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MERCURY CONTAMINATION SITE HISTORY AT SITE 8 NITRATION AREA BETWEEN MAY
1983 AND JANUARY 1992 NSWC INDIAN HEAD MD
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? Paul Berkman?
1992

MERCURY CONTAMINATION SITE, SITE 8
NITRATION AREA
INDIAN HEAD DIVISION, NAVSURWARCEN
INDIAN HEAD, MARYLAND
SITE HISTORY

PAUL
BERKMAN
MEMO

Site 8, the mercury contamination site at the Indian Head Division, Naval Surface Warfare Center, continues to be investigated under the Navy's Installation Restoration Program. The following report is a summary of the events and the studies conducted at this site over the past 13 years to present.

The nitration area plant office/laboratory building (Bldg. #766) was constructed in 1953 to support the manufacture of nitroglycerin and other nitrated ester products. The laboratory used nitrometer test equipment to determine the degree of nitration of these products. The nitrometer apparatus used two glass reservoirs containing approximately 15 pounds each of mercury. The product test sample was reacted with sulfuric acid and the mercury was used to contain and allow measurement of the reaction off-gas to determine the degree of nitration.

In 1981 while conducting a wastewater survey 10 pounds of mercury were found in the manhole adjacent to the building. The laboratory procedures were immediately changed so discharges of mercury from the laboratory were terminated. In addition, the termination of the drain line from the building to the manhole was fitted with a trap to catch any accidental mercury releases. Monthly inspections disclosed no accumulation of mercury in the trap.

1. Initial Assessment Study by Fred C. Hart Associates, Inc. under the Navy Assessment and Control of Installation Pollutants (NACIP) Program - May 1983.

This study examined the entire facility by reviewing old records, interviewing employees, and conducting a site visit to determine if past hazardous waste sites existed which posed a potential threat to human health or the environment. The study identified 38 past waste disposal sites of which 3 were recommended for continued study due to the potential hazards they posed. These 3 sites were:

- a. Building 731 (Site 5) wastewater discharges into open ditch area from the development of X-ray film

b. Town Gut Landfill (Site 12) visual evidence of hazardous waste disposal were observed

c. Building 766 (Site 8) approximately 23 pounds of mercury used in laboratory tests had been discharged into a manhole leading to a stream over a twenty year period. The discovery of the mercury in the manhole in 1981 was a major factor for including this site into the NACIP Program.

In August of 1984 a contractor doing excavation for a new sewer line inadvertently ruptured a 3 inch drainfield line leading from Building 766. Mercury was observed leaking from the pipe and in the adjacent soil. The State of Maryland and the EPA were notified and cleanup efforts were initiated. The State of Maryland issued a formal Complaint and Order to insure that the station will follow the proper procedures for cleaning the site.

The Waste Management Administration's Technical Services and Enforcement staff of the State of Maryland made sampling inspections at the site, and as of August 13, 1985 concluded that the station was in compliance with the Complaint and Order and the backfilling at the site could be initiated (cleanup levels had to approach a background level established by the state at 0.1 ppm mercury). Approximately two hundred 55 gallon drums of contaminated soil and mercury waste were collected and transferred to the Property Disposal Office for deposition at an authorized landfill.

2. NACIP Confirmation Study by CH₂M Hill - September 1985.

This study implemented the recommendations of the Initial Assessment Study to further examine the 3 sites identified as posing potential hazards. The purpose of this study was to conduct on-site sampling to confirm or deny the existence of hazardous wastes, and to eliminate from further consideration those sites that posed no threat or potential threat to human health and the environment. Of the 3 sites, Site 8, the mercury contamination site, was the only one recommended for continued study under the Navy Assessment and Control of Installation Pollutants Program. The recommendation for Site 8 was as follows:

Building 766 (Site 8) - Sediments and surface waters at this site are contaminated with mercury at levels in some areas that pose potential threats both to human health and the environment. Between 200 and 500 pounds of mercury were estimated to be in the sediments with 95% residing in the lowlands and wetlands. The recommended actions included restriction of access, removal of contaminated sediments in highly contaminated areas, and continued monitoring to detect any off-site migration of contaminants.

