

123357  
~~2736A~~

---

BY THE U.S. GENERAL ACCOUNTING OFFICE

## Report To The Secretary Of Defense

OF THE UNITED STATES

---

# DOD Can Make Further Progress In Controlling Pollution From Its Sewage Treatment Plants

The Department of Defense (DOD) has spent over one billion dollars for either facility improvement or for connection to civilian sewage treatment systems since fiscal year 1976. Although DOD has made a great effort to improve its sewage treatment plants to meet compliance requirements, efforts have not been completely successful. To ensure that the most cost-effective sewage treatment methods are used, GAO recommends that the DOD institute methods to assure that the services comply with DOD policy by carefully evaluating all feasible treatment alternatives, including regional or municipal tie-ins. Also, DOD should require written justifications supporting the selection of sewage treatment alternatives that differ from those recommended by cost-effectiveness studies.

To improve the operation and maintenance of DOD treatment plants, GAO recommends that the Secretary of Defense direct the services to provide more specific guidance to their bases on how to assure adequate plant operation and maintenance to comply with permit requirements.



GAO/NSIAD-84-5  
FEBRUARY 3, 1984

027815

**Request for copies of GAO reports should be sent to:**

**U.S. General Accounting Office  
Document Handling and Information  
Services Facility  
P.O. Box 6015  
Gaithersburg, Md. 20760**

**Telephone (202) 275-6241**

**The first five copies of individual reports are free of charge. Additional copies of bound audit reports are \$3.25 each. Additional copies of unbound report (i.e., letter reports) and most other publications are \$1.00 each. There will be a 25% discount on all orders for 100 or more copies mailed to a single address. Sales orders must be prepaid on a cash, check, or money order basis. Check should be made out to the "Superintendent of Documents".**



UNITED STATES GENERAL ACCOUNTING OFFICE  
WASHINGTON, D.C. 20548

NATIONAL SECURITY AND  
INTERNATIONAL AFFAIRS DIVISION

B-166506

The Honorable Caspar W. Weinberger  
The Secretary of Defense

Dear Mr. Secretary:

This report discusses Department of Defense (DOD) efforts to control pollution from its sewage treatment plant operations. We made the review to evaluate progress made since our previous reports and to determine if DOD plants are meeting EPA discharge permit requirements. We also wanted to determine whether or not DOD bases are joining civilian systems when this is the most efficient method of sewage treatment.

Our report contains recommendations to you on pages 18 and 32. As you know, 31 U.S.C. § 720 requires the head of a federal agency to submit a written statement on actions taken on our recommendations to the House Committee on Government Operations and the Senate Committee on Governmental Affairs not later than 60 days after the date of the report. A written statement must also be sent to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report. We would appreciate receiving copies of these statements.

We are sending copies of this report to the chairmen of the four committees mentioned above as well as to the Chairmen of the House and Senate Committees on Armed Services. We are also sending copies of the report to the Director, Office of Management and Budget; the Secretaries of the Army, Navy, and Air Force; and the Commandant of the Marine Corps.

Sincerely yours,

  
Frank C. Conahan  
Director



D I G E S T

The Department of Defense (DOD) sewage treatment plants are subject to federal, state, interstate, and local water quality standards and effluent limitations. DOD has about 560 major installations in the United States. As of December 1982, 260 bases had sewage treatment plants and 300 were either connected or planned to connect to civilian sewage systems. The latest complete data available shows that DOD spent \$1.16 billion for facility improvement or for connections to civilian systems in fiscal years 1976 through 1981. DOD has identified 282 bases that need 678 projects to improve their sewage treatment. (See pp. 1-4.)

In previous reports on the management of sewage treatment plants at military bases, Improvements Needed In Operating and Maintaining Waste Water Treatment Plants, (LCD-76-312, June 18, 1976) and DOD Problems In Joining Civilian Sewer Systems, (LCD-77-359, June 23, 1978,) GAO recommended that:

- Necessary controls be established to insure that sewage treatment facilities comply with effluent limitations and water quality standards.
- The services determine the improvements needed, program for them, and monitor their progress.
- DOD provide guidance on what costs should be considered and compared in choosing between plant upgrades or joining regional systems. (See p. 2.)

GAO made this review to determine what improvements DOD has made since its previous reports.

AFTER MANY IMPROVEMENTS, DESIGN AND  
CONSTRUCTION PROBLEMS STILL EXIST

DOD has made great efforts to improve its sewage treatment plants to meet compliance requirements. However, DOD's efforts have not been fully successful because:

--The services have not always selected the most cost-effective treatment methods available. (See pp. 16 and 17.)

--The plant upgrades and modifications often have serious design and construction flaws that reduce plant efficiency. (See pp. 11 through 16.)

At 13 military bases visited, GAO evaluated the factors considered in determining whether treatment plants should be altered, replaced, or tied into regional systems. DOD completed feasibility studies at seven of these bases to determine the most cost-effective methods of improving sewage treatment. For three of the bases the services approved treatment systems which differed from the recommended alternatives. (See pp. 6 through 11.)

For example, in 1981 Tyndall Air Force Base awarded a contract to determine the best method for treating the base's sewage in the future. The architect/engineer firm recommended that Tyndall continue to provide secondary treatment and construct a force main to discharge the effluent into the regional system. Tyndall officials chose not to follow the firm's recommendation because they questioned their cost estimates; yet they did not invalidate the firm's cost estimates or develop new costs. (See pp. 7 and 8.)

GAO found that 11 of the 13 sewage treatment plants have undergone major upgrades since the mid-1970s in order to comply with EPA and/or state water quality standards. However, because of design deficiencies many of these upgraded plants are not operating effectively; therefore, they are not meeting the sewage treatment levels expected. (See pp. 11 through 16.)

GAO also observed at 7 of the 13 bases construction problems which reduced plant efficiency and increased government costs. Many of these construction problems seemed to result from poor quality control and the services' lack of initiative in holding the responsible parties liable. (See pp. 15 and 16.)

For example, a construction contractor at Robins Air Force Base poured inadequate foundations for one treatment process resulting in a serious lean. Also, a rotary kiln was not operational because the wrong type bricks were used. The contractor repaired the foundations but the rotary kiln had not been repaired. (See p. 16.)

OPERATION AND MAINTENANCE PROBLEMS  
AFFECT PERMIT COMPLIANCE

The effectiveness of DOD sewage treatment plants is also seriously impaired by operation and maintenance problems. GAO found that 11 of 13 DOD plants had been unable to consistently meet National Pollution Discharge Elimination System permit requirements for a number of years. These bases were formally notified of permit violations between 1977 and 1982. The number of instances and severity of the violations varied from base to base. Continued non-compliance is due to a combination of problems limiting the plants' ability to treat wastes such as:

- Lack of specific guidance on how to assure adequate operation, maintenance, and compliance. (See p. 24.)
- Lack of follow-up on problems found by DOD, EPA, and state environmental inspectors. (See pp. 24 and 25.)
- Equipment deficiencies. (See pp. 25 and 26.)
- Infiltration and inflow problems. (See p. 27.)
- Deficient operation and maintenance practices. (See pp. 28 through 32.)

## RECOMMENDATIONS

In order for the most cost-effective sewage treatment methods to be used, GAO recommends that the Secretary of Defense:

- Ensure that the services comply with DOD policy by carefully evaluating all feasible treatment alternatives, including regional or municipal tie-ins.
- Require written justifications supporting the selection of sewage treatment alternatives that differ from those recommended by cost-effectiveness studies.
- Study and pilot test the feasibility of making one party responsible under contract for designing and constructing a treatment plant, and for demonstrating, with plant operators, that the plant will meet discharge permit requirements before releasing the plant to the services for operation.

To improve the operation and maintenance of DOD treatment plants, GAO also recommends that the Secretary of Defense direct the services to provide more specific guidance to their bases on how to assure adequate plant operation and maintenance in order to be in compliance with permit requirements. (See pp. 32 and 33.)

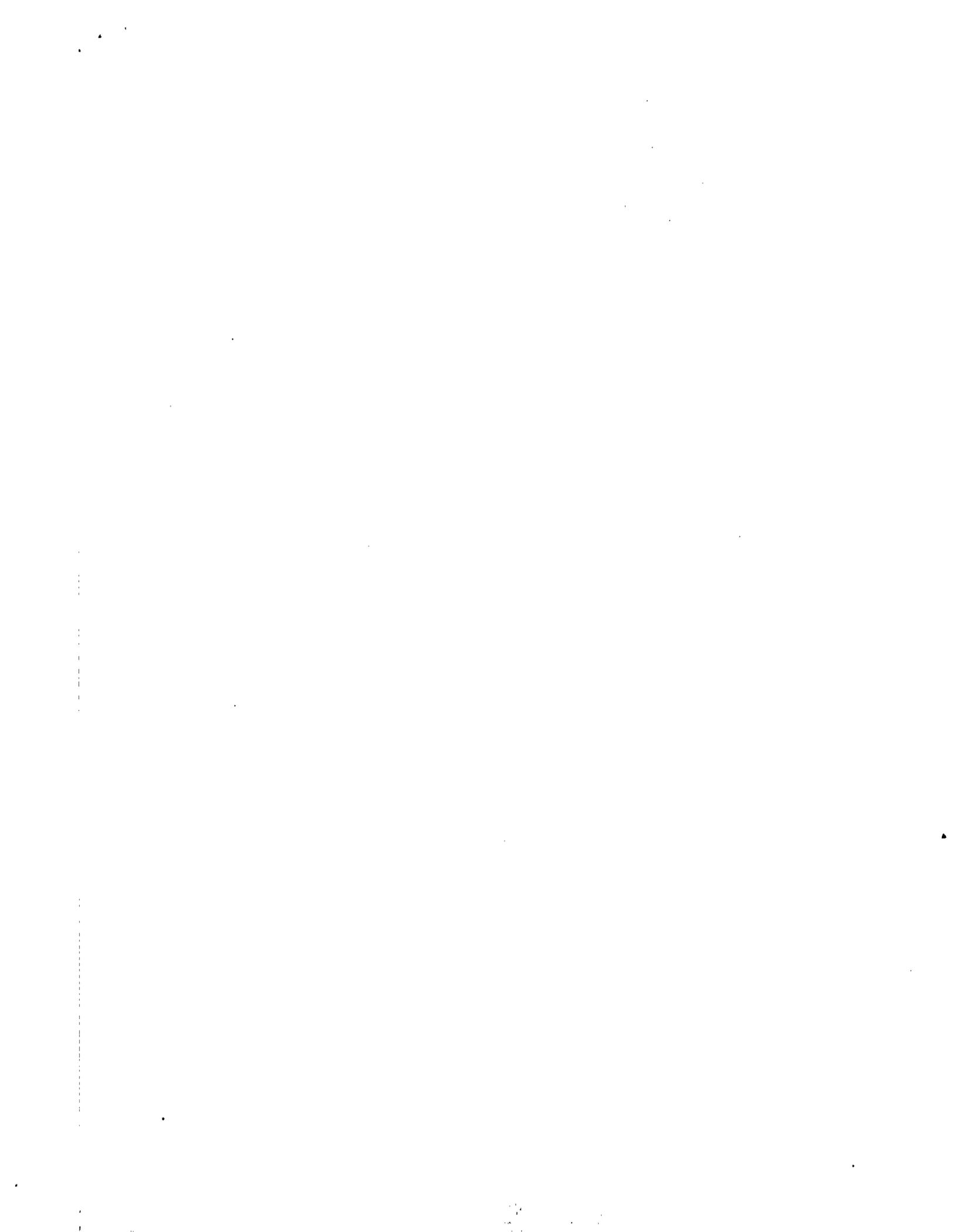
## AGENCY COMMENTS AND OUR EVALUATION

DOD concurred with most of GAO's findings, conclusions, and recommendations. DOD did not agree with our recommendation that one party be made responsible for all phases of acquiring facilities. It objected to GAO's including planning in this proposal. DOD thought that its construction managers had the expertise and were generally capable of managing sewage treatment plant construction projects. The planning GAO referred to was not the requirements determination but that necessary for interfacing design and construction. Also, officials at NAVFAC and the Corps told GAO that they were extremely understaffed and as a result most of their engineers and construction managers had large numbers of projects to

oversee. This prevents them from giving what these offices think is adequate oversight and management of individual projects.

DOD was also concerned, however, that GAO's report unfairly implied that most DOD sewage treatment plants were not in compliance with permit requirements. While this was the situation for most of the bases included in GAO's review, GAO does not project its findings to all of DOD plants.

The Environmental Protection Agency told GAO that it would consider the implementation of administrative actions to increase the level of compliance by DOD facilities.



C o n t e n t s

		<u>Page</u>
DIGEST		i
GLOSSARY		
CHAPTER		
1	INTRODUCTION	1
	Prior GAO reports	3
	DOD project status	3
	Objectives, scope, and methodology	4
2	AFTER MANY IMPROVEMENTS, DESIGN AND CONSTRUCTION PROBLEMS STILL EXIST	6
	Need to improve analysis of alter- natives for upgrading sewage treatment plants	6
	Upgraded plants have design deficiencies	11
	Construction defects are affecting plant operations and increasing costs	15
	Conclusions	17
	Recommendations	18
	Agency comments and our evaluation	18
3	OPERATION AND MAINTENANCE PROBLEMS AFFECT PERMIT COMPLIANCE	22
	DOD has not provided specific guidance to assure adequate operation, maintenance, and permit compliance	24
	Inconsistent action to correct problems found by DOD, EPA, and state environmental engineers	24
	Equipment deficiencies have prevented plants from achieving design capabilities	25
	Infiltration problems have overloaded plant capabilities	27
	Continuing operation and maintenance problems hinder plant performance	28
	Conclusions	32
	Recommendations	32
	Agency comments and our evaluation	33
APPENDIX		
I	Summary of previous evaluations and corrective actions taken	36
II	Letter dated August 25, 1983, from the Acting Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics)	38

III Letter dated July 20, 1983, from the  
Acting Associate Administrator for Policy  
and Resource Management, Environmental  
Protection Agency

53

ABBREVIATIONS

A/E	Architect/engineer
AEHA	Army Environmental Hygiene Agency
AFB	Air Force Base
BOD	Biochemical oxygen demand
DOD	Department of Defense
EPA	Environmental Protection Agency
GAO	General Accounting Office
MCB	Marine Corps Base
NAS	Naval Air Station
NAVFAC	Naval Facilities Engineering Command
NOS	Naval Ordnance Station
NPDES	National Pollution Discharge Elimination System
O&M	Operation and maintenance

## GLOSSARY

<b>Advanced waste treatment</b>	Wastewater treatment beyond the secondary or biological stage that includes removal of nutrients such as phosphorus and nitrogen and a high percentage of suspended solids. Advanced waste treatment, known as tertiary treatment, is the "polishing stage" of wastewater treatment and produces a high quality effluent.
<b>Aeration</b>	The process of being supplied or impregnated with air. Aeration is used in wastewater treatment to foster biological and chemical purification.
<b>Bar screen</b>	A screen that removes large floating solids in sewage treatment plants.
<b>Biochemical oxygen demand (BOD)</b>	A measure of oxygen consumed in the biological processes that breaks down organic matter in water. Large quantities of organic wastes require large amounts of dissolved oxygen. The more oxygen-demanding matter, the greater the pollution.
<b>Chlorinator</b>	A device for adding chlorine gas to sewage to kill infectious bacteria.
<b>Chlorine contact chamber</b>	A detention basin where chlorine is diffused through liquid.
<b>Chlorine residual</b>	The chlorine left in treated wastewater after the chlorine contact chamber and before discharge into the receiving waters.
<b>Clarifiers</b>	See sedimentation tanks.
<b>Combined sewers</b>	A sewerage system that carries both sanitary sewage and storm water runoff. During dry weather, combined sewers carry all wastewater to the treatment plant. During a storm, only part of the flow is intercepted because of plant overloading; the remainder goes untreated to the receiving stream.
<b>Comminutor</b>	A device that grinds solids to make them easier to treat.

