

DOCUMENT RESUME

02464 - [A1612593]

Improving Military Solid Waste Management: Economic and Environmental Benefits. LCD-76-J45; B-166506. June 2, 1977. 32 pp. + 5 appendices (11 pp.).

Report to the Congress; by Elmer B. Staats, Comptroller General.

Issue Area: Facilities and Material Management: Operation and Maintenance of Facilities (708); Materials: Renewing Resources (1810); Environmental Protection Programs: Solid Waste Disposal and Resource Recovery (2206).

Contact: Logistics and Communications Div.

Budget Function: National Defense: Department of Defense - Military (except procurement & contracts) (051).

Organization Concerned: Department of Defense; Environmental Protection Agency.

Congressional Relevance: House Committee on Armed Services; Senate Committee on Armed Services; Congress.

Authority: Resource Conservation and Recovery Act (90 Stat. 2795). Resource Recovery Act of 1970. Solid Waste Disposal Act of 1965. National Environmental Policy Act of 1970.

The Department of Defense (DOD) can save money and protect the environment by improving its solid waste management. **Findings/Conclusions:** DOD and other Federal agencies are responsible for the annual disposal of 32 million tons of solid waste. Low priority has been given solid waste management, and the absence of DOD deadlines for complying with the Environmental Protection Agency's guidelines contribute to the problem. There has been only minimal recovery of recyclable materials to date. As of June 1975, military installations recycled 4.2% of their waste material in FY 75, compared with the national average of 6%. There are both economic and environmental benefits related to energy recovery from solid waste. However, military management has been slow in recovery programs because most bases have sufficient landfill areas. **Recommendations:** The Secretary of Defense should publish guidance for determining whether and under what circumstances bases should initiate energy recovery programs; issue specifications to the services for preparing energy recovery systems proposals; and designate a focal point for reviewing such project proposals and establishing priorities for their funding. (Author/DJM)

02464 2599

REPORT TO THE CONGRESS

*BY THE COMPTROLLER GENERAL
OF THE UNITED STATES*

Improving Military Solid Waste Management: Economic And Environmental Benefits

Department of Defense

Local governments consider solid waste a major urban problem, but, with diminishing natural resources and increasing land and disposal costs, alternative uses for solid waste make it potentially valuable to the Nation.

Resource recovery legislation requires Federal agencies to comply with all Federal, State, and local laws. The Department of Defense and other Federal agencies are responsible for annual disposal of about 32 million tons of the 135 million tons of community and business waste. This report discusses how the Department is meeting its responsibilities in disposing of solid wastes.

LCD-76-345

THIS REPORT IS PRINTED ON RECYCLED PAPER

JUNE 2, 1977



COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-166506

To the President of the Senate and the
Speaker of the House of Representatives

This is our report on Department of Defense efforts to comply with the Resource Recovery Act of 1970 and the Environmental Protection Agency's implementing guidelines.

A previous report issued on October 26, 1972 (B-166506), also dealt with ways in which Federal agencies could exercise greater leadership in the nationwide effort to improve solid waste management practices.

We made the review pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53), and the Accounting and Auditing Act of 1950 (31 U.S.C. 67).

We are sending copies of this report to the Director, Office of Management and Budget; the Secretary of Defense; and the Administrator, Environmental Protection Agency.

A handwritten signature in black ink, reading "James B. Steeds".

Comptroller General
of the United States

COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

IMPROVING MILITARY SOLID WASTE
MANAGEMENT: ECONOMIC AND
ENVIRONMENTAL BENEFITS
Department of Defense

D I G E S T

The Department of Defense can save money and better protect the environment by improving its solid waste management. In this report GAO recommends steps toward reduced pollution, higher land use, and greater energy recovery. The Department has programs in progress to accomplish the recommendations.

STATUS OF POLLUTION CONTROLS

Although the military services have reduced pollution by eliminating most open burning and dumps, more stringent controls over on- and off-base landfills are needed to keep track of landfill uses and to prevent leaching into ground and surface water.

The low priority given solid waste management and the absence of Department of Defense deadlines for complying with Environmental Protection Agency guidelines have contributed to the problems. The Department's October 1976 directive established compliance deadlines.

For better leadership in solid waste management, the Secretary of Defense should require the service Secretaries to establish periodic environmental team inspections of installation disposal practices and prescribe enforcement procedures for correcting reported violations.

The Department said that the services' procedures provide for inspections above the installation level and appropriate followup to correct deficiencies.

A Defense official told GAO that the services are drafting regulations implementing the October 1976 directive, including procedures to insure correction of identified deficiencies. (See p. 15.)

MINIMAL RECOVERY OF RECYCLABLE MATERIALS

Recycling of waste materials can produce benefits in lower disposal costs, conservation of natural resources, and reduced pollution. As of June 1975, Defense records showed that installations recycled 4.2 percent of their waste materials in fiscal year 1975 compared with the national recycling average of about 6 percent.

The installations' recycling rate will start to improve during fiscal year 1977 as they begin compliance with Environmental Protection Agency's materials recovery and beverage container guidelines. (See p. 17.)

Competition with other installation activities for resources, inability to recover costs, and fluctuating markets for recyclable materials held back recycling programs.

GAO proposed that the Secretary of Defense require the Secretaries of the Army and Air Force to conduct surveys, as the Navy is doing, to decide on the conditions that make recycling programs practical and to determine each installation's potential for recycling materials from solid waste.

The Department said that its October 1976 directive will apply the Environmental Protection Agency guidelines Defense-wide, including the conduct of appropriate surveys. The directives's policy is designed to prevent competition with commercial recycling and requires participation in joint or regional civilian systems when possible in lieu of separate Defense systems.

The Department's current directive and its ongoing test of beverage container guidelines will improve the recycling of materials at its installations. (See p. 22.)

ENERGY RECOVERY FROM SOLID WASTE

The economic benefits of energy recovery from solid waste are the value of the energy produced, improved materials recovery by mechanical separation, and the savings in disposal

costs. The environmental benefits are the potential for decreasing air and water pollution and the reduced land area needed for disposal.

Service officials have been reluctant to begin recovery system projects partly because of technology problems but mainly because most bases have sufficient landfill areas available. (See p. 23.)

The Army has programed two energy recovery facilities, the Air Force one; the Navy, on the other hand, has built one facility, is constructing another, and has designed three others. (See pp. 26 and 27.)

Installations that considered such systems generally planned only for their own needs without considering joint or regional systems that may be more economical. Only the Navy issued some guidance for considering energy recovery, but the Navy could also improve coordination and review of the individual installations' plans for recovery systems. (See pp. 6 and 29.)

Defense can help insure that the most beneficial systems are considered by issuing guidance for feasibility studies and coordinating the requirements of the various installations.

The Secretary of Defense should:

- Publish guidance for determining whether and under what circumstances bases should initiate energy recovery projects.
- Issue specifications to the services for preparing energy recovery systems proposals.
- Designate a focal point for reviewing such project proposals and establishing priorities for their funding.

Although the Department commented on the prudence of installing several types of

energy recovery systems, it did not say whether it intended to take these actions. GAO believes that such action is necessary for an orderly and economic selection of energy recovery systems. (See p. 30.)

C o n t e n t s

		<u>Page</u>
DIGEST		i
CHAPTER		
1	ECONOMIC AND ENVIRONMENTAL BENEFITS OF RESOURCE RECOVERY	1
	Costs	2
2	LEGISLATION, POLICY, AND GUIDELINES	3
	Legislation	3
	EPA guidelines	4
	DOD policy and guidelines	5
3	EFFORTS TO CONTROL SOLID WASTE POLLUTION	7
	Status of pollution controls	7
	Program responsibilities decentralized	13
	Surveys and audits	14
	Conclusions	15
	Recommendation, agency comments, and our evaluation	15
4	MINIMAL RECOVERY OF RECYCLABLE MATERIALS	17
	Problems in recovery of recyclable materials	17
	Conclusions, agency comments, and our evaluation	22
5	ENERGY RECOVERY FROM SOLID WASTE--DOD CAN HELP	23
	Benefits of energy recovery systems	23
	Problems in recovery of energy from refuse	24
	Direction of effort by the services	25
	Conclusions	30
	Recommendations, agency comments, and our evaluation	30
6	SCOPE	32
APPENDIX		
I	Letter dated January 25, 1977, from the Assistant Administrator for Planning and Management, Environmental Protec- tion Agency	33

APPENDIX**Page**

II	Letter dated January 19, 1977, from the Assistant Secretary of Defense (Installations and Logistics)	34
III	Glossary on solid waste	40
IV	EPA analysis of 1974 postconsumer net solid waste	42
V	Principal officials responsible for administering activities discussed in this report	43

ABBREVIATIONS

DOD	Department of Defense
EPA	Environmental Protection Agency
GAO	General Accounting Office

CHAPTER 1

ECONOMIC AND ENVIRONMENTAL

BENEFITS OF RESOURCE RECOVERY

Local governments consider solid waste a major urban problem, but in today's environment of diminishing natural resources and increasing land and disposal costs, solid waste is potentially very valuable to the Nation. Solid waste consists of garbage, refuse, sludge, and other material discarded from industrial, commercial, and community activities. This report discusses postconsumer waste from administrative offices and community activity in the Department of Defense (DOD). Waste from administrative offices is generated from goods bought with public (appropriated) funds and, to some extent, private money; community activity waste is from goods bought with a person's own money.