3. Feasibility Study/Remedial Design for Building 766 (Site 8) by E.C. Jordan Co.; initiated in February 1987; program management provided by Martin Marietta Energy Systems Inc.

Based on the recommendations of the Confirmation Study, this phase of the Installation Restoration program continued to study the site by collecting the data necessary for supporting a removal action. The removal action would remove the sediments that contained high levels of mercury thereby reducing the risks to human health and the environmental.

To accomplish the above, the project was divided into nine tasks outlined in a Work Plan completed by E.C. Jordan in June 1987. The Work Plan itself was considered Task 1:

Task 1 - Work Plan Preparation; Part A: Technical Approach, completed June 1987.

This work plan then proposed the remaining tasks required to complete the Feasibility Study and Remedial Design:

- Task 2 - Supplemental Site Characterization
- Task 3A - Screen Control Measures
- Task 3B - Develop Detailed Alternatives
- Task 3C - Evaluation of Detailed Alternatives
- Task 4 - Conceptual Design for the Selected Alternative(s)
- Task 5 - Prepare Environmental Assessment
- Task 6 - Prepare Preliminary Draft Feasibility Study Report
- Task 7 - Prepare Draft Feasibility Study Report
- Task 8 - Prepare Final Feasibility Study Report
- Task 9 - Prepare Final Plans and Specifications

The estimated completion date for all the above tasks was March 1988.

Task 2 - Supplemental Site Characterization, completed December 1987.

The purpose of this study was to complete the understanding of the physical environment, and assess the distribution, migration, and fate of mercury in sediment and surface water. This information would be used for development of the Feasibility Study. This report would be issued as a draft only, any comments received from the Navy concerning this report were to be incorporated in the development of the Feasibility Study Report (Tasks 5 and 6).

The objectives of this Feasibility Study were to develop and evaluate remedial alternatives for cleaning up the site. This information is then presented to a decision maker for the selection of the appropriate remediation alternative.

The results of this investigation were as follows:

a. The pond has a basal flow of approximately 23 gallons per minute, and increases to approximately 117 gallons per minute subsequent to industrial process water discharges into the Atkins Road tributary.

b. The beaver dam at the Noble Road culvert, by increasing the water depth in the tidal pond, enhances the tendency of particles to remain in the pond.

c. Mercury migration appears to be related to sediment transport rather than migration in solution in surface water.

d. The total volume of sediments in the stream and tidal pond is approximately 23,042 cubic yards. The depth ranges from 2 to 7 feet.

e. The volume of sediments containing more than the indicated concentrations of mercury is estimate as follows:

<u>Mercury Concentration</u> (mg/kg)	<u>Volume</u> (cu. yd)	<u>*Estimated</u> <u>Weight</u>
0.1	12,313	2.7 lbs
1	7,555	8.25 lbs
5	2,276	>12.1 lbs

*This calculation was made by the author of this paper assuming the worst cases; 12,313 cu. yds. contains 1 ppm, 7,555 cu. yds. contains 5 ppm, with the remaining 2,276 cu. yds. containing the majority of the estimated 200 to 500 pounds of mercury released. This also assumes that no mercury contamination escaped from the site.

Task 3 (combined Tasks 3A, 3B, and 3c) - Remedial Alternatives Evaluation Report (Screen, Develop, and Evaluate Control Measures) completed February 1988.

The purpose of this study was to provide an environmental and cost evaluation of remedial alternatives that addressed the mercury contamination. It compared applicable remedial options and made a recommendation on the most appropriate alternative for the site.