<b>Digester</b>	A closed tank that decreases the volume of solids and stabilizes raw sludge by bacterial action.
<b>Effluent</b>	The wastewater discharged by an industry or municipality.
<b>Flow equalization basin</b>	A facility where surges of sewage from the collection lines are stored and from which sewage is fed out to the plant at an equal flow.
<b>Grit chamber</b>	A detention chamber or an enlargement of a sewer designed to reduce the velocity of the flow of raw sewage to allow sand, grit, cinders, and small stones to settle to the bottom.
<b>Grit elevator</b>	A device for removing grit from the grit chamber.
<b>Headworks</b>	The first part of a treatment plant, usually intake valves, flow meters, grit chambers, flow equalization, bar screens, and comminutors.
<b>Industrial waste</b>	Liquid waste from industrial processes as distinct from domestic or sanitary sewage.
<b>Influent</b>	Sewage water or other liquids, raw or partially treated, flowing into a treatment plant.
<b>Lagoon</b>	In wastewater treatment, a shallow pond--usually manmade--where sunlight, bacterial action and oxygen interact to restore wastewater to a reasonable state of purity.
<b>Multi-media filter</b>	A special process made up of a series of filters containing different types of filtering material used to provide additional removal of solids from wastewater.
<b>Parshall flume</b>	A device for measuring wastewater flow.
<b>Percolation</b>	Downward flow or infiltration of water through the pores or spaces in rock or soil.

<b>Pretreatment</b>	Any process used to reduce pollution load before the wastewater is introduced into a main sewer system or delivered to a treatment plant.
<b>Primary waste treatment</b>	Treatment usually involving screening and sedimentation for removal of the larger solids in wastewater. This process removes about 30 percent of carbonaceous BOD from domestic sewage.
<b>Rapid infiltration ponds</b>	A type of waste water treatment that provides treatment by having the water percolate through the earth below the ponds.
<b>Sanitary sewers</b>	Sewers that carry wastewater from homes, businesses, and industry.
<b>Scraper</b>	A device used in the bottom of a sedimentation tank to move settled sludge to a discharge port.
<b>Scum removal</b>	The process of removing floating solids from waste water usually done in the sedimentation tanks.
<b>Secondary waste treatment</b>	Wastewater treatment beyond the primary stage in which biological processes are used to accelerate the decomposition of sewage. The decomposition is accomplished by use of trickling filters or the activated sludge process. As generally defined by EPA, secondary treatment would remove at least 85 percent of both BOD and suspended solids.
<b>Sedimentation tanks (Clarifiers)</b>	Tanks where the solids are allowed to settle or to float as scum. Scum is skimmed off, and settled solids are pumped to incinerator, digester, filter, or other means of disposal.
<b>Settleable solids</b>	Materials heavy enough to sink to the bottom of wastewater.
<b>Sewage treatment plant</b>	A series of tanks, screens, filters, and other processes by which pollutants are removed from water.
<b>Sewers</b>	System of pipes that collect and deliver wastewater to treatment plants or receiving streams.

**Skimmer**

A mechanical device used to remove floating grease or scum from the surface of wastewater in a tank.

**Sludge**

The solid matter removed from wastewater through treatment. Sludge handling involves the processes that remove solids and make them ready for disposal. Disposal may involve incineration, dumping in oceans, or land application.

**Sludge drying**

The process of removing water from sludge by drainage or evaporation, through exposure to the air, application of heat, or other methods.

**Storm sewers**

A separate system of pipes that carry surface water runoff.

**Suspended solids**

Small particles of solid pollutants in sewage that contribute to turbidity and that resist separation by conventional means.

**Trickling filter**

A device for the biological or secondary treatment of wastewater consisting of a bed of rocks or stones that support bacterial growth. Sewage is trickled over the bed enabling the bacteria to break down organic wastes.

**Weirs**

Adjustable flow control devices.

## CHAPTER 1

### INTRODUCTION

The objective of the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500) (33 U.S.C. 1151) is to restore and maintain the chemical, physical, and biological integrity of the nation's waters by eliminating the discharge of pollutants into navigable waters of the United States by 1985. An interim goal is to attain water quality sufficient for the protection and propagation of fish, shellfish, and wildlife and for recreation by July 1, 1983.

Sewage treatment plants on military installations are subject to the same federal, state, interstate, and local water quality standards and effluent limitations as non-federal sewage treatment plants. The pollution control amendments require publicly-owned waste treatment plants to use (1) secondary treatment as a minimum level by July 1, 1977, and (2) the best practicable waste water treatment technology by July 1, 1983. Higher levels of treatment may be required if needed to meet water quality standards. A diagram of a typical secondary treatment plant is shown on the following page.

The Environmental Protection Agency (EPA) Administrator is authorized to extend the secondary treatment deadline requirements to July 1, 1988, if through no fault of the installation, construction could not be completed in time or because Congress had not appropriated adequate funds.

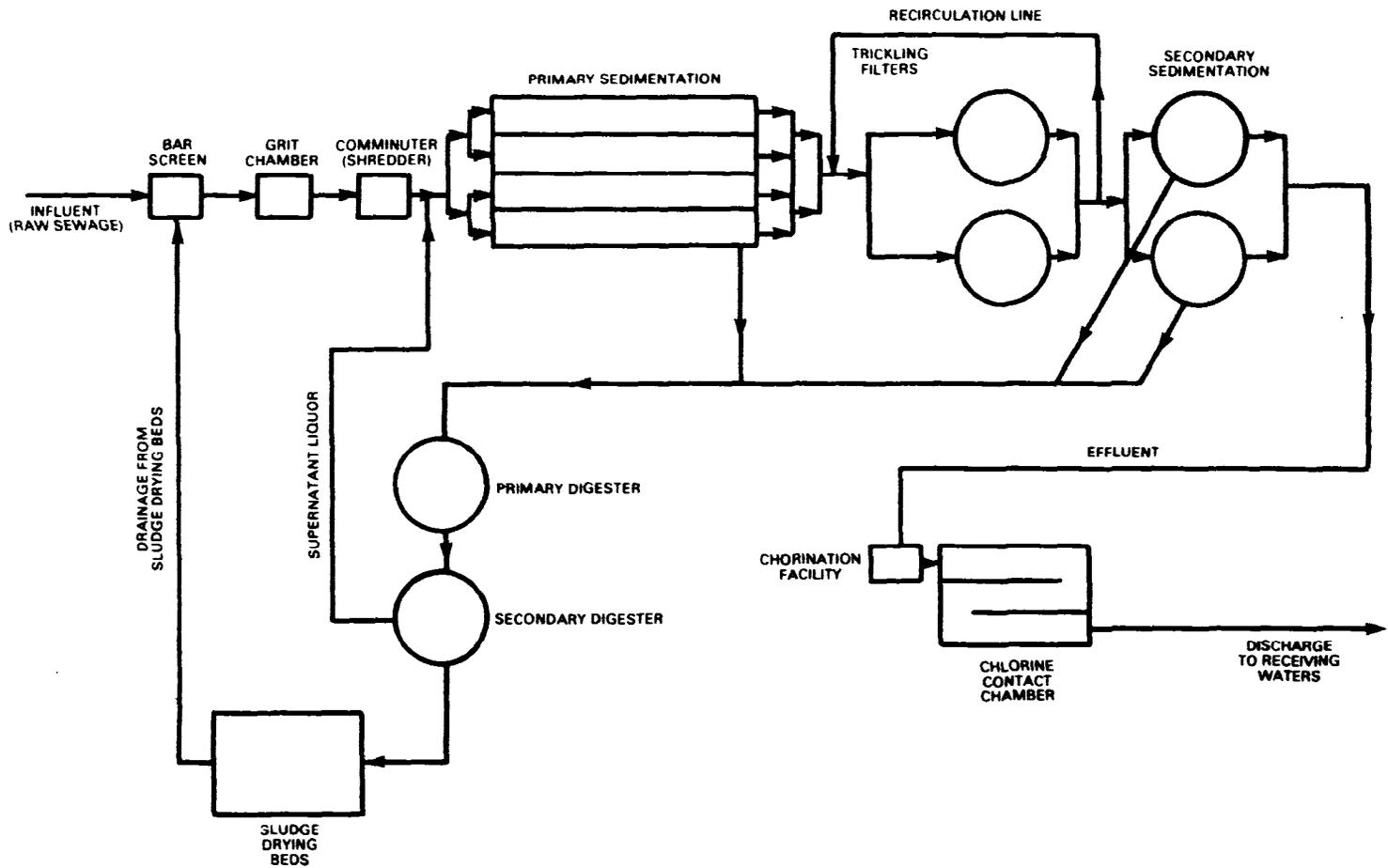
The act also created the National Pollutant Discharge Elimination System (NPDES) whereby all federal agencies must obtain a permit from EPA or the state to discharge any pollutant into navigable waters. Permits are issued on the condition that the discharge will meet all applicable requirements of EPA or state regulations relating to effluent limitations, water quality standards, new source performance standards, toxic effluent standards, inspections, and monitoring and entry provisions.

Executive Order 12088, dated October 13, 1978, mandates that federal agencies comply with applicable standards for the prevention, control, and abatement of environmental pollution in full cooperation with state and local governments. It requires the head of each federal agency

--to insure that facilities under his jurisdiction comply with federal and state water quality standards and

--to present a plan each year to the Director of the Office of Management and Budget for improvements necessary to meet federal, state, interstate, and local water quality standards and effluent limitations.

# FLOW DIAGRAM FOR TYPICAL TRICKLING FILTER SECONDARY TREATMENT PLANT



## PRIOR GAO REPORTS

We have issued two reports concerning sewage treatment at military bases. In our 1976 report, Improvements Needed In Operating And Maintaining Waste Water Treatment Plants, (LCD-76-312, June 18, 1976), we stated that many Department of Defense (DOD) facilities did not meet water quality standards and that DOD had not taken adequate measures to insure compliance by July 1, 1977. We also stated that even though about \$263 million had been appropriated for improvements to DOD sewage treatment plants or connections to civilian systems, the effectiveness of DOD's program was seriously impaired by problems in plant design and operation and maintenance.

We recommended that the Secretary of Defense direct the Secretaries of the Army, Navy, and Air Force to establish the necessary controls for insuring that waste treatment facilities comply with effluent limitations and water quality standards. We also recommended that DOD direct the military services to:

- Determine the capabilities of all treatment plants and the improvements in plant and operations needed to meet effluent limitations and water quality standards.
- Price out, budget for, and program improvements in plant, laboratory equipment, staff, and training to bring plants into compliance with applicable water quality standards.
- Monitor the progress of improvements through internal operating reports and evaluations made by EPA and environmental groups within DOD.

In our 1978 report, DOD Problems In Joining Civilian Sewer Systems, (LCD-77-359, June 23, 1978), we found that 7 out of 16 military bases chose either upgrading an on-base treatment plant or joining a civilian system without analyzing the relative costs and benefits of the alternatives. We recommended that DOD should provide guidance on how to compare the costs of each alternative to insure that the services chose the most economical and effective sewage disposal system.

## DOD PROJECT STATUS

The DOD has about 560 major Army, Navy, and Air Force installations in the United States. Of these, about 300 connect or plan to connect to public sewage systems and about 260 had their own treatment plants in operation at the time of our field work.

The services surveyed their installations in 1976 and 1977 to identify those bases needing improvements. Project proposals for capital improvements to correct problems at sewage treatment facilities originate at the base level and are reviewed by

various offices; including the major commands and the environmental, engineering, and budgeting offices in each service. The services assign priorities to each project, and those with the highest priorities are then included in each service's military construction program which is limited by budget guidelines set by the President. DOD, EPA, and the Office of Management and Budget review the service's program requests, and a DOD military construction program is prepared for submittal to the Congress. According to the latest available complete data, DOD spent \$1.16 billion to either improve its facilities or for connections to civilian systems in fiscal years 1976 through 1981. Another \$110.6 million was appropriated for capital projects in fiscal year 1982.

As of December 1982, DOD had identified 282 bases that still needed 678 projects to improve their sewage treatment. Of these, DOD has funded 284 projects which are in various stages of design or construction. DOD estimates that \$415 million is needed to complete those projects not funded.

#### OBJECTIVES, SCOPE, AND METHODOLOGY

Our objectives were to ascertain what improvements DOD has made since our previous reports were issued to insure that its sewage treatment plants are meeting EPA discharge permit requirements. We also wanted to determine, where applicable, whether DOD bases are joining civilian systems when this is the most efficient method of sewage treatment. We did not evaluate DOD's contracting procedures with civilian systems other than to review how they arrived at the estimated cost figure for joining a civilian system and to see if the bases had made adequate economic analyses for the various sewage treatment alternatives.

We visited 13 bases representing all services in 10 states located throughout the United States from July 1982 to January 1983. These bases were selected by location, type of treatment, and size of plant. We also included some of the bases that we reviewed previously to see what progress they had made. The findings developed in this report can not be projected to all DOD installations.

