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55 Jonspin Road ■ Wilmington, MA 01887-1020  
(978) 658-7899 ■ FAX (978) 658-7870 ■ www.tetrattech.com

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January 6, 1999

Project Number 5278

Mr. James X. Shafer  
Remedial Project Manager  
Northern Division, Naval Facilities Engineering Command  
10 Industrial Highway, Mail Stop 82  
Lester, Pennsylvania 19113

Reference: CLEAN Contract No. N62472-90-D-1298  
Contract Task Order 218

Subject: RAB Meeting Minutes

Dear Mr. Shafer:

Enclosed is a copy of the minutes from the December 9, 1998 RAB meeting. If you have any questions about this matter, please contact me at 978-658-7899.

Very truly yours,

A handwritten signature in cursive script that reads "Betsy Horne".

Betsy Horne  
Community Relations Specialist

BH:b

Enclosures

c: Dr. D. K. Abbass (w/enc.)  
Ms. Barbara Barrow (w/enc.)  
Ms. Mary A. Blake (w/enc.)  
Dr. David W. Brown (w/enc.)  
Mr. Richard D. Coogan (w/enc.)  
Mr. Paul M. Cormier (w/enc.)  
Mr. Anthony D'Agnew (w/enc.)  
Ms. Beth Everett (w/enc.)  
Mr. Byron J. Hall (w/enc.)  
Mr. Eugene Love (w/enc.)

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Ms. Elizabeth Mathinos (w/enc.)  
Mr. Joseph Mello (w/enc.)  
Mr. Thomas McGrath (w/enc.)  
Mr. John Palmieri (w/enc.)  
Mr. Howard L. Porter (w/enc.)  
Mr. John Vitkevich (w/enc.)  
Ms. Claudette Weissinger (w/enc.)  
Ms. Mary Philcox (w/enc.)  
Mr. David Egan (w/enc.)  
Mr. Tom Nicholson (w/enc.)  
Mr. Paul Kulpa, DEM (w/enc.)  
Ms. Kymberlee Keckler, EPA (w/enc.)  
Capt. Jon Wyman, NETC (w/enc.)  
Capt. A. C. Oakleaf, NETC (w/enc.)  
Mr. James Barden (w/enc.)  
Hon. Paul W. Crowley (w/enc.)  
Hon. June Gibbs (w/enc.)  
Mr. Joseph F. McEnness (w/enc.)  
Mr. Paul D. Russell (w/enc.)  
Mr. Charles Salmond (w/enc.)  
Mr. John Torgan (w/enc.)  
Councilman Dennis McCoy (w/enc.)  
Mr. Vincent Arnold (w/enc.)  
Dr. David Kim (w/enc.)  
Mr. Brian Bishop (w/enc.)  
Sister Annie Marie Walsh (w/enc.)  
Brother Joseph (w/enc.)  
Newport Public Library (w/enc.)  
Ms. Joanne Gorman, Middletown Free Library (w/enc.)  
Portsmouth Free Public Library (w/enc.)  
Mr. Bob Jones, Groton (w/enc.)  
Mr. David Sanders, NETC (w/enc.)  
Mr. David Dorocz, NETC (w/enc.)  
Ms. Melissa Griffin, NETC (w/enc.)  
Mr. Woody Monaco, NETC (w/enc.)  
Ms. Sarah White, EPA (w/enc.)  
Ms. Jennifer Hayes, Gannett Fleming (w/enc.)  
Mr. Tim Prior, USF&WS (w/enc.)  
Mr. Ken Finkelstein, NOAA (w/enc.)  
Mr. R. Boucher, NORTHDIV (w/o enc.)  
Ms. Diane McKenna, TtNUS, Wilmington (w/enc.)  
Mr. Garth Glenn, TtNUS, Philadelphia (w/enc.)  
Ms. Meg Price, TtNUS, Philadelphia (w/o enc.)  
File 5278-3.2 w/o enc./9.4 w/enc.

**NAVAL STATION NEWPORT  
RESTORATION ADVISORY BOARD MEETING  
DECEMBER 9, 1998**

**MINUTES**

On Wednesday, December 9, 1998, the NETC Newport Installation Restoration Program Restoration Advisory Board (RAB) gathered at NETC's Officers' Club for its monthly meeting. The meeting began at 7:08 and ended at 9:45.

Thirteen of the 16 RAB community members attended: Kathy Abbass, Barbara Barrow, Mary Blake, David Brown, Dick Coogan, Tony D'Agneica, Beth Everett, Liz Mathinos, Tom McGrath, Joseph Mello, John Palmieri, Howard Porter, and Claudette Weissinger. Other RAB members attending were: Paul Kulpa, the RIDEM Remedial Project Manager; Kymberlee Keckler, EPA Remedial Project Manager; Captain Wyman, the Navy Co-Chair, and Jim Shafer, NORTHDIV's Remedial Project Manager. Captain Oakleaf, the Commanding Officer, attended. Mary Philcox, representing AICAB, the TAG recipient, was present. Steve Sorgen, from the Navy Environmental Health Center, and Dave Peterson (EPA) were also present. Dave Dorocz and Melissa Griffin were present from NETC's Environmental Division, as was David Sanders, PAO. Byron Hall indicated he would not attend. Anne Berman and Paul Cormier were not present.

Tom McGrath, the Community Co-chair, welcomed the group and introduced Captain Oakleaf. Those in attendance were asked to introduce themselves around the room. When no changes to the October RAB minutes were voiced, they were adopted as written.

Agenda items are denoted by underscoring.

**COMMITTEE REPORTS**

**Membership Committee** - Howard Porter announced that Anne Berman had resigned and that he was proposing two new candidates for RAB membership. Gene Love was present; John Vitkevich had a previous family obligation. Both men, who are Portsmouth residents, were approved as RAB community members.

Dave Brown asked if the RAB should assess whether its membership was sufficiently balanced to accurately represent the Aquidneck Island communities and interests.

Howard stated that the recent public concern for use of Katy Field was the result of a lack of good internal communication in the RAB. He fears the RAB may have lost potential new members because of it.

**Public Information Committee** - Claudette Weissinger mentioned that Melissa Griffin had told her that the activity had contracted out work on the quarterly newsletter. Questions were posed as to why that had been approved without discussing it with Claudette, who the contractor was and what the contractor's responsibilities would be, and when the contract would begin. Dave Dorocz indicated that the contractor would be selected by the Navy's procurement office from a pre-existing list of contractors who could provide management

services. The statement of work includes a fixed number of hours to support the RAB. The RAB would identify topics for the newsletter, PAO would serve as an advisor on content and language, and the contractor would create and produce the document. Dave Brown also indicated an interest in being involved.

**Planning Committee** - Dave Brown stated that Tom McGrath, John Palmieri, Dick Coogan, and he had reviewed the Melville North Landfill Background Study. He indicated the report comes through quite nicely.

**Project Committee** - Kathy Abbass stated that the pre-RAB meetings with the agencies had been successful. She recommended that an upcoming pre-RAB session be devoted to administrative issues that the community members need to discuss. Tom suggested that this issue be postponed for discussion under New Business.