In 1974, the year of latest available data, homes and businesses disposed of about 135 million tons of postconsumer waste. DOD and other Federal agencies are responsible for disposal of about 32 million tons of postconsumer waste annually.

An Environmental Protection Agency (EPA) analysis of such waste showed that over half is composed of recyclable items, such as paper, glass, steel, and aluminum. (See app. IV.) Benefits from recovery of such items include

- conservation of nonreplenishable resources, such as steel and aluminum;
- less land required for waste disposal landfills;
- fewer environmental problems with waste disposal in landfills;
- lower disposal costs; and
- energy savings from recycling used materials instead of producing new ones.

A major resource in solid waste is its value as fuel to produce energy. DOD is recovering too little of this energy at a time when fossil fuel costs are soaring and the future availability of sufficient fuel is in doubt. Also, Federal and private research has developed improved techniques and facilities for recovering energy from solid

waste, thereby widening opportunities for economically feasible recovery.

COSTS

The military construction funds appropriated for the control of pollution caused by solid waste, within the lump-sum authorizations for air and water pollution abatement, are as follows.

<u>Fiscal year</u>	<u>Army</u>	<u>Navy</u>	<u>Air Force</u>
	----- (millions) -----		
1974	\$ 2.6	\$ -	\$ -
1975	.1	1.8	.4
1976	5.3	2.9	1.5
1977	<u>6.7</u>	<u>.3</u>	<u>-</u>
Total	<u>\$14.7</u>	<u>\$5.0</u>	<u>\$1.9</u>

In addition the services plan to alter two oil-fired boilers, enabling them to burn refuse as fuel, and to install two new boilers to be fired with refuse and coal. The projects were funded under the fiscal year 1976 and 1977 energy conservation investment programs at a cost of \$8.7 million.

During fiscal years 1975 and 1976, the services spent about \$50 million and \$57 million, respectively, for trash collection and disposal in the continental United States.

CHAPTER 2

LEGISLATION, POLICY, AND GUIDELINES

LEGISLATION

The Solid Waste Disposal Act of 1965 was the first major Federal legislation to deal with the solid waste problem. The Resource Recovery Act of 1970 amended the Solid Waste Disposal Act to redirect waste management in urban areas from disposal to resource recovery and recycling.

The 1970 act and the President's reorganization plan of 1970 gave the Environmental Protection Agency the responsibility to take certain actions, such as to study resource recovery activities, make grants for recovery systems and improved disposal facilities, and develop guidelines for collection, separation, recovery, and disposal systems.

The National Environmental Policy Act, approved January 1, 1970, established a national policy for protecting the environment and further recognized that the Nation should make every effort to enhance the quality of renewable resources and maximize recycling of depletable resources.

The Resource Conservation and Recovery Act (90 Stat. 2795), approved on October 21, 1976, after our fieldwork was completed, further amended the Solid Waste Disposal Act. The objectives of the 1976 act are to promote the protection of health and the environment and to conserve valuable material and energy resources by

- providing technical and financial assistance to State and local governments and interstate agencies for the development of solid waste management plans;
- prohibiting future open dumping on the land and requiring the conversion of existing open dumps to facilities that do not pose a danger to the environment or to health;
- providing for the promulgation of guidelines for solid waste collection, transport, separation, recovery, and disposal practices and systems;
- promoting a national research and development program;

- promoting the demonstration, construction, and application of solid waste management, resource recovery, and resource conservation systems;
- establishing a cooperative effort among the Federal, State, and local governments and private enterprise to recover valuable materials and energy from solid waste;
- requiring Federal agencies to comply with all Federal, State, interstate, and local requirements, both substantive and procedural (including any requirement for permits or reporting); and
- requiring each procuring agency to procure items composed of the highest percentage of recovered materials practicable consistent with maintaining a satisfactory level of competition.

EPA GUIDELINES

In December 1973, to make certain that the Government provides leadership in pollution control, the President issued Executive Order 11752 on prevention, control, and abatement of environmental pollution at Federal facilities. This order requires Federal agencies to see that all facilities under their jurisdiction are designed, constructed, and operated so as to conform to EPA guidelines for solid waste recovery, collection, storage, separation, and disposal.

EPA issued guidelines for

- incinerating and landfilling waste that cannot be recovered beneficially (August 1974);
- the establishment and use by Federal agencies of source separation systems to conserve resources, reduce waste disposal, and produce high-value industrial raw materials (April 1976);
- resource recovery facilities, requiring agencies to determine within 1 year what actions will be taken to establish a resource recovery facility (September 1976); and
- beverage containers, requiring Federal facilities that sell beverages in containers to sell them in returnable containers and to charge a refundable

deposit of at least 5 cents on each refillable or nonrefillable container (September 1976).

Besides these guidelines, EPA has periodically published data on several technologies in various stages of development for recovering energy from solid waste.

DOD POLICY AND GUIDELINES

In May 1973 DOD stated its overall policy to

- comply with environmental laws, Executive orders, and regulations and
- demonstrate leadership in both abating environmental pollution and enhancing the environment, in ways that do not conflict with the security interests of the Nation.

More specifically, DOD's policy for solid waste is to (1) design, use, store, handle, and ultimately dispose of all materials so as to minimize the possibility of polluting the environment; (2) conserve resources; and (3) dispose of waste materials to the extent practicable by reprocessing, recycling, and reuse.

DOD assigned responsibility to the services for identifying environmental problems, taking necessary corrective measures, and implementing its policy guidance.

DOD Directive 6050.3 (November 19, 1974) set the following requirements for the military services in reprocessing, recycling, and disposing of solid waste.

- Quantities of solid and other waste shall be reduced at the source wherever possible.
- Solid and other waste materials shall be recovered and recycled.
- Joint or regional systems are encouraged when it will be advantageous to combine collection and/or processing facilities.
- Contracts for disposing of solid and other waste material shall include provisions for recycling whenever possible.

DOD Directive 4165.60 (October 4, 1976) supersedes the 1974 directive, incorporates the above provisions, and adds the following:

- Incorporates the EPA guidelines issued after the 1974 DOD directive was published.
- Expands on various management responsibilities.
- Outlines the procedures for using excess proceeds from the recycling program to fund environmental improvement and energy conservation projects.
- Provides for the net proceeds from the sale of commercial, residential, and institutional waste (includes high value paper and computer printouts and cards) to go to a base's recycling activity to help recover operating costs.
- Requires a base to establish or use resource recovery facilities to separate and recover materials or energy when that base generates 100 tons of waste or more each day.
- Requires bases located in large metropolitan areas to participate with other Federal facilities in a single regional resource recovery system including energy generation.
- Requires use of regional resource recovery systems whenever possible.

The Navy issued guidelines in August 1975 which provide a systematic approach for evaluating alternatives, including energy recovery, for disposing of solid waste at military installations. The other services do not have such guidelines.

CHAPTER 3

EFFORTS TO CONTROL SOLID WASTE POLLUTION

STATUS OF POLLUTION CONTROLS

By mid-1976, pollution control of solid waste disposal at military installations had gone as far as closing dumps, discontinuing open burning, maintaining landfills, and reclaiming some materials for resale or reuse. Over 90 percent of the solid waste is placed in landfills either on or off Federal property. Most of the installations in our review were not insuring that disposal operations complied with EPA guidelines.

Because it is considered a routine activity, solid waste pollution control often competes for resources with other installation activities. The table on pages 8 and 9 summarizes data from selected bases on waste disposal, recycling, and energy generation.

Open burning of solid waste

Although the Department of Defense does not specifically prohibit open burning, the Navy and Air Force have issued and the Army plans to issue regulations prohibiting open burning. These will be consistent with EPA's recommendation against open burning and the regulations of most States.

Of the 20 installations in our review for which data was available, only 3 burned trash in the open. After our visit, the Naval Air Station, Jacksonville, closed its burn dump in November 1975. The Holston Army Ammunition Plant had a State exemption for open burning because much of its waste is contaminated with explosive chemicals. The Marine Corps' Camp Lejeune, contrary to State law, burns scrap wood in the open.

Closing dumps

At the time of our fieldwork, eight installations had open dumps for waste, such as old appliances and construction materials (see photographs on p. 10) but all have been or are being closed. The Resource Conservation and Recovery Act of 1976 prohibits open dumps and requires that they be converted into facilities which do not endanger the environment.