In addition, we visited two Engineering Field Divisions of the Naval Facilities Engineering Command and four Corps of Engineers District Offices to obtain information from those responsible for reviewing and processing military construction projects and for providing operation and maintenance resources for the bases.

Most of our work was done at the base engineering and environmental offices which are responsible for the operation and maintenance of sewage treatment plants. These offices are also responsible for identifying plant problems and for preparing military construction project proposals submitted to the services' engineering offices.

We discussed with the plant operators the procedures they used and any problems they had with the plant. We reviewed copies of the state and EPA required documents prepared by the plant operators on whether or not the plant was meeting the permit requirements. We also reviewed the operating logs, maintenance records, spare parts inventory, operation and maintenance cost records, copies of inspection or evaluation reports made on the plant, and training records kept for each operator.

We reviewed the applicable legislation and implementing DOD and service directives, instructions, and regulations concerning sewage treatment. At each base we identified the state and local legal and regulatory requirements to determine those that DOD bases had to meet to be in compliance.

EPA and state inspectors accompanied us to each plant to provide us with technical expertise in evaluating the plants. The reports they provided were used in determining the compliance status for most bases.

Our review was conducted between May 1982 and August 1983. It was done in accordance with generally accepted government audit standards.

## CHAPTER 2

### AFTER MANY IMPROVEMENTS DESIGN

#### AND CONSTRUCTION PROBLEMS STILL EXIST

In 1976 we reported that many DOD sewage treatment facilities did not meet the water quality standards set by federal law and state regulations. Since then DOD has made great progress in attempting to improve sewage treatment. DOD has worked with regulatory agencies in developing compliance schedules and has spent \$1.16 billion to improve its sewage treatment. In spite of many improvements, problems still exist that reduce the effectiveness of these efforts.

During our followup review of sewage treatment plants at 13 military bases we found that the services did not always adequately

- consider or analyze all feasible options available such as upgrading the present plant, replacing it with a new plant, or joining a civilian system;
- review the technical feasibility of plant design before construction approval; and
- ensure quality control during construction.

#### NEED TO IMPROVE ANALYSIS OF ALTERNATIVES FOR UPGRADING SEWAGE TREATMENT PLANTS

We reviewed and evaluated the factors considered by the services in determining whether treatment plants should be altered, replaced, and/or tied into regional systems. We found that the services did not accept the conclusions and recommendations of some analyses done in support of needed sewage treatment improvements nor did they consider all feasible alternatives. Therefore, DOD cannot be assured that all plant upgrades approved were the most cost-effective and efficient treatment methods available.

#### Architect/engineer recommendations rejected

The services had studies made to determine the most cost-effective methods of improving sewage treatment at seven bases visited. Studies were not made at four of the other six bases because either there was no upgrade or there was no other alternative. Officials at the other two bases could not furnish us any information on whether a study had been made. For three of the bases that did obtain feasibility studies, the approved treatment systems differed from the recommended alternatives.

## Redstone Arsenal

In February 1976, the Corps of Engineers contracted for a feasibility study to determine the most cost-effective treatment method at Redstone Arsenal. Because Redstone Arsenal officials in 1975 rejected joining the Huntsville regional treatment system (see p. 10) as a solution for sewage treatment problems, this alternative was not considered in the study. The study stated that the only feasible alternatives were to build a centralized secondary sewage treatment plant or to replace the four existing treatment plants on an individual basis. Because of initial and annual costs, the study concluded that the centralized plant was the most cost-effective alternative. The Army, however, chose not to follow the architect/engineer (A/E) firm's recommendation. It chose to upgrade three of the existing treatment plants although the study did not recommend this as a cost-effective alternative.

The Army justified not building a centralized treatment plant due to funding constraints and future requirements. However, as of September 1982, the Army had spent over \$6.3 million upgrading Redstone's four plants. An additional \$270,000 contract was awarded in late 1982 for further upgrades. Even with these improvements, the upgrade is not as extensive as was originally included in the feasibility study. Redstone officials told us that even with these upgrades, the base may have to build a new centralized plant or join a regional system by 1989. The 1977 engineering study had concluded that a centralized treatment plant, estimated to cost \$7.85 million, was the best alternative. The Redstone upgrades may not be cost-effective since the Army did not (1) update the feasibility study for the changed scope or (2) document the justification for not accepting the study's recommendation.

According to base officials a justification was not prepared because they thought they would not receive the total amount needed to implement the recommended course of action.

## Tyndall Air Force Base

Air Force officials rejected the treatment method recommended by the A/E for Tyndall Air Force Base. They selected an alternative that did not appear to be cost-effective and which possibly could have affected future compliance.

The Air Force, in 1975 modified Tyndall's treatment plant to treat sewage by spray irrigation for \$1.1 million. The spray irrigation system did not work as anticipated and the Air Force awarded a contract to determine the best method for treating Tyndall's sewage in the future.

The A/E evaluated seven alternatives considering cost-effectiveness and current and future state and federal compliance requirements. The firm recommended as the most cost-effective

alternative that Tyndall provide secondary treatment and construct a force main to discharge the effluent into the regional Bay County Lagoon. The Air Force chose, however, to take its secondary treatment system out of service and provide only primary treatment before discharging into the lagoon. Bay County's Director of Water and Wastewater Systems, who is responsible for establishing service fees for customers using the Bay County Lagoon, believes Air Force officials did not recognize that the type of treatment provided could affect Tyndall's service fees to Bay County for the following reasons:

- Tyndall's service fee for dumping into the lagoon would be based on the number of gallons discharged (hydraulic loading) and the sewage's Biological Oxygen Demand (BOD loading).
- Primary treatment can only reduce the BOD loading by 30-35 percent. Secondary treatment can reduce the BOD loading by 85-90 percent.
- Assuming constant hydraulic loading and a reduction in BOD loading of only 75 percent from secondary treatment, the use of the secondary system could reduce Tyndall's fees paid to Bay County by as much as 62 percent.

We also believe Tyndall officials did not adequately consider future problems in complying with local, state, and federal environmental requirements. Using an aerated lagoon, such as Bay County's, is relatively unique in Florida. An EPA official stated that secondary treatment could be required if the lagoon proves less effective than anticipated, or if federal or state discharge standards become more stringent. In either case, if Tyndall were to dismantle or not maintain its secondary treatment plant, rehabilitation costs could be substantial.

Because Tyndall's modifications had not been started when we evaluated the plant, we advised Air Force officials of our concerns. The Air Force re-evaluated the issues and now plans to provide secondary treatment before discharging the sewage into the Bay County system. The project cost is \$1.36 million.

An Air Force official said that they did not follow the A/E's recommendations because they questioned the firm's cost estimates. However, they did not attempt to invalidate the estimates or develop new ones.

#### Pensacola Naval Air Station

Because of funding limitations, the Navy did not implement all of the planned 1978 upgrades recommended for the Pensacola Naval Air Station wastewater treatment facility. Four years later, though, the Navy decided to build the omitted improvements and updated the initial cost-effectiveness analysis to

show that the remaining improvements were still cost-effective when in fact they were not.

The Navy awarded a feasibility study in 1975 to determine how to best increase Pensacola's treatment and disposal capacity from three million to four million gallons a day. A Pensacola official said that more treatment capacity was needed because anticipated workload increases in the base air rework facility would generate additional flows exceeding the plant's capacity. A Navy official also said that EPA would not allow the additional wastewater generated to be discharged into the Gulf of Mexico. The study concluded that the most cost-effective alternative was to increase the plant treatment capacity and dispose of the treated effluent by discharge into the Gulf and golf course spray irrigation. The Navy increased the plant treatment capacity but excluded spray irrigation because funds were limited.

In 1982, four years later, Navy officials decided to add the spray irrigation system. Officials revised the cost-effectiveness analysis and computed a 15-year return on investment. However, the projected savings incorrectly used potable water instead of lake water pumping costs. The following errors were in the updated analysis:

- The initial analysis showed that it was more cost-effective to water the base golf course with treated wastewater rather than with more expensive potable water. The 1982 revised analysis made the same cost comparison between potable and treated wastewater even though the base was no longer using large amounts of potable water. This comparison showed a 15-year return on investment due to the difference in potable and wastewater rates.
- Most of the irrigation water used now is not potable water but water from a nearby lake. The analysis should have compared the cost of pumping lake water versus treated wastewater. This would have shown that it would take the Navy 127 years to recover its investment at about a \$6,000 savings per year.
- Pensacola officials also did not recognize that the additional disposal capacity was not needed as originally projected because the plant's average daily flow has only increased from 1.8 to 2.2 million gallons a day, substantially less than the 3 million gallons a day capacity that existed before the 1 million gallon upgrade. At times the plant does receive surge flows over 3 million gallons per day; however, it is normal practice to build treatment plants large enough to accommodate the average daily flow with a safety margin built in. This margin is usually considerably less than 35 percent of average flow which the upgrade provided.

We discussed our observations with Pensacola officials who agreed that the spray irrigation system currently being installed is not cost-effective. But they contended that, although only a small amount of potable water is used on the golf course, the system is needed to decrease the use of potable water and possibly help prevent the need for drilling additional wells. This position was not supported by the cost analysis as it did not evaluate the potential for wastewater spray irrigation saving money through the prevention of more well drilling. Naval Facilities Engineering Command (NAVFAC) officials also said that the spray irrigation project will lessen the pollutant load discharged to the bay.

Regional system not properly considered as an alternative

The Army does not know if its decision to upgrade the Redstone Arsenal sewage treatment system was the most cost-effective solution for correcting sewage treatment problems because the base did not adequately consider a tie-in with the city of Huntsville, Alabama as an alternative required by DOD policy.

During the mid-1970s, the Army recognized that Redstone Arsenal's sewage treatment plant could not meet EPA water quality standards. In 1975 the city of Huntsville invited Redstone Arsenal to participate in its plans for an upgraded municipal system. Even though DOD policy requires the bases to consider civilian systems, Redstone declined the city's offer and continued with plans for a separate treatment system. Base officials could not explain nor did they document why the base did not join the municipal system.

In 1977 Redstone officials approached the city about joining the regional system. The city officials told them that because Redstone had told the city in 1975 that they were not interested in joining the regional system, the city had gone ahead with its plans for a regional system and had not included enough capacity to accommodate Redstone's sewage. In 1979 after further discussions, city officials told Redstone officials that in order to modify their current plant, the city would incur an additional \$5.6 million cost which would be charged to the base. When the cost of building a sewer line to connect to the regional lines was included, the total cost for the Arsenal to join the regional system would be over \$9 million.

In 1980, shortly before plant modifications were to begin, the Army Material Development Command asked why it was not feasible for Redstone Arsenal to tie-in to the Huntsville treatment system. In response Redstone officials developed the following cost comparison to justify not joining the city system:

	<u>Estimated cost of joining city system</u>	<u>Estimated cost of upgrading Redstone system</u>
Initial Cost	\$9,162,000	\$7,011,000
Annual Cost	\$201,600	\$132,000

The estimate for upgrading the Redstone system included upgrading three of the base's secondary treatment plants. The validity of this upgrade cost estimate is questionable because:

- Upgrading the three Redstone plants was considered an interim solution. The \$7 million initial cost estimate excluded projected costs for a new centralized treatment plant being proposed as a final solution.
- Fiscal year 1979 actual treatment costs totaled \$184,419; therefore, the Army's \$132,000 estimate for annual sewage treatment appears low. Fiscal year 1982 treatment costs totaled \$301,264.

#### UPGRADED PLANTS HAVE DESIGN DEFICIENCIES

Of the 13 sewage treatment plants visited, 11 have undergone major upgrades since the mid-1970s in order to comply with EPA and/or state water quality standards. The other two sewage treatment plants underwent their last major upgrades in 1969 and 1970. Many of these upgraded plants are not operating effectively, and therefore are not meeting the sewage treatment levels expected.

Poor design appears to be one of the major causes. Design deficiencies result from many causes including: limited state of the art, insufficient monitoring and analysis of conditions prior to plant design, time and funding constraints, and other factors not easily discernible. Currently design deficiencies exist at 12 of the 13 military bases evaluated (Whidbey Island NAS was the exception). These deficiencies include improperly designed chlorine contact chambers, improper flow measuring devices, inadequate sludge processing equipment, and inefficient pumps used in various processes of the plant. The following are examples of sewage treatment plants with design deficiencies. (See chart on page 23 for complete list.)

#### Tyndall Air Force Base

Tyndall Air Force Base's secondary treatment plant has had serious discharge compliance problems for many years. In 1975, EPA told Tyndall officials that the plant would have to be modified because the plant effluent did not meet the EPA permit requirements for discharging into the Gulf of Mexico. As a result of a study the base had made of the various alternatives for treating its sewage, Tyndall officials decided to have a

spray irrigation project built on base at a cost of \$1.1 million. However, the spray irrigation field had serious ponding problems almost since becoming operational. In 1978, EPA issued an administrative order to close the field.

The cause of Tyndall's sewage treatment problems is the poor design of the spray irrigation system. The Army Corps of Engineers made a soil analysis of the spray irrigation field and provided the information to the A/E. Tyndall officials found that the soil analysis had serious flaws because the Corps did not realize that (1) the water table was too high for spray irrigation to be effective, (2) a four inch hard pan of black clay prevents the ground from properly absorbing the water discharged, and (3) part of the land selected was unusable for other reasons. The Air Force attempted to correct the spray field problems by clearing it, attempting to break up the hard pan, and planting grass, but these efforts were not successful.

To solve the compliance problems caused by the deficiencies of the spray irrigation system, Tyndall is scheduled to tie into a regional system--the Bay County Lagoon--by February 1984. Necessary modifications to tie into the regional system are estimated to cost \$1.36 million.

#### Fort Polk

Fort Polk's compliance problems result from poor design of improvement projects. The Army spent about \$13.7 million between 1975 and 1981 to upgrade Fort Polk's sewage treatment plant, but it still does not consistently meet the present EPA sewage discharge permit requirements. The most recent sewage treatment plant upgrade, which was completed in June 1981 at a cost of \$5.8 million, involved adding about 80 acres of advanced waste treatment infiltration ponds to the existing treatment plant. If additional improvements are not made, the plant's compliance problem will likely increase because a more stringent discharge permit may take effect in 1984.

