

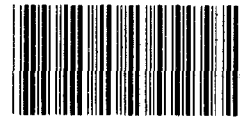
GAO

Briefing Report to the Chairman,  
Subcommittee on Environment, Energy  
and Natural Resources, Committee on  
Government Operations, House of  
Representatives

May 1987

# HAZARDOUS WASTE

## Abandoned Disposal Sites May Be Affecting Guam's Water Supply



133388

**RESTRICTED — Not to be released outside the General  
Accounting Office except on the basis of specific approval  
by the Office of Congressional Relations.**

538958

RELEASED

---

---



United States  
General Accounting Office  
Washington, D.C. 20548

National Security and  
International Affairs Division

B-213706

May 21, 1987

The Honorable Mike Synar  
Chairman, Subcommittee on Environment,  
Energy and Natural Resources  
Committee on Government Operations  
House of Representatives

Dear Mr. Chairman:

In July 1986 you requested that we review the Department of Defense's efforts to identify and clean up abandoned hazardous waste disposal sites on its two installations in Guam, including an assessment of (1) the Installation Restoration Program's Phase I reports prepared for Andersen Air Force Base (AFB) and the Guam Naval Complex, (2) the safety of Andersen AFB's drinking water, and (3) regulatory agency involvement in the program. The results of our review are summarized below and discussed more fully in appendixes I, II, and III.

The Department initiated the restoration program to (1) identify and evaluate suspected problems associated with closed disposal sites located on Defense installations and (2) control the migration of hazardous contamination from these sites. The program consists of four phases. Phase I is the installation assessment, including site assessments and records search, to identify bases with closed, potentially hazardous waste sites; Phase II is to confirm that contaminants are affecting the environment; Phase III is used for developing or advancing the technology needed to solve some of the problems; and Phase IV is the operation or corrective action effort.

Phase I was completed at Andersen AFB in March 1985 and preliminary work on the Phase II confirmation study began in September 1986. Phase I was completed at the Guam Naval Complex in October 1983 and a contract for a Phase II confirmation study was awarded in April 1986.

Based on a review of the results of Phase I, officials of the Environmental Protection Agency (EPA), Guam EPA, and the U.S. Geological Survey believe that both installations need

to include more site assessment work in Phase II. For example, they

- questioned the scope of the Phase I studies,
- noted that 45 potential waste disposal sites determined in Phase I to require no further study should be reexamined during Phase II,
- identified sites not assessed during Phase I that should have been assessed.

Because Navy officials did not ask EPA or Guam EPA to participate in Phase I, disagreement exists between the Guam Naval Complex and EPA and Guam EPA over the amount of Phase II testing to be done at certain sites and the number of sites that should be included. The Navy recommended that seven sites be tested and monitored during Phase II. Officials from EPA and Guam EPA believe that the Navy's Phase I study did not recommend sufficient Phase II testing at the 7 sites and should have recommended the monitoring of 27 other sites. The Navy has agreed to perform additional testing on the 7 sites. It has not agreed, however, to monitor the other 27 sites, but discussions with EPA and Guam EPA officials are continuing.

EPA and Guam EPA were not involved in the Andersen AFB Phase I study either. At our request, both agencies reviewed and commented on the Phase I report. Both questioned the Air Force's decision not to do any further work at 18 of 38 sites included in the Phase I study. In addition, EPA questioned why some sites had not been included. In January 1987 we provided Andersen AFB officials with a copy of the regulatory agencies' comments. Officials of Andersen AFB and Guam EPA said that they are now working closely together and with the contractor during Phase II to facilitate completion of a technically sound confirmation study that includes reassessing the sites not considered during Phase I.

In 1978 Andersen AFB officials discovered that the base's drinking water was contaminated with the cleaning solvent trichloroethylene (TCE), a suspected carcinogen. The suspected sources of the contamination were old, abandoned landfills where the solvents had been disposed. Tests of samples taken over the years from the 11 Andersen AFB wells revealed that TCE was present at concentration levels that, according to EPA, pose an unacceptable health risk to those drinking the water for extended periods of time. The most troublesome well contained TCE levels ranging from 1.5 to

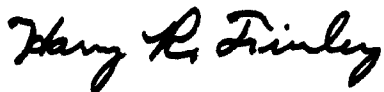
29.9 parts per billion and the remaining wells contained TCE levels ranging from 0.0 to 8.5 parts per billion. EPA's proposed maximum contaminant level is 5 parts per billion.