Solid Waste Disposal and Resource Recovery
at DOD Installations

<u>Standard metropolitan</u> <u>statistical area</u> <u>and installation(s)</u>	<u>Daily</u> <u>tonnage</u> <u>(note a)</u>	<u>Disposal in landfill</u>		<u>Resource recovery</u>	
		<u>Percent</u> <u>on-base</u>	<u>Percent</u> <u>off-base</u>	<u>Materials</u> <u>recycled</u> <u>(note b)</u>	<u>Energy</u> <u>generation</u>
Charleston, North Charleston:					
Charleston Shipyard	70	-	100	Yes	Under study
Charleston Air Force Base	24	-	100	No	Under study
Dayton:					
Wright-Patterson Air Force Base	44	93	7	Yes	Under study (refuse- derived fuel)
Indianapolis:					
Fort B. Harrison	18	100	-	Yes	Not planned
Naval Avionics Facility	3	-	100	No	Not planned
Jacksonville:					
Naval Air Station, Cecil Field	24	5	95	Yes	Not planned
Naval Air Station, Jacksonville	47	14	86	Yes	Designing system
Mayport Naval Station	39	78	22	No	Designing system
Johnson City, Kings- port, Bristol:					
Holston Ammunition Plant (note c)	277	8	10	No	Not planned
Macon:					
Robins Air Force Base	55	100	-	Yes	Not planned
Newport News, Hampton:					
Fort Eustis	25	100	-	Yes	Planned with Newport News
Fort Monroe	8	-	100	No	Planned with Hampton
Fort Story	10	(note d)		No	Not planned
Langley Air Force Base	23	100	-	Yes	Planned with Hampton
Norfolk, Virginia Beach, Portsmouth:					
Norfolk Shipyard	101	(note e)		No	Under con- struction
Oceana Naval Air Station	65	100	-	Yes	Not planned

Standard metropolitan statistical area and installation(s)	Daily tonnage (note a)	Disposal in landfill		Resource recovery	
		Percent on-base	Percent off-base	Materials recycled (note b)	Energy generation
Seattle, Everett:					
Puget Sound Shipyard	33	-	100	No	Designing system
Keyport Torpedo Station	4	89	11	No	Not planned
Trident Support Site	5	(Installation under construction)			
Tacoma:					
Fort Lewis	281	-	100	Yes	Not planned
McChord Air Force Base	73	100	-	Yes	Not planned
None:					
Camp Lejeune Marine Corps Base	320	100	-	No	Not planned

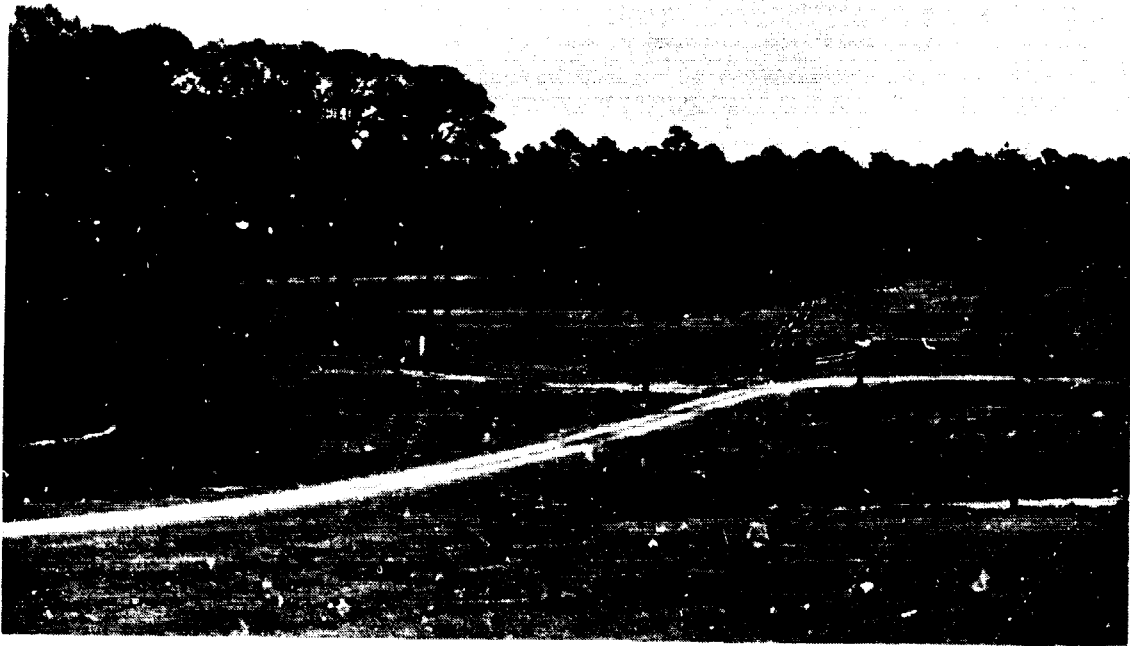
a/Based on a 5-day week (260 days a year), excluding materials reclaimed for recycling or for sale by the Defense Property Disposal Office.

b/Includes only those materials normally disposed of in landfills, such as waste paper, cardboard, aluminum cans, and glass; items that installations normally turn in to the Defense Property Disposal Office, such as scrap metal, computer cards and printouts, scrap tires, and rubber, are therefore excluded. These programs ranged from volunteer efforts to installation-wide programs to reclaim high-grade paper, cardboard, glass, and aluminum.

c/Mostly explosive-contaminated waste (82 percent of total waste).

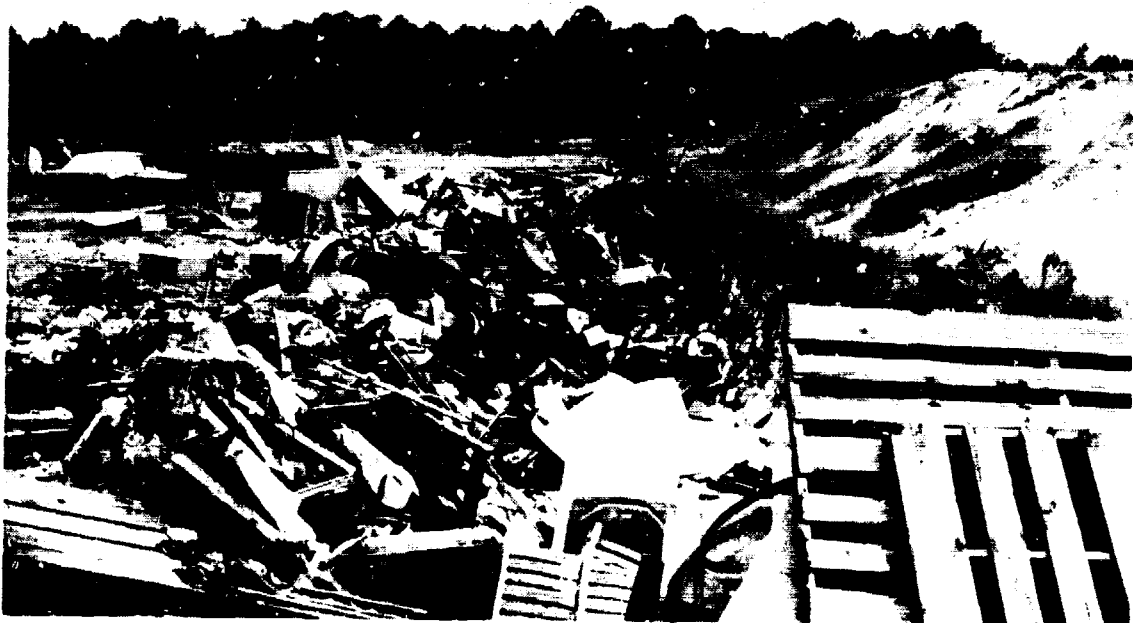
d/Incinerated by Norfolk Naval Base, Public Works Center.

e/Percentages not developed.



SITE OF A CLOSED BURN DUMP AT CAMP LeJEUNE MARINE CORPS BASE

SOURCE: CAMP LeJEUNE MARINE CORPS BASE



OPEN DUMP

SOURCE: NAVAL STATION MAYPORT, FLORIDA

Landfills do not comply with
EPA guidelines

EPA's landfill guidelines require or recommend that land disposal sites conform to applicable water and air quality standards; responsible agency and disposal site operators determine acceptable and unacceptable wastes; cover material be applied to minimize fire hazards, infiltration of precipitation, odors, and blowing litter; and site location be adaptable to appropriate land-use plans. The EPA guidelines are mandatory for Federal agencies under section 211 of the Solid Waste Disposal Act, as amended.

Eleven of 13 installations operating on-base landfills deviated from EPA guidelines in one or more of the following ways:

- Landfills were located in high water table areas near rivers and streams without due care for preventing leaching into ground and surface water resources. (See photograph on p. 12.)
- Waste materials ineligible for disposal in landfills were not identified or controlled.
- Landfill operators did not apply 6 inches of cover material daily. (See photograph on p. 12.)
- Waste was not compacted in 2-foot layers to minimize moisture infiltration and settlement.
- Fences or other devices were not used to control blowing litter.
- Disposal sites were located near aircraft runways, attracting birds which are a hazard to low-flying aircraft.