In June 1975 the Army Environmental Hygiene Agency (AEHA), at the request of headquarters U.S. Army Forces Command, evaluated the geohydrologic feasibility of ultimate effluent disposal by land application. This study was made because the existing sewage treatment plant could not meet EPA or state permit requirements. The study stated that there were several techniques for application of liquid wastes to the land surface which was EPA's preferred method for meeting the permit requirements. The study grouped the various techniques into three major categories: spray irrigation, overland runoff, and rapid infiltration. The study concluded that spray irrigation was probably the best method for Fort Polk. However, it recommended that whichever method was chosen, it should be on a pilot or experimental test basis prior to building a complete system.

After the AEHA report was issued the Army's Cold Regions Research Engineering Laboratory reviewed it in August 1976 and concluded that AEHA had underestimated the permeability of the subsurface materials. Because of the Laboratory's conclusion and the extensive amount of land required for spray irrigation, although available, Fort Polk and Office, Chief of Engineers officials decided to construct the rapid infiltration ponds.

The Fort Worth District, Corps of Engineers, believed that these ponds needed further research and development. However, the base level engineers and the Office, Chief of Engineers in Washington, D.C. disagreed with the Fort Worth District, and the Corps headquarters instructed the district to award a design contract.

According to Fort Worth District officials, the A/E made an error in calculating the acreage needed when designing the infiltration ponds. The District subsequently found that the acreage required to treat the volume of sewage generated by Fort Polk was almost three times the design estimate.

As a result of the designer's inaccurate estimates, and other design problems, the current sewage treatment system is incapable of meeting EPA requirements. Now the Army plans to spend an additional \$750,000 to \$1 million to try and salvage the \$5.8 million already invested. Fort Worth District officials said that the project to correct the problems is also questionable and deserves more research and development. The Office, Chief of Engineers again disagreed with the District and has ordered the remedial project to be completed. However, a U.S. Army Cold Regions Research and Engineering Laboratory engineer said in a May 1982 memorandum for the record that the newly proposed system cannot meet secondary effluent standards or anything more stringent. He further stated that, in view of the controversy and embarrassment over the present non-operational rapid infiltration ponds, it seems imprudent to construct an unproven and untested system.

As of January 1983, neither the base nor the Corps had determined how much of the additional cost incurred for corrective actions is due to the A/E's poor design. Base and District officials have recognized that there are serious design problems and have, for over 2 years, tried to correct them. However, their primary concern was not to determine who should be held accountable, but to correct the problems which necessitated the expenditure of base O&M funds.

#### Quantico Marine Corps Base

Quantico's sewage treatment plant cannot consistently meet effluent permit standards even though improvements costing \$3.8 million were added between 1975 and 1977. Officials attribute the problem to a deficient design resulting from funding and

time constraints. More improvements are necessary for the plant to consistently meet permit requirements.

The original plans for modifying the Quantico plant included a general upgrade of the existing facilities and adding, among other components, a flow equalization basin and a grit removal chamber. As the project progressed through the various steps for project development, approval, and funding, it became apparent that the project's total cost would exceed available funds. When the construction contract was awarded at a cost of about \$3 million, the flow equalization basin and grit removal chamber had been deleted. Quantico and the Naval Facilities Engineering Command, Chesapeake Division officials believed it was better to proceed with a partial upgrade that could be funded, rather than postpone the total project until sufficient funds were available.

Since the plant became operational, it has not been able to meet the state and EPA permit requirements. Deleting the flow equalization basin continues to cause hydraulic overloading surges that result in degraded biological action, chemical processes, and solids collection. Deleting the grit removal process is causing additional wear and tear on plant equipment. Quantico and Chesapeake Division officials have proposed another plant upgrade, estimated to cost about \$2 million, which would install the equipment and facilities deleted from the last upgrade.

Additional plants with similar design deficiencies

The following plants were also upgraded since the mid-1970s and have design problems, similar to those just discussed, that make it difficult to meet EPA and/or state water quality standards:

--Robins Air Force Base. The sewage treatment plant was complying with state permit discharge requirements when the GAO/EPA team evaluated it. However, in order to comply, operators were treating industrial wastes manually before they entered the sewage treatment plant. This was necessary because a pretreatment facility installed in 1979 was inoperable. This and other recently installed equipment was either inoperable or was operating inefficiently because of design flaws. The Air Force will have to spend additional funds to fix the pretreatment facility and other equipment. Base officials said that they are planning to go ahead with the corrective action because they cannot afford to wait for an involved, time consuming court case to determine liability.

--K.I. Sawyer Air Force Base. The Air Force spent about \$4.7 million between 1976 and 1980 to upgrade its sewage

treatment plant to meet increasingly more stringent state and EPA requirements. Base officials believed that each new upgraded design would meet such requirements; but, to date, the plant effluent does not meet permit standards. The present plant is a combination of several major modifications which has led to uncoordinated plant operations. For example, instrumentation throughout the plant does not function properly because of incompatible equipment, thereby giving operators inadequate control of the treatment process. New designs, estimated to cost up to \$4.3 million when constructed, are being viewed as another final solution to the discharge permit compliance problem.

--Redstone Arsenal. Even though the Army has recently spent over \$6 million on plant upgrades in an attempt to meet federal and state water quality standards, the plant still violates permit standards. Three of four Parshall flumes were designed incorrectly, three new secondary clarifiers are inoperable due to motor problems, and new force main variable speed pumps are thought to be causing surges which blow apart the pipeline junctions.

--Fort Dix. The Army upgraded the Fort Dix sewage treatment plant for \$3.4 million in 1976 because it could not meet EPA discharge permit requirements. The upgraded plant is still violating its permit because of several component design and construction deficiencies.

--Fort Carson. The Army upgraded the plant between 1975 and 1980 spending about \$5 million to meet discharge permit requirements. However, in May 1982, EPA issued a formal notice of violation and an order to meet permit conditions. In October, EPA found the plant still unacceptable as its effluent consistently contained excessive oil and grease and total chlorine residual. To correct the problems, Fort Carson has programed a project in fiscal year 1984 which is estimated to cost about \$450,000. The primary clarifier flow distribution boxes at Fort Carson were also inadequately designed and constructed, allowing excessive solids through the system and adversely affecting operations. Base officials said that they have no plans to have the contractor correct the problems since it would be too difficult to enforce the contract warranty provisions because of the involved procedures, cost, and time required.

CONSTRUCTION DEFECTS ARE AFFECTING  
PLANT OPERATIONS AND INCREASING COSTS

In addition to DOD's problems with deficient plant designs, we also identified at seven military bases construction problems that degrade plant operations and increase government costs.

(See the chart on page 23.) Even though DOD and the services have regulations to ensure quality construction, many construction problems seemed to result from poor quality control and the services' lack of initiative in holding the responsible parties liable. For example:

- Many equipment items, such as trickling filter media and various flow meters installed in a \$3.4 million upgrade at Fort Polk, have not been operational since the government accepted ownership. Base officials said that it is difficult to enforce warranty provisions against the contractors because fault is difficult to establish due to an involved, complicated, and very time consuming procedure. The Corps of Engineers has spent an additional \$42,000 to correct some of the deficiencies.
- A construction contractor at Fort Dix used duct tape for joints on sludge pipes going from the primary clarifiers to a sludge collection tank. This resulted in untreated sludge permeating the soil and rising to the surface. Base maintenance personnel dug up the pipe and repaired the joints.
- About 100 minor construction deficiencies remained to be corrected when Quantico officials accepted ownership of a 1976 plant improvement. Additional deficiencies became known later. The deficiencies have caused extra O&M costs and caused some of the plant's processes not to work correctly. As a result, the Quantico plant cannot meet its discharge permit requirements. The contractor corrected some problems, but billed the government for the repairs and refused to correct other problems. The Chesapeake Division of the Naval Facilities Engineering Command has issued additional contracts costing about \$177,000 to correct most of the remaining deficiencies.
- A construction contractor at Robins Air Force Base poured inadequate foundations for one of the treatment processes resulting in a serious lean. Also, a rotary kiln is not operational because the wrong type bricks were used. Another contractor used media (crushed rock) in the trickling filters that did not meet design specifications. The contractors repaired the foundations and the trickling filters but the rotary kiln has not been repaired.

#### Consideration of alternative construction contracting procedures needed

The problems noted above have resulted in additional costs for DOD. Furthermore, DOD has identified several hundred projects still necessary to improve sewage treatment operations at military installations. In view of these facts, we believe

that DOD needs to study and test possible alternative methods of construction contracting.

One means for assigning responsibility would be for DOD to use a construction contracting procedure that would enable it to hold one contractor responsible for the total project. Two possible alternatives are the construction manager technique and the design/construction or turn-key concept. In either case, DOD could stipulate that the contractor would be responsible for designing and constructing sewage treatment plants and for demonstrating, with DOD plant operators, that the plant will meet the discharge permit requirements before DOD accepts it. These methods could also alleviate some O&M problems discussed in chapter 3, by making the turn-key contractor also responsible for developing the plant O&M manuals and training the plant staff.

### CONCLUSIONS

Since the mid-1970s, DOD has made a great effort to improve its sewage treatment plants by working closely with regulatory agencies to determine what improvements are needed to meet compliance requirements. Although it has spent \$1.16 billion to upgrade or build new treatment systems, efforts have not been fully successful because

- the services have not always selected the most cost-effective treatment methods available, and
- the upgrades and modifications built often have serious design and construction flaws that degrade plant efficiency.

At most of the bases evaluated, we found that the services hired A/E firms to evaluate all feasible sewage treatment alternatives and to identify the most cost-effective treatment methods available. We noted, however, that feasible alternatives such as tie-ins with regional systems were sometimes excluded from the studies, although DOD policy requires the services to evaluate the feasibility of joining a regional system in lieu of replacing or upgrading base plants. We also noted that the services sometime reject, with little or no justification, the conclusions and recommendations of these studies. Feasibility studies are costly and a waste of government funds if the findings are not used, especially in those cases where a treatment process may be approved that is less cost-effective.

Also, the services were not properly reviewing the technical feasibility of plant designs nor were they adequately ensuring quality control during construction. Although deficient designs and construction problems are easily identifiable when plant upgrades do not perform as intended, identifying accountability and responsibility for repairs is very difficult. The

various parties involved--designers, contractors, the services, and regulatory agencies--often blame one another. Even where the potential exists to legally resolve the accountability, the services are sometimes reluctant to take action because of the complex procedure and time usually involved in a legal action. Therefore, the government has spent additional funds to fix the same treatment plants it originally spent millions to construct.

Due to the number of projects still to be designed and constructed, as well as the DOD's problems with determining responsibility when treatment plants do not function as planned which results in additional expense, we believe that DOD should study and test this matter further to see if other contracting methods should be tried.

### RECOMMENDATIONS

To guarantee that the most cost-effective sewage treatment methods are used, we recommend that the Secretary of Defense:

- Ensure that the services comply with DOD policy by carefully evaluating all feasible treatment alternatives, including regional or municipal tie-ins.
- Require the services to provide written justifications supporting the selection of sewage treatment alternatives that differ from those recommended by cost-effectiveness studies.
- Study and pilot test making one party responsible under contract for designing and constructing a treatment plant, and for demonstrating, with plant operators, that the plant will meet discharge permit requirements before turning over the plant to the services for operation.

### AGENCY COMMENTS AND OUR EVALUATION

DOD commented orally on a draft of this report on August 8, 1983, and by letter dated August 25, 1983. (See app. II.) In general, DOD agreed that while improvements have been made in the sewage treatment area, problems still exist that prevent maximum efficiency and effectiveness in treatment plant operations. DOD also agreed that there are improvements to be made in documenting analyses of alternatives for upgrading treatment plants. However, they did not agree with all specific examples used to illustrate this. Some changes have been incorporated into this report to provide additional information on each example and where applicable to reflect data provided by DOD.

Further, DOD agreed that many upgraded plants are not operating effectively and that the services are not properly reviewing the technical feasibility of plant designs or adequately insuring quality control during construction.

Finally, DOD acknowledged that construction problems reduce plant efficiency and increase costs, and they stated that all construction defects discussed in this report either have been corrected or have corrections planned.

DOD did not concur with our conclusions that the services do not always evaluate all alternatives in sewage treatment plant feasibility studies despite DOD policy requiring that they do so. DOD stated that its guidance and the implementing services' instructions already require a presentation of the alternatives in the military construction project backup documentation. However, where a preliminary review shows that a regional connection is not feasible, this alternative is not always given further consideration.

In its comments DOD questioned two of the examples supporting this point in our draft report. DOD stated that both examples had substantial errors. However, after reviewing the additional material provided by DOD, we saw no reason to revise our examples except for adding some additional material on pages 11 through 14 for the Pensacola Naval Air Station.

While DOD agreed that there may be some occasions where the services reject, with little or no justification, conclusions and recommendations of feasibility studies, it stated that management systems are now in place to prevent this in future projects. DOD did agree, however, to strengthen its policy requiring written justification when a base selects a treatment alternative other than that shown in the feasibility study as the best choice.

Although DOD did not concur with our conclusions, it commented that it will review current service guidance and revise DOD policy if necessary to strengthen this guidance to insure that the services carefully evaluate all alternatives. In addition, DOD stated that it will revise its instruction on "Environmental Pollution Prevention, Control and Abatement" to: (1) strengthen existing DOD policy requiring written justification to support selection of treatment alternatives that differ from those recommended in feasibility studies and (2) reemphasize that the design A/E should have more direct involvement with the construction project during initiation, construction, design of O&M manuals, and plant-specific operator training.

In our draft report we proposed that in order to make design and construction accountability more identifiable, the Secretary of Defense should make one party responsible under contract for planning, designing, and constructing a treatment plant and for demonstrating, with plant operators, that the plant will meet the discharge permit requirements before turning the plant over to the services for operation. DOD did not agree that one party must be responsible for all phases when acquiring a treatment plant because the installation engineer is in the

best position to determine the base's needs and can best develop basic improvement plans or new construction plans. Further, DOD commented that its construction agents have the capability and experience to manage the design and construction of many complex projects.

DOD also stated that a single private construction manager would have limited authority under existing Defense Acquisition Regulations and would probably be more costly than using a designated DOD construction agent (Corps or NAVFAC) as the construction manager. DOD also commented that a turn-key contract would require an up-front investment by bidders and therefore tend to reduce competition. DOD believed that problems cited can best be corrected by insuring that the DOD construction agents select the most competent A/E design firms, improve design reviews, and improve construction quality assurance.

