, certainly could produce a reservoir, then, of beta radiation, that could be essentially decaying or off-gassing, as we might say, for a significant amount of time.

One of the things that concerned me when I first learned about it at the IEL site is --

Q. Learned about what at the IEL site?

A. One of the things I learned about at the IEL site was that apparently there was a lot of disposal of latex products that, for whatever reason, and I don't know what those reasons were, were not used, they were discarded or they didn't fit into the particular process or they didn't meet some quality control specs or whatever the reason was that it was dumped there, and if one then is doing a lot of irradiation of those materials, that can have then a lot of beta radiation essentially embedded into the process, and then one has

[redacted]

problem. I don't really view in this particular case the, quote, "sealed sources," the Nickel 63 or the tritium sources of gas chromatographs, as perhaps a major factor in any potential radiological contamination of the site.

Q. What do you think is the major problem in terms of the radiological contamination at the IEL site?

A. I think at this point we can only say there are things that concern us that certainly we can say we have to do a lot more work. For example, there is some description of uranium hexafluoride enrichment, you know, the typical centrifugal enrichment procedures that may have been used, for example, at Goodyear Aerospace. UF 6 is the most toxic compound of uranium, very highly-toxic compound. If that particular waste were to dump -- have been dumped at IEL, that could be a major source of radioactivity at the site.

Knowing now as we're reading the data base that this did occur --

Q. That what did occur?

A. That UF 6 enrichment apparently was going on,

[redacted]

[redacted]

used.

Q. Have you seen any information that it was?

A. I can't say that I have at this point, but it's certainly a very large unanswered question at this point.

Q. Okay. Other than the uranium hexafluoride enrichment process which you believe was occurring at Goodyear Aerospace, other than the latex rubber process which may have generated irradiated latex waste which was radioactive, and other than the liquid scintillation counting which may have generated wastes in solvents which were radioactive, is there something else that you're looking at as a likely source or reasonable source of radioactivity in the IEL as generated by any of the rubber companies?

A. Well, one of the questions I would have certainly particularly for Ravenna Arsenal weapons production is generated by some of the results that are now coming out of the quarterly monitoring. The Plutonium 238, for example, levels that have been detected in the -- we'll call them ground water samples certainly are elevated beyond what we would

[redacted] [redacted] [redacted]

[redacted]

anticipate in water. The Plutonium 238 is usually bound to soil and is usually something that does not show up in ground water. For example, if it was naturally occurring, it would be bound to the solid matrix. We're finding this, however, in shallow wells at the IEL site, and that certainly suggests to me that that was a dumped product rather than some natural source. Plutonium 238 is certainly something that concerns us, and so those findings now on the quarterly sampling make me wonder where was the Plutonium 238 source. I don't think it is sand and gravel at IEL. I think it came from some external source.

Q. Sure.

What makes you think it might have had something to do with the rubber companies?

A. Well --

Q. What would a Plutonium 238 be used for in a rubber industry?

A. Well, it could have been used in Goodyear Aerospace, could have been used in Ravenna Arsenal production, these type of cases.

Q. Do you know what type of weapons production

[redacted] [redacted]

[redacted]

TITLE IEL Onsite Walk-Thru **PROJECT NO.** IEL

EX. B

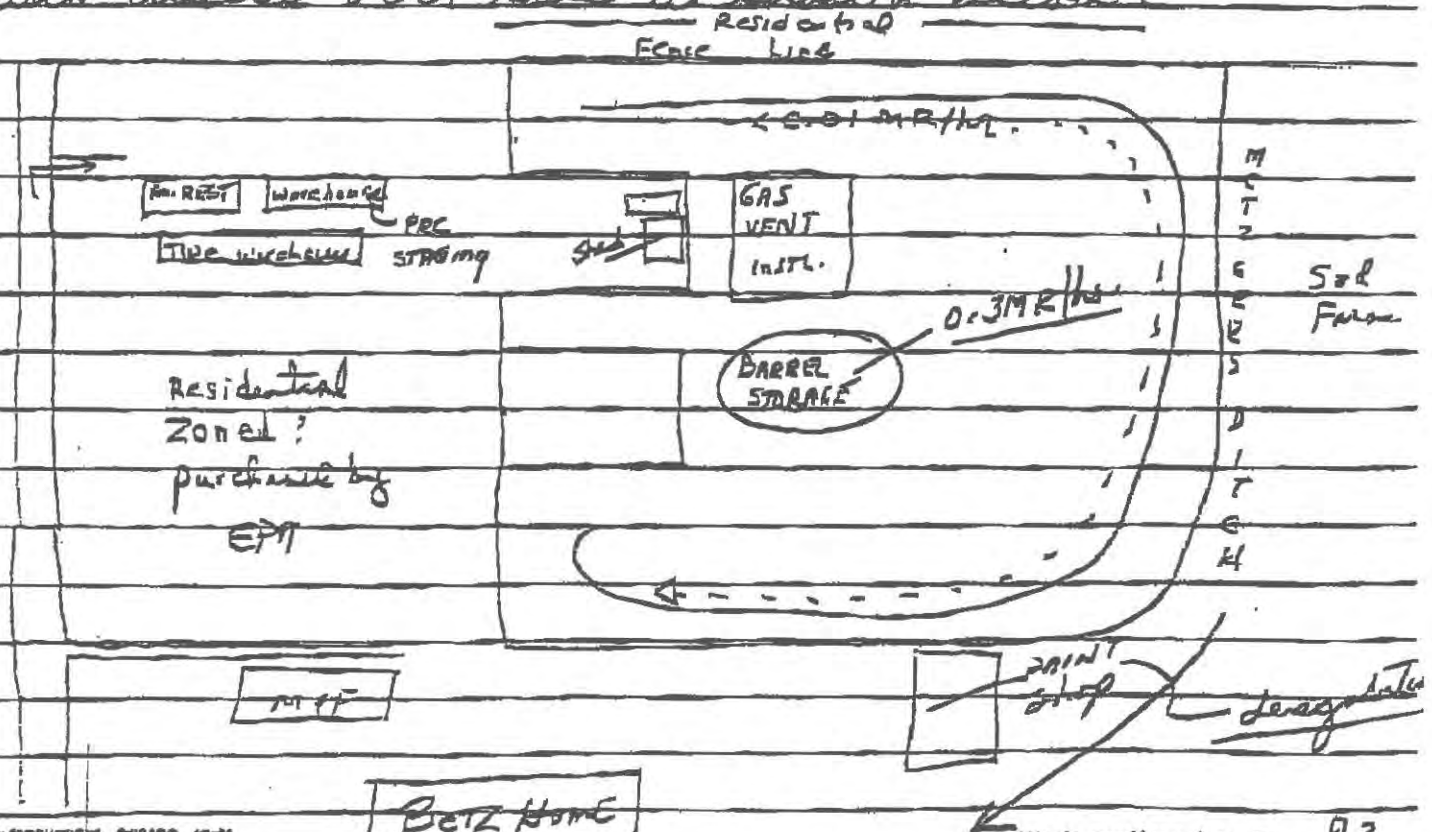
Work continued from Page →   **BOOK NO.** 9201