Practices of private refuse
contractors not checked

Twelve installations used private contractors to dispose of part or all of their solid waste off base because they did not have suitable landfill sites on base or contractors were less costly. For example:

- Charleston Naval Base, South Carolina, terminated on-base landfilling in July 1974 because solid waste disposal experts of EPA, the State, and the county



SOLID WASTE LANDFILL LOCATED IN A HIGH WATER TABLE AREA

SOURCE: MAYPORT NAVAL STATION, FLORIDA



COMPACTED SOLID WASTE NOT COVERED DAILY WITH 6 INCHES OF EARTH

SOURCE: ROBINS AIR FORCE BASE

considered all available landfill sites unsuitable due to a high water table and possible contamination of tidal waters.

--The Naval Air Station, Cecil Field, Florida, elected to contract for off-base disposal because it estimated the contract for fiscal year 1975 would cost about \$36,000 less than on-base disposal.

Where off-base facilities are used, EPA requires Federal agencies to insure that processing and disposal facilities comply with its guidelines. Only four installations that use private refuse contractors had taken steps to insure that off-base disposal facilities complied with EPA's guidelines.

PROGRAM RESPONSIBILITIES DECENTRALIZED

Service headquarters delegated responsibility for solid waste pollution programing and related funding requests to installation commanders, DOD said (see app. II) that such delegation is consistent with decentralized management generally followed by large Federal agencies. It in no way implies an abrogation of program control but insures appropriate integration of pollution control with planning and budgeting for the services' functional programs pursuant to Executive Order 11752.

Office of Management and Budget Circular A-106 requires Federal agencies to submit semiannual reports showing what is needed to bring their facilities into compliance with applicable environmental standards. DOD said that Circular A-106, issued to place management control at the headquarters level, works well and that DOD, with EPA and the Office of Management and Budget, is effectively managing the numerous needs identified and listed in the A-106 reports.

DOD officials believed that pollution control needs would not be overlooked because of continuous scrutiny by State, local, and EPA officials and by community and environmental groups. Because of this reliance on others, DOD and the services had no internal system to check on the accuracy and completeness of the installations' A-106 reports.

Contrary to DOD's belief, EPA, State, and local officials devoted little attention to DOD installations. EPA officials said that their agency lacks the staff to monitor DOD installations regularly, and State and local officials said that they did not have authority to inspect Federal sites. (The

Resource Conservation and Recovery Act of 1976 now authorizes the States to inspect Federal facilities.) Of the 13 bases in our review operating landfills in 1975, 3 had been inspected by EPA and only 1 had been inspected by its State.

Executive Order 11752 directs EPA to determine how well Federal agencies implement EPA guidelines. EPA planned to inventory and survey all solid waste land disposal facilities but did not have the staff or funds to do so. In March 1976 EPA requested all Federal agencies to inventory and survey their land disposal sites and to determine if they were in compliance with EPA's guidelines. DOD said that it worked closely with EPA in completing the survey and was referring the results to the services for the installations to follow up with EPA regional offices.

SURVEYS AND AUDITS

Environmental surveys

The Army and Navy make environmental surveys of solid waste practices at their bases. The Air Force does not make environmental surveys but depends on the civil engineer at each base to arrange for waste disposal.

The Army Environmental Hygiene Agency makes surveys at the request of a base commander, usually for specific problems including evaluations of landfill sites, testing for leaching, and evaluations of disposal methods to select the most efficient one. Army officials told us that, because surveys are usually made at the request of base commanders, it is to a base's advantage to carry out survey team recommendations; however, there is no established procedure to make certain that recommended actions are taken. The reports are also sent to the Environmental Office in the Office, Chief of Engineers. The Environmental Office depends upon EPA and the States to report on base compliance with environmental standards.

Regional environmental teams of the Navy's Engineering Field Divisions conduct regular surveys to identify pollution problems and recommend corrective action. The Chief of Naval Operations requires all activities to report to the major commands and to his office the actions taken on the survey recommendations.

Internal audits

The Army Audit Agency reported in May 1973 that the installations, in reports to higher command levels and regulatory bodies, had not identified all sources of pollution.

It recommended that the major commands start high priority programs to identify and solve all pollution problems and report them to headquarters. The Deputy Chief of Staff for Logistics agreed with the audit recommendations.

In December 1975 the Air Force Audit Agency recommended that Air Force headquarters (1) formalize funding procedures to assure prompt completion of pollution projects requiring operation and maintenance funds and (2) request firm guidance from DOD for resource recovery and recycling programs. Air Force officials agreed with the Audit Agency's recommendations.

The Navy Audit Service has not made any audits of the Navy's control of environmental pollution.

CONCLUSIONS

The services have reduced pollution by eliminating most open burnin and dumps. But, in our opinion, the services have not demonstrated the leadership in pollution abatement contemplated by the May 1973 DOD policy statement. (See p. 5.) They have located landfills in high water table areas without applying stringent controls to prevent leaching and have not followed landfill management practices, such as compacting waste and covering it with earth. Also, the services have not exercised control over the practices of private refuse contractors working for them.

We believe the low priority given solid waste management and the absence of Department of Defense deadlines for complying with EPA standards contributed to the problem. (DOD's October 1976 directive now requires a final determination on compliance actions within 1 year from the effective dates of the EPA guidelines.)

Because the Army did not insure compliance with environmental team recommendations and the Air Force did not make solid waste environmental surveys, we believe that neither service made sure that all solid waste pollution problems were identified and corrective action taken.

RECOMMENDATION, AGENCY COMMENTS, AND OUR EVALUATION

For better leadership in solid waste management, we recommend that the Secretary of Defense require the service Secretaries to establish the following controls on land disposal of solid waste:

--Periodic inspections and reports by service environmental teams not responsible to the installation commanders.

--Procedures for assuring that reported violations are corrected.

DOD replied (see app. II) that:

--The military service audit and inspection procedures include provisions for inspections and reports by personnel above the installation level.

--The services initiate appropriate followup procedures as required to correct outstanding deficiencies in accordance with program priorities.

A DOD official told us that the services are drafting regulations implementing the new DOD directive, including followup procedures to insure that identified deficiencies are corrected.

Since new directives in themselves do not insure compliance, we believe periodic inspections and reports coupled with enforcement procedures, as we recommend, will help the services overcome the land disposal problems we identified.

CHAPTER 4

MINIMAL RECOVERY OF RECYCLABLE MATERIALS

Recycling programs at DOD installations generally have been voluntary activities not requiring large capital expenditures. As of December 31, 1975, 105 of 313 major installations had such recycling programs.

As of June 1975, DOD records showed that installations had recycled 4.2 percent of the postconsumer solid waste generated in fiscal year 1975, compared with the national recycling average of about 6 percent. We believe that the recycling rate at installations will improve during fiscal year 1977 as they begin complying with EPA's materials recovery and beverage container guidelines. (See p. 4.)

PROBLEMS IN RECOVERY OF RECYCLABLE MATERIALS

Lack of resources, unrecovered costs, and fluctuating demand for recyclable materials were the primary reasons installation officials gave for not establishing required comprehensive resource recovery and recycling programs. However, under DOD's November 1974 directive on resource recovery and recycling, service Secretaries could grant an exemption only when an installation could demonstrate that a recycling program was not possible. Exemptions could not be granted solely on the basis that proceeds from sales did not cover operating expenses.

DOD's October 4, 1976, directive on solid waste management (see p. 6) allows exceptions after appropriate analysis has determined that there is no market for recovered products or that recovery is too costly to be economically practical.

Lack of resources and financial incentives

Under the November 1974 regulation, installations were entitled only to that portion of the net sales proceeds needed to reimburse them for certain recycling expenses. Reclaimed waste from materials purchased with appropriated and nonappropriated funds had to be turned in to the Disposal Service for sale, and the installation was not entitled to any proceeds.

Installation and headquarters officials told us that they had not established comprehensive recycling programs because they lacked the resources--funds, staff, and equipment. They also told us that they do not expect sufficient revenue to cover

operating costs because waste from materials bought with appropriated funds cannot be included in a recycling program.

The Deputy Under Secretary of the Army, in a December 4, 1974, letter to the Assistant Secretary of Defense, expressed the concern existing at the base and command levels over the absence of financial incentives to recycling solid waste. He said that, as a result, recycling programs would likely be largely voluntary programs with most of the recovery done by youth organizations and civic groups. He concluded that DOD regulations should be changed to enable installations to receive the proceeds from all recyclable materials which they recover.

Air Force officials endorsed the Army's position and added that successful recycling programs cannot be expected unless the installations can recover their expenses from sales of postconsumer waste.

Section 612 of the fiscal year 1975 Military Construction Authorization Act (Public Law 93-552, 88 Stat. 1765-66, Dec. 27, 1974) established the following rules for the sale of recyclable material: The proceeds must be credited first to the cost of collecting, handling, and selling the material, including purchase of required equipment; second to environmental improvement and energy conservation projects, up to \$50,000 a year, at each installation with a recycling program; and third any remaining proceeds to the Treasury.

To cover some costs of recycling materials, the October 1976 directive provides that the net proceeds from the sale of materials recovered from solid waste generated by commercial, residential, and institutional (hospitals, schools, etc.) activities go to the installation's recycling activity. The new directive also outlines the procedures for using any excess proceeds generated by recycling programs. This includes the requirements of section 612 of the 1975 Military Construction Authorization Act.