DOD stated that it was going to revise its instruction on "Environmental Pollution Prevention, Control and Abatement" to reemphasize that the design A/E should be required to assign an engineer to assist the DOD construction agent until the new plant is fully operational and meets required water quality standards. Plant start-up, development of O&M manuals, and training of operators can be accomplished by requiring A/E assistance during construction.

We agree with DOD that the installation engineer, along with NAVFAC and Corps assistance, is in the best position to determine the base's needs for sewage treatment and to develop basic improvement plans or new construction plans. However, the planning we included in our proposal was not that related to requirements determination but rather that necessary for interfacing the design and construction phases of the project.

We also agree that DOD construction agents (NAVFAC and Corps) have expertise and are generally capable of managing sewage treatment plant construction projects. However, we were told by officials in both NAVFAC and Corps' district and division offices that they were extremely understaffed and, as a result, most of their engineers and construction managers had large numbers of projects to oversee. This prevents them from giving what the district and division managers think is adequate oversight and management of individual projects. In fact, at one division office, officials said that they could only review a sample of the work drawings. In addition, many of the engineers who were responsible for the oversight inspection of construction work said that because they had so many projects to review, there was no way they could be constantly on site reviewing the work being done. These officials also said that they depend on the integrity of the contractors to insure that the plants were designed and constructed correctly.

We did not analyze in detail DOD's staffing and organizational capacity for managing construction projects nor did we do a cost analysis and comparison of using a contractor construction manager versus a DOD construction agent. However, we believe that using the DOD construction agent approach has resulted in DOD paying extra costs to correct deficiencies at several of the installations we visited. In fact some costs have not yet been incurred because DOD has not corrected all of the deficiencies we observed.

We did not make an analysis to determine if using the turn-key concept would restrict competition, but DOD did not provide any data showing that competition would be restricted or the extent of such restriction. We noted that DOD is using the turn-key concept for construction of family housing.

After considering DOD comments, we modified our recommendation. The intent of our recommendation is to encourage DOD research of the single contractor concept on some test or trial projects to determine if it is a viable means for reducing operational and cost problems encountered under its current contracting procedures.

## CHAPTER 3

### OPERATION AND MAINTENANCE PROBLEMS

#### AFFECT PERMIT COMPLIANCE

DOD spent \$1.16 billion from 1976 through 1981 to improve its plants and their operations. We found that many improvements have in fact been made. However, we also found that most of the DOD plants visited have been unable to consistently meet National Pollution Discharge Elimination System (discharge) permit requirements for a number of years.

Eleven of the bases we reviewed had been formally notified of permit violations between 1977 and the time of our visits in 1982. One of these bases was fined and another was involved in litigation because of permit violations. The remainder were attempting to bring their plants into consistent compliance.

The cause of continued non-compliance is a combination of problems limiting a plant's ability to treat wastes. Other than the design and construction problems discussed in chapter 2, these problems can generally be categorized into one or more of the following areas:

- Lack of specific DOD guidance on how to assure adequate operation, maintenance, and compliance.
- Lack of follow-up on problems found by DOD, EPA, and state environmental engineers.
- Equipment deficiencies which have prevented plants from operating at designed capabilities.
- Infiltration and inflow problems which have overloaded plants' capabilities.
- Operation and maintenance (O&M) deficiencies which have hindered effective performance.

The table on page 23 summarizes the problems identified at each plant.

The discharge permit, the principal tool used in the water quality enforcement program, is designed to control the discharge of pollutants into waterways from all specific point sources, such as sewage treatment plants. The permit specifies which pollutants may be discharged and sets daily average and maximum limits on discharges to meet effluent limits and water quality standards. Any violation of permit conditions is a violation of law, and the violator is subject to various penalties including fines.

SUMMARY OF FINDINGS

AT PLANTS VISITED

<u>Installation</u>	<u>Plant design</u>	<u>Plant construction</u>	<u>Guidance O&amp;M</u>	<u>O &amp; M</u>	<u>Equipment</u>	<u>Staffing and/or training</u>	<u>Infiltration and/or inflow</u>	<u>Laboratories and Procedures</u>	<u>Rating of (note) plant</u>
<u>ARMY</u>									
Fort Carson	X	X		X	X		X	X	U
Fort Dix	X	X	X	X	X	X	X	X	U
Fort Polk	X	X	X	X	X		X		C
Redstone Arsenal	X		X	X	X		X	X	U
Vint Hill Farms	X	X			X	X	X	X	C
<u>NAVY</u>									
NOS, Indian Head	X		X			X	X		U
Pensacola NAS	X		X	X		X	X		A
Whidbey Island NAS							X		A
Quantico MCB	X	X			X	X	X	X	U
<u>AIR FORCE BASES</u>									
McGuire	X		X	X	X	X	X	X	U
Robins	X	X	X	X		X	X	X	A
K.I. Sawyer	X		X	X	X				U
Tyndall	X	X	X	X	X	X	X	X	U
Total	12	7	9	9	9	8	12	8	
	---	---	---	---	---	---	---	---	

Note: Ratings provided by EPA.  
 A - Acceptable  
 U - Unacceptable  
 C - Conditionally

DOD HAS NOT PROVIDED SPECIFIC  
GUIDANCE TO ASSURE ADEQUATE OPERATION,  
MAINTENANCE, AND PERMIT COMPLIANCE

DOD and its services are responsible for assuring that bases receive specific guidance on how to operate and maintain the plants and comply with their discharge permits. However, 9 of the 13 bases visited had not received adequate guidance from DOD on these functions. Base officials generally felt that the only type of direction given in this regard was the periodic and sometimes infrequent O&M inspections performed by DOD, EPA, and state environmental engineers. These inspections were to evaluate the adequacy of plant O&M at a specific time and usually made constructive comments and recommendations. According to base officials, though, while such inspections were helpful, they did not provide specific guidance on how to assure adequate O&M for the entire plant. For example:

--At Robins Air Force Base, DOD and the Air Force had provided general guidance including a January 1982 manual on O&M. However, plant operators said that they do not read or follow these instructions because they are too general and not applicable to their plant's problems.

--At Fort Polk, DOD and the Army had not provided formal or specific direction as to what constitutes adequate O&M at that plant. Base officials said they felt that the Army simply assumes adequate O&M if the plant meets or comes close to meeting discharge permit conditions.

--At Fort Carson, base officials also said the Army has not provided direction as to what constitutes adequate O&M at that plant. Plant operators stated they sometimes use a general EPA manual but are unaware of any DOD direction that applies specifically to their plant.

--At the Naval Ordnance Station, Indian Head, Maryland, operators said that the only directives or instructions received from outside organizations on proper O&M of sewage treatment plants were informal comments from EPA or state inspectors during inspections. Neither DOD nor the service headquarters have given much direction. The standard operating procedures for the base consist of limited listings of things to be done but do not explain how to do them or their purpose and how each step relates to the total process.

INCONSISTENT ACTION TO CORRECT  
PROBLEMS FOUND BY DOD, EPA, AND  
STATE ENVIRONMENTAL ENGINEERS

The performance of sewage treatment plants at most of the DOD installations visited has been evaluated by environmental engineering teams from the three services, EPA, state agencies,

and consulting engineers. We reviewed 49 evaluations made between 1976 and August 1982 at the 13 bases visited; most evaluations were extensive and identified many problems similar to those we found. If plant officials had acted on the recommendations in these evaluations, the efficiency of the plants would have increased. However, action taken on the problems identified and recommendations made by the environmental teams varied from base to base. These problems ranged in complexity from relatively minor ones, correctible at base level with little cost, to major problems requiring action by the service or DOD headquarters. Some of the major problems could require military construction funds. Appendix I lists these evaluations and the number of problems noted and corrected up to the time of our visits.

While some bases had made substantial plant improvements by acting on the recommendations of environmental teams, others did not respond as well. For example, at Fort Dix, Army, EPA, and state environmental engineers made six detailed evaluations of plant operations between May 1977 and March 1981. The problems they found included lack of spare parts, broken equipment items, and general inattention to O&M needs. When we visited Fort Dix in July and August 1982, we found that only 19 of 54 problems identified by the inspectors had been corrected and the base was continuing to violate conditions of its discharge permit. A major portion of these problems were those that plant personnel could correct if adequate O&M procedures were used.

Within each service some of the environmental engineering teams evaluate conditions upon request, while other groups make evaluations according to a schedule. Officials from the three services said that there was no formal means to require the base to reply to the recommendations and there was no procedure which would insure that the bases took any follow-up action.

Sewage treatment plant operators and base officials responsible for operating treatment plants have not been responsive to the recommendations made during evaluations of the sewage treatment plants. They said some of the necessary corrections that were not made were due to a lack of requested funds. This has resulted from several factors including the low priority of sewage treatment plants for O&M projects and problems in getting larger projects through the military construction process. We observed that some unheeded recommendations dealt with operational changes not requiring funds for implementation.

EQUIPMENT DEFICIENCIES HAVE PREVENTED  
PLANTS FROM ACHIEVING DESIGNED CAPABILITIES

At the time of our visits nine treatment plants were experiencing operational and permit compliance problems caused by equipment failures. For example:

- At Redstone Arsenal, three new secondary clarifiers were inoperable because the sludge pumps burned out two weeks after the 12-month warranty period expired. Also, the new clarifiers have had motor valve and bearing problems.
- At Fort Carson, problem equipment included one of four trickling filters that was inoperable because its water distributor was broken. Also several plant instrumentation systems have been inoperable since 1979 and the bar screen is often frozen and non-functional in the winter because it is not sheltered from wind and snow.
- At K.I. Sawyer Air Force Base, all plant instrumentation was not functional for adequate flow pacing due to a design problem. The scum removal arm in a clarifier was inoperable because it was bent.
- At Fort Polk, two of three screw pumps at the headworks were down since construction in 1980 because of construction contractor error; one of two augers for grit removal were down because of design problems and lack of parts. Influent, effluent, and recirculation flow meters have not operated since they were constructed in 1980 and the contractor has not made good on warranty provisions. The proportional chlorine feeder was inoperable because of construction problems which the contractor has not fixed.

Officials at several bases cited various reasons why equipment problems existed:

- Low bid contractors often must install inexpensive and sometimes inferior equipment items to make a profit on the contract.
- Contractors do not always honor equipment warranties. DOD has had legal difficulty enforcing warranties and sometimes awards new contracts to fix such problems.
- Construction contractors blame equipment problems on deficient plant design.
- Construction contractors claim plant operators are negligent in their O&M of relatively new equipment items.

INFILTRATION PROBLEMS HAVE  
OVERLOADED PLANT CAPABILITIES

Infiltration and inflow <sup>1/</sup> of water into treatment plants are caused by combined storm water and sewer lines and/or defective sewer piping. As infiltration and inflow overload plant components, hydraulic overloading occurs which impairs the efficiency of the treatment processes. In some cases, this causes raw sewage to bypass the treatment plant and be discharged into the receiving waters.

DOD has made many improvements trying to correct infiltration and inflow problems. However, 12 of the 13 bases we reviewed still have minor to severe infiltration which, in turn, leads to other operational problems and violations of some discharge permits. For example:

--Vint Hill Farms Station had a study made of its sewage collection system and has had numerous repair projects to correct the inflow and infiltration. Although some improvement has been made, the Station still incurs high flows during wet weather. With a plant capacity of about 246,000 gallons per day, the plant has been overloaded often and in one case the flow reached 700,000 gallons per day. Hydraulic overloading has an adverse effect on the treatment provided by the plant.

--Redstone Arsenal upgraded its largest treatment plant in 1979 to a capacity of 6.5 million gallons per day although the plant's average daily flow is 1.6 million gallons. Extreme infiltration was one reason for increasing the plant's capacity. The base continues to reduce its infiltration problem and plans to use the excess capacity for additional holding time which should provide somewhat better treatment.

--Tyndall Air Force Base experiences a 100 percent flow increase because of infiltration during wet weather. Base officials have proposed a project to correct the problem, but it had not been approved as of October 1982. Since Tyndall's fees to the Bay County lagoon will be partly based on the number of gallons discharged; infiltration could result in increased treatment costs.

---

<sup>1/</sup>Infiltration occurs when ground water enters a sewer system through means such as defective pipes, pipe joints, connections or manhole walls. Inflow is caused by water discharged into a sewer system from sources such as roof leaders; cellar, yard, and foundation drains; manhole covers; cross connections from storm sewers and combined sewers; catch basins; storm waters; surface runoff; or street wash waters.

CONTINUING OPERATION AND  
MAINTENANCE PROBLEMS HINDER  
PLANT PERFORMANCE

In our 1976 report to the Congress we noted that O&M problems had been widespread for many years leading to inefficient plant operations. DOD responded to these problems by funding various construction and O&M projects which have resulted in generally improved practices and operations. We found, however, that O&M deficiencies still exist at some of the bases we visited. These deficiencies continue to impede plant effectiveness and contribute to discharge permit compliance problems.

Satisfactory O&M is critical to a plant's overall performance. Proper O&M practices are essential not only for the efficient operation of sewage treatment plants but also to reduce future construction and replacement costs. Prolonging the life of plant equipment helps protect the huge investment of DOD construction funds.

Ten of the thirteen bases we visited had O&M deficiencies which hindered effective plant performance. Such deficiencies included

- inadequate staffing,
- lack of O&M procedures, and
- lack of adequate laboratories and related procedures.

Insufficient number of qualified  
plant operating personnel

Operation and maintenance problems at sewage treatment facilities are frequently caused by a lack of qualified personnel to operate the plant. Sewage treatment plants must be staffed with enough qualified personnel to achieve the designed level of treatment and to protect the large investments in the physical plant. Deficiencies in either the number of staff or their qualifications can adversely affect a plant's operation.

Our 1976 report noted that 12 of the 20 plants we visited were understaffed and/or were in need of trained personnel. In 1982 we found that 8 of the 13 plants visited had similar problems due to the inability to recruit and retain qualified operators, lack of incentives for operators to become state-certified, and lack of training opportunities. For example:

- At Robins AFB, base officials said that both the number and quality of plant staff were inadequate to assure proper O&M, which resulted in degraded plant operation. They said most operators were either totally inexperienced, poorly educated, or untrainable. According to

the plant foreman, the staffing procedures from preparation to final approval are excessively long and this has resulted in the base's inability to hire more qualified applicants. For example, the position of plant chemist has been unfilled for about one year. Also, base employees who work at other jobs and who have little or no knowledge of plant operations have been transferred to the plant. In addition, many of the plant employees hired have little education and are difficult to train. Only 3 of 16 civilian operators are certified although many of them have worked long enough to have satisfied the requirements for taking the certification exam.