The results were as follows:

a. Human Health Effects - Based on site characteristics, human exposure is highly unlikely.

b. Target levels for cleaning up sediments, soil, and water were given:

sediments (FDA Action Level).....1 to 5 ppm
soil (based on lethal dietary data
for birds and mammals.....10 ppm
water (AWQC).....0.012 ppb

c. The remedial control measures considered included: no action; long term monitoring; solidification; in place adsorption; dredge/excavate; plant uptake and harvest; channel diversion; sediment retention basins; containment (covering); and water treatment. These technologies and actions were screened based on their ability to remediate the site either on their own or in combination with other technologies.

d. The recommendation for remediation was on-site solidification of those sediments containing greater than 10 ppm of mercury, including sediments containing free mercury. Mildly contaminated soils and sediments with less than 10 ppm of mercury would be left in place and monitored. The sediments containing free mercury, along with selected areas with excessive mercury levels would be removed (excavated by suction) and solidified. The use of the Bronson Road Landfill as a disposal site for solidified sediments and soil was recommended. It was also recommended that one round of sediment samples be collected in the Mattawoman Creek near the Noble Road culvert to assess the potential impact of mercury contamination in this area. It was recommended also that for water cleanup, no immediate action should be taken.

The results of this study were to be presented as a draft report in a meeting to be held 2 weeks after submission. This meeting was to include the regulatory agencies in order to obtain concurrence on the recommended remedial action. It is noted that the first meeting to discuss the remedial action involving the regulatory agencies at Indian Head did not take place until July 17, 1991, the first Technical Review Committee meeting.

On May 26, 1988, a status meeting was held at the Naval Ordnance Station to discuss the findings of Task 2 and 3, and to plan subsequent efforts. This meeting was attended only by the Navy and its contractors, Martin Marietta and E.C. Jordan.

The findings presented at this meeting for Task 2 by E.C. Jordan were different from those found in the draft report and are as follows:

a. Mercury concentrations in sediments are generally lower than previous data had indicated. This finding is consistent with literature reports of mercury loss from sediments over time.

b. The significant increase in data points on mercury concentration in sediments has revised old estimates to approximately 60 pounds.

c. Most of the mercury is in the upper foot of sediments and concentration decreases with depth.

d. Free elemental mercury droplets were observed at the sampling station closest to the Building 766 former discharge point.

e. With the exception of this upstream segment containing free mercury, little or no risk to humans or biota is evident at Site 8.

E.C. Jordan presented new information at this meeting which modified the Site 8 investigation. Researchers at the Oak Ridge National Laboratory released new information concerning the behavior of mercury in the environment. They concluded that mercury contamination in soils and sediments transforms into mercuric sulfide. This sulfide has such a low solubility that it can be left in place without adverse effects to human health or the environment. Additionally, mercury that has transformed into other

species (organic, etc.) can be transformed to the sulfide compound with in-site treatment. Based on this new information E.C. Jordan proposed doing a mercury speciation study which would provide additional justification for a no action alternative or for new remedial alternatives to evaluate.

The consensus of the meeting was to present the State of Maryland with this new information to support the long-term monitoring of the site, and pending these monitoring results the innovative in-situ chemical treatment can be re-evaluated.

In April, 1989, based on the consensus of the May 1988 meeting, an amendment was made to the E.C. Jordan contract. This amendment added three additional tasks to the 9 original tasks required for the completion of the Feasibility Study and Remedial Design. The additional tasks are as follows:

- Task 10 - Review of Monitoring Data
- Task 11 - Mercury Speciation Study
- Task 12 - Treatability Studies

At this time Task 4, Conceptual Design for the Selected Alternative(s), was placed on hold. The purpose of the above 3 tasks was to provide additional data required to support the development of Task 4 in light of the new information regarding mercuric sulfide from the Oak Ridge National Laboratory researchers. Task 4, the conceptual design for on-site solidification was never implemented.

Task 10 - Review of Monitoring Data; draft report completed in November, 1989, this report was never made final.

This report presented a review of the environmental monitoring database collected during the period from November 1985 to March 1989.

The conclusions of this study were:

1. It estimated the mass of mercury contamination in sediments (0 to 1 foot) to be between 146 to 246 pounds.

2. The measurement of mercury contamination of sediments is spatially highly variable.

3. Areas in the upper region of the stream near the office building contain high levels of mercury sediment contamination.

4. There may be another source of mercury in the Tidal Pond upstream in the northeast drainage ditch. Mercury was detected in sediment and surface water samples from this ditch.