### OLD BUSINESS

Jim Shafer discussed the RAB review dates calendar (attached as a handout). The Federal Facilities Agreement dictates the review time frames on the calendar.

Jim discussed the projects' status.

**McAllister Point Landfill** - The on-shore area is capped. The off-shore area final feasibility study will be issued on January 4. To accelerate the process, the Navy will be releasing the draft Proposed Plan with the FS. Once the final Proposed Plan has been issued, the Navy will hold a 30-day public comment period. Comments will be considered and a record of decision (ROD) will be signed adopting a cleanup strategy.

**Tank Farm Five** - The groundwater pump and treat system was shut down a year ago because it was drawing clean water. The Navy wanted to prepare a No Further Action ROD but RIDEM expressed concern about possible contamination in the bedrock. To determine if bedrock has been impacted, new monitoring wells need to be installed. A soil gas survey was performed to help determine the best location for drilling those wells; the report is being issued this week. The soil gas survey report will be used to determine the locations of the bedrock wells. If the wells test clean, RIDEM has agreed to support the Navy's No Further Action ROD.

**Derecktor Shipyard** - The Navy will issue comment responses on the draft off-shore FS by the end of the month. The draft final FS will be issued in February. For the on-shore areas, the Building 6 removal action should be completed this month.

**Melville North Landfill** - This is excessed Navy land, which is now privately owned. RIDEM is the lead agency for the cleanup action. RIDEM is reviewing a background study the Navy conducted to establish cleanup levels. The Navy will prepare a remedial action plan (similar to an FS) that will indicate the landfill should be excavated, for an estimated cost of between

\$6 and 8 million. (The cap at McAllister Point cost approximately \$13 million). Removal actions at Melville have already cost nearly \$2 million. A cleanup contract should be signed during the winter of 1999, with construction to occur in the late spring/early summer of the year 2000.

**Comment:** How far afield did you have to go to obtain a background location at Melville?  
**Response:** The Navy first identified on-site soil types, then needed to find an upgradient, off-site location with the same soils, but which had not been directly impacted by human activity. The task was very difficult. Dave Brown had suggested the name of a soils specialist to assist. Areas to the south of the site and across the street that met the soils parameters did not work out, either because of petroleum contamination or site access issues.

The Navy ended up with 20 locations from which surface samples (0 to 2 feet) were taken. Problems with depth were encountered because of bedrock.

**Comment:** Dave Brown mentioned that some reviewcopies of documents were being shared. Should the Navy provide community members with additional copies of documents to review?

**Response:** Tom McGrath stated that the community members are having a hard enough time dealing with the copies it has. If anyone else needs to review documents, they can always use the library copy.

**Comment:** Are copies being sent to the libraries in a timely fashion?

**Response:** Dave Brown's wife works at the Newport Library and reports that there has been lag time in receiving the material. Dave Dorocz stated that NSN will be hiring additional staff to assist in ensuring that the information repositories receive the reports as soon as they are issued.

**Gould Island -** The Navy neared completion of a work plan but a new twist has arisen. NSN's funding request for money to demolish Gould Island structures has been approved. Building 32 (the IR site) may be included in that list. It would make the site investigation work much easier if the building was not there.

**Comment:** What would happen to the demolition material?

**Response:** It would be disposed at an appropriately licensed landfill.

**Comment:** Where is the nearest possible landfill to which it could go?

**Response:** In South Kingstown. Some of it could also be recycled. There are bricks and cobblestones that could be reused.

**NUSC Disposal Area -** A work plan was completed. The Navy is waiting for funding.

**Comment:** What has happened to NSN's funding?

**Response:** Of the \$28 million Northern Division has to spend on all its northeast sites, approximately one-third was earmarked for NSN, but it is clear we will not get the entire \$9 million. The Navy will use the priorities the RAB established last year [ranking included in the November 1997 minutes]. NUSC Site 8 and the tank farms ranked among the lower priorities in that vote.

**Site-wide background study** - The revised work plan will be issued the end of December. Its purpose was to gather as much information as possible to establish cleanup levels for all the NSN IR sites. The sampling effort has been funded; the contract should be awarded in the spring.

**Comment:** Don't you need to obtain RIDEM's agreement up front that this approach will be acceptable?

**Response:** RIDEM's regulations allow use of background for cleanup levels. It is complicated by the fact that arsenic background in Rhode Island is 1.7 parts per million; levels generally found on Aquidneck Island vary considerably, so establishing a site-specific level is important. Neighboring states use background levels as high as 30 parts per million.

**Comment:** What about the situation where the site in question is going to be paved (such as Melville North)?

**Response:** Originally the Navy used industrial cleanup standards because the site was proposed as a commercial marina. However, the owner and RIDEM decided that since the owner was proposing to construct condominiums or time-share units, the Navy would have to use residential cleanup standards, which are more stringent and therefore more costly to attain.

**Comment:** Why does RIDEM require residential standards? Why should public money be used to underwrite the more expensive residential cleanup?

**Response:** The site owner's development plan has been approved with residential units included.

Jim requested that Paul Kulpa provide a copy of the state's document explaining how background studies are performed. It should be included with the meeting minutes.

**Comment:** Could the recent concern about Katy Field provide more leverage to retain funding for NSN? DoD has shown it can move quickly to address problems when it thinks they are a priority....such as the lawyers' involvement at Melville.

**Response:** This does not apply here. The Melville cleanup has been in the pipeline a long time; it was scheduled for action in fiscal year 1997 but not enough funding was available. The involvement of attorneys is not the reason it is a priority. Melville is a high priority because it is one of the Navy's worst sites.

Dave Brown reminded the RAB that the site priorities it established reflect three basic

considerations: economic development, ecological harm, and human health risk. The recent Katy Field concern is a reminder that the RAB should focus on human health risks, whether real or perceived, before recommending that available IR funds be dedicated to cleanups at large-scale sites such as Melville North, McAllister Point (off shore), Derecktor (off shore), or Gould Island.

Dave asked Kymberlee and Paul if other on-shore hot spots remain that pose human health risks. They indicated that those locations that might present a human health risk have been fenced or (in the case at Gould Island) are geographically isolated. However, evidence exists that human activity is occurring at these sites. Holes in the fences, empty soda/beer cans, unlocked gates, and graffiti (on Gould) have been observed. Paul suggested that community members and the public could help if they would report these signs of human activity as soon as they are discovered.

Jim estimated that the dredging off McAllister Point Landfill will cost approximately \$24 million, which will have to be phased over several fiscal years. The design (costing nearly \$500,000) will be completed in fiscal year 2000, with the cleanup starting the following year. There is no question that using this level of funding at one site will impact the progress at other sites at all naval activities from Maine to Pennsylvania. The Navy initially proposed monitoring for the McAllister Point Landfill for a period of 5 years to determine what impact the newly installed cap had on groundwater and the marine environment. This proposal was not acceptable to RIDEM or EPA. The Navy certainly would not propose any action it knows the agencies would not support. Based on comments received on the FS development, both EPA and RIDEM support the dredging alternative. The Navy will identify dredging as the preferred remedy.