Army

One of the most active recycling programs we observed was at Fort Lewis, Washington, which, during the period September 1973 through August 1975, sold reclaimed materials for about \$89,000. Of these proceeds, \$73,000 was returned to the Treasury and most of the remaining \$16,000 was paid to non-appropriated fund activities for their recyclable bottles.

The Army Audit Agency completed an audit of the Fort Lewis recycling program in November 1974 and reported that

its operating cost (labor excluding prisoners, equipment usage, and other costs) was about \$160,000 during fiscal year 1974. The Audit Agency recommended that the installation make a cost analysis to determine if the recycling program should be continued by Government personnel or be contracted out.

Fort Lewis recovers only 5 percent of recyclable materials because it collects only materials voluntarily deposited in containers at the base. The Fort Lewis program was mainly due to the interest of the commanding officer in ecology and the use of military personnel and prisoners to staff the program. (See photographs on p. 20.)

Navy

In August 1975 the Navy issued (1) uniform survey and analysis guidelines for a solid waste activity, (2) information on a variety of available solid waste management systems, and (3) a description of how an activity can evaluate waste disposal options. Naval Facilities Engineering Command division offices are applying these guides at shore installations to survey the potential for recovering resources, including energy from solid waste. By September 23, 1976, the Navy had completed 16 surveys, 28 were in process, and about 20 others were scheduled.

Seven of the 10 Navy installations in our review had recycling programs but these programs were limited to cooperating with Boy Scout troops to recover aluminum cans (2 installations), and to the recovery and sale of cardboard and/or other paper products (5 installations).

Air Force

Contrary to the November 1974 DOD directive on resource recovery, Air Force headquarters issued a letter in December 1974 instructing installations to implement recycling programs only where they proved to be cost effective.

Robins Air Logistics Center, at the insistence of the Center's commanding general, began to recover cardboard, glass, aluminum, and paper in May 1975. An economic analysis of the program showed operating costs of about \$1,270 a year and income of about \$640.

An Air Force test program in 1976 to find out whether sales proceeds could finance the cost of recycling post-consumer waste showed that recycling programs were not cost effective. DOD's new directive on solid waste management



BALING RECLAIMED CARDBOARD-- EACH BALE WEIGHS ABOUT 800 LBS.

SOURCE: FORT LEWIS, WASHINGTON



RECLAIMED BOTTLES BEING CRUSHED FOR SALE TO A GLASS RECYCLER.

SOURCE: FORT LEWIS, WASHINGTON

now permits bases to include high value paper in their recycling programs.

Fluctuating markets for reclaimed materials

A cost effective and successful materials recovery program is contingent on a steady market and reasonable prices for reclaimed products. In its 1973 annual resource recovery report, EPA stated that, with the possible exception of aluminum, lack of industrial demand for secondary materials is the primary constraint on significantly increasing the recycling rates of metal, fiber, and rubber by source separation.

EPA's analysis of postconsumer net solid waste shows that paper constitutes about 32 percent and all glass and aluminum about 11 percent of the total weight. (See app. IV.) The unsteady market for recyclable paper is, therefore, a major problem for installations. During 1973 and early 1974 the demand for wastepaper increased sharply due to an inadequate supply of virgin pulp, which caused wastepaper prices to rise to their highest level since the Korean War. During the last half of 1974 demand decreased sharply, and prices fell to about one-fourth the early 1974 price level. Accordingly, wastepaper recovery became uneconomical for many potential suppliers, including military installations.

Of the 21 bases we visited, 11 have had programs to recycle wastepaper. Seven discontinued their programs because they could not find markets for the paper. Officials at the other four stated that the price for paper has declined about 50 percent. Officials at the 10 remaining bases said that there was no market for wastepaper.

At several installations, recycling programs were discouraged by unfavorable market conditions. For example, officials at McChord Air Force Base said they attempted to set up a resource recovery program in 1974, but soon dropped the program because the market for reclaimed materials ceased to exist. Officials at Wright-Patterson Air Force Base said they do not plan to expand their recycling program, other than through volunteer efforts, because a market for such items as plastic and lumber is nonexistent and the market for glass makes its recovery uneconomical.

EPA's new requirement that Federal facilities charge a refundable deposit on beverage containers by September 1977 should help substantially to reduce the volume of glass and aluminum discarded at military installations. The

refund of at least 5 cents for each container provides a positive incentive for consumers to return the empty containers so that refillable bottles can be reused and non-refillable containers can be recycled. DOD is testing the feasibility of the EPA requirement at installations in the continental United States. Ten bases have been chosen for the yearlong test, which was scheduled to begin at Fort Knox in March 1977 and at the others by June. DOD hopes to develop enough data by September 1977 to select the bases where the beverage container deposit-refund program would be feasible and to determine how it should be conducted. The test will also provide the type of evidence needed under EPA guidelines to omit the program where it is not practical.

The October 1976 DOD directive on solid waste management outlines program responsibilities. The Assistant Secretary of Defense (Installations and Logistics) has primary responsibility for policy development, programing, and planning of the program.

The service Secretaries and the directors of Defense agencies are responsible for identifying those installations which should establish resource recovery programs and for budgeting and financial planning for approved programs. The Defense Logistics Agency is responsible for furnishing market analyses to DOD components before the establishment of recycling programs and for negotiating contracts for marketable materials and sale of solid waste to public or commercial resource recovery operations.

CONCLUSIONS, AGENCY COMMENTS, AND OUR EVALUATION

The competition for resources, inability to recover costs, and the fluctuating markets for recyclable materials have been drawbacks to programs for recycling postconsumer refuse.

We proposed that the Secretary of Defense require the Secretaries of the Army and Air Force to conduct surveys, as the Navy is doing, to decide on the conditions that make recycling programs practical and to determine each installation's potential for recycling materials from solid waste. DOD (see app. II) said that its October 1976 directive will apply the EPA recycling guidelines DOD-wide, including the conduct of appropriate surveys.

We believe that DOD's current directive and its ongoing test for carrying out the beverage container guidelines will improve the recycling of materials at military installations.

CHAPTER 5

ENERGY RECOVERY FROM SOLID

WASTE--DOD CAN HELP

Although energy recovery from solid waste has certain economic and environmental benefits compared with other disposal methods, military service officials have been reluctant to initiate such recovery. This is partly due to technology problems but mainly because most bases have sufficient landfill areas.

BENEFITS OF ENERGY RECOVERY SYSTEMS

The economic benefits of energy recovery from solid waste are the value of the energy produced, improved materials recovery by mechanical separation, and the savings in disposal costs. The environmental benefits are decreased air and water pollution and less land area used for disposal.

From 1972 to June 1976 crude oil prices increased from \$2.48 to \$10.88 a barrel and prices for coal used in steam or utility plants increased from about \$8 to \$18 a ton. According to EPA, about 70 to 80 percent of residential and commercial solid waste is combustible. A ton of average composition waste when burned will release energy comparable to the energy from

--one-third ton of coal,

--65 gallons of No. 2 fuel oil, or

--10,000 cubic feet of natural gas.

According to EPA, many industrial plants could generate at least half of the process steam they need by using solid waste fuel. Industrial activities at military bases, by implementing such recovery systems, could reduce their consumption of fossil fuels as well as the quantity of waste that otherwise would go into a landfill. For example, a small municipal energy recovery incinerator system evaluated by EPA reduced the volume of waste by 95 percent and saved about 67,000 cubic feet of natural gas (or about \$61) a day.

PROBLEMS IN RECOVERY OF ENERGY FROM REFUSE

The technology problems that cause some of the reluctance of military officials to initiate energy recovery systems are that several such recovery options are still in development and the existing systems are large-scale operations and therefore require a large investment.

Energy recovery options

Technologies for recovering energy from refuse are (1) burning unprocessed waste in steam-generating incinerators, (2) pyrolysis, (3) processing refuse for use as fuel, and (4) methane recovery. A 1976 EPA solid waste management guide stated that none of these technologies are yet free of risks and only two are commonly considered commercially available. The commercially available technologies are (1) waterwall incinerators fueled solely by unprocessed solid waste and used for cooling, heating, and industrial processing; and (2) boiler modifications to enable the use of shredded solid waste as a supplement to pulverized coal.

DOD said (see app. II) that waterwall incinerators are costly to build, operate, and maintain and that pulverized coal boilers are rare in DOD. EPA said that other, possibly better, technologies are being developed and are expected to become commercially available during the period 1977 to 1982.

DOD said that one such new development is refuse-derived fuel. It appears to offer several major advantages over waterwall incinerators. The initial cost required to burn refuse-derived fuel and the operation and maintenance costs should be much less than incineration with heat recovery.

Early 1976 tests at Wright-Patterson Air Force Base, Ohio, on existing coal-fired boilers with stokers of the type commonly found in DOD demonstrated that refuse-derived fuel can be burned in combination with coal. An added benefit is that higher sulfur coal can be used because the refuse-derived fuel has little sulfur, and the mix results in acceptable stack emissions. At present, procurement authority to purchase the fuel from commercial sources is limited, and DOD is proposing to seek statutory authority from the Congress to enter into 10-year contracts for refuse-derived fuel. (Commercial suppliers stated that a 10-year

period is the minimum time for them to amortize plant investment.) With 10-year contracting authority, DOD would use the fuel at many installations having coal-fired boilers that would require little or no modification.