5. It is not possible to compare data among the three studies conducted at Site 8 due to differences in sampling locations and analyses techniques.

6. Due to lack of appropriate information it is not possible to make any conclusions with regard to sediment mercury concentrations over time.

The recommendations of this study were:

1. Samples should be collected and analyzed under a QA/QC plan with the same sampling and analysis methods.

2. Analytical results should include a percentage moisture measurement for sediments and soils so results can be reported on a dry weight basis.

3. If samples are collected for the purpose of evaluating trends in mercury concentrations over time then sampling design should include replicates, duplicates, and exact sampling locations in addition to the QA/QC plan.

According to the Statement of Work for Task 10, E.C. Jordan would supply the Government with a quarterly report that would summarize, interpret, and evaluate the data acquired. The November 1989 draft was the first of these reports and therefore caught everyone up to date with all sampling from 1985 to present (which was March of 1989). The Statement of Work assumed that sampling on a quarterly basis by either NOS personnel or E.C. Jordan would continue but this was not the case (quarterly sampling of sediments and surface water were taken by NOS personnel in 1986 and 1987 only with less sampling in 1988 and 1989). The draft report of November 1989 was the only report the Government received from E.C. Jordan under Task 10.

Task 11 - Mercury Speciation Study Report; draft report completed in July 1990, this report was never made final but a presentation of results and recommendations were given at Indian Head on 5 September 1990.

The purpose of this task was to identify the chemical forms of mercury present to better define the toxicity and therefore aid in developing the appropriate cleanup methodologies based on, in part the mercuric sulfide theory.

The draft report was submitted to the Navy in July of 1990. The results of sampling analysis showed that mercuric sulfide was present only in the upper reaches of the stream and in these upper reaches accounted for only 16% of the different forms of mercury present. These results did not support the sulfide transformation theory proposed by the Oak Ridge National Laboratory researchers. This study did identify the presence of methyl mercury, a very toxic form, which warrants the remediation of the upper stream sediments.

The final conclusions of this study were given at the September 1990 presentation:

1. In the upper portion of the stream; due to the presence of high total mercury concentrations (mean of 306 mg/kg). transformable mercury species (elemental and bound) and methyl mercury in the sediments it is probable that toxic and bioaccumulative effects to aquatic life are occurring.
2. In the upper portion of the stream; although mercury has translocated downstream, mean total mercury concentrations have not decreased over the 5 year period between comparable sampling events. This suggests there could still be an input of mercury to the system.
3. In the lower portion of the stream; the presence of methyl mercury in the sediments of the stream suggests that the transformation of elemental mercury to methyl forms is occurring.
4. In the lower portion of the stream; methyl mercury is bioconcentrating and toxic suggesting the potential for in-stream toxicity and bioconcentration of mercury by aquatic organisms.
5. In the lower portion of the stream; the amount of methyl mercury that is actually released to the water column may be different than the upper portion of the stream due to changes in sediment type.

6. In the tidal pond; the mercury in the tidal pond is primarily bound mercury (37%) and elemental mercury (60%).

7. In the tidal pond; due to the large proportion of elemental mercury in tidal pond sediments, formation of methyl mercury is possible although none was detected.

8. In the tidal pond; the detection limits associated with this study may not allow for measurement of methyl mercury in tidal pond sediments if it is present at the same concentrations measured in stream sediments.

9. In soils; total mercury in floodplain soils at 1.1 ppm is higher than that of site background soils at 0.18 ppm and is composed of elemental (14%) and bound mercury (86%).

10. In soils; the mean concentration of total mercury in floodplain soils at 1.1 ppm is 5 times higher than the concentration in the background sample (0.18 ppm).

11. In Mattawoman Creek; total mercury averages 1.0 ppm in sediments and consists of bound (61%) and elemental (39%) mercury. This is the second sediment sample collected beyond Noble Road into Mattawoman Creek and supports the conclusion that mercury is migrating from Site 8 into the creek.