Kymberlee Keckler arrived late, having just left Middletown Town Hall. She has been instructed to assure Aquidneck Island residents that EPA cares about their health, so a 2-day interview/accessibility effort began that day, from 11 to 7; it will be repeated tomorrow. NSN personnel were also present.

Kymberlee related what they had experienced. Letters had been sent to parents of the 130 Middletown Little League members plus 15 others who had attended the public meeting. People were asked to stop by and complete a questionnaire about how their children had used Katy Field. Nine people stopped by; most of them were very cooperative. Questions tended to focus on their children. EPA compiled the information it gathered from the questionnaire to help update the risk assessment, which was originally prepared in 1994.

Comment: Had any of the children been harmed?

Response: Some had had routine blood lead testing related to school requirements (and not associated with the recent concern about Katy Field).

Comment: What role did EPA play?

**Response:** Mostly EPA was available to answer questions. The 16 questions will help refine information in the new risk assessment, such as the actual number of person/days children have spent on the site.

Kymerlee provided a copy of the questionnaire for inclusion with the minutes.

**Comment:** When will the information from the latest sampling at Katy Field be available?

**Response:** The ATSDR report will be available in January; the Navy report will be issued in February.

**Comment:** Why conduct the survey now?

**Response:** EPA needs to better estimate the number of person/days children were at the site to ensure the exposure assessment portion of the risk assessment is accurate.

**Comment:** Did all the players agree that conducting the survey now was appropriate?

**Response:** No. The Navy and ATSDR did not feel it was appropriate because of the tone of the questions.

**Comment:** Who was contacted?

**Response:** Besides the Little Leaguers and public meeting attendees, we found out that lots of people used the site. Apparently it has been in use for the last 7 years for youth activities. The NSN Morale and Recreation Office may have a list of people who used the site.

**Comment:** What was the mood of those you spoke to today?

**Response:** One woman was angry and made a strongly worded request that she be kept updated because she was concerned for her children. Most of those attending were concerned but not in a panic.

**Comment:** Were children from off-island considered?

**Response:** No, only those that played on the field were contacted. Only a few off-island people were contacted. There were no off-island teams on the Middletown Little League lineup.

**Comment:** Why aren't the children being tested for lead right now?

**Response:** The Navy hospital is offering blood lead testing. Most parents didn't know what contaminants to test for. There is no good test to assess polycyclic aromatic hydrocarbons (PAHs) in the system. The procedure for lead is to take a baseline, then test again in 3 months. Because lead flushes out of the system within that time, if a child continues to experience a high lead level after 90 days, the problem is not from Katy Field but from a continuing exposure in that child's environment. Arsenic has a biological half-life of 48 hours. The contamination at Katy Field is not so high that one would expect to see any effects.

**Comment:** Is lead testing being done initially?

**Response:** The offer of testing at the Navy hospital was made in early November. The hospital has received 27 calls but has performed only one test. People may be taking their children to their own doctors for testing. The Navy has issued two fact sheets (one for physicians) about Katy Field, which were provided as handouts.

**Comment:** At the November public meeting, several experts said that Katy Field was contaminated but not enough to hurt anyone. Is that correct?

**Response:** Blood lead testing is a well established protocol. It can tell you when an exposure occurred.

**Comment:** If Katy Field is not a risk but children are not feeling well, what is causing the problem?

**Response:** Only one child was not feeling well but is better now. Their symptoms are not much different from the kinds of symptoms all children exhibit at some time, so it is hard to determine if there is an environmental exposure.

**Comment:** Has there been any concern expressed about who will pay for the testing?

**Response:** People may not want to go to a Navy doctor but it is a service for which no fee is charged.

**Comment:** Who drafted the letter telling the Navy not to allow children onto Katy Field?

**Response:** It was a draft enforcement action that was prepared by a team within EPA in the early fall. However, Captain Wyman had a fence constructed. There was a July letter that expressed concern about the use of Katy Field for youth activities.

**Comment:** At the last RAB meeting I thought we had some resolution on the Katy Field problem. What happened?

**Response:** EPA's letter to the Navy fell into a reporter's hands, making the issue highly political. Both Senator Chaffee and Congressman Kennedy were brought into the fray.

In early November, Tom Gibson, who works for Senator Chaffee on the Senate Public Works Committee, requested that Navy, EPA, RIDEM, and ATSDR come to Washington to brief him on the situation. The Navy's position was that previous studies showed no unacceptable risk. EPA's position was that circumstances had changed since the 1994 risk assessment was completed: new criteria had been developed and the site was in more intensive use than envisioned in the risk assessment. More data were needed in the areas where children play. Mr. Gibson asked if some additional sampling could take place by the end of November. Within a week, the Navy, EPA, and RIDEM met to walk Katy Field and identify data gap locations. Jim produced an easel-sized map of Katy Field on which the locations of all previous sampling points were

depicted, as well as the newly sampled sites. It was determined that 36 new samples would be collected and analyzed, focusing on high use areas, those areas where previous analyses had indicated elevated lead levels, and areas identified as spacial gaps.

The samples were collected during the week of November 9 (EPA took split samples to be analyzed by a different laboratory). The EPA should have its results by the end of next week; they need to be validated and then evaluated.

**Comment:** Were only surface samples taken?

**Response:** Yes. That was the focus, although EPA has requested that other data gaps in the subsurface be collected in the spring. The Navy will perform another risk assessment, with both the old and new data, which should be issued at the end of February. The ATSDR will issue a health assessment the third week of January. Another public meeting will be scheduled when the results are ready.

**Comment:** How much will these activities cost?

**Response:** The additional sampling and reporting will cost around \$100,000

**Comment:** Does this include the laboratory analysis?

**Response:** Yes, but not ATSDR's activities.

**Comment:** What would happen if elevated lead levels are found?

**Response:** The site is now fenced and we've been actively working on remedial actions. After the risk assessment and ecological risk assessment are finished, the Navy will prepare an FS in fiscal year 2000.

**Comment:** What did the 1994 risk assessment determine?

**Response:** It found there was no surface risk. Kymberlee added that PAHs, lead, arsenic, and dioxin were risk drivers for construction workers and explained that EPA thought the 1994 human health risk assessment underestimated the risk to a recreational user.

**Comment:** Will any more testing be done?

**Response:** Besides the subsurface testing EPA has requested, EPA has also asked that some geophysical work be done to determine whether there is anything in the site mounds that may contribute to health risks. Demolition material from the buildings previously on site may be inside them.

In 1997, the Navy conducted a subsurface investigation called a source removal study to determine if the piping from the fire fighting system remained below the site. Test pitting found no source area. The results of this exercise will also be included in the upcoming reports.