Testing of Andersen AFB's drinking water has been sporadic and has not included water consumed by portions of the installation populace. Concern that some of the drinking water might contain higher levels of TCE contamination than previously thought resulted in Andersen AFB officials establishing procedures to test water samples monthly at different points in the water distribution system during the Phase II study. We were told that if the test results indicate contamination, corrective action will be taken to make the drinking water safe, or the wells will be shut down.

We discussed our findings with Defense Department officials during the course of our review and incorporated their comments where appropriate. As requested, we did not obtain official Defense Department comments on this report. More details on the scope of our review are included in appendix IV.

As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of its issuance. At that time, we will send copies to the chairmen of other concerned committees; the Secretary of Defense; the Secretaries of the Army, the Navy, and the Air Force; the Director, Office of Management and Budget; and other interested parties upon request.

Sincerely yours,



Harry R. Finley  
Senior Associate Director

Contents

		<u>Page</u>
LETTER		1
APPENDIX		
I	INSTALLATION RESTORATION PROGRAM	6
	Background	6
	Phase I	7
	Phase II	11
II	INSTALLATION RESTORATION PROGRAM ACTIVITIES IN GUAM NOW INCLUDE REGULATORY AGENCIES	12
	Regulatory Agencies' Coordination	
	Problems With DOD	12
	Agreement for Groundwater Management	14
III	CONTAMINATION OF DRINKING WATER AT ANDERSEN AIR FORCE BASE	15
	Testing Shows High Levels of TCE Contamination	15
	Questionable Testing to Determine the Extent of TCE Contamination	16
	Sources of Contamination	18
	Reducing TCE Contamination	18
IV	OBJECTIVES, SCOPE, AND METHODOLOGY	20
TABLE		
	Table III.1: TCE Contamination Levels for Samples Taken at Marbo Well 2 and the Clinic	17

FIGURES

Figure I.1: Map of Northern Guam Showing the 38 Air Force and 3 Navy Abandoned Hazardous Waste Sites on Andersen AFB Assessed During Phase I	8
Figure I.2: Map of Southern Guam Showing the Naval Complex With 31 Abandoned Hazardous Waste Sites Assessed During Phase I	9

ABBREVIATIONS

AFB	Air Force Base
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
DOD	Department of Defense
EPA	Environmental Protection Agency
IRP	Installation Restoration Program
PCB	polychlorinated biphenyl
ppb	parts per billion
TCE	trichloroethylene
USGS	United States Geological Survey

## INSTALLATION RESTORATION PROGRAM

### BACKGROUND

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. 9601, commonly known as Superfund, was enacted on December 11, 1980, to provide for cleanup of the nation's uncontrolled hazardous waste<sup>1</sup> sites. Federal agencies must comply with CERCLA's requirements to the same extent that private entities must comply.

The Installation Restoration Program (IRP) is the Department of Defense (DOD) program, started in 1975 by the Army, to (1) identify and evaluate suspected problems associated with past hazardous waste disposal sites located on DOD installations and (2) control the migration of hazardous contamination from these sites. Initially, this program only applied to contaminated lands and facilities that were or might become excess to DOD's needs. However, in June 1980, DOD expanded the program to include all DOD installations.

The Air Force and Navy issued their initial IRP policy guidance in December 1980 and started their programs in January 1981. Under its policy, the Air Force's major commands are responsible for implementation. The Navy's IRP<sup>2</sup> was developed using the structure of the existing Naval Environmental Protection Support Service and the Naval Facilities Engineering Command's Engineering Field Division Offices.

The IRP consists of four phases. Phase I is the installation assessment, including site assessments and records search, to identify bases with closed, potentially hazardous waste sites; Phase II is to confirm that contaminants are affecting the environment; Phase III is used for developing or advancing the technology needed to solve some of the problems; and Phase IV is the operation or corrective action effort.