The final recommendations presented at the September 1990 meeting:

1. Remediation is required for the sediments in the upper stream.

2. Investigate the possibility of current sources of mercury input into the stream.

3. For the remainder of the stream, tidal pond system and Mattawoman Creek, a biological assessment and monitoring program should be designed and implemented to:

- a. Determine if the present sediment mercury levels are hazardous and require remediation.
- b. Provide baseline information for the determination of site specific clean up levels.
- c. Provide a baseline of impacts (bioaccumulation and toxicity) necessary to evaluate the effectiveness of remedial actions.

Task 12 - Treatability Studies, task never implemented.

The purpose of the Treatability Studies were to assess the effectiveness of one or more mercury treatment technologies on the contaminated soils and/or sediments. This study was required for doing the cleanup by using on-site solidification, which was the remediation selected under the Task 3 study. A treatability study consists of taking small amounts of mercury contaminated soils and sediments and trying different types of solidifiers on these samples to determine which solidifier will do the best job immobilizing the mercury, thus protecting the environment.

E.C. Jordan was to recommend the treatability studies that would immobilize the species of mercury present at the site based on the results of Task 11 above. A Work Plan was to be submitted for approval by the Government, and the results of this study were to be incorporated into the Task 3 report.

Martin Marietta Energy Systems, Inc. in a supplemental agreement (June 13, 1989) with the Government had made Task 12 an optional task for E.C. Jordan to perform, the option was never exercised.

At the September 5, 1990 meeting a list of tentative action items for Site 8 was drafted. The amendment to the scope of work to incorporate these action items was drafted in February of 1991 (E.C. Jordan, Inc. now changed its name to ABB Environmental). The amended scope of work contained these additional tasks to further study Site 8:

- Task 13 - This task number was never assigned
- Task 14 - Technical Memoranda
- Task 15 - Mercury Source Investigation Plan
- Task 16 - Interim Remedial Action Plans (which included an Engineering Evaluation/Cost Analysis and a Bid Specification Package)
- Task 17 - Biomonitoring Plan
- Task 18 - Characterization Sampling

Due to changes in Navy policy which terminated the interagency agreement (1791-A1) with the Department of Energy, portions of the above Tasks were never completed. The change in Navy policy did not permit further funding to be sent to Martin Marietta Energy Systems, operators of HAZWRAP, the program managers for the Installation Restoration effort at Site 8. Therefore when tasks were not completed due to lack of funding as cited in the following narrative, this was due to official Navy policy which could not be changed by the actions of CHESDIV.

Task 14 - Technical Memoranda; draft final report completed in May 1991.

The Technical Memoranda is a compilation of data and text from previous reports. It also incorporated comments received on all documents currently in draft form. The documents included in this memoranda were as follows:

1. Supplemental Site Characterization Draft Report
2. Remedial Alternatives Evaluation Draft Report
3. The Data Evaluation Draft Report
4. Mercury Speciation Study Draft Report

This memoranda acts as a single-source data base for all data previously generated by E.C. Jordan studies. It also provides a characterization of the site over a five year study period.

Task 15 - Mercury Source Investigation at Building 766; never implemented.

The purpose of this task was to develop a Work Plan for the investigation into the possibility of additional free mercury available to the environment from within Building 766 and the immediately surrounding area.

It was decided that this task should not be implemented until the interim removal action was initiated, thereby combining this activity with the interim removal action. The efforts to produce the Work Plan would be shifted to the Interim Remedial Action Plans and Specifications with the addition of a section to address the source investigation during the removal action.

In August 1991 an amendment to the Scope of Work deleted this task due to lack of funding.

Task 16 - Interim Remedial Action Plans and Specifications

This task had two parts:

1. The development of the Engineering Evaluation/Cost Analysis (EE/CA) for the upper reaches of the stream at Site 8 (Marker 24+60 to 16+00). The purpose of the (EE/CA) is the following:

- a. Satisfy environmental review requirements for removal actions. According to the National Contingency Plan (NCP), Section 300.415[m][4], where a removal action is determined appropriate and when response allows for a six month planning period prior to the initiation of on-site activities, the lead agency (Navy) shall publish a Notice of Availability and a brief description of the EE/CA. The public will then have an opportunity not less than 30 days to submit written and oral comments on the EE/CA to the Navy. After this period a meeting will be held if necessary. The NCP also states that a written response to significant comments will be produced after the public comment period, i.e. responsiveness summary and an action memorandum. Upon completion of the responsiveness summary and action memorandum, the removal action is initiated.
- b. Satisfy administrative record requirements for improved documentation of removal action selection
- c. Provide a framework for evaluating and selecting alternative technologies

This was not done?