- Comment:** As a new member, I am concerned about joining a RAB when things can spin as much out of control in the press as they have with Katy Field. Has EPA's concern been based on the unknown or on something it does know?
- Response:** Kymberlee responded in three parts: 1) The 1994 data showed some areas that were above screening levels; 2) the human health risk assessment was underestimated because the number of days was too low and several pathways (inhalation, dermal, and sediment) were not assessed; and 3) some areas of the site were not sampled and access to them has not been restricted. The fact that these issues were blown up in the press is not something that EPA, the Navy, or RIDEM can control.
- Comment:** As a new member, I sense that the agencies are not on the same path. Disagreements occur in all collaborative efforts. However, you all need to work toward a common goal. Some parents have become overly concerned without need.
- Response:** The Navy, EPA, and RIDEM are working together to resolve this and to share everything they do with the RAB. Under CERCLA, the Navy has to satisfy EPA's and RIDEM's concerns. The Navy meets monthly with this RAB to share information. It meets more frequently than do most RABs; the majority of them only meet quarterly.
- Comment:** Each time we had a site visit to Katy Field, we were told that it was not used. Now we are surprised that it has been.
- Response:** Previous reports prepared by the Navy have indicated that Katy Field was actively used for recreation. The recreational equipment at the site would indicate that it had been an actively used facility. Kymberlee found out about the youth center in April.
- Comment:** Was the previous risk assessment poorly written or presented?
- Response:** EPA has since published new criteria (ingestion rates) and RIDEM's regulations were issued in 1996-1997, after the risk assessment was completed (see earlier comment).
- Comment:** During last summer's site visit, it was obvious that there was disagreement between the agencies. The RAB should take responsibility for some of this public concern because it did not step in and tell EPA and the Navy to resolve the problem before it became uncontrollable.
- Response:** You'll recall the person from ATSDR did not want to talk about risk issues because the report was in draft form.
- Comment:** EPA did not tell the Navy to close the site; that's why they opened the youth center. The only risk of concern was to construction workers.
- Response:** The problem is mostly one of perception but the Navy will take the new information and perform another risk assessment. Kymberlee is looking forward to having new exposure data. She anticipates that the level will be more

intense than the level used to perform the 1994 risk assessment. The new information will assess how dermal contact with the contamination affects the body. It will factor in children playing in sediments at the shoreline.

**Comment:** Regardless of what the data show, will the Navy pledge to do the right thing?  
**Response:** Captain Wyman promised the Navy would do the right thing.

**Comment:** Will the parents of children who may have been exposed to site contamination be provided with specific information about the results?  
**Response:** The first mailing went to Little League parents. They will also be informed about the January meeting and the results.

**Comment:** Is there a way to educate local journalists about IR sites and issues so the media won't sensationalize NSN problems in the future?  
**Response:** Unfortunately, no local reporters specialize in an area so any number of them could cover a NSN story. Different reporters spin stories differently. Of the five stories written covering the November public meeting, two were reasonably balanced, two were highly spun, and the fifth was way off base.

**Comment:** Why did the day care center close? Was it because of the contamination?  
**Response:** The day care center closed in 1994 and the facility was moved to another on-base location. That decision had been in the pipeline long before the state collected samples in 1991-1992. Once elevated results were evident, the Navy capped the site with 6 inches of top soil pending completion of the new facility.

**Comment:** Has the Navy investigated whether OFFTA might be impacted by the outfall pipe for the Newport sewage treatment plant? It is located right off the shoreline.  
**Response:** The outfall is located off Bishop Rock, so it should not contribute to OFFTA problems.

**Comment:** The whole Katy Field issue was sensationalized and was not fair to the Navy.

### NEW BUSINESS

Woody Monaco said the RAB web site would be updated soon. The Navy is in the process of switching over to a new system. He was asked to include a calendar.

Kathy Abbass requested that the 6 pm pre-RAB meetings resume and would like to use the one in February to address community member housekeeping issues, which are items there is never time to cover in RAB meetings. The community members need to take stock of what has happened in the last 3 years and determine whether the goals they originally set still make sense. Dave Dorocz offered to provide a facilitator if the community members felt they need

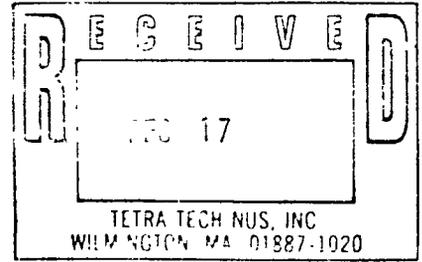
that assistance. John Palmieri will work with Kathy to develop an agenda, which will be included with the minutes for the January meeting.

**NEXT RAB MEETING**

The next RAB meeting is scheduled for Wednesday, January 20.

**Enclosures:** NSN RAB Community Members (with draft)  
NSN RAB Member Roster (with draft)  
EPA's Questionnaire Regarding Use of Katy Field (with draft)  
RIDEM's document explaining how background studies are performed

**Handouts:** RAB Review Dates Calendar  
Katy Field Naval Station Newport Fact Sheet  
Katy Field NEHC Fact Sheet



**BACKGROUND LEVELS OF  
PRIORITY POLLUTANT METALS IN  
RHODE ISLAND SOILS**

**RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
DIVISION OF SITE REMEDIATION**

**phone (401) 277-3872  
fax (401) 277-2017**

## INTRODUCTION

The goal of this study was to investigate the occurrence, geochemical abundance and scatter of the metals regulated by hazardous materials programs in Rhode Island soil.

Due to the natural occurrence of metals, it is necessary for environmental site investigations to attempt to determine the levels of metals in soil beyond the influence of the site being investigated. These levels are referred to as background. These results are then used as control samples and compared to other site samples and available literature to determine the degree and extent of environmental contamination at the site.

The problem with this situation is that available literature is very limited, and the cost of analyzing samples discourages many project managers from taking what they perceive to be unnecessary samples. Also, one or two attempts at taking representative background samples can be insufficient and can lead to over or under stating the extent of contamination. Therefore it is often difficult for regulators, consultants or responsible parties to address the detection of priority pollutant metals at a site. This project's goal is to attempt to solve this problem by utilizing existing site data from both the Federal and State hazardous waste and hazardous materials regulatory programs.

This study relies entirely upon data which was generated under one of two regulatory authorities. The first program is under the Comprehensive Environmental Response Compensation and Liability Act, commonly referred to as Superfund. Superfund is a Federal program which is run by the United States Environmental Protection Agency (USEPA). The purpose of this program is to investigate and clean up the nation's worst hazardous waste disposal sites.

The second regulatory program which generated samples used in this study was the Rhode Island Department of Environmental Management's Division of Site Remediation, which regulates the investigation and cleanup of sites similar to those in the Federal Superfund program. This State program follows the general framework of the Federal program but is much smaller in size. Although these samples are generated by another organization, they are included in this study because the goals of both the State and Federal programs are very similar and the same USEPA laboratory procedures were required for both programs.

This study compiles a comprehensive database of background levels of priority pollutant metals throughout the State of Rhode Island utilizing 106 sample points. Figure 1 shows an outline of Rhode Island and the approximate locations of the sampling points. In addition to the gathering of analytical results, the average land usage in the vicinity of the site was also recorded. The data was then statistically evaluated with the goal of establishing statewide background levels as well as investigating to what degree man's activities influence these levels.

## PARAMETERS AND METHODOLOGIES

The analytical results presented in this study included only total recoverable levels of the metals. Samples were taken from approximately the top two feet of surficial soil in the vicinity of the site investigated.