DOD requires that its components advise Environmental Protection Agency (EPA) regional offices and state and local governments of

---

<sup>1</sup>Hazardous waste is defined as waste which, because of its quantity; concentration; or physical, chemical, or infectious characteristics, may cause or contribute to an increase in mortality or pose a substantial hazard to human health or the environment when improperly treated, stored, transported, or disposed of.

<sup>2</sup>The Navy IRP is called the Assessment and Control of Installation Pollutants Program.



their IRP activities. When health, welfare, or environmental problems are discovered, these agencies should be notified immediately.

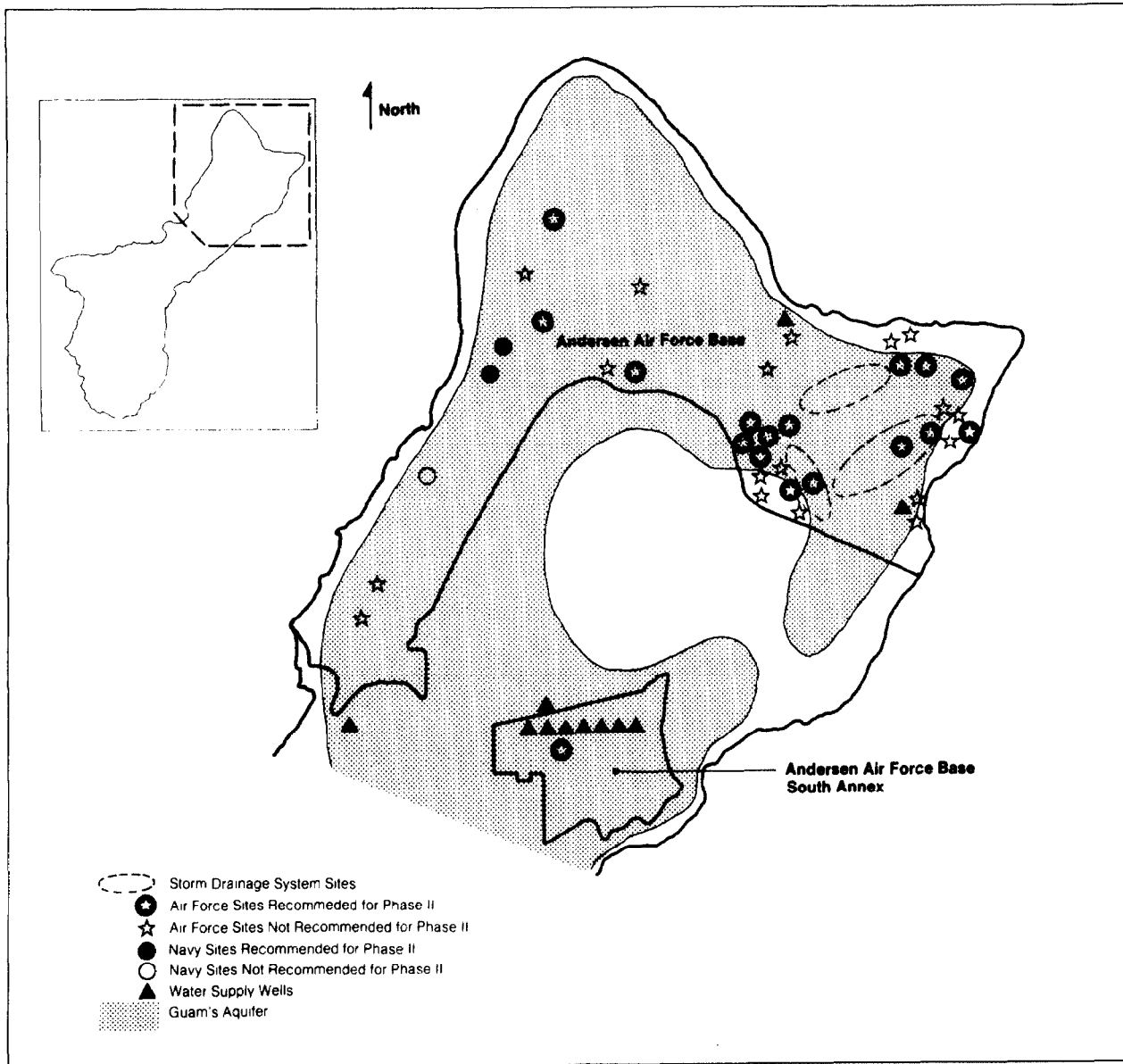
#### PHASE I

During Phase I in Guam, the Air Force contracted with Environmental Science and Engineering, Inc., to conduct a study and issue a report on Andersen Air Force Base (AFB). This IRP Phase I report was issued in March 1985. The Navy used the Naval Energy and Environmental Support Activity to study and report on the Guam Naval Complex. The Navy's report on the Apra Harbor area was issued in August 1983 and its report on the outlying activities in October 1983.

The Air Force's contractor concluded that 20 sites on Andersen AFB had the potential for environmental contamination resulting from past waste disposal practices; at 18 other sites the contractor determined that no further study was necessary. Figure I.1 is a map of northern Guam showing the 38 abandoned Air Force hazardous waste sites on Andersen AFB that were assessed in Phase I.

The Navy support group concluded that seven sites at the Guam Naval Complex should be monitored to confirm or deny the existence of suspected contamination and to quantify the extent of any problems. The group concluded that 27 other sites required no further attention. Figure I.2 is a map of southern Guam, showing the Naval Complex with 31 of the 34 abandoned Navy hazardous waste sites. Three Navy sites are located within the confines of Andersen AFB and are shown in figure I.1.

Figure I.1: Map of Northern Guam Showing the 38 Air Force and 3 Navy Abandoned Hazardous Waste Sites on Andersen AFB Assessed During Phase I



Assessments Questioned

The Phase I reports for Andersen AFB and the Guam Naval Complex identified potential environmental contamination at 27 abandoned hazardous waste disposal sites. However, officials from EPA, Guam EPA, and the U.S. Geological Survey (USGS) believe that the services should do more assessment work during Phase II on 45 sites that were determined during Phase I to require no further study. In addition, EPA questioned why some sites had not been included in the Air Force Phase I study at all.