--The Indian Head Naval Ordnance Station has experienced problems in adequately staffing its sewage plant. At the time of our review the base was short one of eight authorized operators. In addition the plant foreman and the shift leader said that one other operator position should be authorized to meet plant staffing needs. Even though base officials agree with the need for additional staff, plant operators are assigned other duties that require them to be away from the plant about 20 percent of the time. To further complicate the problem, base officials said that three of the operators are not interested in doing an adequate job. These people were assigned to the plant because they were civil servants who had had trouble doing their work at previous jobs. The station has sent its operators to training courses but these three are apparently not motivated to pass the required state of Maryland certification tests.

--McGuire Air Force Base has filled all of its authorized operator positions at its plant, but 14 of the 18 operators are airmen who attend training maneuvers leaving only 4 civilians to operate the plant for up to 2 weeks or more. This has resulted in the plant being merely watched rather than being effectively operated and maintained. In addition, the only New Jersey certified sewage plant operator can not spend adequate time at the plant as the state requires because he is assigned other duties away from the plant.

#### Inadequate maintenance programs

To function effectively and meet discharge permit requirements, treatment plants need an inventory of spare parts and a preventive maintenance program to keep equipment functioning properly and to use it most productively.

Nine of the thirteen plants did not keep a sufficient spare parts inventory so that when breakdowns occurred, lengthy periods with inoperable equipment resulted. Only four plants had a spare parts inventory to keep most equipment working if parts wore out. As a result, equipment necessary for effective

operation at these nine plants was not functioning at the time of our visits. Both the plant operators and the EPA inspectors who accompanied us on our inspections stated that plant effectiveness was adversely affected by inoperable equipment. Examples of bases which had inoperable equipment due to lack of parts were:

- At K.I. Sawyer Air Force Base, two comminutors, the centrifuge feed pumps, and sections of the final clarifier were all out of service.
- At Fort Polk, one of two augers used for grit removal and one of two screw pumps between the final clarifier and chlorine contact chamber were inoperable.
- At Fort Dix, pumps at pump stations, a grit elevator, a comminutor, and a chlorine residual analyzer were out of service.

Five of the plants had no regularly scheduled preventive maintenance program nor any maintenance records. Maintenance was done primarily on an as-needed basis to try to keep the plant operating. In addition, six plants did not have an O&M manual describing the entire plant's functions, piping, valves, electrical schematics, operation procedures, and emergency procedures. Because of a lack of maintenance, operational problems included:

- unlevel trickling filter arms and plugged filter nozzles leading to uneven loading of filter media;
- improperly adjusted scrappers in settling tanks leading to septic conditions;
- non-working or uncalibrated flow meters leading to inaccurate flow data; and
- uneven weirs on primary and secondary settling tanks leading to short-circuiting of the treatment system.

#### Deficiencies in laboratory equipment and procedures

Adequate laboratory controls and testing procedures are essential for determining the operational efficiency of a plant and any necessary adjustments to the treatment processes. EPA permits usually require tests for BOD, suspended solids, acidity and alkalinity, and fecal coliform. BOD and suspended solids tests are required on both the influent to the plant and the effluent from the plant to determine the rate of removal. Some plants are also required to take additional tests for dissolved oxygen, nitrogen, ammonia, phosphorus, chlorine residual, and oils and grease. These tests are required depending on the

characteristics of the wastewater, type of operation, or particularly stringent requirements of the receiving body of water. Other tests are usually considered necessary for plant operation.

Tests required by the permit were not made at eight plants either because of a lack of equipment or because an inexperienced operator did not know how to make the tests. At these plants we could not determine whether pollution limitations for parameters, such as BOD and suspended solids, were being met.

#### Laboratory equipment

At four plants essential items of laboratory equipment to complete the EPA-required tests were either obsolete or defective. These included inadequate or inoperable key equipment items, inadequate temperature devices, and uncalibrated equipment. Of these four plants, two had recognized the problem and had requested the equipment needed. The plant operators could not say why the needed equipment had not been ordered at the other bases.

#### Laboratory procedures

Some of the procedures for sampling and testing were not acceptable at seven plants. EPA permits require that analytical and sampling methods conform to the latest edition of "Standard Methods for the Examination of Water and Wastewater" or other equivalent EPA-approved methods.

Not following acceptable analytical and sampling procedures can result in unreliable test data. Although not applicable to all plants, testing procedures could be improved by proper sampling methods, better quality control during testing, and adherence to procedures set forth in standard methods.

The following are examples of the problems we noted at the bases we visited:

--At Robins Air Force Base, the EPA inspector who accompanied us noted that the plant's laboratory and testing controls were inadequate because (1) many samples were taken incorrectly, (2) the laboratory had no quality control program to ensure that test results were accurate, (3) operators used inappropriate testing procedures, and (4) operators did not keep records of when or if flow measuring equipment was calibrated.

--At Tyndall Air Force Base, the EPA inspectors concluded that the plant and hospital laboratories, where some tests are run, did not have good quality control programs. Technicians did not conduct duplicate tests nor did they use reference standards. Also, the EPA

inspectors observed that the laboratory technicians were conducting tests improperly.

## CONCLUSIONS

The effectiveness of some of DOD's sewage treatment plants is seriously impaired by O&M problems. At 12 of the 13 bases we visited these problems have contributed to the bases' inability to comply with discharge permit requirements. O&M problems continue to adversely affect plant operations because DOD has not always provided adequate specific guidance to the plant operators to insure proper plant operation. In addition, inadequate staffing, infiltration and inflow, deficiencies in laboratory equipment and procedures, and equipment deficiencies continue to affect proper plant operations. To further compound the problem almost half of the 13 bases do not have a preventive maintenance program or an adequate spare parts inventory.

Various environmental organizations have evaluated or inspected base sewage treatment plants and their operations and have made recommendations for improvements. However, corrective actions have not always been taken to solve the identified problems. These problems vary both in complexity and the amount of resources and effort needed to solve them. Some bases have made substantial efforts to correct the identified problems while others have not. In those cases where little has been done, the plant effectiveness has been adversely affected.

Greater emphasis needs to be placed on the importance of sewage treatment, especially at the installation level. Until such time as DOD, its services, and bases place a higher priority on O&M, in terms of both staffing and other resources, the problems noted in this report will continue to detrimentally affect the high capital investment that has been made and is continuing to be made in sewage treatment facilities. In addition, unless the facilities are properly operated and maintained, it is unlikely that the sewage treatment plants will perform well consistently and comply with permit requirements.

## RECOMMENDATIONS

We recommend that the Secretary of Defense:

- Direct and assist the services as necessary to provide more specific guidance to their bases on how to assure adequate plant operation and maintenance in order to be in compliance with permit requirements.
- Require the service secretaries to establish some formal means of assuring that deficiencies identified at sewage treatment plants are followed up and corrected in a timely manner.

- Revise DOD and service regulations to require a provision for O&M manuals to be in all military construction authorization documents (1391's) for improving sewage treatment.
- Work with the Office of Personnel Management to revise the staffing guidelines for sewage treatment plants because of the ever increasing complexity of the treatment plants and processes.

#### AGENCY COMMENTS AND OUR EVALUATION

DOD generally agreed with our overall findings, conclusions, and recommendations concerning the effect of operation and maintenance problems on plant performance. (See app. II.) DOD commented that it will initiate formal discussions with the Office of Personnel Management to revise existing staffing guidelines for sewage treatment plants before the end of 1983.

In addition DOD commented that it will revise its instruction on "Environmental Pollution Prevention, Control and Abatement" to incorporate our recommendations to: (1) provide for specific O&M guidance for individual installation's sewage treatment plants, (2) require some formal means of assuring that deficiencies identified at the plants are followed up and corrected in a timely manner, and (3) require that O&M manuals be provided under contract when a sewage treatment plant is built or a major upgrade occurs. The revised instruction should be issued during 1984.

Although DOD did not concur with our recommendation that the services be required to provide for O&M manuals in all military construction authorization documents for improving sewage treatment, its proposed revision to its instruction should fulfill the intent of our recommendation.

DOD believes that we generalized our findings and conclusions to the entire population of military bases with sewage treatment plants. Although most of the bases we visited had been unable to consistently meet NPDES permit requirements, we did not and cannot conclude that most DOD plants were in this situation. However, while we agree that our findings at 13 bases cannot be generalized to all 335 military sewage treatment plants, it should be noted that our sample was not subjectively chosen to illustrate problems. (See p. 5.)

DOD did not concur with our conclusion that the effectiveness of DOD sewage treatment plants is seriously impaired by O&M problems and that they continue to adversely affect plant operations because DOD has not always provided adequate specific guidance to the plant operators to insure proper plant operation. DOD stated they thought our implication that most DOD sewage treatment plants were not in compliance was seriously in

error. DOD acknowledged that there are some O&M deficiencies at isolated sewage treatment plants and that specific guidance may be needed for some plant operations at some locations.

We agree that the O&M deficiencies we observed in our sample can not be projected to all DOD bases. It should be noted, however, that when we started our review we asked DOD to point out some of their best plants and we included two of these, Quantico MCB and Whidbey Island NAS, in our sample. We found severe O&M problems at one and some minor problems at the other.

DOD stated in its comments that it had received only 8 notices of violations at 335 permitted installations in 1982. During 1982 EPA only inspected 74 of the 335 DOD bases, and of these, 13 were done at GAO's request.

According to EPA officials, once an inspection is made and the base is found to be discharging pollutants in excess of its permit parameters or there are other permit violations, it is standard EPA operating procedure that the EPA regional office staffs work with the bases to solve the problems informally. If the informal process does not work, the next step is for EPA to give the base a notice of non-compliance. With a notice of non-compliance, EPA works with the base to reach an agreement about how the problem causing non-compliance is to be solved. If agreement cannot be reached at this point, the next step is for EPA or the state to enter into a compliance agreement which outlines the steps and timeframe for DOD to solve a problem at a base. If this does not work, then EPA takes a "step of last resort" and issues a notice of violation. However, EPA has decided not to issue notices of violation to federal agencies unless it is a very extreme case warranting the resources to build a court case.

We agree with DOD's observation that it has made a substantial effort to train a large number of people. DOD pointed out that 632 DOD civilian wastewater treatment plant operators require operator certification by the states in which they work; while, in fact, 751 operators possess state certification. While this suggests that DOD operators are qualified at higher levels than required, it does not mean that such personnel are working at all of those bases requiring certified operators. Six of the thirteen bases we visited did not have properly certified operators. In addition, at one base the three operators who had certificates were not assigned to the sewage treatment plant on a full time basis. A major portion of their time was spent inspecting pump stations. At another base, the certified operator spent about 25 percent of his time at other required duties.

EPA, in its comments (see app. III.), pointed out that our draft report did not address all forms of water pollution at DOD

installations. Because we only discuss discharges from sewage treatment plants, they suggested we revise the report title, which we did.

EPA also stated that in view of the continuing noncompliance of DOD operated facilities, it will consider the institution of administrative actions, including the possible renegotiation of the EPA/DOD Memorandum of Understanding, to obtain NPDES compliance in line with that required of non-governmental permittees.

SUMMARY OF PREVIOUS EVALUATIONS  
AND CORRECTIVE ACTIONS TAKEN

<u>Site</u>	<u>Evaluated by</u>	<u>Date</u>	<u>Problems noted</u>	<u>Corrected before GAO visit</u>
Fort Carson	AEHA <sup>a/</sup>	10-76	6	2
	AEHA	11-77	3	1
	EPA	12-80	13	6
	AEHA	6-81	6	4
	EPA	8-82	8	0
	EPA	8-82	3	1
Fort Dix	AEHA	5-77	5	4
	EPA	9-77	8	3
	New Jersey	5-79	9	3
	EPA	4-80	6	2
	AEHA	5-80	10	3
	New Jersey	3-81	16	4
Fort Polk	AEHA	1-81	2	2
	EPA	5-81	9	3
	AEHA	4-82	5	5
Redstone Arsenal	Alabama	9-80	8	2
	AEHA	11-80	6	3
	Alabama	11-81	13	5
Vint Hill Farms	EPA	10-79	0	0
	Virginia	1-80	6	6
	Virginia	5-80	0	0
	Virginia	11-80	8	3
	AEHA	3-81	6	6
	AEHA	2-82	48	22
	Virginia	3-82	9	3
NOS, Indian Head	Maryland	3-79	8	4
	NAVFAC <sup>b/</sup>	9-79	1	0
Pensacola NAS	Florida	11-79	4	0
	Florida	3-81	1	0
	Florida	11-81	2	0
Quantico MCB	NAVFAC	6-78	5	3
	Virginia	8-80	12	3
	Virginia	10-81	1	0
	NAVFAC	10-81	5	0
	Virginia	3-82	7	4

<sup>a/</sup>Army Environmental Hygiene Agency

<sup>b/</sup>Naval Facilities Engineering Command

SUMMARY OF PREVIOUS EVALUATIONS  
AND CORRECTIVE ACTIONS TAKEN

<u>Site</u>	<u>Evaluated by</u>	<u>Date</u>	<u>Problems noted</u>	<u>Corrected before GAO visit</u>
Whidbey Island NAS	EPA	1-78	0	0
McGuire AFB	EPA	11-76	7	4
	New Jersey	11-78	14	10
	New Jersey	4-79	18	8
	New Jersey	7-79	18	5
	Air Force	7-79	4	0
	Air Force	3-81	14	5
Robins AFB	EPA	4-81	6	3
	Georgia	9-81	4	1
K.I. Sawyer AFB	Air Force	10-80	6	4
	Michigan	10-81	1	0
	Michigan	3-82	8	4
Tyndall AFB	EPA	11-76	1	1
	Florida	1-82	1	1



## ASSISTANT SECRETARY OF DEFENSE

WASHINGTON, D.C. 20301

MANPOWER,  
RESERVE AFFAIRS  
AND LOGISTICS

25 AUG 1983

Mr. Frank C. Conahan  
Director, National Security and  
International Affairs Division  
U.S. General Accounting Office  
Washington, DC 20548

Dear Mr. Conahan:

This is to forward Department of Defense (DoD) comments on the GAO draft report entitled "DoD Has Made Progress In Controlling Water Pollution, But Further Improvements Are Needed" (Code 945604, OSD Case #6280). The comments reflect the concerns expressed in our meeting with GAO representatives on August 8, 1983.