It is standard operating procedure for environmental investigators to remove approximately the top 2 inches of soil prior to collecting a background sample. This procedure is an attempt to limit the effects of potential pollutant sources such as automobile emissions, road runoff or other very common sources of soil contamination.

The data used throughout this study were obtained from analytical results from USEPA laboratory methods. These methods are described in great detail in the EPA document entitled: *EPA Methods for the Chemical Analysis of Water and Wastes, and Test Methods for Evaluating Solid Waste (SW-846)*. The EPA laboratory method numbers are: antimony (6010), arsenic (7060), beryllium (6010), cadmium (6010), chromium (6010), copper (6010), lead (6010 and 7421), mercury (7470 and 7471), nickel (6010), selenium (7740), silver (6010), thallium (7840, 7841 and 6010) and zinc (6010).

Although all of this data was generated using consistent EPA methodologies, the individual quality assurance and quality control procedures followed by the laboratories did vary. This variance is due to the overlapping jurisdiction of the State and Federal hazardous materials programs. The federally investigated sites utilized the USEPA's Contract Laboratory Program (CLP). This program was initiated at the same time as the Superfund program. Its purpose is to provide consistent, high quality, legally defensible analytical results to support the Superfund program on a nationwide basis. These program laboratories utilize the same USEPA laboratory analytical methodologies as standard laboratories, but the CLP also mandates strict procedures for documentation of quality assurance and quality control.

CLP data are accepted nationwide as the highest quality data available<sup>1</sup>. This program is not available, however, for use by State personnel or private contractors. Thus data generated by a second quality assurance and quality control program is incorporated into this study. This second program is one which meets the requirements of the State but which does not include as heavy an emphasis on validation procedures and legal defensibility as the CLP.

The land usage type was primarily determined by reviewing the report which contained the analytical results and was supplemented by interviews with State personnel familiar with the site. In order to make this study more useful, land usage was broken down into two general categories. These were:

A. High Density: used to indicate industrial parks, urban areas, areas of heavy, historic development (such as the former Naval Base, Quonset Point) and densely populated residential areas. Fifty nine sampling points (56%) were considered to be in a high density land usage area.

B. Low Density: used to indicate areas with low density residential development and very limited commercial or industrial usage. Forty seven sampling points (44%) were considered to be in a low density land usage area.

## FREQUENCY OF OCCURRENCE

A total of 106 samples were included in this study. However, due to the variety of site characteristics and the organization taking the samples, not all samples were analyzed for all parameters. Each metal was analyzed in at least 84 of the 106 samples.

On a statewide and land usage basis Table 1 indicates a metal's frequency of occurrence in samples for which it was analyzed. Very few trends are apparent in this analysis, but several points are noteworthy. Arsenic, cadmium, copper and mercury occur at significantly higher rates in high density areas than low density, suggesting that their occurrence is likely influenced by land usage. Barium, beryllium and nickel, however, occur at significantly lower rates in high density areas than in low density areas, suggesting that their occurrence is not impacted by man's usage and is likely a soil property.

On a statewide basis, six metals occurred in less than 20 percent of the samples analyzed for that parameter. These were antimony, cadmium, mercury, selenium, silver and thallium. Review of the occurrence data suggested that the presence of these metals could be more the result of man's impact than natural occurrence.

## STATISTICAL ANALYSIS

The goal of this study was to investigate the occurrence, geochemical abundance and scatter of the metals regulated by hazardous materials programs. Prior to proceeding, two decisions were necessary. The first regarded how to handle a non-detect sampling result, and the second regarded the validity of statistically analyzing sampling results for metals which occurred infrequently.

For the purposes of calculating averages and deviations, this study assumed a level of half of the method detection limit (as reported in the certificate of analysis for sample results) was present for results reported as non-detectable. Based on this assumption, all metals which did not occur in at least 20 percent of the samples were not statistically analyzed, as the sample detection limits would have disproportionately weighted the results. These metals (antimony, cadmium, mercury, selenium, silver and thallium) are reported in Table 2 along with their respective ratio of occurrence and range of detected levels. Using the 20% cutoff criterion left beryllium, which occurred at 47.7%, as the lowest occurring metal carried forward in the study.

The analytical results for the remaining eight, more commonly occurring, metals in the study (arsenic, barium, beryllium, chromium, copper, lead, nickel and zinc) were studied in greater detail. These data were compiled into a series of frequency bar graphs which compare ranges of analytical results to their frequency. These graphs, as shown on Figures 1 through 8, indicate

that the analytical results for all of the metals are positively skewed and lognormal.

Due to the lognormal distribution, the geometric data were selected as the most representative of geochemical abundance<sup>2</sup>. The bar graphs also indicate that several of the results may fall outside of the expected range of variation and are thus suspect. Utilizing the geometric data, a 95% confidence interval was determined, and results falling outside of the interval were eliminated. As the data were positively skewed, only the upper bound of the confidence intervals was necessary. This value was calculated as the product of the geometric average and the geometric deviation to the second power.

For comparative purposes, arithmetic average and deviation, geometric average and deviation and the geometric data with 95% confidence were calculated on a statewide and land usage basis for each of the commonly occurring metals. These results are depicted in Table 3 and 4.

The results of the categorical analysis of this data by land usage were somewhat surprising. Comparing the results of the land usage data with the statewide data, one expects a comparison of potential pollutant levels (in this case metals) would be the largest for high density areas and lowest for low density areas. This was not consistently the case.

Geometric average levels detected in high density areas were greater than the low density average for arsenic, copper and lead and significantly less than the low density average for barium, chromium and nickel.

The results for beryllium and zinc did not fit into either of the above categories. The results for beryllium showed no variance when comparing land usages to the statewide average using the geometric data and a slight variance in the arithmetic data. The zinc arithmetic average indicated a level for high density usage above the low density average, while the geometric data indicated a level lower than the statewide average for the same category.

This inconsistency of the results with regard to land usage is likely the result of most samples containing very little if any actual surficial soil. It is standard operating procedure for environmental investigators when taking background samples to remove the top two inches of soil in an effort to avoid ubiquitous contamination such as automobile emissions or road runoff. This procedure appears to have impacted the results of this investigation with regard to investigating the relationship between land usage and the geochemical abundance of a metal.

## OTHER INVESTIGATIONS

Only one investigation of similar scope could be located. This was by the United States Geological Survey and entitled: *Elemental Concentrations in Soils and Other Surficial Materials of the Conterminous United States (USGS Professional Paper 1270)*<sup>3</sup>. This investigation began in 1961 and continued in several phases until 1981. Samples were collected by USGS scientists when traveling to project sites and during field work for other studies. A total of 1,318 samples were taken as part of this investigation and analyzed for either 35 or 46 elements depending upon the time period the sample was taken. All 14 metals which were part of this study were included

in the USGS study. The USGS study included 28 samples in New England, one of which was near the Rhode Island/Connecticut border.

The results of the USGS study are presented in Table 5. The data from this study also indicated that the metals concentrations were positively skewed and lognormal. For this reason it was concluded that the geometric average and deviation were more representative of the geochemical abundance than the arithmetic data. Arithmetic averages were also calculated for comparative purposes.