Regarding the Andersen AFB study, the USGS said that the contractor had done a remarkable job in conducting the investigation and in preparing the report, given the time constraints and the fact that the investigators were unfamiliar with the hydrogeologic environment of Guam. However, EPA, Guam EPA, and USGS officials believe that the Air Force and the Navy should do more work in the assessment and confirmation phases. They cited the following problems with the Phase I studies.

- The Air Force's Phase I study identified 38 potential hazardous waste sites at Andersen AFB. The study determined that 18 of these sites did not pose threats to the environment and recommended 20 sites for further study. USGS officials stated that the 18 sites determined not to pose threats should be reassessed. They noted that the lack of adequate records to determine what had been disposed of, combined with the proximity of these sites to drinking water sources, make these sites potential threats to the drinking water supply for Guam.
- USGS officials also questioned the scope of the contractor's Andersen AFB study because the contractor had limited its records searches to reviews of available written records for currently operating base activities. The USGS pointed out that there was no indication that the contractor had reviewed records for facilities that were no longer part of the installation.
- EPA noted that there were several waste disposal sites not included in the Air Force's Phase I study. The excluded sites include underground storage tanks, areas possibly contaminated with polychlorinated biphenyls (PCB), chemical storage areas, and fuel spill sites--all of which pose risks of environmental contamination. For example, EPA stated that the report contained no information concerning the integrity, monitoring, or testing of the underground storage tanks. Also, the proximity of these tanks to water supply wells and other

conduits to the public drinking water supply was not discussed in the Phase I study report.

- EPA and Guam EPA concluded that the Navy's Phase I study should have recommended the further investigation of 34 sites because they pose threats of contamination to the environment; this figure includes 27 sites determined not to require further study in the Navy's reports. The USGS also questioned the criteria used in the Navy's Phase I study to determine that these 27 sites did not pose threats to the environment. It also recommended that the sites be considered for further investigation.

## PHASE II

The Phase II confirmation study of Andersen AFB was awarded to Battelle Memorial Institute on September 24, 1985. The contractor initiated preliminary work in September 1986 and estimates that its Phase II activities will be completed in February 1988. Andersen AFB is working with the Phase II contractor, EPA, and Guam EPA to determine what Phase II work is required for the 18 sites not recommended for further study in the Phase I study report, as well as the sites identified by EPA that were not included in the Phase I study.