① 1142 hours - BG inside M&F hallway $\frac{3/min}{330/min} \times 0.1 mR/hr \leq 0.001$ mR/hr

1147 hours BG outside MF in parking lot $\frac{20/min}{330/min} \times 0.1 mR/hr \leq 0.01$ mR/hr.

② Site VISIT (~1215 hrs to 1345 hrs)
Attendees: Julie Corkran, Ph.D., Proj. Coord, OEPA
Todd — Hydrogeol., OEPA
Mary Rowlands, atty
RK Semon, PhD., TI

③ Left Rowland office and drove to northwest entrance of site near warehouse. Parked car and walked over site as shown below.



Work continued to Page 93

SIGNATURE RK Semon   DATE 012494

DISCLOSED TO AND UNDERSTOOD BY   DATE   WITNESS   DATE

[redacted]

TITLE IEL Onsite Walk Thru PROJECT NO. IEL

Work continued from Page 94

BOOK NO. 9201

4.13. I questioned why EPA (PRC) had demobilized the pumphouse. Why was there no field site lab or lab benches for pH, filtering water samples, etc? Why was there no heat or electric so that the site coordinator could have use of the building; and quarterly GW monitoring samples could be processed? Refrigerator for temporary storage of samples was not present? This setup raised questions in my mind about the competence of the site program.

Work continued to Page ____

SIGNATURE DATE

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

Appendix N

Eyewitness Accounts from
Liz and Harlan McGregor, April 8, 1999
Rex Shover, February 6, 1999
and
Jim Shover, March 2, 1999

LIZ MCGREGOR

Memo

To: U.S. EPA - REGION 5 -

TO WHOM IT MAY CONCERN

From: LIZ MCGREGOR

CC:

Date: 04/08/99

Re: UNIONTOWN LANDFILL

PLEASE RECORD THE FOLLOWING INFORMATION FOR THE UNIONTOWN, OH CONCERNED CITIZENS:

WE MOVED INTO OUR HOUSE AT 3444 HILLTOP STREET, UNIONTOWN, OH 44685 IN APRIL 1970, WE SEEN MANY ARMY TRUCKS COME INTO LANDFILL IN THE EARLY 1970'S. I KNEW THEY BELONGED TO THE ARMY BECAUSE THE SIDES OF THE TRUCKS COMING IN READ U.S. ARMY CORPS. THE TRUCKS THAT I SEEN WERE LOADED WITH 50-100 STAINLESS STEEL CANISTERS ON FLATBED TRUCKS. CANISTERS HAD HAZARDOUS MARKINGS ON THEM. HARLAN SEEN ARMY TRUCKS WITH TARPS ON THEM AND MANY TANKERS. THE TANKERS WOULD COME IN ALL THROUGH THE NIGHT AND DUMP STUFF; SOME TANKERS EVEN HAD THEIR OWN KEYS TO THE GATE.

HARLAN WENT TO THE CLEVELAND CLINIC IN 1978 AND HAD SOME TESTING DONE. THE TEST RESULTS WERE VERY SURPRISING TO US DUE TO DOCTORS ASKING HARLAN WHERE HE WAS STATIONED IN THE SERVICE. HARLAN WAS NEVER IN THE SERVICE. THREE MONTHS LATER, CLEVELAND CLINIC SENT US A LETTER STATING WE SHOULD MOVE AWAY FROM WHERE WE LIVE TO HELP HARLAN AND WE COULD'NT UNDERSTAND AT THE TIME WHAT THEY WERE TALKING ABOUT.

CHRISTMAS OF 1989, AN ARMY ENGINEER CAME TO OUR HOME IN UNIONTOWN (IF THEY HAD NO PART OF DUMPING, WHAT WAS HE DOING THERE), HE SAID HE WAS INSPECTING THE PREMISES.

WHEN I HAD MY SECOND BLOOD TEST DONE WITH - ENVIRONHEALTH LABORATORIES, 990 N. BOWSER ROAD, SUITE 800, RICHARDSON, TX 75081, 214-234-5577, I WAS NOT WORKING, I WAS AT HOME AND MY TESTING INCREASED. THEY COULD NOT PUT DOWN THE FULL AMOUNT BECAUSE THE GOVERNMENT COULD COME IN ON THEM AND THEY WERE NOT ALLOWED TO PUT DOWN MORE THAN 200.

IF YOU HAVE ANY FURTHER QUESTIONS, PLEASE DO NOT HESITATE IN CONTACTING ME AT (330) 966-0534.