The USGS found that three metals (cadmium, silver and thallium) were not detected at sufficient frequency to allow averages and deviations to be calculated. This finding is consistent with this study, as all three of these metals were detected at frequencies too low to evaluate the levels on a statewide basis (cadmium 14.4%, silver 4.2%, thallium 4.8%).

Comparison of the remaining three low occurrence metals in the Rhode Island study with the USGS findings was noteworthy. Antimony was detected at 5.9% in Rhode Island, which is relatively consistent with the USGS finding of 23.7%. However the results of this comparison for mercury (17.3% (RI) vs. 100% (USGS)) and selenium (14.1% (RI) vs. 84.1% (USGS)) show that these two metals occur at significantly higher rates in the eastern United States as a whole than they do in Rhode Island.

In general, geometric averages for the eight common Rhode Island metals were all substantially lower than the USGS results. The exception was lead, with 13.91 mg/kg (RI) versus 14 mg/kg (USGS). Barium had the greatest differential, 19.56 mg/kg (RI) to 420 mg/kg (USGS). A review of the entire data set indicates that almost all of the Rhode Island results did fall within the range of the USGS results.

## **SUMMARY AND CONCLUSION**

The findings of this investigation indicate that of the fourteen metals most commonly regulated by hazardous materials programs in Rhode Island (antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, zinc), six occur only infrequently in Rhode Island soil (antimony, cadmium, mercury, selenium, silver, thallium). Their occurrence is likely the result of anthropogenic effects. Occurrence of the more common metals in Rhode Island soils (arsenic, barium, beryllium, chromium, copper, lead, nickel, zinc) is more likely the result of nature.

For the common metals, distribution of the geochemical abundance levels is lognormal and positively skewed. For all metals in this investigation, results were consistently lower than the results found for the eastern United States in a comparable study by the United States Geological Survey.

The results of the categorical analysis of this data by land usage indicate that arsenic, copper and lead occur at greater levels in high density areas than low density. This result suggests that their

concentration is slightly influenced by land usage. Barium, chromium and nickel, however, occur at significantly lesser levels in high density areas than in low density areas, suggesting that their concentration is not impacted by man and is likely entirely a soil property. The results for beryllium and zinc showed little variance by land usage.

During this investigation there was a large amount of thought given to the idea of applying a confidence interval to the data and eliminating the data points which did not fall within this interval. As an original premise of this study was that the samples in it were representative of background conditions at a given site, it would seem arbitrary to then eliminate values which did not fall within an expected range. In reviewing the data set, however, it was obvious the certain values were very suspicious. Therefore, a 95% confidence interval was established using the geometric data. Applying the confidence interval to the statistical results for the common metals allowed data to be eliminated for four of the metals. The results of this application were most notable for arsenic, which had its Statewide geometric average drop almost 30%.

In conclusion, eight metals regulated by hazardous material programs are common in Rhode Island soil. These are arsenic, barium, beryllium, chromium, copper, lead, nickel and zinc. Six metals regulated by the hazardous material programs are not common in Rhode Island soil. These are antimony, cadmium, mercury, selenium, silver and thallium. The geometric average with the application of the 95% confidence interval is the best estimate of the geochemical abundance of priority pollutant metals in Rhode Island soil.

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**TABLE 1**  
**FREQUENCY OF OCCURRENCE**  
**STATEWIDE AND LAND USAGE COMPARISON**

	<b>STATEWIDE</b>	<b>HIGH DENSITY</b>	<b>LOW DENSITY</b>
<b>ANTIMONY</b>	5.9% (5)	7.0% (3)	4.8% (2)
<b>ARSENIC</b>	76.4% (81)	81.4% (48)	70.2% (33)
<b>BARIUM</b>	82.4% (75)	74.5% (38)	92.5% (37)
<b>BERYLLIUM</b>	47.7% (42)	35.6% (16)	60.5% (26)
<b>CADMIUM</b>	14.4% (14)	20.0% (10)	8.5% (4)
<b>CHROMIUM</b>	90.6% (96)	93.2% (55)	87.2% (41)
<b>COPPER</b>	75.3% (73)	80.0% (44)	69.0% (29)
<b>LEAD</b>	94.2% (98)	94.9% (56)	93.3% (42)
<b>MERCURY</b>	17.4% (17)	19.6% (10)	14.9% (7)
<b>NICKEL</b>	59.2% (58)	41.8% (23)	81.4% (35)
<b>SELENIUM</b>	14.1% (13)	15.2% (7)	13.0% (6)
<b>SILVER</b>	4.2% (4)	5.9% (3)	2.3% (1)
<b>THALLIUM</b>	4.8% (4)	2.3% (1)	7.3% (3)
<b>ZINC</b>	92.6% (88)	96.3% (52)	87.8% (36)

Note: (n) indicates the actual number of positive detections  
References: 4 - 80

**TABLE 2**  
**RANGE OF CONCENTRATIONS FOR**  
**LOW OCCURRENCE METALS**

<b>METAL</b>	<b>RATIO OF OCCURRENCE</b>	<b>RANGE DETECTED (mg/kg)</b>
<b>ANTIMONY</b>	5: 85	2.00 - 5.90
<b>CADMIUM</b>	14: 97	0.22 - 3.50
<b>MERCURY</b>	17: 98	0.02 - 0.50
<b>SELENIUM</b>	13: 92	0.05 - 1.10
<b>SILVER</b>	4: 95	0.20 - 1.30
<b>THALLIUM</b>	4: 84	0.43 - 0.94

References: 4 - 80

**TABLE 3**  
**STATISTICAL SUMMARY TABLE**  
**ARITHMETIC DATA**  
 (all results in mg/kg)

LAND USAGE	STATEWIDE		HIGH DENSITY		LOW DENSITY	
	AVE.	DEV.	AVE.	DEV.	AVE.	DEV.
ARSENIC	2.71	2.93	2.74	2.86	2.66	3.01
BARIUM	25.80	21.61	24.15	24.34	27.91	17.31
BERYLLIUM	0.55	0.43	0.54	0.42	0.57	0.44
CHROMIUM	9.20	9.73	8.08	6.99	10.61	12.19
COPPER	13.56	28.22	15.28	35.24	11.30	14.28
LEAD	33.50	55.54	39.55	66.00	25.58	36.14
NICKEL	6.81	9.33	6.03	10.63	7.80	7.21
ZINC	41.94	73.44	48.44	94.84	33.37	22.85