Engineering Evaluation/Cost Analysis Reports:

The draft EE/CA was completed in August 1991. It recommended excavation and offsite disposal of mercury contaminated sediments/soils in a permitted facility. The estimated cost for the removal action was 2 million dollars.

The first revision to the draft EE/CA was submitted in November 1991. This revision was the result of comments received during the second Technical Review Committee held on October 15, 1991. This revision included further justification for the elimination of remedial alternatives.

The second revision to the draft was submitted in March 1992. This revision incorporated the MDE comments and was considered by ABB Environmental to be the final document.

2. The Plans and Specifications Package for the interim removal action. The Plans and Specifications provide detailed engineering information for implementation of the removal action, and supports the procurement of the construction contract.

A final Bid Specification Document was submitted in June 1991. This fulfilled the task requirements which specified a service contract formatted document. This document became obsolete due to a change in Navy contracting requirements calling for a construction formatted document to support removal actions. This document would be converted into the construction format under an additional amendment to the Scope of Work, Task 19.

Task 17 - Biomonitoring Program; final Work Plan submitted in January 1992.

The biomonitoring was for the stream and tidal pond with the following goals:

1. Determination of the in-situ toxicity of mercury
2. Determination of the extent of mercury contamination in the aquatic food chain
3. Evaluation of the effects of remedial actions in the upper stream
4. Evaluation of the effectiveness of the remedial response

A Biomonitoring Work Plan would be developed conforming to EPA guidance on ecological assessments at hazardous waste sites. This plan would implement the biomonitoring before, during, and after the interim removal action. The results of this investigation would provide the basis for decisions regarding remedial actions in the lower stream, tidal pond, and for formulation of site-specific target cleanup levels.

In September 1991 an amendment to the Scope of Work added the implementation of the Biomonitoring Work Plan. This called for conducting all biomonitoring activities called for in the Biomonitoring Work Plan, and preparing a Biomonitoring Report giving the results of the work.

The draft final Work Plan was submitted by ABB Environmental in January 1992. This plan is currently under review by Halliburton, NUS with assistance from the U.S. Fish and Wildlife Service. The plan will be finalized and the field work initiated by the end of July 1991.

Task 18 - Characterization Sampling; never implemented.

The contractor would conduct characterization sampling of the sediments to determine waste characteristics for use in developing Plans and Specifications for removal of contaminated sediment. Samples would be collected from the area upstream of the point where the drain from Building 766 entered the drainage, and from the upper reaches of the drainage between markers 20+00 and 24+00. This task was never implemented due to lack of funding.

The following task was added to the Scope of Work by the September 1991 amendment:

Task 19 - Preparation of a Bid Specification Document; partially completed;

The contractor will prepare a Bid Specification Document for the interim removal actions addressing the mercury-contaminated sediment located in the upper reaches of the stream near Building 766. The document will utilize the information contained in the June 1991 Final Bid Specification Document previously prepared for Site 8 under Task 16. This new document will be in a construction format to meet the new Navy contracting requirements.

This document was never completed by ABB Environmental due to lack of funding. The incomplete document will be turned over to Halliburton, NUS to support their efforts in the site remediation.

Technical Review Committees (TRC)

Section 211 of the Superfund Amendments and Reauthorization Act (SARA) of 1986 in which the Defense Environmental Restoration Program (DERP) is codified, requires that whenever possible and practical a TRC shall be established for the purpose of reviewing and commenting on actions and proposed actions respecting releases or threatened releases at the installation. It is the Navy's goal to use this requirement to facilitate technical input from all affected parties.