We agree that DoD has made significant progress during the past 5 years to control water pollution; and we agree that further improvements are both possible and necessary. We believe that improvements to the design and construction process can be made, and that the opportunity exists to upgrade operations and maintenance at DoD wastewater treatment plants.

We are concerned that the draft report unfairly portrays the compliance status of the majority of DoD wastewater plants. Further, we believe adequate documentation already exists to show why specific wastewater treatment alternatives were selected in most cases.

The enclosure provides specific comments on each finding, conclusion, and recommendation.

We appreciate the opportunity to comment on the GAO study on wastewater treatment.

Sincerely,

Jerry L. Calhoun  
ACTG Assistant Secretary of Defense  
(Manpower, Reserve Affairs & Logistics)

Enclosure

GAO DRAFT REPORT, DATED JUNE 15, 1983  
 (GAO CODE NO. 945604) OSD CASE NO. 6280

**"DOD HAS MADE PROGRESS IN CONTROLLING WATER  
 POLLUTION, BUT FURTHER IMPROVEMENTS ARE NEEDED"**

**FINDINGS**

**FINDING A: DoD's Efforts to Improve Its Wastewater Treatment Plants Have Not Been Fully Successful.** GAO found that, although DOD has made great strides in attempting to improve wastewater treatment, problems still exist that degrade the effectiveness of these efforts. GAO further found that, DOD (1) has spent \$1.16 billion to improve its facilities or for connections to civilian systems in FYs 1976 through 1981, (2) has identified 282 bases that still need 678 projects to improve their wastewater treatment, and (3) has about 560 major plants in the U.S. that are subject to Federal, State, interstate, and local water quality standards and effluent limitations. (GAO noted deficiencies in DOD's wastewater treatment in two prior GAO reports: (1) 1976 Report--LCD-76-312. GAO found that many DOD facilities did not meet water quality standards and DOD had not taken adequate measures to insure compliance by July 1, 1977--made several recommendations for necessary controls and (2) 1978 Report--LCD-77-359. GAO found that 7 out of 16 military bases chose between upgrading an on base treatment plant and joining a civilian system without analyzing the relative costs and benefits of the alternatives--recommended that DoD provide guidance on how to consider and compare the costs of each alternative. GAO further noted that the objective of the Federal Water Pollution Act Amendments of 1972 was to restore and maintain the chemical, physical, and biological integrity of the Nation's waters with the goal of eliminating the discharge of pollutants into navigable waters of the U.S. by 1985.) (p.i, Digest, pp. 1, 2, 3, and 6 GAO Report)

**DoD Response:**

- (1) **Position:** Concur
- (2) **Comment:** It should be noted that as the Environmental Protection Agency, and state and local governments continue to promulgate new and increasingly stringent water pollution control regulations, DoD will continue to identify additional water pollution control project needs.

**FINDING B: Analysis of Alternatives For Upgrading Wastewater Treatment Plants Needs Improvement.** GAO found that, in determining whether treatment plants should be altered, replaced and or tied into regional systems, the Services did not accept the conclusions and recommendations of some analyses done in support of needed water treatment improvements. For example, for two of the bases that obtained a feasibility study, treatment systems different from the recommended alternatives were approved; i.e., (1) In 1981, the Air Force rejected the treatment method recommended by the architect/engineer (A/E) for Tyndall Air Force Base, selecting an alternative which did not appear cost effective and could have impacted on future compliance. The A/E firm had recommended that Tyndall continue to provide secondary treatment and construct a force main to discharge the effluent into the regional system-- this course of action was not followed by Tyndall officials as they questioned the cost

estimates, although, they did not invalidate the firms' cost estimates or develop new costs; (2) The Redstone Arsenal officials rejected joining the Huntsville municipal treatment system as a solution for wastewater treatment problems, therefore, this alternative was not considered in the feasibility study. The Army does not know if they selected the most cost effective solution as they eliminated an alternative, and, in addition, did not select the most cost-effective solution alternative recommended in the feasibility study--instead choosing to upgrade three of the existing plants without justifying their rejection of the A/E firms' recommendation. (pp. ii, iii, Digest, pp. 6-11, GAO Report)

DoD Response:

- (1) Position: Partially concur
- (2) Comment: DoD concurs in GAO's finding that there are improvements possible in documenting the analyses of alternatives for upgrading wastewater treatment plants. DoD does not concur in all specific examples cited to illustrate this finding. There are substantial errors in the GAO analysis of the Naval Air Station, Pensacola, Florida, and the Redstone Arsenal, Alabama. GAO was provided with written backup on these issues.

FINDING C: Many Upgraded Wastewater Treatment Plants Are Not Operating Effectively. GAO found that, although 11 of the 13 wastewater treatment plants visited have undergone major upgrades since the mid-seventies, because of design deficiencies many of these plants are not operating effectively, and therefore are not meeting the wastewater treatment levels expected. GAO further found that design deficiencies resulted from many causes; i.e., limited state of the art, insufficient monitoring and analysis of conditions prior to plant design, time and funding constraints, and sometimes a combination of factors not easily discernible. (GAO noted several examples of wastewater treatment plants with design deficiencies to include: (1) Tyndall Air Force Base's secondary treatment plant has had serious discharge problems for many years and as a result of a study it was decided to have a spray irrigation project built on base at a cost of \$1.1 million. However, the spray irrigation field has had serious ponding problems due to the poor design of the spray irrigation system. The soil analysis had serious flaws for the Army Corps of Engineers failed to realize several important considerations/constraints. (2) Quantico Marine Corps Base's wastewater treatment plant cannot consistently meet effluent permit standards--improvements costing \$3.8 million were added between 1975 and 1977. The problem is attributed to a deficient design as a result of funding and time constraints. Since the plant became operational, it has not been able to meet the state and EPA permit requirements because of intermittent but continuous hydraulic overloading which has resulted in degraded biological action, chemical processes, and solids collection. This is the result of deletion of the flow equalization basin and grit removal chamber during contract award. (GAO noted additional plants, with similar design deficiencies, that make it difficult to meet EPA and/or state water quality standards at: Fort Polk, Robins Air Force Base, R.I. Sawyer Air Force Base, Redstone Arsenal, Fort Dix, and Fort Carson.) (pp. 11-15, GAO Report)

**DOD Response:**

- (1) **Position:** Concur
- (2) **Comment:** However, DoD believes the case of Marine Corps Base, Quantico, Virginia, illustrates a real situation which has no simple, practical answer.

The Marine Corps Base, Quantico, wastewater treatment plant was unquestionably needed to reduce pollution discharged to the Potomac River. The State and EPA were pressing the Navy and Marine Corps for a rapid solution. It was determined during design that the amount of military construction funds programmed were inadequate to meet 100% of the requirements, the Navy and Marine Corps were faced with the dilemma of constructing partial facilities that would do about 80% of the water pollution control job, or do nothing in that program year, but seek additional funds in a subsequent fiscal year program. The partial solution was chosen, and under the circumstances, is believed to have been the best course of action. The final objective will be achieved through construction of a flow equalization basin and grit removal facilities, now under consideration for the Fiscal Year 1986 military construction program.

DoD also believes that GAO's discussion of design problems at Fort Polk, Louisiana, is not complete and is therefore inaccurate. The comments made regarding the Fort Worth District, Army Corps of Engineers do not reflect consultations held between officials at EPA Region VI, the State of Louisiana, Fort Polk, and the Office of the Chief of Engineers (U.S. Army), that the proposed solution is the least costly way to recover a usable facility able to meet effluent standards.

**FINDING D: Construction Problems Reduce Wastewater Treatment Plant Efficiency and Increase Costs.** GAO found that construction problems at seven military bases have degraded plant operations and increased Government costs. GAO further found that, although DoD and the Services have regulations in place to ensure quality construction, many construction problems, resulted from (1) poor quality control and (2) the Services lack of initiative in holding the responsible parties liable. (GAO noted several examples to include: (1) At Fort Dix, a construction contractor used duct tape for joints on sludge pipes going from the primary clarifiers to a sludge collection tank--resulting in untreated sludge permeating the soil and rising to the surface. (2) At Robins Air Force Base, a construction contractor poured inadequate foundations which resulted in a serious leak, a rotary kiln is not operational because the wrong type bricks were used, and media (crushed rock) was used in the trickling filters which did not meet design specifications). (pp. 15-17 GAO Report)

**DOD Response:**

- (1) **Position:** Concur
- (2) **Comment:** It is noted that the construction defects mentioned in the GAO report have either been corrected or are planned for correction.

**FINDING E: Most DoD Plants Have Been Unable to Consistently Meet National Pollutant Discharge Elimination System (Discharge) Permit Requirements.** GAO found that, although DoD has spent \$1.16 billion from 1976-1981 to improve its plants, most of the DoD plants visited; i.e., 11 of 13, have been unable to consistently meet discharge permit requirements for a number of years. GAO further found that the cause of continued non-compliance is not just one but a combination of problems (see Findings F-J). (GAO noted the affected bases were notified of the permit violations and that the number of instances and severity of the violations varied from base to base. GAO further noted that the discharge permit is the principal tool used in water quality enforcement and any violation of permit conditions is a violation of law.) (p. lli, Digest, p. 22 GAO Report)

**DoD Response:**

- (1) **Position:** Non-concur
- (2) **Comment:** The GAO finding was based on an evaluation of 13 DoD wastewater treatment plants. GAO admits this was not a statistically valid sampling of DoD installations but was subjectively chosen to illustrate problems. In fact, there are 335 DoD installations with National Pollutant Discharge Elimination System (NPDES) permits. As noted elsewhere in the DoD response, during 1982 there were only 8 notices of violation received. If GAO had evaluated a statistically significant sample of DoD wastewater treatment plants, and found the same result, then GAO's findings would be warranted. However, DoD does not believe that is the case.

**FINDING F: DoD Has Not Provided Specific Guidance To Assure Adequate Operation Maintenance (O&M) And Permit Compliance.** GAO found that, for 9 of the 13 bases visited, adequate guidance had not been received from DoD on how to operate and maintain their plants in order to consistently meet permit requirements. GAO further found that base officials felt that (1) the only type of direction given was the periodic and sometimes infrequent O&M inspections, and (2) while such inspections were helpful they did not provide the specific guidance needed to assure adequate O&M for the entire plant. (GAO noted several examples at Robins Air Force Base, Fort Polk, Fort Carson and the Naval Ordnance Station where basically there was only general, informal guidance but no DoD direction that specifically applied to these plants.) (pp. 22-24, GAO Report)

DoD Response:

(1) Position: Concur

FINDING G: Inconsistent Action to Correct Problems Found By DoD, EPA, and State Environmental Engineers. GAO found that, although most evaluations made by environmental teams from the three Services, EPA, State agencies, and consulting engineers were extensive and identified many similar problems, the action taken varied from base to base. GAO further found that (1) if plant officials had acted on the recommendations made, plant efficiency would have increased, (2) problems ranged in complexity from those correctible at the base level (little costs) to those requiring action by the Service or DoD headquarters (could require military construction funds), (3) some bases had made substantial plant improvements by responding to the environmental teams' recommendations, others had not; i.e., at Fort Dix only 19 of 54 problems found had been corrected and the base continued to violate conditions of its discharge permit, (4) with each service some environmental teams make evaluations as requested while other groups make evaluations according to a schedule, (5) there is no formal means to require the base to reply to the recommendations and/or insure that the bases take any follow-up action. (GAO noted that, they were informed by sewage plant operators and base officials responsible for operating treatment plants, they have not been responsive to the evaluator's recommendations due to lack of funds. However, GAO further noted that some recommendations dealt with operational changes that did not require funds--even these recommendations were not always implemented.) (pp. 24-25, GAO Report)

DoD Response:

(1) Position: Concur

FINDING H: Equipment Deficiencies Have Prevented Plants From Achieving Designed Capabilities. GAO found that several treatment plants were experiencing operational and permit compliance problems caused by equipment failures; i.e., at Sawyer Air Force Base, all plant instrumentation was not functional for adequate flow pacing because of a design problem; at Fort Polk, 1 of 2 augers for grit removal were down because of design problems and lack of parts. GAO further found that various reasons for the equipment problems existed that included, (1) low bid contractors often must install inexpensive and sometimes inferior equipment items in order to make a profit, and (2) construction contractors' claim that deficient designs lead to equipment problems. (pp. 25-26, GAO Report)

DoD Response:

- (1) Position: Concur

**FINDING I: Infiltration Problems Have Overloaded Plant Capabilities.** GAO found that, although DoD has made many improvements in order to correct infiltration and inflow problems, 12 of the 13 bases reviewed still have minor to severe infiltration which in turn leads to other operational problems and violations of some discharge permits. (GAO noted examples of infiltration problems at several locations including (1) Vint Hill Farms Station, that has had numerous repair projects to correct its inflow and infiltration problems, yet still incurs high flows during wet weather and (2) Redstone Arsenal, that in 1979 upgraded its largest treatment plant to a capacity of 6.5 million gallons per day although the plants average daily flow is 1.6 million gallons--the excess capacity is planned to provide additional holding time. GAO noted that infiltration occurs when ground water enters a sewer system through means such as defective pipes, pipe joints, etc., while inflow is caused by water discharged into a sewer system from sources such as roof leaders, cellar, yard, and foundation drains, etc.) (p. 27, GAO Report)

DoD Response:

- (1) Position: Concur
- (2) Comment: It is noted that DoD's experience with infiltration and inflow (I&I) problems is typical of that experienced throughout the United States. The Army Corps of Engineers has published Technical Note No. 10, "Current Sewer System Infiltration and Inflow Management Techniques and Requirements for Excessive Flow Detection, Analysis and Correction," April 27, 1982, to assist installations in I&I studies.