Lizette McGregor 4-9-1999

Harlan L McGregor 4-9-1999

HORVATH, Notary

State of Ohio

STATE OF OHIO)
) s.s.
COUNTY OF STARK)

AFFIDAVIT

I, Rex E. Shover, being first duly sworn according to law state:

1. I am over twenty-one years of age and am fully competent to make this affidavit.
2. I make this affidavit of my own free will.
3. I have resided in Uniontown, Ohio the majority of my life.
4. I am personally familiar with the Industrial Excess Landfill located in Uniontown, Ohio.
5. I served as a volunteer fireman for the Uniontown Volunteer Fire Department from approximately 1958 to 1976. While a volunteer fireman I received training in the labeling of various materials, including radioactive materials. I am familiar with and can recognize placards and labels used for radioactive materials.
6. During my time as a volunteer fireman, I personally saw tanker trucks carrying radioactive insignia enter the Industrial Excess Landfill late at night after the landfill was closed.

FURTHER AFFIANT SAYETH NAUGHT.

Rex E. Shover

Before me, a Notary Public, appeared Rex E. Shover who acknowledged that he did execute the foregoing, and that the same is his free act and deed.

In testimony whereof, I have hereunto set my hand this 6 day of February, 1999.

My commission expires:
July 7, 2001

Sharon Lee Greenleaf
Notary Public

SHARON LEE GREENLEAF
NOTARY PUBLIC, STATE OF OHIO
MY COMMISSION EXPIRES JULY 7, 2001

F:\shared\cdda\0660misc.doc

INDUSTRIAL EXCESS LANDFILL SUPERFUND SITE

PUBLIC MEETING

MARCH 2, 1999

7:00 p.m.

- - -

BE IT REMEMBERED that upon the hearing of the above-entitled matter held at Uniontown Community Center, 3696 Apollo Street, Uniontown, Ohio, and commencing on Tuesday the 2nd day of March, 1999, at 7:00 o'clock p.m., the following proceedings were had.

COMPUTERIZED TRANSCRIPTION BY

BISH & ASSOCIATES, INC.

812 Key Building

Akron, Ohio 44308-1318

(330) 762-0031

(800) 332-0607

FAX: (330) 762-0300

E-Mail: stenos@raex.com

for the companies, said that the water in the landfill was just peachy keen and really good to drink, probably be all right to drink. Well, if you want to come up and get it, here it is.

And one other thing, this is my opinion of what's happened -- this is my opinion of what's been taking place at this site for the last 15 years, (indicating). Thank you.

MR. DOZIER: Okay. I'm going to try to cut the applause down so we can spend the time communicating. Thank you, Terry.

Our next speaker that signed up is Rex Shover. Rex, if you'll come up.

MR. SHOVER: My name is Rex Shover, I live at 3707 Edison Street here in Uniontown.

I'm here to read a letter that was sent to me by my brother who lives in Garden Grove, California. This letter was submitted to Bob Martin, EPA in Washington.

Dear Mr. Martin: I'm writing this letter to inform you of my personal knowledge concerning the IEL site in Uniontown, Ohio.

I was born in Akron, Ohio on March 31st, 1948 and resided with my parents and brothers at 467 Stetler Avenue. In 1952 we moved to Uniontown, and at that time Uniontown population was less than 500 people. I soon discovered that many families there were related to each other through one degree or another.

Every house in Uniontown was supplied with water by their own well with the exception of the Madroo farm where my three great-aunts lived. Their land was located west of Old State Route 8, now Cleveland Avenue, across from the IEL site and was about 27 acres in size.

Their drinking water came out of the ground from a natural spring located northeast of the present day farmhouse and flowed down the creek in a north to south direction where it ran into a pond. A pipe delivered this water from the creek to a cistern in the basement.

The public health department

monitored this water on a yearly basis and was considered to be the cleanness and purest water in Uniontown according to my three aunts. My brothers and I drank water directly from this creek many times during our youth without any danger of any kind.

During the years that I was growing up in Uniontown I never once have heard of anyone with cancer, leukemia or having any kind of birth defects. Most people died of old age, natural causes or accidents. Old age being defined as early 80s to mid 90s.

Now I hear that the cancer and leukemia levels are about the national average or above the national average and one child was born without a brain.

The IEL was originally a sand and gravel pit until sometime between 1959 and 1961 at which time trash and junk started to appear at this site.

During the summer of 1964 I met and

started dating Melissa (Missy) Kittinger. Her father, Charles Kittinger, I soon found out was the owner/operator of Kittinger Trucking Company and was leasing a three acre IEL site.

During the winter of 1964 and '65 Mr. Kittinger employed me part-time as a mechanic's helper to assist in repairs of his trucks at the IEL site. I was told by Mr. Kittinger at one time that I was not to walk beyond a certain point behind the maintenance building because there was hazardous material there and he didn't want anyone exposed to it.

On many occasions I rode along with the dump truck drivers to pick up waste materials from Seiberling Rubber, Firestone, Goodrich, General and Goodyear Tire & Rubber Companies in Akron. This waste material was then driven to the IEL site in Uniontown and dumped.

In 1966 I enlisted in the United States Navy, which started a 25 year career both in the military and in Civil Service with the Department of Navy. While stationed at the navel air station in Norfolk, Virginia I received formal training in nuclear, biological and chemical warfare and served as a member of the NBC rapid response team.

In June of 1970 I returned to Uniontown after my first enlistment and can remember that on several occasions from 1966 to 1971 observing U.S. Army tanker trucks with radioactive material placards affixed to them both coming and going from the IEL site.

It must be understood that during my first enlistment that I would routinely return to Uniontown on weekend liberty and military leave. My knowledge today is that the Army trucks that I observed were especially designed double-lined tankers designed to transport liquid radioactive waste material.

I reenlisted in the United States Navy in August of 1971 for four more years during which time I received formal training as an industrial radiologist -- radiographer. This schooling increased my knowledge of radiation, radioactive materials and associated health problems on humans and the nuclear regulatory requirements as specified in Title 10.

On February 28th, 1977 I was hired at the Philadelphia Navel Shipyard as an industrial radiographer and transferred to the Long Beach Naval Shipyard in California in July of 1981 to continue my career in the same capacity.