Scale of operation required

Most energy recovery systems in use today required large capital outlays because plants had to be built to process large quantities of waste--200 or more tons a day--to be economical. However, the size of such plants becomes less of a controlling factor as energy recovery technology is improved. For example, EPA recently completed a study of a small town's 21-ton-a-day modular system that uses solid waste to generate steam and was built for about \$371,000. By selling the steam to a local manufacturer, the town expects to recover its costs (capital and interest on bonds) in about 16 years. The study showed that there were no significant problems with the system's operations and that, for the purposes intended, it operated effectively on untreated municipal solid waste. Technology is being further improved for using small incinerators with capacities of 5 to 12 tons a day to economically generate energy from solid waste. Many military installations use large quantities of steam and therefore would not have a problem using the steam they produce.

DIRECTION OF EFFORT BY THE SERVICES

Although DOD has recommended that the services consider energy recovery from solid waste as an alternative to recycling, it has not given them guidance for determining under what circumstances projects for recovering energy from solid waste would be beneficial. Consequently, the services have adopted different approaches.

The following table shows the potential annual fuel (oil) savings by burning solid waste in resource recovery facilities planned or in use at the installations listed.

Potential Annual Fuel Savings by Burning
Solid Waste in Resource Recovery Facilities

<u>Installation</u>	<u>Gallons of oil</u>
	(000 omitted)
Fort Eustis	4,000
Fort Monmouth	1,900
Picatinny Arsenal	330
Puget Sound Naval Shipyard (note a)	210
Mayport Naval Station	345
Norfolk Naval Station	1,000
Norfolk Naval Shipyard	1,000
Charleston Naval Shipyard	368
Andrews Air Force Base	<u>1,000</u>
 Total	 <u><u>10,153</u></u>

a/There will also be a savings in natural gas, but data was not available.

At Jacksonville Naval Air Station the potential annual fuel savings is 132 million cubic feet of natural gas.

The Army budgeted funds for two projects to recover energy from solid waste--\$1.8 million for Fort Monmouth, New Jersey, in fiscal year 1976 and \$600,000 for Picatinny Arsenal, New Jersey, in fiscal year 1977. By converting its oil-fired central boiler, Fort Monmouth expects to save \$562,000 a year, and by building an energy recovery incinerator, Picatinny Arsenal expects to save \$250,000 a year worth of fuel oil. Thus, the cost of each project would be recovered in about 3 years.

Fort Eustis and the city of Newport News, Virginia, are considering a resource/energy generating system. A 1974 study showed that Fort Eustis would save about \$1.7 million in reduced oil-generated steam and landfilling costs and the city would save about \$1.7 million in disposal costs.

Until recently, the Army did not study methods for recovering energy from waste because other Federal agencies and private companies were doing so. Further, the Army does not believe it has a disposal problem at most of its bases because landfill space is plentiful.

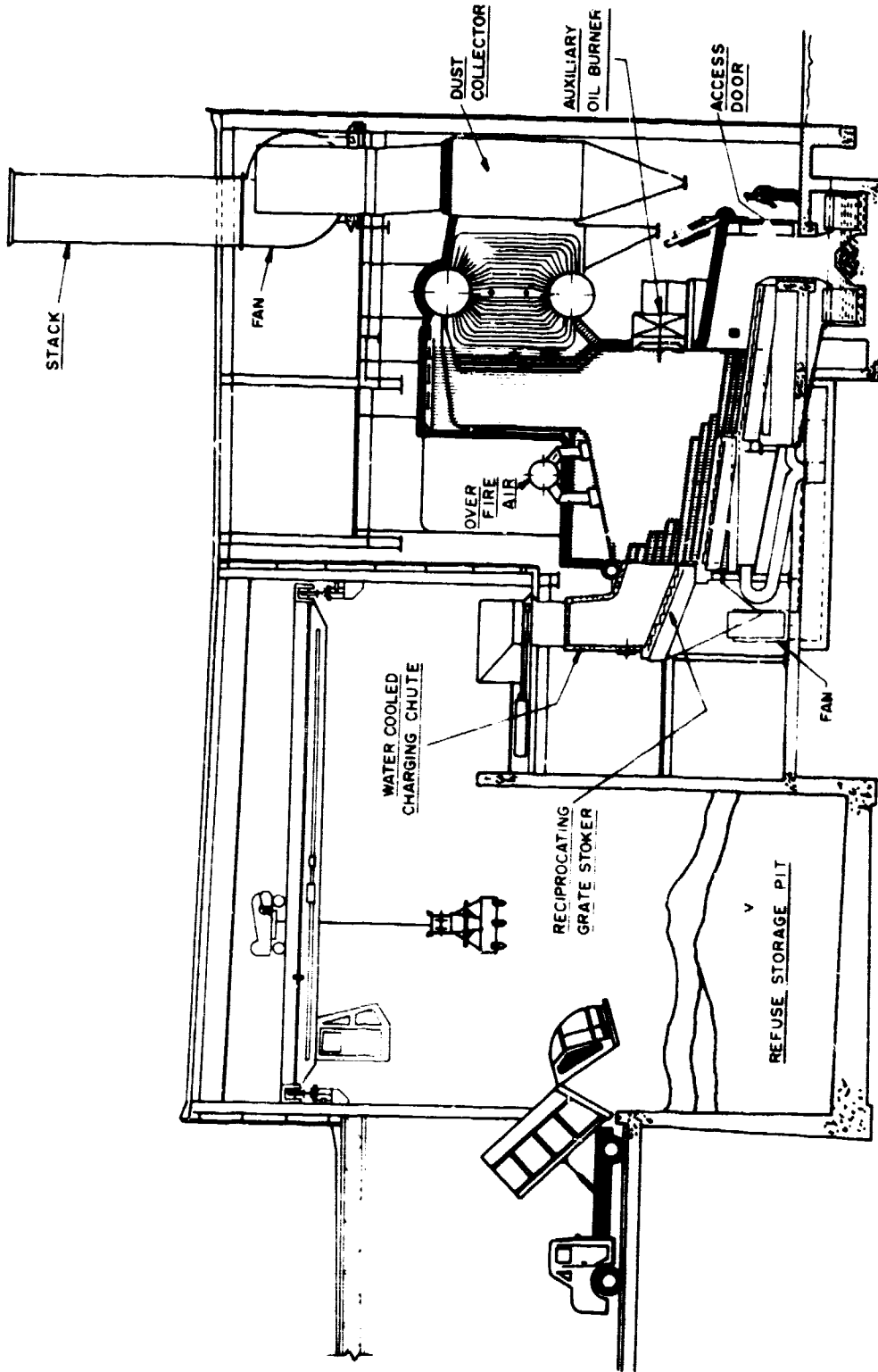
The Air Force received \$1.7 million in its fiscal year 1977 budget to convert the oil-fired central heating plant at Andrews Air Force Base, Maryland, to a solid waste burning operation. The Air Force expects the conversion to save about \$300,000 a year in fuel and disposal costs. The Air Force, like the Army, has made very few studies of energy recovery from solid waste and generally believes that it has sufficient landfill area for its immediate needs. Also, the Air Force does not believe that sufficient testing has been done to prove the concept of generating energy from solid waste.

Of the three services, the Navy has made the most progress in studying and initiating recovery systems to generate energy from solid waste. Most Navy bases are located in or near densely populated areas where available landfill areas are scarce. Even when land is available, high water tables often make such areas unsatisfactory as sanitary landfills.

Accordingly, the Navy has studied the feasibility of using solid waste to generate energy at 13 installations and has built a solid waste energy recovery plant at the Norfolk Naval Station, Norfolk, Virginia (see p. 28), and is building another at the Norfolk Naval Shipyard in Portsmouth, Virginia. It contracted for the design of solid waste energy recovery systems at three other installations we visited: Mayport Naval Station, Florida; Jacksonville Naval Air Station, Florida; and Puget Sound Naval Shipyard, Washington. The estimated annual savings for Mayport is \$535,000, Jacksonville, \$589,000, and Puget Sound, about \$245,000. Jacksonville received \$4.7 million in fiscal year 1977 to build the recovery system.

The plant at the Norfolk Naval Station was the first steam generating, waterwall incinerator built in the United States for burning solid waste. The Navy completed it in May 1967 at a cost of \$2.2 million. Later improvements increased this figure to almost \$4 million. The plant supplements the oil-fired plant, generating about 10 percent of the station's steam demand from about 150 tons of waste a day from five nearby military installations and from some city activities. Although the Navy initially had many problems with the plant, they were alleviated as plant operators became familiar with operating procedures.