In April 1986, the Navy Facilities Engineering Command, Pacific Division, awarded a contract for a Phase II confirmation study on five of the seven Navy Complex sites identified in the Phase I study. The Naval Installation's Public Works Center had already completed confirmation studies for the other two sites, the PCB Filter Area and the Old Naval Ship Repair Facility Optical Shop, which was suspected of having radioactive contamination.

Remedial action is already being taken on the PCB Filter Area, which was confirmed as having PCB-contaminated soil. The Navy has approved \$1 million for this cleanup project, which is scheduled to be completed in September 1987. No radioactive contamination was found during Phase II at the old Naval Ship Repair Facility Optical Shop. A Public Works Center official said that additional experts will be consulted to confirm the absence of radioactive particles at this facility.

EPA and Guam EPA are working with Navy officials to resolve differences concerning the number of sites to be included in Phase II.

INSTALLATION RESTORATION PROGRAM ACTIVITIESIN GUAM NOW INCLUDE REGULATORY AGENCIES

EPA and Guam EPA have been trying to coordinate IRP Phase I activities with the Navy since 1981 and the Air Force since 1984. The Air Force and Navy did not consult either EPA or Guam EPA during the Phase I studies. Both services have now taken action to ensure greater regulatory agency participation throughout the IRP process in the future.

REGULATORY AGENCIES' COORDINATION  
PROBLEMS WITH DOD

EPA officials told us that they have encountered problems in their dealings with DOD activities in Guam despite DOD policy and written agreements concerning cooperation in environmental matters. The Defense Environmental Quality Program Policy Memorandum 81-5, dated December 11, 1981, from the Office of the Deputy Assistant Secretary of Defense for Environment states that all components will advise EPA regional offices and state and local governments of IRP activities. In addition, a Memorandum of Understanding, dated August 12, 1983, covering the implementation of CERCLA legislation, commits DOD and EPA to (1) exchange information on a regular basis, (2) inform each other at the earliest possible stage of any evidence of contamination, types of contamination, and potential remedial or corrective actions, and (3) inform each other regarding the type and availability of data or information, such as new identification procedures, new testing procedures, and results of cleanup activities that may be applicable to other sites.

The Navy did not consult with or advise either EPA or Guam EPA about its Phase I IRP activities in Guam while they were in process. However, the Facilities Engineering Command, Pacific Division, which manages the Navy's IRP for Pacific installations, did coordinate with EPA before initiating Phase II by asking EPA, in 1986, to review the 1983 Phase I study reports. The Guam EPA had not been given an opportunity to review the reports until we asked them to do so in August 1986. The lack of coordination during the Phase I study has contributed to disagreements between the Navy and EPA regarding sites in Guam needing further assessment. For example, in its Phase I study, the Navy recommended that seven sites be tested and monitored during Phase II to confirm, define, and quantify the contamination. However, EPA and Guam EPA believe that the Navy's Phase I study should have recommended additional testing for the 7 sites and the monitoring of 27 other sites during Phase II.

According to the Hazardous Waste Program Manager at the Facilities Engineering Command, Pacific Division, the Navy has agreed to perform the additional testing on the seven sites. However, the Navy has not agreed to monitor the 27 additional sites. The Facilities Engineering Command and EPA are working to resolve their differences.

In February 1987, the Naval Facilities Engineering Command, Pacific Division, informed us that they had asked the USGS to provide hydrogeological expertise to independently check the technical recommendations of EPA and Guam EPA.

The Air Force did not involve EPA or Guam EPA in its Phase I study at Andersen AFB. At our request, the regulatory agencies reviewed the Phase I report and questioned why 18 of 38 potential hazardous waste sites had been excluded from the Phase II review. In addition, EPA questioned why some sites had not been reviewed in Phase I.

The regulatory agencies' concerns were presented to the Air Force in January 1987. Shortly afterwards, Andersen AFB officials asked the regulatory agencies to become involved in the planning and execution of Phase II.