From 1977 to 1994, at which time I retired as a GS-11 quality assurance specialist in ship building, I received extensive training and experience concerning radioactive materials, radiation safety, the health effects associated with radioactive materials and ionization radiation and the Nuclear Regulatory Commission requirements as specified in CFR Title 10.

During my career I have worked with high energy x-ray machines, Cesium 137, Iridium

192 and Cobalt 60. I was properly trained in safe handling thereof.

Today I'm employed as a nondestructive testing inspector for a company in Garden Grove, California. In December 1988 we were contracted to perform inspections at the San Onofre Nuclear Generation Station (S.O.N.G.S.) located in San Diego County, California at which time I received training in nuclear safety, security, hazardous materials, hazardous waste and et cetera prior to performing our required inspection during the outage phase and refueling of unit two.

I will return there again in March of this year for more training prior to inspecting unit number three during its outage phase for repairs and refueling and will require more training.

This basically sums up my knowledge and experience in the aforementioned topics. I will now focus on the problems at the IEL site in

Uniontown.

I find that the presence of so many types of radioactive materials and the energy levels being emitted at the IEL site and in the surrounding groundwater to be a very serious problem and could create long-term health problems.

Now referring to an article written by Bob Downing, a staff writer for the Akron Beacon Journal that was published on Saturday, January 23rd, 1999, "Toxic Heavy Metals That Appeared to be a Puzzle Based on 1997 Test Results were Reanalyzed Using a Different Testing Method." His question is this, what testing method was used, the magic wand technique?

Joseph Towarnicky of the Columbus-based Sharp & Associates made the statement, "Metals do not seem to be an issue." Really? Now, Mr. Towarnicky is either a bona fide idiot or he's been taking lying lessons from President Clinton.

Cobalt, uranium, thorium, plutonium, strontium, cadmium and radium are heavy metals and have been found in the groundwater in and around the IEL site. Mr. Towarnicky states that heavy metals do not seem to be an issue.

Now, Mr. Martin, I have some serious questions concerning the IEL site. Is the Nuclear Regulatory Commission involved in any of the cleanup and monitoring of the IEL site? If not, why?

The U.S. N.R.C. is responsible for the licensing requirements for anyone manufacturing, handling, shipping, receiving, disposing and storage of radioactive materials and waste by-products including monitoring requirements, training and the associated records thereof.

Did the U.S. Army hold an N.R.C. license to transport and dispose the radioactive material at the IEL site? Did Kittinger Trucking Company and the owner of the IEL site have an

N.R.C. license to receive and store radioactive material? To my knowledge they did not.

Did the IEL site meet the requirements of a disposal site for radioactive materials as specified in U.S.C. Title 10? To my knowledge the answer is no.

MR. DOZIER: Okay. Thank you. I want to ask you all to help me because I wanted to make sure that everybody will have an opportunity to speak tonight and I'm not worried about time. Again, I'm not going to try to cut people off, but I would ask that you make these presentations consistent with what you want to say as brief as possible so we can give everybody a chance to speak.

Our next speaker is Sue Ruley.

MS. RULEY: You can scratch my fellow trustee off there, he's just loaned me his three minutes.

MR. DOZIER: No, we're not doing

Appendix O

Letter from Elaine B. Panitz, MD, FACP, FACPM
to Assistant Director for Public Health Practice at ATSDR

December 1, 1992

ATTACHMENT 1

Elaine B. Panitz, MD, P. A.
Occupational and Environmental Medicine

Telephone
(609) [illegible]

[illegible] Lane
Princeton, N J 08540

Telecopier
(609) [illegible]

December 1, 1992

Maureen Y. Lichtveld, MD, MPH
Assistant Director for Public Health Practice
Division of Health Assessment and Consultation
ATSDR, US PHS, DHHS
Atlanta, Georgia 30333

Re: IEL Uniontown, Ohio

Dear Dr. Lichtveld:

This is in reference to your letter of October 14, 1992 which requested health information on the IEL site in Uniontown, Ohio. I am a physician who is board certified in both Internal Medicine and Preventive Medicine (Occupational Medicine), and I am a Clinical Assistant Professor of Medicine at Robert Wood Johnson Medical School.

I was recently asked to review a cancer death case in a young man who lived on the western edge of the IEL site in Uniontown (see Appendix, Patient #1). The diagnosis proved to be osteosarcoma of the right fibula, prompting concern about the possible role of environmental radiation exposure. During preliminary interviews with multiple area residents, there appears to be an unusually large number of neoplasms of the extremities, of the reticuloendothelial system (RES), and of other sites (see Appendix for currently available information). The majority of these neoplasms appear to have occurred in young people.

I have reviewed materials suggesting radiation contamination of the IEL site and surrounding groundwater. There is also evidence of contamination with benzene, vinyl chloride, and chlorophenols, among many other chemical agents.

ATTACHMENT 1

Maureen Y. Lichtveld, MD, MPH
November 21, 1992
IEL Uniontown, Ohio (continued)

In my opinion, the case of Patient #1 (coupled with the anecdotal evidence of Appendix Patients #2 and #3, and the many other neoplams suggested in the Appendix) presents disturbing evidence that radiation (and possibly other carcinogens such as benzene, vinyl chloride, and chlorophenols) may be causing neoplasms among residents surrounding the IEL site. The routes of exposure are likely to include ingestion (well water, fruits and vegetables), skin absorption (well water for bathing and washing clothes, as well as swimming or playing in marshy areas near IEL), and inhalation (radiactive dusts released from the landfill, radioactive gases released from contaminated ground and groundwater).

I urge you to consider an immediate review of cancer death certificates from 1970 to the present for the counties surrounding the IEL site. The neoplasms of greatest concern, based on my informal interviews, are those of a) bone and soft tissue, b) the reticulo-endothelial system, c) breast, d) thyroid, and e) CNS.

Thank you for your consideration, and please let me know if I can be of assistance in your investigations.