The first Technical Review Committee (TRC) was held at the Naval Ordnance Station on July 17, 1991. At this meeting Capt. Nicholson made introductions and Ken Morin summarized the IR Program activities conducted at the activity since 1983. Frank Van Ryn of HAZWRAP reviewed specific details of the history of Site 8 and outlined the current approach for the remediation. Terry Smith of ABB Environmental gave more specifics on the proposed removal action (excavation and offsite disposal) as called for in the draft EE/CA (submitted August 1991). The purpose and the progress in the development of the biomonitoring plan was also discussed.

The second Technical Review Committee was held at the Naval Ordnance Station on October 15, 1991 with Capt. Nicholson conducting introductions. Ken Morin discussed the implications of the Hazard Ranking Scoring (HRS) and the need for continued biomonitoring in connection with Site 8. Shawn Jorgensen discussed the status of the current Site Inspection being conducted by Ensaf under the SOUTHDIV CLEAN contract. Shawn also presented an overview of the Site 8 EE/CA with Ken recognizing that the Land Ban issues were not addressed and therefore the EE/CA should be revised before distribution to the TRC members. There was a discussion between the Navy, the Maryland Department of Environment, and other committee members on the function of the TRC in reviewing documents and in making decisions. CHESDIV made a commitment to supply TRC members with narratives on the documents sent to them for review, of which this document is the first such narrative. The TRC decided to have the EE/CA modified to include the pretreatment alternatives to satisfy the Land Ban issues, and also to go into more detail on the reasons for eliminating the alternative remedial actions which were not recommended.

The third Technical Review Committee was held on February 18, 1992. At this meeting the official welcome and introduction were given by Ken Morin. Ken explained the contractor change for Site 8 due to the termination of the DOE program management contract. Terry Smith of ABB Environmental gave an overview of the revised EE/CA submitted to the Government November 1991. Terry Smith also went over the Maryland Department of Environment's comments on the August 1991 draft EE/CA. There was a question and answer period during which the committee members raised many questions concerning the remediation effort. The responses to these questions and the State of Maryland comments are incorporated in the second revision of the EE/CA submitted March 1992.

U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service was contracted by the Navy in February of 1987 to conduct a remedial bio-assay study for a 5 year period, with samples taken once per year. The study investigated mercury bioaccumulation in three recreational fish species, the largemouth bass, the bluegill, and the channel catfish. Two sampling stations were established in Mattawoman Creek; an upstream reference and an experimental site at March Island, adjacent to the area where the mercury release occurred. Five individual fish of each species were collected at both stations and were analyzed for total mercury at U.S. Fish and Wildlife Service laboratory facilities. The 1987, 1988, and 1989 studies demonstrated no statistically significant mercury accumulations in fish tissue between the experimental site and the upstream reference. The 1990 study found mercury concentrations in channel catfish elevated at the Marsh Island site. The mean mercury concentration for channel catfish from the experimental site was greater than the State mean but less than the national mean.

The last year of sampling under this contract was conducted between May 20, 1991, and May 24, 1991. A third sampling site located off the Mattawoman Creek was added as a control site since mercury concentrations in fish tissues were higher at the reference site than at the experimental site for some species of fish. The results of the 1991 sampling will be available in June of 1991.

In an unrelated study to the above, January 1990, the U.S. Fish and Wildlife Service through coordination with the EPA's Chesapeake Bay Program and the Maryland Department of the Environment, Selected NOSIH as one of four sites to determine the effectiveness of National Pollution Discharge Elimination permits. The objective of the study was to determine whether metal contaminants introduced by the NOS outfalls (more than 50 outfalls) were affecting fish and wildlife. Metal Residues were measured in sediment, several species of fish, clams, and aquatic plants. The study results led to the following conclusions:

1. Metal residues in biota did not show greater levels at the discharge site relative to the reference site.

2. Bioassays did not show acute effects were occurring at the discharge site relative to the reference site.

3. Chronic health effects to fish at the discharge site were indicated by histopathological results.

4. Levels of several metals in sediment near NOS discharges were higher than at the reference site and higher than Chesapeake Bay means (copper, lead, arsenic and possibly selenium).