#### DOD's Actions to Improve Coordination With Regulatory Agencies

The need for DOD to coordinate with regulatory agencies in hazardous waste management was discussed in our report entitled Efforts to Clean Up DOD-Owned Inactive Hazardous Waste Disposal Sites (GAO/NSIAD-85-41, April 12, 1985). DOD is implementing changes to ensure more involvement and coordination with the regulatory agencies. The Air Force and Navy now recognize the importance of getting the regulatory agencies involved.

In July 1985 the Air Force revised its IRP guidance to incorporate the experience gained from the involvement or problems caused by the lack of involvement of regulatory agencies in Phase I and II studies. The revised guidance emphasizes the need to involve the regulatory agencies in Phase IV because most of the program will consist of long-term monitoring or cleanup actions. It also incorporates the 1983 DOD/EPA agreement, which calls for exchanging information on a regular basis. In accordance with this guidance, officials at Andersen AFB are working closely with Guam EPA and the contractor during Phase II to facilitate completion of a technically sound confirmation study.

The Navy has not revised its IRP guidance. However, Navy officials told us that they have initiated efforts to include

officials from EPA and Guam EPA in all program meetings, including those defining the work to be done, executing remedial actions, and preparing any reports.

#### AGREEMENT FOR GROUNDWATER MANAGEMENT

In 1980 the Congress instructed the Department of the Interior to study the adequacy of Guam's water resources. The result was the Northern Guam Lens Study, which in December 1982 recommended that a cooperative agreement be reached among the Government of Guam, EPA, and DOD. According to the study, the purpose of the agreement would be to govern groundwater management issues in Guam. The study further recommended establishing a Technical Advisory Committee to provide technical assistance to Guam EPA in evaluating the progress and effectiveness of the Groundwater Management Program.

In November 1985, the Government of Guam attempted to reach formal agreement with EPA, the Department of Interior, the Navy, and the Air Force to manage Guam's groundwater. The Air Force originally thought that such an agreement would serve to "remove the flexibility that would allow all parties to meet their own unique needs while still acting in the best interests of the conservation of Guam's groundwater system." In September 1986, however, the Commander of Andersen AFB said that, with some revisions, he would sign a cooperative agreement to coordinate Guam's groundwater management. We were told that the Commander of the Naval Installation is also willing to sign a cooperative agreement.

CONTAMINATION OF DRINKING WATERAT ANDERSEN AIR FORCE BASE

In early 1978, Andersen AFB officials discovered that the base's drinking water<sup>3</sup> contained the cleaning solvent trichloroethylene (TCE), a suspected carcinogen. TCE was present at concentration levels that, according to EPA, pose an unacceptable health risk to those drinking the water for extended periods of time. In November 1985, EPA proposed a maximum contaminant level for drinking water of 5 parts per billion (ppb). The concentration levels of TCE appear to be episodic and, in one water well, the concentration went as high as 29.9 ppb.

TESTING SHOWS HIGH LEVELS  
OF TCE CONTAMINATION

Prior to February 1978, Andersen AFB officials did not test the installation's water for the presence of TCE because there was no requirement to do so. A 1977 discovery of TCE in the water supply of two Air Force bases in the continental United States, we were told, prompted the Air Force to start an Air Force-wide water quality testing program. Tests of 11 wells at Andersen AFB revealed that one well usually contained higher concentrations of TCE, up to 29.9 ppb. The remaining 10 wells, on a sporadic basis, contained TCE at concentrations above the EPA guideline of 5 ppb.

Andersen AFB officials told us that water from wells with high concentrations of TCE is mixed with water from wells with low concentrations of TCE, thus reducing the concentration levels of TCE at the distribution points. However, we found that over 1,200 base personnel were receiving water with possibly higher concentrations of TCE than the rest of the installation received, because their water contained a higher percentage of water from the well with the high TCE concentration. After we pointed this out to installation officials, they established procedures to test water samples monthly at different points in the water distribution system to ensure that TCE concentration levels meet EPA's guidelines.

---

<sup>3</sup>Andersen AFB is located on top of Guam's primary source of drinking water, known as the Northern Lens Aquifer. This aquifer is divided into six hydrologic sub-basins. In 1978, the groundwater resources of northern Guam were designated a "principal source aquifer" in recognition of their extraordinary importance as the primary source of drinking water for about three fourths of the island's population. The designation noted that the aquifers are vulnerable to contamination and consequently require constant attention to protect against degradation.