References: 4 - 80

**TABLE 4**  
**STATISTICAL SUMMARY TABLE**  
**GEOMETRIC DATA**  
 (all results in mg/kg)

LAND USAGE	STATEWIDE		HIGH DENSITY		LOW DENSITY	
	AVE.	DEV.	AVE.	DEV.	AVE.	DEV.
<b>ARSENIC</b>	1.67	1.53	1.80	1.41	1.52	1.68
<b>95 % CI</b>	1.19	1.29	1.25	1.15	1.12	1.44
<b>BARIUM</b>	19.57	16.61	17.01	16.76	23.40	16.43
<b>95 % CI</b>	NA	NA	NA	NA	NA	NA
<b>BERYLLIUM</b>	0.43	1.47	0.43	1.44	0.43	1.51
<b>95 % CI</b>	0.38	1.50	0.38	1.46	0.38	1.54
<b>CHROMIUM</b>	6.53	4.72	6.08	4.78	7.14	4.65
<b>95 % CI</b>	NA	NA	NA	NA	NA	NA
<b>COPPER</b>	6.41	4.69	6.59	4.66	6.19	4.72
<b>95 % CI</b>	5.98	4.31	5.81	4.31	NA	NA
<b>LEAD</b>	13.91	11.36	15.66	11.25	11.92	11.50
<b>95 % CI</b>	NA	NA	NA	NA	NA	NA
<b>NICKEL</b>	4.37	3.02	3.73	3.15	9.33	2.84
<b>95 % CI</b>	4.24	2.92	3.53	3.06	NA	NA
<b>ZINC</b>	25.27	22.06	24.38	22.10	26.49	22.01
<b>95 % CI</b>	NA	NA	NA	NA	NA	NA

95 % CI = statistical recalculated data after application of 95 % confidence interval

NA = all values in data set fell within 95 % confidence interval

References: 4 - 80

**TABLE 5**  
**SUMMARY OF USGS RESULTS**  
**FOR THE EASTERN UNITED STATES**  
**ALL RESULTS IN mg/kg**

METAL	FREQ.	AVERAGE ARITH.	GEOM.	GEOMETRIC DEVIATION	RANGE
ANTIMONY	23.7%	0.76	0.52	2.38	<1 - 8.8
ARSENIC	98.9%	7.40	4.80	2.56	<0.1 - 73
BARIUM	100%	420	290	2.35	10 - 1,500
BERYLLIUM	32.2%	0.85	0.55	2.53	<1 - 7
CHROMIUM	100%	52	33	2.60	1 - 1,000
COPPER	98.1%	22	13	2.80	<1 - 700
LEAD	78.0%	17	14	1.95	<10 - 300
MERCURY	100%	0.12	0.81	2.52	0.01 - 3.4
NICKEL	82.0%	18	11	2.64	<5 - 700
SELENIUM	84.1%	0.45	0.30	2.44	<0.1 - 3.9
ZINC	98.1%	52	40	2.11	<5 - 2,900