Yours truly,

Elaine B. Panitz, MD, FACP, FACPM

EBP/jp

Appendix P

"Revised and Supplemented Report of Investigation
by the United States of America
Regarding Certain Statements by Charles M. Kittinger,"

U.S. v Industrial Excess Landfill, Inc.
U.S. District Court for the Northern District of Ohio, Eastern Division

Please contact POGO for a copy of the complete report cited in Appendix O.

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF OHIO
EASTERN DIVISION

UNITED STATES OF AMERICA, Plaintiff, v. INDUSTRIAL EXCESS LANDFILL, INC., et al. Defendants	Case Nos. 5:89 CV 1988 5:91 CV 2559
STATE OF OHIO, ex rel., LEE FISHER, ATTORNEY GENERAL OF OHIO, Plaintiff, v. INDUSTRIAL EXCESS LANDFILL, INC., et al. Defendants	JUDGE JOHN MANOS Submitted *in camera*

REVISED AND SUPPLEMENTED REPORT OF INVESTIGATION BY THE UNITED STATES OF AMERICA REGARDING CERTAIN STATEMENTS BY CHARLES M. KITTINGER

SUBJECT TO COURT CONFIDENTIALITY ORDER
SUBMITTED *IN CAMERA*

such an extraordinary event, or could corroborate any of the critical details of Mr. Kittinger's account.

Fourth and fifth, in addition to seeking documentary information and interviewing witnesses, the United States solicited two types of expert assistance in its investigation, looking for objective, scientific corroboration for Mr. Kittinger's allegations, if any exists. We retained an expert to analyze historic aerial photographs of the landfill. Government scientists were tasked to apply remote sensing technologies to the part of the landfill where the "egg" disposal allegedly took place. Although the limitations of both the aerial photo analysis and the remote sensing technologies must be acknowledged, the experts' conclusions do not support Mr. Kittinger's account either.

The available aerial photographs from the relevant time frame cast significant doubt on Mr. Kittinger's description of the hole into which the "eggs" were dumped. Although excavations are seen in four of the five photographs analyzed, none is as wide nor nearly as deep as the hole Mr. Kittinger described. The points Mr. Kittinger identified as the disposal area in a recent visit to the Site do not correspond with any of the excavated areas seen in the photographs. There are not enough photographs to exclude the possibility that the hole Mr. Kittinger described existed at some point, but the photographs that do exist show no evidence of it.

Similarly, the remote sensing techniques applied by EPA and the U.S. Geological Survey ("USGS") do not confirm Mr. Kittinger's account. Scientists from these agencies chose their techniques based on Mr. Kittinger's description of the objects as stainless steel. Assuming the steel was of high enough quality, it would conduct electricity but would not be magnetic. Unless buried in close proximity to ferrous metal -- a point on which Mr. Kittinger's testimony was at best unclear -- such stainless steel objects could be detected by measuring electric resistance but would not be detected by magnetic sensing methods. Applying both resistivity testing and magnetometry in the area of the disposal points identified by Mr. Kittinger, the scientists found one "anomaly" that might be caused by stainless steel. This anomaly could also be caused by other materials, however (or by stainless steel objects other than the "eggs"), and because of its depth and information from the aerial photographs, it is extremely likely that whatever is causing this anomaly must have been buried years after Mr. Kittinger stopped being involved with IEL.

Finally, Mr. Kittinger's allegations not only lack corroboration, they also are not credible for other reasons. Mr. Kittinger's February, 2001 testimony directly contradicts sworn testimony he gave as recently as January, 2001. He provided no convincing or objectively verifiable reason for changing his testimony. Mr. Kittinger's conclusion that the "eggs" were nuclear bombs strains credulity. The way he reached that conclusion, by after-the-fact "research," raises the possibility that his recollection of events has been colored by subsequent reading or learning. Mr. Kittinger's description of the open and notorious, far from delicate, way in which the "eggs" were handled is dramatically inconsistent with their supposed nature and with the directions Mr. Kittinger says he was given to keep the objects' disposal, and their plutonium-238 contents, secret. That description is also strikingly inconsistent with the sworn testimony of Mr. Kittinger's son, who (according to both father and son) was present during the disposal. Additionally, Mr. Kittinger's description of the "eggs" is inconsistent with physical reality; for example, based on the stated dimensions and compositions of the eggs, such an object likely exceeded the capacity of the "stake" truck Mr. Kittinger said was hauling them.

The National Guard tickets found in the initial review all are dated in 1970 or 1971.[12] Thus the tickets appear inconsistent with Mr. Kittinger's initial testimony that the Army deliveries occurred about the time of the incorporation of Industrial Excess Landfill, Inc. while Johnson was president. During the comment period after the original version of this report was submitted to the Court, however, some parties to the action questioned whether tickets from years before 1970 had actually been available for review. Because EPA had requested all of IEL Inc.'s records, and because of the volume of tickets, the initial review did not focus on specifically identifying the date ranges covered by the mass of tickets in EPA's possession.[13] See Supp. Decl. of Gloria Carvajal ¶ 2 ("Carvajal Supp. Decl., attached as Exhibit BB). After the question was raised, EPA reviewed its files again and discovered that it did not appear to possess any tickets dated earlier than 1970. Id.

The United States asked the Rubber Company Defendants, which had marked a large compilation of IEL tickets as exhibits in the December 2000 - January 2001 depositions of Mr. Kittinger and Mr. Hyman Budoff, to assist the investigation by searching their ticket collection

---

[12] Three of the tickets show month and day of the month but not the year. In EPA's records of the tickets received from IEL, these tickets were filed with the 1970 tickets, and they have been listed as 1970 tickets in the summary attached to Ms. Carvajal's declaration. However, based on the form of these three tickets and the price for the loads, it seems likely that these tickets may have been from 1971 -- or possibly even from 1972 or later, which would be after Mr. Kittinger ceased being involved with the landfill.