QUESTIONABLE TESTING TO DETERMINE  
THE EXTENT OF TCE CONTAMINATION

Andersen AFB's bioenvironmental engineer is responsible for testing base drinking water on a quarterly basis. We noted, however, that quarterly tests had not been taken when the wells were inoperative or retaken when sample containers were broken in transit to the laboratory.

The highest levels of TCE have been detected at Andersen AFB's Marbo Well 2, which supplies approximately 10 percent of the base's drinking water. Test results for Marbo Well 2 during the period February 1978 through July 1986 indicated concentrations of TCE ranging from 29.9 ppb in September 1978 to 1.4 ppb in March 1984. The most recent reading was 14.0 ppb. The well was scheduled to be tested 30 times over the period. On 11 occasions no sample was analyzed, either because the sample container had been broken in transit or the well was inoperative. Test reports show that 13 of the 19 times the samples were analyzed they contained TCE concentrations higher than the level proposed by EPA as acceptable.

In addition to testing the 11 wells, Andersen AFB's bioenvironmental engineer takes quarterly samples of the drinking water at the base clinic. The clinic's water, which is taken from Andersen's 11 wells, is considered by the engineer to be representative of Andersen's overall drinking water. Tests of the clinic's water from February 1978 to July 1986 show that concentrations of TCE have ranged from 24.1 ppb in September 1978 to 0.0 ppb in March and August 1982 and October 1985. The most recent reading was 1.3 ppb. Water samples were not taken at the clinic for a 2-year period, February 1983 through January 1985, and on five other occasions the sample container was apparently broken in transit to the laboratory. Table III.1 provides the test results for samples taken at Marbo Well 2 and the clinic.

Table III.1: TCE Contamination Levels for Samples Taken at Marbo Well 2 and the Clinic

Date	Sampling Point	
	---(parts per billion) <sup>a</sup> ---	
	<u>Marbo Well 2</u>	<u>Clinic</u>
Feb. 1978	b	3.6
Mar. 1978	b	3.0
Jun. 1978	b	2.8
Sept. 1978	29.9	24.1
Apr. 1979	19.3	15.6
Sept. 1979	22.2	17.2
Mar. 1980	9.4	b
Apr. 1980	11.0	3.0
May. 1980	8.6	1.1
Sept. 1980	b	c
Dec. 1980	b	b
Feb. 1981	b	b
Sept. 1981	c	c
Mar. 1982	b	0
Aug. 1982	2.4	0
Feb. 1983	4.3	d
Mar. 1983	7.2	d
July 1983	4.5	d
Dec. 1983	b	d
Feb. 1984	9.2	d
Mar. 1984	1.4	d
July 1984	1.5	d
Nov. 1984	b	d
Jan. 1985	12.3	b
Apr. 1985	18.5	b
July 1985	b	c
Oct. 1985	5.9	0
Jan. 1986	b	c
Apr. 1986	24.0	1.6
July 1986	14.0	1.3

<sup>a</sup>EPA's proposed action level for TCE concentration levels is 5 ppb.

<sup>b</sup>No sample was analyzed, the sample container was broken in transit, or the well was inoperative at the time.

<sup>c</sup>Trace of TCE.

<sup>d</sup>Site not sampled.

Based on the test results on the water samples taken at the clinic, Andersen AFB officials told us that the water from Marbo Well 2 was sufficiently diluted with water from the other 10 wells to reduce the TCE concentration to acceptable levels before it is distributed to base personnel and their dependents.

The Commander of Andersen AFB and the bioenvironmental engineer believed that water from all 11 wells was pumped into one pipeline and mixed together before it was distributed for consumption. They were not aware that some of the combined water from four wells, including Marbo Well 2, was diverted from the pipeline before it was mixed with water from the remaining seven less-contaminated wells. The diverted water was being consumed by over 1,200 military personnel and their dependents residing in a barracks compound and a housing complex. Although the sample results for the three wells, other than Marbo 2, only exceeded EPA's proposed standard of 5.0 ppb two times, the combined water from these four wells was not as diluted as the water tested at the clinic.