**FINDING J: Although DoD Has Funded Various O&M and Construction Projects, Continuing Operation and Maintenance Problems Hinder Plant Performance.** GAO found that O&M deficiencies still exist which hurt plant effectiveness and have contributed to discharge permit compliance problems. GAO further found that operation and maintenance problems are frequently caused by, (1) an insufficient number of qualified personnel to operate the plant--in 1982, 8 of the 13 plants visited were understaffed and/or the plant personnel needed training, (2) inadequate maintenance programs--9 of the 13 plants visited did not keep a sufficient spare parts inventory, so that when breakdowns occurred, lengthy periods with inoperable equipment were experienced, and (3) deficiencies in laboratory equipment and procedures--tests required by permit were not made at eight plants due to lack of equipment (either obsolete or defective) or because an inexperienced operator did not know how to make the test, therefore, these plants could not determine whether pollution limitations for parameters were being met. (GAO noted that satisfactory O&M is critical to a plants performance and proper O&M practices are essential for

the achievement of the efficient operation of waste treatment plants. GAO further noted (1) examples of deficiencies in either the quantity or qualification of the operating staff at Robins Air Force Base--where they were informed that most operators were either totally inexperienced, poorly educated or untrainable; other examples were noted at Indian Head Naval Ordnance Station and McGuire Air Force Base, (2) an example of a base with inoperable equipment, was noted at K.I. Sawyer Air Force Base, where two comminutors, the centrifuge field pumps and sections of the final clarifier were all out of service for lack of parts, and (3) deficiencies in laboratory equipment and examples of deficiencies in procedures were noted at several bases; i.e., at Tyndall Air Force Base technicians did not have good quality control programs nor did they conduct duplicate tests or use reference standards.) (pp. 28-32, GAO Report)

DOD Response:

- (1) Position: Concur
- (2) Comment: However, it is noted that the wastewater treatment plant operator staffing Naval Ordnance Station, Indian Head, Maryland is adequate, when all appropriate circumstances are considered (size and nature of plants; completion of a construction project).

CONCLUSIONS

CONCLUSION 1: GAO concluded that since the mid-seventies, DoD has made a great effort to improve its wastewater treatment plants by working closely with regulatory agencies to determine what improvements are needed to meet compliance requirements and then by spending \$1.16 billion to upgrade or build new treatment systems. (p. 17, GAO Report)

DoD Response:

- (1) Position: Concur
- (2) Comment: DoD has made a major effort to bring all of its installations in full compliance with applicable water quality standards and National Pollutant Discharge Elimination System (permit) limits as quickly as possible.

CONCLUSIONS 2: GAO concluded that DoD's effort to improve its wastewater treatment plants have not been fully successful because (1) the Services have not always selected the most effective treatment methods available, and (2) the upgrades and modifications built often have serious design and construction flaws that degrade plant efficiency. (p. 17, GAO Report)

DoD Response:

- (1) Position: Concur

CONCLUSIONS 3: GAO concluded that, although the Services hired A/E firms to evaluate all feasible wastewater treatment alternatives and identify the most cost effective treatment methods available, feasible alternatives such as tie-ins with regional systems were sometimes excluded from the studies, although DoD policy requires the Services to evaluate that alternative. (p. 17, GAO Report)

DoD Response:

- (1) Position: Non-concur
- (2) Comment: Military Construction project documentation (such as the DD Form 1391's series) already requires a presentation of alternatives. In the case of wastewater treatment plant construction, the alternative of connection to a municipal system is always addressed. However, this alternative is not always given detailed consideration in those instances where preliminary consideration has shown that municipal connections are impractical or infeasible. They may be infeasible if they are not available, have inadequate capacity, or are not compatible with DoD wastewater characteristics. These and other factors, such as planned changes in DoD installation mission, are not always apparent to outside architect-engineers who perform cost or feasibility studies.

**CONCLUSION 4:** GAO concluded that the Services sometimes reject, with little or no justification, the conclusions and recommendations of studies which then become costly and a waste of Government funds. ( p. 17, GAO Report)

**DoD Response:**

- (1) **Position:** Partially concur
- (2) **Comment:** While DoD agrees that in retrospect there may be occasional instances where the GAO conclusion may be true, we believe good management systems are now in place to assure that all reasonable and feasible alternatives are addressed in future projects.

**CONCLUSION 5:** GAO concluded the Services are not properly reviewing the technical feasibility of plant designs nor are they adequately ensuring quality control during construction. ( p. 17, GAO Report)

**DoD Response:**

- (1) **Position:** Concur

**CONCLUSION 6:** GAO concluded that, although deficient designs and construction problems are easily identifiable when plant upgrades do not perform as intended, identifying accountability and responsibilities for repairs is very difficult. DoD could use a construction contracting procedure that would enable it to hold one contractor responsible for the total project. Two possible alternatives are the construction manager technique and the design/construction or turn-key concept. ( p. 17-18, GAO Report)

**DoD Response:**

- (1) **Position:** Partially concur
- (2) **Comment:** Although deficiencies are spotlighted when a wastewater treatment plant does not perform as intended, DoD does not concur in GAO's suggestion that this problem may be solved by holding a single party responsible. A single private construction manager would have limited authority under existing Defense Acquisition Regulations, and would probably be more costly than using a designated DoD construction agent (The Army Corps of Engineers or the Naval Facilities Engineering Command) as the construction manager.

A turn-key contract requires an up-front investment by bidders and therefore tends to reduce competition. Many DoD wastewater treatment plants have been designed, constructed, and operated successfully using the conventional design-bid-build technique.

DoD believes that problems cited by the GAO under Conclusion 6 can best be corrected by assuring that the DoD construction agents select the most competent architect/engineer (A/E) design firms, improve design reviews, and improve construction quality assurance.

See also the DoD response to Recommendation 3.

**CONCLUSION 7:** GAO concluded that the effectiveness of DoD wastewater treatment plants is seriously impaired by O&M problems and they continue to adversely affect plant operations because DoD has not always provided adequate specific guidance to the plant operators to insure proper plant operation. (p. 32, GAO Report)

**DoD Response:**

- (1) **Position:** Partially concur
- (2) **Comment:** DoD acknowledges that there are some operations and maintenance deficiencies at isolated wastewater treatment plants, and that specific guidance may be needed for some plant operations at some locations. However, GAO's implication that most DoD wastewater treatment plants are not in compliance is seriously in error. According to the December 31, 1982 DoD environmental management-by-objectives report, there were 8 notices of violation at wastewater treatment plants during 1982 for all DoD, which includes 335 installations with National Pollutant Discharge Elimination System permits and 1,454 individual permitted discharges. Operator training and certification of wastewater treatment plant operators continues to receive a high priority from the military services, as evidenced by the fact that 632 DoD civilian wastewater treatment plant operators require operator certification by the states in which they work; while, in fact, 751 DoD civilian operators possess state certification. This indicates DoD operators are qualified at a higher level than required.

**CONCLUSION 8:** GAO concluded that inadequate staffing, infiltration and inflow, deficiencies in laboratory equipment and procedures and equipment deficiencies also continue to affect proper plant operations. In addition, GAO concluded that almost half of the bases do not have a preventative maintenance program or an adequate space parts inventory. (p. 32, GAO Report)

**DoD Reponse:**

- (1) **Position:** Concur

**CONCLUSION 9:** GAO concluded that, although various environmental organizations have evaluated or inspected base wastewater treatment plants and their operation and have made recommendations for improvement, corrective actions have not always been taken to solve the identified problems and in those cases where little has been done the plant effectiveness has been adversely affected. (p. 32, GAO Report)

**DOD Reponse:**

(1) **Position:** Concur

**CONCLUSION 10:** GAO concluded that greater emphasis needs to be placed on the importance of wastewater treatment, especially at the installation level and until such time as the DOD, its Services and bases place a higher priority on O&M, in terms of both staffing and resources, the problems noted will continue to detrimentally affect the high capital investment that has made and is continuing to be made. (p. 32, GAO Report)

**DOD Response:**

(1) **Position:** Concur

**CONCLUSION 11:** GAO concluded that unless the facilities are properly operated and maintained, it is unlikely that its wastewater treatment plants will perform well, consistently and comply with permit requirements. (p. 32, GAO Report)

**DOD Response:**

(1) **Position:** Concur

RECOMMENDATIONS

RECOMMENDATION 1: GAO recommended that the Secretary of Defense ensure that the Services comply with DoD policy by carefully evaluating all feasible treatment alternatives, including regional or municipal tie-ins. (p. 18, GAO Report)

DoD Response:

- (1) Position: Concur
- (2) Comment: DoD will review current Service guidance, and if necessary, will revise existing DoD Instruction 4120.14, August 30, 1977, Subject: Environmental Pollution Prevention, Control and Abatement, to incorporate the GAO recommendation to ensure that the services carefully evaluate all feasible wastewater treatment alternatives.

RECOMMENDATION 2: GAO recommended that the Secretary of Defense require the Services to provide written justifications supporting the selection of wastewater treatment alternatives that differ from those recommended by cost-effective studies. (p. 18, GAO Report)

DoD Response:

- (1) Position: Concur
- (2) Comment: The DoD will revise existing DoD Instruction 4120.14, August 30, 1977, Subject: Environmental Pollution Prevention, Control and Abatement, to incorporate the GAO recommendation to strengthen existing DoD policy requiring written justifications to support selection of wastewater treatment alternatives that differ from those recommended by cost-effectiveness studies. DoD will issue the revised instruction during 1984.

RECOMMENDATION 3: GAO recommended that the Secretary of Defense make one party responsible under contract for planning, designing, and constructing a treatment plant and for demonstrating, with plant operators, that the plant will meet the discharge permit requirements before turning the plant over to the Services for operation. (p. 18, GAO Report)

DoD Response:

- (1) Position: Non-concur
- (2) Comment: DoD does not agree that one party must be responsible for cradle-to-grave planning, designing, constructing and start-up operation of DoD wastewater treatment plants. This is because the installation engineer is in the best position to determine his needs for wastewater treatment, considering such factors as the installation's mission and applicable water quality standards. The installation engineer can best develop basic improvement plans or new construction plans.

The DoD construction agents (the Army Corps of Engineers and the Naval Facilities Engineering Command) have the professional capability and experience necessary to manage the design and construction of many complex projects, including wastewater treatment plants. The individual installation engineer normally does not have this capability.

The design architect/engineer, (A/E) should be required to assign an engineer to assist the DoD construction agent for the wastewater treatment plant project until the plant is fully operational, and meets required work quality discharge standards. Plant start-up, development of operations and maintenance manuals, and training of operators can be accomplished by requiring A/E assistance during construction.

DoD will revise existing DoDI 4120.14 to reemphasize this latter point during 1984.

**RECOMMENDATION 4:** GAO recommended that the Secretary of Defense direct and assist, as necessary, the Services to provide more specific guidance to their installations on how to assure adequate plant operation and maintenance in order to be in compliance with permit requirements. (p. 32, GAO Report)

**DoD Response:**

- (1) **Position:** Concur
- (2) **Comment:** DoD will revise existing DoD Instruction 4120.14, August 30, 1977, Subject: Environmental Pollution Prevention, Control and Abatement, to incorporate the GAO recommendation to require the Services to provide for specific operations and maintenance guidance to individual installations wastewater treatment plants. DoD will issue the revised instruction during 1984.

**RECOMMENDATION 5:** GAO recommended that the Secretary of Defense require the Service Secretaries to establish some formal means of assuring that deficiencies identified at wastewater treatment plants are followed up and corrected in a timely manner. (p. 32, GAO Report)

**DoD Response:**

- (1) **Position:** Concur
- (2) **Comment:** DoD will revise existing DoD Instruction 4120.14, August 30, 1977, Subject: Environmental Pollution Prevention, Control and Abatement, to incorporate the GAO recommendation to require some formal means of assuring that deficiencies identified at wastewater treatment plants are followed up and corrected in a timely manner. DoD will issue the revised instruction during 1984.

**RECOMMENDATION 6:** GAO recommended that the Secretary of Defense revise DoD and Service regulations to require that a provision be included in all military construction authorization documents (1391's) for improving wastewater treatment that O&M manuals will be provided under contract. (p. 33, GAO Report)

**DoD Response:**

- (1) **Position:** Partially Concur
- (2) **Comment:** DoD will revise existing DoD Instruction 4120.14, August 30, 1977, Subject: Environmental Pollution Prevention, Control and Abatement, to incorporate the GAO recommendation to require that O&M manuals shall be provided under contract when a wastewater treatment plants is built, or a major upgrade occurs. However, DoD does not concur that the DD Form 1391 documentation (a financial planning document) is the best form to accomplish this. DoD will issue the revised instruction during 1984.

**RECOMMENDATION 7:** GAO recommended that the Secretary of Defense work with the Office of Personnel Management to revise the staffing guidelines for wastewater treatment plants because of the ever increasing complexity of the treatment plants and processes. (p. 33, GAO Report)

**DoD Response:**

- (1) **Position:** Concur
- (2) **Comment:** DoD will initiate formal discussions with the Office of Personnel Management to revise existing staffing guidelines for wastewater treatment plants before the end of 1983.



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

20

OFFICE OF  
POLICY AND RESOURCE MANAGEMENT

Mr. J. Dexter Peach  
Director  
Resources, Community and  
Economic Development Division  
U. S. General Accounting Office  
Washington, D.C. 20548

Dear Mr. Peach:

The Environmental Protection Agency (EPA) has reviewed the General Accounting Office (GAO) draft report entitled "DOD Has Made Progress In Controlling Water Pollution, But Further Improvements Are Needed." In accordance with Public Law 96-226, EPA has prepared the following comments on the draft report.

Though the title indicates that the report covers all sources of 'water pollution', the report reviews only the status of compliance at sanitary wastewater treatment facilities. The report does not address the water pollution problems due to point source discharges from industrial operations or from spills and other non-point source discharges on Department of Defense (DOD) facilities. In addition, the report does not discuss the related matter of adherence to Safe Drinking Water Act requirements. A reconsideration of the report's title is therefore warranted. In addition, the Agency recommends that GAO undertake further studies to evaluate the adequacy of DOD's efforts to alleviate these additional sources of water pollution and to protect the public health.

The report concludes that, though improvements have been made, a large percentage of DOD facilities continue to violate National Pollution Discharge Elimination System (NPDES) requirements. To alleviate this situation, the report offers recommendations which are substantially the same as those offered in GAO's 1977 and 1978 reports on the subject.

In view of the continuing noncompliance of DOD operated facilities, EPA will consider the institution of administrative actions, including the possible renegotiation of the EPA/DOD Memorandum of Understanding (MOU), to obtain NPDES compliance in line with that required of nongovernmental permittees.

We appreciate the opportunity to review this GAO draft report prior to final publication.

Sincerely yours,



John M. Campbell  
Acting Associate Administrator  
for Policy and Resource Management

(945604)



27369

**AN EQUAL OPPORTUNITY EMPLOYER**

**UNITED STATES  
GENERAL ACCOUNTING OFFICE  
WASHINGTON, D.C. 20548**

**OFFICIAL BUSINESS  
PENALTY FOR PRIVATE USE, \$300**

**POSTAGE AND FEES PAID  
U. S. GENERAL ACCOUNTING OFFICE**



**THIRD CLASS**