[13] When EPA originally made its information request to IEL, Inc., the primary purpose for obtaining the tickets was to identify landfill customers who may have arranged for disposal of hazardous substances at the landfill and would therefore be liable for the cleanup. For this purpose, analyzing the comprehensiveness of the date range covered by the tickets was unimportant. Accordingly, EPA did not focus on the dates when it originally obtained the tickets, either. See Declaration of Ruth McNamara (Exhibit CC).

corresponding tickets are dated between July and November, 1969. One lists the customer as "Armory Board," one as "Army Board,"[18] and three -- dated July 8, August 4, and August 25, 1969 -- as "U.S. Army." It appears very probable, however, that the "U.S. Army" line entries on these three non-consecutive daily reports are merely shorthand for the Ohio Army National Guard. The space to list customers on the daily reports is relatively small -- much smaller than the space on the tickets -- and there are many instances in which the daily report entry uses an abbreviation or includes only some of the identifying information on a ticket.[19] Although EPA does not have tickets corresponding to the three 1969 deliveries listed as "U.S. Army" on the daily reports, there is one other daily report entry listed as "U.S. Army," and for that entry the corresponding ticket is available. On the daily report for October 26, 1970, ticket 12777 is listed, with "U.S. Army" as the customer. See Carvajal Supp. Decl., attachments 1 and 2. On the actual ticket number 12777, however, the customer is identified fully as "U.S. Army National Guard." See Carvajal Decl. attachment (Exhibit E). Thus, in the one instance where a "U.S. Army" daily report entry can be compared directly to the underlying ticket, the ticket reflects a

---

[18] We assume that "Army Board" is just another variant of "Armory Board" and "Armoured Board." This assumption is supported by the daily log entry for ticket number 4910, dated March 24, 1970, which indicates "Army Board" as the customer where the ticket itself states "Armoured Board."

[19] For example, tickets number 5036 and 6448 are labeled "Armory Board Greensburg" but the corresponding daily reports list "Armory" and "Army Board" respectively; ticket number 15332 is labeled "107th Army Cav." but the daily report lists "107th Arm Cav."; ticket number 15254 is labeled "107th Troop N Armored" but the daily report lists "107th Armored"; ticket number 4910 is labeled "Armoured Board" but the daily report lists "Army Board"; and on many of the daily reports, "Board," "National," or "Guard" are abbreviated. Space-saving devices are not limited to military shipments: the daily reports refer to Hybud Equipment Corporation as "Hybud Equip.," "Hybud Eq.," or "Hybud," and to Morgan Trucking as "Morgan Trucking," "Morgan Trk.," "Morgan Tr.," and "Morgan." for example.

to the garage than either the 1966 or 1970 excavation. See Aerial Photo Analysis at 6 & Figure 8. They are somewhat closer to the garage, and considerably closer to the main access road, than the 1969 pit in the mounded material. For what it is worth, none of these locations corresponds to the area Mr. Kittinger marked on the aerial photograph, either.[75] The 1966 and 1970 excavations also are considerably farther west (150 and 125 feet from the garage, respectively) than the distance Mr. Kittinger verbally estimated (70 to 80 feet). Id.

The pit seen within the mounded material in the 1969 photo is about 75 feet west (and slightly south) of the garage. This is some 50% farther west than the locations Mr. Kittinger identified in the field but is within Mr. Kittinger's verbal estimate of the distance to the disposal site. If one were to credit the verbal estimate more than the field estimate, one might ask whether the 1969 pit could be the excavation to which Mr. Kittinger referred. This is unlikely, however, for four reasons. First, as noted above, the pit is not nearly deep enough to correspond with Mr. Kittinger's description of the disposal. Second, the 1969 pit is not as wide as the pit Mr. Kittinger described -- 36 feet or less across instead of the 50 Mr. Kittinger stated (although arguably that could be within the range of Mr. Kittinger's inaccuracy in estimating distances). Third, the pit is within the mound of medium-toned material. As the photographs show, this mound of material was in a state of constant flux -- being graded, getting larger and smaller, changing shape and height. Assuming the mounded material was fly ash, it was intended to be used as cover for landfilled material, rather than permanently left where it lay. It seems very

[75] The very southern edge of the 1970 excavation abuts, but does not overlap, the circle Mr. Kittinger drew. It seems somewhat unlikely, however, that Mr. Kittinger would have drawn a small circle to represent this larger, oblong excavation.

(which could include the "eggs" if one assumes they were made of non-magnetic stainless steel buried relatively apart from the old cars and trucks buried nearby, but which could not include the "eggs" if one assumes they were buried relatively close to the cars and trucks). Finding a resistive anomaly with an associated magnetic anomaly indicates the presence of ferrous metal, and therefore is inconsistent with the presence of an isolated mass of non-ferrous metal (like the "eggs," if one assumes they were buried relatively apart from the cars and trucks), but provides no information about whether there may be non-ferrous metal in relatively close proximity (and therefore tells nothing about the presence or absence of the "eggs" if one assumes they were buried relatively close to the cars and trucks). See generally Vendl Decl. ¶ 6; EPA Magnetometry Report at 2 & n.5.

Comparing the resistivity and magnetometry data, EPA found that the location of the first, more westerly resistive anomaly ("dc1") matched closely the location of the large magnetic anomaly in the northwest corner of the survey area. EPA Magnetometry Report at 8. EPA accordingly concluded that "it is likely that both the dc resistivity and magnetic readings stem from a ferrous mass in that location." Id. at 9. Thus it appears that this first resistive anomaly is not caused by isolated stainless steel objects.[91]

The second resistive anomaly USGS noted is located farther to the east, close to one of the two points Mr. Kittinger identified on his visit to the Site, near -- but not in exactly the same place as -- two smaller magnetic anomalies. See USGS Report at 5 & Figs. 1-3; EPA

---

[91] As explained in the preceding paragraph, the association of resistive anomaly dc1 with a magnetic anomaly does not rule out the possible presence of non-ferrous metal in close proximity to ferrous metal, but the combination of magnetometry and dc resistivity testing cannot distinguish such a deposit from ferrous metal buried alone.

described.[95] Although USGS acknowledged that this difference could be the result of limitations of the model, it could also mean that the anomalies are caused by something smaller than what Mr. Kittinger described. See USGS Report at 6-7.