#### SOURCES OF CONTAMINATION

In our report entitled DOD Installations in Guam Having Difficulty Complying With Regulations (GAO/NSIAD-87-87, April 22, 1987), we noted instances where maintenance activities at Andersen AFB improperly dumped or spilled hazardous waste into the storm drainage system on the installation. The storm water drainage system at Andersen consists of more than 100 storm drains, which rapidly remove surface runoff water into the aquifer through dry wells.<sup>4</sup> These storm drains and the dry wells can act as direct conduits for contaminants to enter the aquifer, Guam's primary source of drinking water.

Other suspected sources of aquifer contamination are abandoned landfills, where hazardous wastes such as TCE could have been disposed. Andersen AFB's Phase I study identified 20 such abandoned disposal sites that could be affecting the environment, including the aquifer. In addition, there are other sites not included in the Phase I assessment that EPA and Guam EPA believe could adversely affect Guam's drinking water supply.

#### REDUCING TCE CONTAMINATION

Concern that some of Andersen AFB's drinking water may contain higher levels of TCE contamination than previously thought has led to a decision to test water samples monthly at different points in the water distribution system for the duration of the Phase II

---

<sup>4</sup>Dry wells are holes drilled into the ground to facilitate the recharge of the aquifer by rainwater runoff.

study. The base commander stated that if test results show that TCE levels exceed EPA's proposed standard of 5 ppb, steps will be taken to reduce the level in the drinking water, including shutting down wells if necessary.

Further, officials of the Air Force and regulatory agencies believe that working together in planning and executing Phase II will lead to a confirmation study that will find ways to eliminate the threat of abandoned hazardous waste sites contaminating the drinking water.

OBJECTIVES, SCOPE, AND METHODOLOGY

The Chairman of the Subcommittee on Environment, Energy and Natural Resources, House Committee on Government Operations, asked us to assess DOD's efforts to identify and clean up abandoned hazardous waste disposal sites on Guam. Our objectives were to assess (1) the adequacy of Phase I reports prepared for Andersen AFB and the Naval Installation in Guam, (2) the safety of Andersen AFB's drinking water, and (3) DOD's practices for involving regulatory agencies in IRP activities. At our request, EPA, Guam EPA, and the USGS performed technical evaluations of the Phase I reports. EPA had already reviewed these reports for the Navy and provided us with a copy of its comments. We reviewed and forwarded these evaluations to responsible Air Force and Navy commands for their consideration.

In addition, we

- interviewed officials in Guam from Andersen AFB's Hazardous Waste Management Office, Civil Engineering Division, and Bioenvironmental Office; the Naval Installation's Public Works Center; the Guam EPA; the Air Force's contractor for Phase II IRP activities; and the local contractor for waste oil removal;
- accompanied Andersen AFB's bioenvironmental engineering officer on inspections of maintenance shops and facilities;
- reviewed files, reports, and other records relating to Andersen AFB and Naval Installation activities responsible for the IRP in Guam;
- interviewed officials in Hawaii from the Navy's Facilities Engineering Command, Pacific Division, which manages the Navy's IRP in the Pacific and the U. S. Geological Survey's regional office, which was responsible for the review of the Guam Phase I reports; and
- interviewed EPA San Francisco, Region IX, officials concerning their oversight of the IRP.

The comments of officials responsible for managing the IRP were sought during the course of our review, and their comments are included where appropriate. As requested, we did not obtain official agency comments.

Our review was conducted between August 1986 and January 1987 in accordance with generally accepted government auditing standards.

(392261)

---

Requests for copies of GAO reports should be sent to:

U.S. General Accounting Office  
Post Office Box 6015  
Gaithersburg, Maryland 20877

Telephone 202-275-6241

The first five copies of each report are free. Additional copies are \$2.00 each.

There is a 25% discount on orders for 100 or more copies mailed to a single address.

Orders must be prepaid by cash or by check or money order made out to the Superintendent of Documents.

---

United States  
General Accounting Office  
Washington, D.C. 20548

First-Class Mail  
Postage & Fees Paid  
GAO  
Permit No. G100

Official Business  
Penalty for Private Use \$300

Address Correction Requested

---