References: 4 - 80

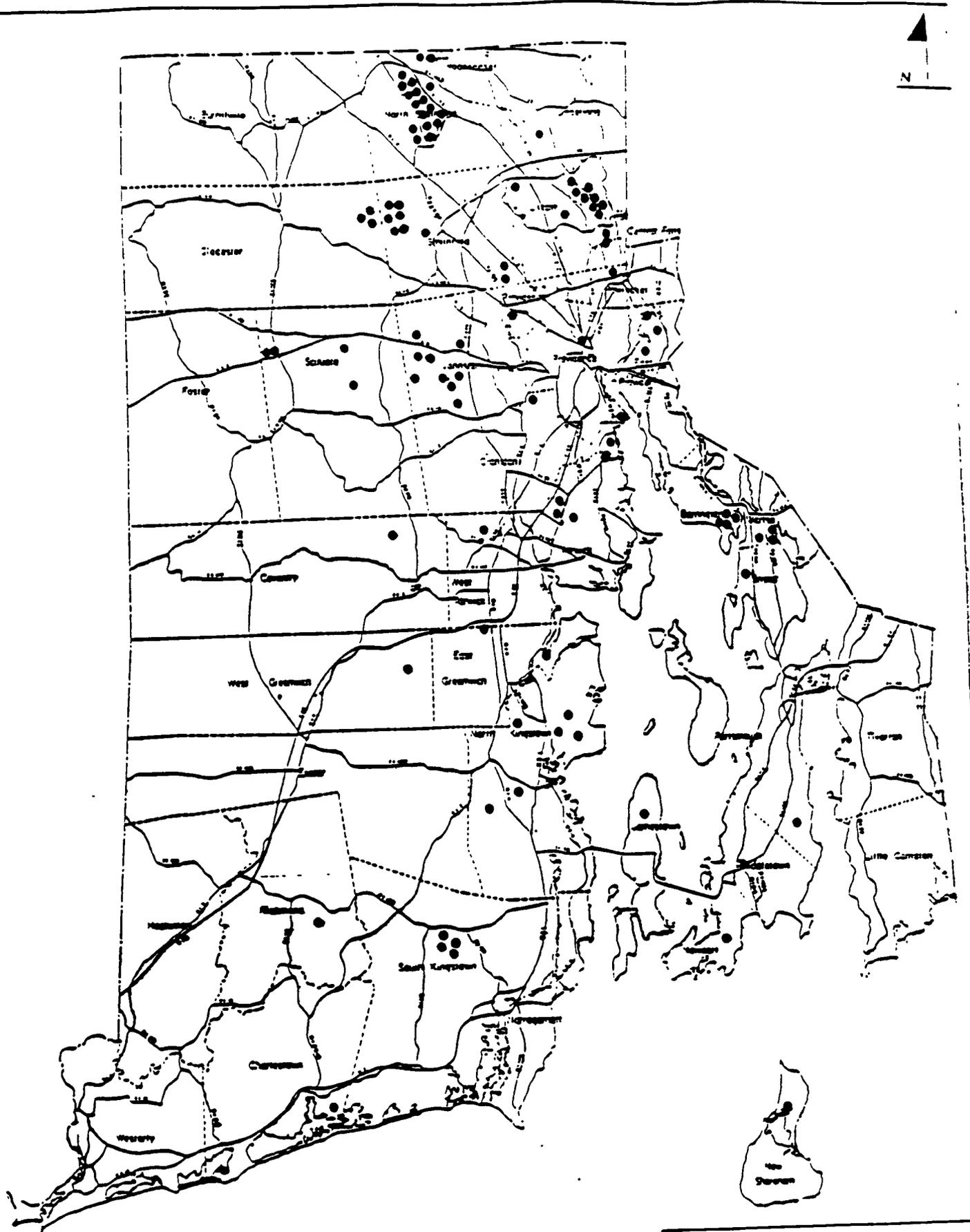


FIGURE 1  
SAMPLE LOCATIONS

FIGURE 2: ARSENIC STATEWIDE FREQUENCY DISTRIBUTION

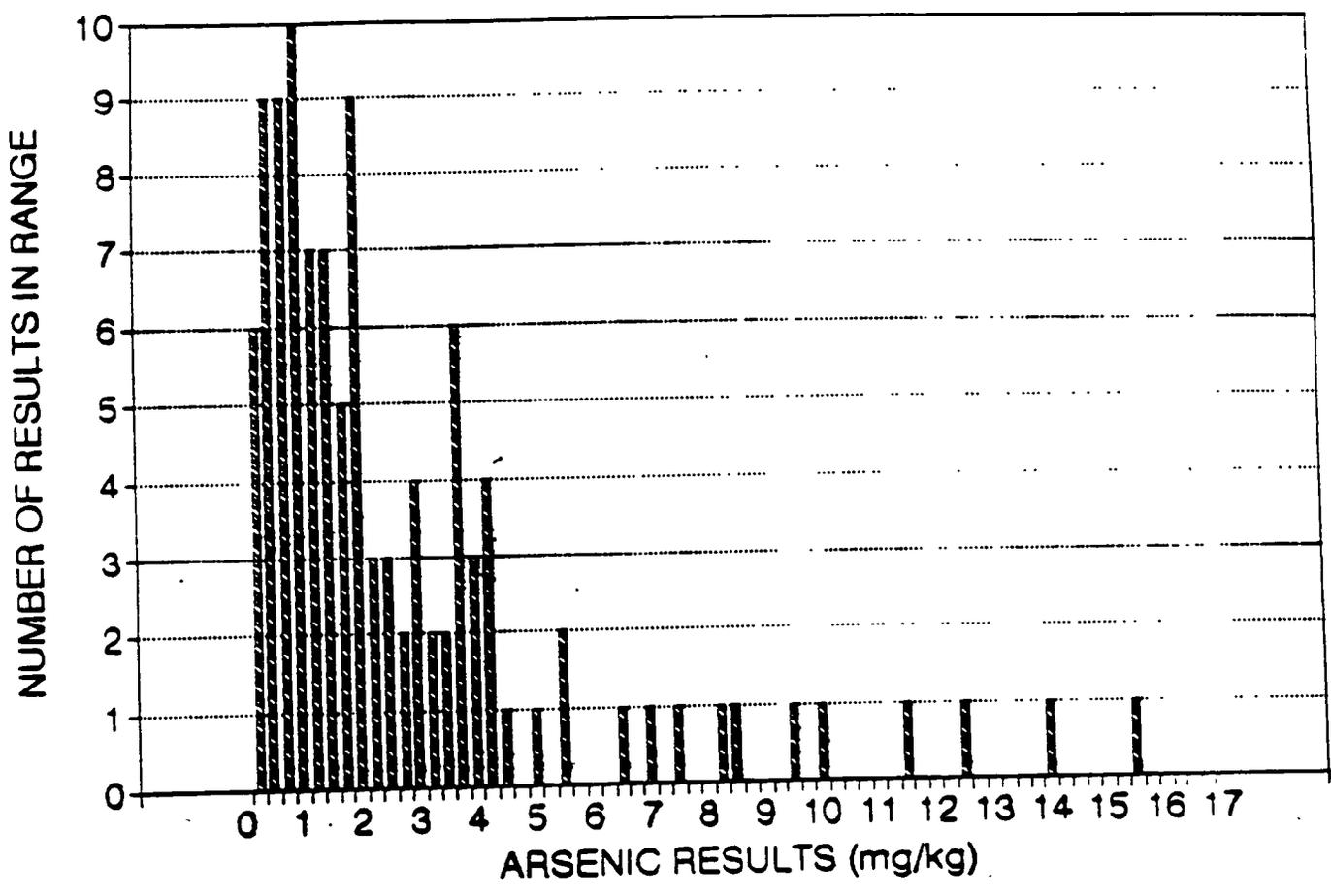


FIGURE 3: BARIUM  
STATEWIDE FREQUENCY DISTRIBUTION

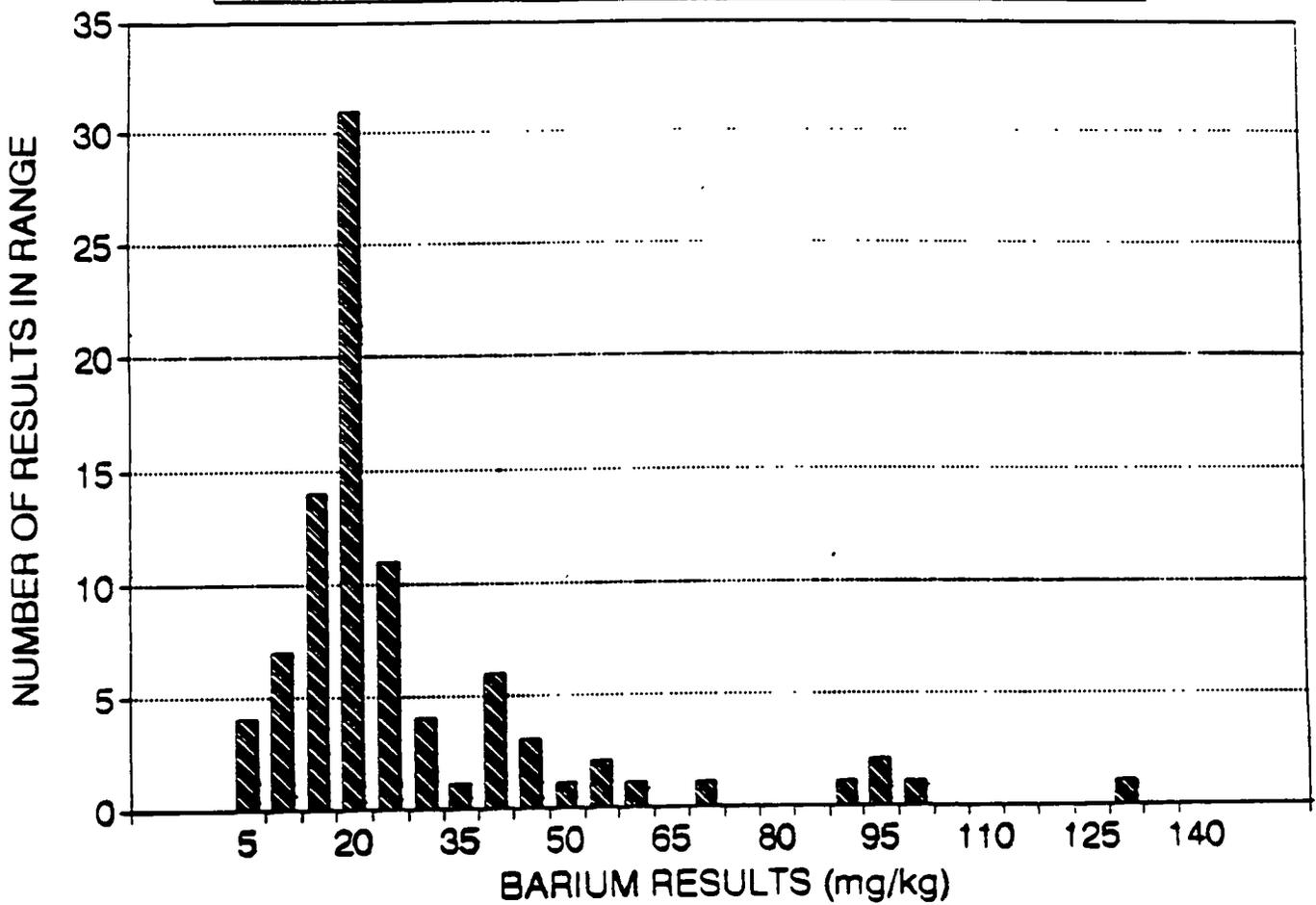


FIGURE 4: BERYLLIUM  
STATEWIDE FREQUENCY DISTRIBUTION