Fifth, the depth of the anomaly is inconsistent with what would be expected if dc2 were caused by the objects Mr. Kittinger described. Mr. Kittinger testified that the hole in which the "eggs" were dumped was 25 feet deep. The aerial photo analysts, using photographs and topographic maps, determined that the pertinent portion of the landfill is today[96] generally 12 to 15 feet above its original grade. Aerial Photo Analysis at 7. Thus, if the "eggs" were buried 25 feet below the original grade, one would expect these objects to be 37 to 40 feet below the surface today. The USGS concluded, however, that the second resistive anomaly was 3 to 8 meters (approximately 10 to 26 feet) deep.[97]

---

[95] In his comments on the original submission of this report, Mr. Kittinger suggested that the "eggs" were smaller than the dimensions he had his grandson put on the drawing of the objects. This belated suggestion is neither particularly credible nor of any consequence to the conclusions of the geophysical investigation. See Response to Comments Received on The Report of Investigation by the United States of America Regarding Certain Statements by Charles M. Kittinger at 11-13 (attached as part of Exhibit AA).

[96] The most recent detailed topographical map the analysts were able to obtain is based on aerial photography taken in 1978. We assume that this portion of the landfill, which had been built up with fill by 1978 and was seeded by about 1980, is no lower today than it was in 1978.

[97] A 1970 detailed topographic map of the landfill shows a sharp rise in elevation over a small area in the vicinity of dc2. Even assuming, however, that the surface at that location in 1970 was at the same elevation as the surface at that location today, a disposal 25 feet below the 1970 surface would be at or below the extreme low range of the depth of the dc2 anomaly. And the aerial photographs show much change from year to year in the topography of this part of the landfill, as discussed above. There is no way to tell whether the ground elevation at the location of dc2 may have been lower at other times during Mr. Kittinger's operation of the landfill.

Appendix Q

"Recap of IEL Customers," compiled by DOJ Investigators
"IEL 'Military' Dump Tickets," compiled by DOJ Investigators
and
"Industrial Excess Landfill, Inc., Daily Reports" from
July 8, 1969; August 4, 196?; August 25, 1969; October 26, 1970

RECAP OF I.E.L. CUSTOMERS   ALPHABETICAL U

Customer Name	Years
U & B Body Shop	70
U-Haul	70,71,73,74,75,77
US Army	69,70
Ubanks	76
Udell	73,74,75
Uhel	72
Uhl	74
Ujhaszy	78
Ulm	70
Unble.	68
Underwood	70,73,75
Union Dry Wall	72,73,75
Union Mission Church	72
Uniontown Church of Christ	72
Uniontown Council	74
Uniontown Development	74
Uniontown Electric	69
Uniontown Fire Department	73,74,77
Uniontown Lawn & Garden	72,73,74
Uniontown Post Office	70
Uniontown Septic	78
United Construction	72
United Insulation	71
United Plumbing	69
Unkeffer	72,73
Uphouse	72
Uppton	70,71,72
Urbach	72,73
Urban	75

IEL: "Military" Dump Tickets

Customer on Ticket	Customer on Log	Date	Ticket Number	Description	Fee
N/A	U.S. Army*	07/08/69	8376	N/A	$4.50
N/A	U.S. Army*	08/04/69	6564	N/A	$4.50
N/A	U.S. Army*	08/25/69	6843	N/A	$4.00
N/A	Army Board*	09/22/69	6981	N/A	$4.00
N/A	Armory Board*	11/25/69	6439	N/A	$4.50
Armory Board	Armory Bd	01/05/70	3651	Truck load	$4.00
Armory Board Greensburg	Armory	02/05/70	5036	Stake truck	$4.00
Armory Board	Armory Bd	02/26/70	5322	Truck load	$4.00
Armoured Board	Army Board	03/24/70	4910	Stake truck	$4.00
Armoured Board•	N/A	04/20/70	05244	Stake truck	$4.00
Armory (?) Board Greensburg	Army Board	04/22/70	6448	(Illegible)	$4.00
Armoured Board	Armoured Brd	05/01/70	05284	Stake truck	$4.00
Armoured Board	Armoured Board	05/02/70	05326	Stake truck	$4.00
Armoured Board	Armoured Brd	05/04/70	05357	Stake truck	$4.00
N/A	Board*	05/05/70	05440	N/A	$3.00
Armoured Board	Armoured Board	05/06/70	05470	Stake truck	$4.00
National Guard	National Grd	05/22/70	06519	Stake truck	$4.00
National Guard	National Guard	06/08/70	06965	Stake truck 1/2 load	$3.00
National Guard•	N/A	06/21**	3038	Stake truck (rubbish)	$5.00
National Guard	National Guard	06/23/70	08407	Stake truck (rubbish)	$4.00
N/A	Board*	06/30/70	__13	N/A	$2.00
National Guard	National Grd	07/15/70	09060	Stake truck	$4.00
National Guard	National Gd	07/27/70	09393	Load rubbish	$4.00
National Guard•	N/A	08/16**	06693	Dump truck (rubbish)	$5.00
National Guard	National Guard	08/21/70	10294	Stake truck	$4.00
National Guard	National Guard	08/24/70	10373	Truck load rubbish	$4.00
National Guard	National Guard	09/03/70	10757	Ton truck	$4.00
National Guard	National Guard	09/15/70	11589	Stake truck	$4.00
National Guard	National Guard	09/29/70	11988	Stake truck	$4.00
National Guard	National Grd.	10/09/70	12309	Stake truck	$4.00
National Guard•	N/A	10/26**	11044	Dump truck (rubbish)	$5.00
U.S. Army National Guard	US Army	10/26/70	12777	Stake truck	$4.00
National Guard	National Guard	11/09/70	13618	Stake truck	$4.00
National Guard	National Guard	12/05/70	14412	Stake truck	$5.00
National Guard	National Guard	01/07/71	15238	Stake truck	$4.00
National Guard	National Guard	01/09/71	15308	Stake truck, small load	$2.00
107th Army Cav.	107th Arm Cav.	01/09/71	15332	(No description)	$3.50
107th Troop N Armored	107th Armored	01/16/71	15254	(No description)	$5.00
Armory 1416 TC•	N/A	02/03/71	17044	Truck	$5.00
National Guard	National Guard	02/06/71	15933	Stake truck	$4.00
National Guard	National Guard	02/23/71***	17249	Stake truck	$5.00
National Guard	Nat Guard	03/13/71	17686	Dump (? illegible)	$5.00
National Guard	National Guard	03/27/71	19081	Stake truck	$5.00
National Guard•	N/A	08/06/71	24968	Stake truck	$5.00