The Navy contracted for an economic analysis of the plant. The analysis showed that the cost to dispose of 36,000 tons of refuse in fiscal year 1975 was about \$1.1 million and that the steam generated was valued at about



FOSTER WHEELER STEAM GENERATING INCINERATOR - WATER COOLED FURNACE
 SOURCE U S NAVAL STATION, NORFOLK, VIRGINIA

\$900,000. Thus, net disposal cost was about \$6 a ton compared to the Navy's estimate of about \$10 a ton for a sanitary landfilling. The Navy is pleased with the plant and its operation.

Only nine other operational facilities in the United States use solid waste to generate energy. Another 25 municipal plants are planned or under construction, and about 37 other communities are interested in building plants.

Lack of coordination

Eleven of the 22 installations in our review have independently studied the feasibility of recovering energy from solid waste. Four base studies considered only direct benefits to the installation, overlooking the economic advantages of joint or regional systems with other Federal agencies and civilian communities; three considered DOD installations only; two considered joining regional systems (only one decided to do so); and two, Wright-Patterson Air Force Base and Fort Eustis, are still working with other possible participants on a regional program.

The number of studies made suggests a duplication of effort due to lack of a uniform, coordinated approach to considering energy recovery. Examples of activities that evidence a need for guidance in establishing economical refuse-fired energy recovery systems follow.

Oceana Naval Air Station, Virginia, studied the feasibility of a refuse-fired steam generating plant rather than repairing and modernizing existing powerplant boilers. The study did not consider waste from other nearby installations or municipalities and concluded that landfilling was more economical. The combined solid waste of this and one other nearby Navy installation is about 65 tons a day. Navy criteria provide that an economical energy recovery system becomes "probably applicable" at 40 tons a day.

Camp Lejeune Marine Corps Base, North Carolina, which collects about 320 tons of solid waste a day, considered adding a refuse-fired steam generating boiler as one way to increase its central heating plant capacity. The base did not consider refuse of other nearby military installations or communities, but concluded that the system was feasible with its own waste. Without making a cost comparison, however, base officials chose to add another oil-fired boiler to the heating plant for \$972,000 because they thought the

estimated cost of \$2.4 million for a refuse-fired boiler was prohibitive and would not be funded.

In South Carolina, the Charleston Naval Shipyard and nearby Charleston Air Force Base were independently planning to construct refuse-fired energy recovery systems. Each plan provided for using the refuse of other DOD installations in the area. We discussed this matter with Air Force, shipyard, and Naval Facilities Engineering Command officials who agreed they need better coordination on pollution control plans. In January 1977 the Air Force canceled its projects at the Charleston Air Force Base.

The Puget Sound Naval Shipyard in Bremerton, Washington, is planning to build a refuse-fired energy recovery plant costing about \$2.1 million to dispose of its 33 tons of daily solid waste. The shipyard received funds for this project in fiscal year 1977. However, shipyard officials did not consider a consolidated plant to burn waste from two other naval installations--Keyport Naval Torpedo Station and the Trident Submarine Support Site--within 12 miles of the shipyard. The shipyard public works officer told us that this was not considered because it would be uneconomical to transport waste from the other installations to the shipyard.

CONCLUSIONS

With current technology, use of solid waste for energy can be economical and deserves systematic consideration as a method of waste disposal. The installations that considered recovery of energy from refuse generally planned only for their own needs and therefore did not evaluate a joint or regional system that may have been more economical. The Navy is the only service that has issued some guidance for evaluating energy recovery, but the Navy could also improve the coordination and review of its installation plans for recovery systems.

DOD can help assure that the most beneficial energy recovery systems are considered by issuing criteria and guidelines for making feasibility studies and coordinating the requirements of the various installations.

RECOMMENDATIONS, AGENCY COMMENTS, AND OUR EVALUATION

We recommend that the Secretary of Defense:

- Publish guidance for determining whether and under what circumstances military bases should initiate projects for recovering energy from solid waste.

--Issue specifications to the services for preparing energy recovery system proposals.

--Designate a focal point for reviewing such project proposals and establishing priorities for their funding.

DOD said (see app. II) that although recovery of energy from solid waste is very attractive and simple in concept, its execution is quite complex and cost intensive. Because the state of the art is still advancing rapidly, DOD considers that the prudent course is to install a minimum number of several types of energy recovery systems and closely observe results from these installations, as well as all other new developments. DOD said that one such new development is refuse-derived fuel for which both the initial cost and the operation and maintenance costs should be much less than waterwall incineration costs.

Although DOD commented on the prudence of installing several types of energy recovery systems, it did not say whether it intended to carry out our recommendations. We believe that publishing guidance, issuing specifications, and designating a focal point for reviewing proposals and establishing funding priorities are necessary for an orderly and economic selection of energy recovery systems.

CHAPTER 6

SCOPE

We examined regulations, operating procedures, and available guidelines that each of the services uses to control residential and commercial types of solid waste. We reviewed the solid waste management programs in operation in early 1976 at selected installations to control pollution, recycle material, and produce energy from solid waste. The programs and their effectiveness were discussed with headquarters and installation officials. We excluded disposal of agricultural, industrial, classified, and pathological wastes.

In addition to the installations listed on pages 8 and 9, the review covered the following organizations:

Department of Defense

Office of the Secretary of Defense
Army, Navy, and Air Force Headquarters
Naval Facilities Engineering Command:
 Atlantic Division, Norfolk, Va.
 Southern Division, Charleston, S.C.

Environmental Protection Agency

Headquarters, Washington, D.C.
Region II, Philadelphia, Pa.
Region IV, Atlanta, Ga.
Region V, Chicago, Ill.
Region X, Seattle, Wash.



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

JAN 25 1977

OFFICE OF
PLANNING AND MANAGEMENT

Mr. Henry Eschwege
Director, Community and Economic Development Division
United States General Accounting Office
Washington, D.C. 20548

Dear Mr. Eschwege:

Your draft report on solid waste management in the Department of Defense has been reviewed and our comments were given to your Assistant Director, Mr. Oberson and his staff at a meeting in EPA on January 5th.

We have no other comments or suggestions at this time.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Alvin L. Alm".

Alvin L. Alm
Assistant Administrator
for Planning and Management

GAO note: EPA comments have been incorporated into the report where appropriate.



ASSISTANT SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301

IN
INSTALLATIONS AND LOGISTICS

18 JAN 1977 7

Mr. F. J. Shafer
Director, Logistics and
Communications Division
U.S. General Accounting Office
Washington, D. C. 20548

Dear Mr. Shafer:

This is in response to your letter of November 15, 1976 to Secretary Rumsfeld which forwarded copies of your draft report entitled "Benefits to the Economy and Environment by Improving Solid Waste Management in the Department of Defense," Code 945260 (OSD Case #4483).

The draft report has been reviewed by this office and the Military Departments. Comments from these reviews are attached.

We appreciate the opportunity to review and comment on this report. Its findings and recommendations will be helpful in our implementation of the applicable solid waste guidelines and compliance therewith.

Sincerely,

FRANK A. CHERTIZ
Assistant Secretary of Defense
(Installations and Logistics)

Enclosure

Department of Defense Position
on
GAO Draft Report, dated November 15, 1976
(Code 945260 - OSD Case #4483)

"Benefits to the Economy and Environment by Improving
Solid Waste Management in the Department of Defense"

I. GAO Draft Report Summary

Executive Order 11752 was issued to implement the major federal environmental laws and insure that the federal government provides leadership in a nation-wide effort to control pollution. It requires that federal facilities be designed, constructed, managed, operated and maintained to conform with Environmental Protection Agency (EPA) guidelines for solid waste recovery, collection, storage, separation and disposal.

The GAO review concludes that the DoD can bring about greater economy and environmental benefits by improving its solid waste management. Findings indicated that (1) although much of the pollution has been eliminated, proper precautions are not being taken at some landfills to prevent leaching and to maintain daily ground cover as recommended; (2) there is minimal recovery of recyclable materials, however, GAO believes that recycling will start to improve in FY 77; and (3) there was a reluctance to initiate recovery system projects partly due to technology problems but mainly because of sufficient landfill areas at most bases. It was recommended that the Secretary of Defense (1) require the Service Secretaries to establish controls to insure adherence to requirements and recommended procedures in the land disposal guidelines; (2) have Army and Air Force conduct recycling surveys similar to the Navy's; and (3) publish guidance, issue specifications, and designate a focal point for reviewing and establishing funding priorities for energy recovery projects.

II. Defense Position Summary

The Department of Defense does not generally disagree with the basic findings when compared with today's criteria for solid waste management. It agrees that greater overall environmental benefits will be derived through the improved solid waste management practices that are now being instituted when compared with the practices in effect during the GAO review. It is fully intended that DoD facilities

comply with the Solid Waste Act and related legislated requirements. However, the Draft Report does not account for several recent major developments that impact significantly in this area:

(1) Enactment of the "Resource Conservation and Recovery Act of 1976," signed into law on October 21, 1976, "To provide technical and financial assistance for the development of management plans and facilities for the recovery of energy and other resources from discarded materials and for the safe disposal of discarded materials, and to regulate the management of hazardous waste;

(2) Issuance of the EPA guidelines for resource recovery facilities as late as September 21, 1976;

(3) Deferred implementation within DoD of the DoD Directive 6050.3, "Resource Recovery and Recycling Program - Solid and Other Waste Material," November 19, 1974, due to impending issuance of EPA Guidelines;

(4) DoD Directive 4165.60, "Solid Waste Management - Collection, Disposal, Resource Recovery and Recycling Program," dated October 4, 1976 that implements the criteria of a majority of the EPA Solid Waste Management Guidelines; and

(5) The DoD plan for testing the EPA deposit-refund guidelines for beverage containers which were promulgated on September 21, 1976, will provide DoD with the data it needs to determine the feasibility of implementation of the guidelines at military installations throughout CONUS.

The solid waste guidelines require DoD to report determinations concerning compliance implementation actions. Where the determination is not to implement a mandatory requirement of the guidelines, the rationale for this determination must be stated. Specific time tables were not prescribed for reporting detailed deficiency corrections to EPA.

The Military Services have programs currently in process under which the GAO recommendations have already been accomplished, or are well underway, as result of the recent promulgation of the latest EPA Guidelines on solid wastes and the subsequent DoD implementing Directive. In addition, several research and engineering actions have been underway for the past year or more in the Military Services

to seek ways to recover resources from the solid waste. Many of the conditions described by the draft report are in the process of being corrected. It is recognized that many of these conditions in this connection will require continuing emphasis, time, and follow-up, in addition to significant programing actions. These actions are being pursued on a continuing basis to insure full compliance.

III. Defense General Comments

A. Status of Pollution Controls

The delegation of responsibilities for the solid waste program is consistent with decentralized management practices generally prevailing in large federal agencies. It in no way implies an abrogation of program control in this area, but insures appropriate integration into applicable planning and budgeting procedures for the Services' functional programs pursuant to the Executive Order.

Contrary to the statement that there is no mechanism at the headquarters level to insure identification of pollution control needs or to monitor the progress of projects, the OMB Circular A-106 process was established to accomplish management control at this level. The process works well and DoD, in conjunction with EPA and OMB, is effectively managing the numerous needs that have been identified and listed in the A-106 reports.

Further, in accord with guideline requirements, DoD has worked closely with EPA in completing the Solid Waste Management Land Disposal Survey for its installations which is now being forwarded to the Military Services for follow-up by the involved installations with the EPA Regional Offices.

Military Service audit and inspection procedures include provision for inspections and reports by personnel above the installation level; schedules for compliance with the various EPA Guidelines have been established by the recently issued DoD Directive 4165.60 (copy attached); and Services initiate appropriate follow-up procedures as required to correct outstanding deficiencies in accordance with program priorities. Continuing emphasis will be given to assure management attention in this important area.

B. Recovery of Recyclable Materials

The draft report, while reflecting that minimal recovery has been achieved, recognizes the significant problem areas involved such as

fluctuating market conditions, competition for resources, inability to recover costs, etc. Historically, segregation of the waste stream components and material recovery efforts have been limited to those high value components which are possible to resell. Much resource recovery effort has also been achieved in cooperation with recognized voluntary organizations. However, implementation of the governing DoD Directive in this area will serve to apply the guidelines criteria uniformly DoD-wide, including the conduct by appropriate surveys. The policy contained in the directive is designed to prevent competition with the locally available commercial recycling industry, and specifies that joint or regional civilian systems be utilized whenever possible in lieu of establishing separate DoD systems. We feel that these procedures satisfy the basic report recommendations regarding possible recycling programs.

C. Energy Recovery from Solid Waste

The recommendation for greater emphasis on energy recovery from solid waste is, in general, a good one. However, it must be noted that the guideline on source separation stresses recycling of paper in lieu of its use in energy recovery.

While recovery of energy from solid waste is very attractive and is simple in concept, its execution is quite complex and cost intensive. As noted on page 41 of the report, the EPA 1976 solid waste management guide stated that none of these technologies (energy recovery from refuse) are yet free of risks and only two are considered commercially available. The first of these two available methods is waterwall incinerators which are costly and have high operation and maintenance costs. The second of the two available methods is the use of shredded solid waste as a supplement in pulverized coal boilers which are rare in the DoD. Since the state of the art in energy recovery from solid waste is still advancing rapidly, the DoD considers that the prudent course of action is to install a minimum number of several types of energy recovery systems and closely observe results from these installations as well as all other new developments. One such new development is Refuse Derived Fuel (RDF). At this time, it appears to offer several major advantages over waterwall incinerators. Both the initial cost required to burn RDF as well as the operation and maintenance costs should be much less than incineration with heat recovery. Early 1976 tests at Wright Patterson AFB in existing coal fired boilers, with stokers of the type commonly found in DoD, indicated that RDF can readily be burned in combination with coal. An added benefit is to be found in that higher sulfur coal can be used and because RDF has

essentially no sulfur, the mix results in acceptable stack emissions. At present, procurement authority to purchase RDF from commercial sources is limited and for this reason DoD is proposing to seek statutory authority from Congress to enter into 10 year contracts for RDF. Commercial suppliers have stated that 10 year contracts are the minimum acceptable to enable them to amortize plant investment. Given this contract authority, DoD would propose to use RDF at many installations where existing coal fired boilers can burn RDF with little or no modification.

Enclosure

DoDD 4165.60, 10/4/76

- GAO notes:
1. Page references in this appendix may not correspond to page numbers in the final report.
 2. The cited recent developments have been incorporated into the report.

GLOSSARY ON SOLID WASTE

Burn dump	A site at which solid waste is burned in the open.
Incineration	The controlled process in which combustible solid, liquid, or gaseous wastes are burned and changed into noncombustible gases.
Leachate	The liquid that has percolated through solid waste and contains extracted, dissolved, or suspended materials from it.
Methane	The gas created by the natural decomposition of organic waste.
Open dump	A land disposal site at which solid wastes are disposed of in a manner that does not protect the environment, are susceptible to open burning, and are exposed to the elements, pests, and scavengers.
Postconsumer waste	Waste discarded by the final consumer rather than by raw material producers and manufacturers. Includes waste typically collected in household refuse, as well as similar materials from commercial or governmental office buildings, wholesale and retail trade establishments, and other general business and service sectors of the economy.
Pyrolysis	The thermal decomposition of solid waste into a gas or liquid that can be used as a fuel.
Recycling	The process by which recovered materials from solid waste are transformed into new products.
Resource recovery facility	Any physical plant that processes residential, commercial, or institutional solid waste biologically, chemically, or physically and recovers useful products, such as shredded fuel, combustible oil or gas, steam, metal, glass, etc., for recycling.

Responsible agency	The organizational element that has the legal duty to insure that owners, operators, or users of facilities comply with EPA solid waste guidelines.
Sanitary landfilling	An engineered method of disposing of solid waste on land in a manner that minimizes environmental hazards and nuisances.
Solid waste	Garbage, refuse, sludge, and other discarded solid materials resulting from industrial and commercial operations and from community activities. It does not include solids or dissolved material in domestic sewage or other significant water pollutants, such as silt, dissolved or suspended solids in industrial wastewater effluents, or dissolved materials in irrigation return flows.
Waterwall incinerator	A furnace with walls consisting of vertically arranged metal tubes joined side to side with metal braces. Radiant energy from burning unprocessed solid waste is absorbed by water passing through the tubes. Additional boiler packages, located in the flue, control the conversion of this water to steam of a specified temperature and pressure.

EPA ANALYSIS OF 1974 POSTCONSUMERNET SOLID WASTE

<u>Material</u>	<u>Millions of tons</u>	<u>Percent of total</u>
Paper	43	32
Glass	13	10
Metals (note a)	13	10
Plastics	5	4
Wood	5	4
Rubber and leather	4	2
Textiles	2	1
Food waste	23	17
Yard waste	25	19
Miscellaneous	<u>2</u>	<u>1</u>
Total	<u>135</u>	<u>100</u>

a/Includes about 1 million tons of aluminum.

PRINCIPAL OFFICIALS RESPONSIBLE
FOR ADMINISTERING ACTIVITIES
DISCUSSED IN THIS REPORT

	<u>Tenure of office</u>	
	<u>From</u>	<u>To</u>
SECRETARY OF DEFENSE:		
Harold Brown	Jan. 1977	Present
Donald H. Rumsfeld	Nov. 1975	Jan. 1977
James R. Schlesinger	July 1973	Nov. 1975
SECRETARY OF THE ARMY:		
Clifford L. Alexander	Feb. 1977	Present
Martin R. Hoffmann	Aug. 1975	Feb. 1977
Norman R. Augustine (acting)	July 1975	Aug. 1975
Howard H. Callaway	May 1973	July 1975
SECRETARY OF THE NAVY:		
W. Graham Claytor, Jr.	Jan. 1977	Present
J. William Middendorf II	Apr. 1974	Jan. 1977
John W. Warner	May 1972	Apr. 1974
SECRETARY OF THE AIR FORCE:		
John C. Stetson	Mar. 1977	Present
Thomas C. Reed	Dec. 1975	Mar. 1977
John L. McLucas	May 1973	Dec. 1975