For notes, see next page

Notes

*These entries are based solely upon the IEL Daily Reports in the EPA archives. There were no corresponding dump tickets in the EPA archives. Unlike the dump tickets, the IEL Daily Reports do not include any description of the loads disposed of.

•These entries are based solely upon the IEL dump tickets in the EPA archives. We found no corresponding IEL Daily Report entries, either because (1) there was no year listed on the dump ticket (ticket #s 3038, 6693, and 11044); (2) there was no Daily Report for that date in EPA's archives (ticket # 24968); or (3) there was a corresponding Daily Report in the EPA archive, but no log entry for the dump ticket (ticket #s 5244 and 17044).

**No year listed on dump ticket. These were filed at EPA with dump tickets from 1970, but it is possible they are from 1971 or later. They are on a somewhat different form than other tickets, and the $5 charge is $1 more than what appears to be the standard charge in 1970 - $4. A $5 fee was more common in 1971.

***For this ticket number, the dump ticket indicates 2/23/71 but the corresponding log entry is on a log dated 2/24/71.

INDUSTRIAL EXCESS LANDFILL, INC.
DAILY REPORT

Date Tuesday July 8, '69

Slip No.	Customer	Cash Received		Charged		Received On Account		Landfill Sales		Salvage Sales	
2374	Dixi	3	—								
2375	Beahy	4	—								
2376	U S Army	4	50								
2647	Hyland				✓						
2651	H —				✓						
2653	H —				✓						
2654	H —				✓						
2652	H —				✓						
2660	H —				✓						
2377	Morgan				✓						
2659	Hyland				✓						
2662	H				✓						
2373	Dalgard	1	50		(						
2378	Jackson	3	—								
2657	Hyland				✓						
2663	H —				✓						
2656	H —				✓						
Totals											

Receivable

Cash Sales
Received on Account
Other

Total

Deposit (Memo).

Receivable

Landfill Sales
Salvage Sales
Other

Total Sales

Charged Sales
Cash Sales

Total Sales

INDUSTRIAL EXCESS LANDFILL, INC.
DAILY REPORT

Morlock

Date Aug 4, 196

Slip No.	Customer	Cash Received		Charged		Received On Account		Landfill Sales		Salvage Sales	
2888	Hy Bad			1000							
2878	"			750							
2892	"			500							
2893	"			500							
6565	James Fuller	3	00								
6564	U.S. Army	4	50								
6566	Morgan			1800	✓						
6567	Greentree Sohio	3	00								
6568	Nesbitt	3	—								
6569	Morgan			1800	✓						
2886	Hyhy			750	✓						
6571	Don Mickle	1	50								
		15.00									
Totals		15	00	71	00						

Receivable			Receivable		
Cash Sales			Landfill Sales		
Received on Account			Salvage Sales		
Other			Other		
Total			Total Sales		
Deposit (Memo)			Charged Sales		
			Cash Sales		
			Total Sales		

INDUSTRIAL EXCESS LANDFILL, INC.
DAILY REPORT

Monday

Date aug 25-79

Slip No.	Customer	Cash Received		Charged		Received On Account		Landfill Sales		Salvage Sales	
6839	Schumacher			505	00						
6840	A.H. Wellington	3	00								
6841	Short	2	00								
6842	Straw	3	00								
6843	U.S. Army	4	00								
6844	Morgan			K	K						
6845	Mason	3	00								
6846	Hudson	1	00								
6848	Morgan			K	—						
6849	Dufron	3	—								
6847	Sears	3	00								
6850	Sears	3	00								
6851	F.E. Schumacher	5	00	5	00						
6852	Bd Davis	3	00								
6853	Mike Markelba	3	00								
6854	F.M.			7	50						
6958	Hyland Ey.			5	00						
Totals		31	60	58	50						

Receivable		Receivable	
Cash Sales		Landfill Sales	
Received on Account		Salvage Sales	
Other		Other	
Total		Total Sales	
Deposit (Memo)		Charged Sales	
		Cash Sales	
		Total Sales	89 50

Foggy - 48°

INDUSTRIAL EXCESS LANDFILL, I.C.
DAILY REPORT

Monday.
Date Oct. 26, 1970

Slip No.	Customer	Cash Received		Charged		Received On Account		Landfill Sales		Salvage Sales	
11314	Hyhud Equip			12	-						
11315	" "			10	-						
12764	Jackson	2	-								
11248	Hyhud Equip			5	-						
12765	Fisher	4	-								
11320	Hyhud Equip			5	-						
12766	Reed	3	-								
11316	Hyhud Equip			10	-						
12767	Hall	4	-								
12768	Mogen Tek.			20	-						
12769	Mector Housing			5	-						
12770	Wheeler	1	50								
12771	Young			15	14						
12772	Suburban			5	-						
12773	R. Bloom	3	50								
12774	Neubert	3	00								
12775	Brindley	4	00								
12776	Suburban			5	-						
12777	U.S. Army	4	00								
11319	Hyhud			10	00						
Totals		29	00	102	14						

Receivable			Receivable		
Cash Sales Received on Account Other	63	00	Landfill Sales Salvage Sales Other		
Total			Total Sales		
Deposit (Memo)			Charged Sales	248	36
			Cash Sales	63	00
			Total Sales	311	36