FINAL
FORT MONMOUTH
POLLUTION PREVENTION
PLAN

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POLLUTION PREVENTION PLAN

Guidance Document For Prevention And Reduction Of Pollution At Fort Monmouth, New Jersey

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Solvent (Petroleum Naptha) Recovery	Solid Waste	Started in mid 1994 and concluded in 1999 when switched to aqueous solvent washing	DPW	Reduction of solid waste	5
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Lead Paint Removal/ Encapsulation	Hazardous Waste	Started in mid 1990's continuing operation	DPW	Reduction of hazardous waste	5
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Reduction of Ozone Depleting Chemicals	Air Emissions	Started in mid 1990's continuing operation	DPW	Reduction in ODSs as required by EO13148	11

Project Name	Targeted Pollution Source	Implementation Status and Date	Funding Source	Compliance Thru P2	P2 Plan Section
Chlorinated Solvents	Hazardous Waste	Started in February 1994 and completed	DPW	Eliminated Chlorinated solvents in parts washers	5
NICAD & Alkaline Batteries	Solid Waste	Started in 1995 continuing operation	DPW	Recycling of scrap metal and reduced volume of solid waste	6
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Carburetor Cleaners	Hazardous Waste	Started in 1994 operation stopped in 2001	DPW	Eliminated by 2001 due to acquisition of aqueous parts washers	5
Oily Rags	Solid Waste	Started in early 1990's continuing operation	DPW	Recycle	6
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Painting Operations	Air/ Hazardous Waste	Started in mid 1990's continuing operation	Mission	Reduction of hazardous waste and VOCs	5 and 7

				emissions	
Project Name	**Targeted Pollution Source**	**Implementation Status and Date**	**Funding Source**	**Compliance Thru P2**	**P2 Plan Section**
Underground Storage Tanks	Air/ Hazardous Waste	Started in late 1980's continuing operation	DPW	Reduction in the number of tanks or compliance sites	5 & 7
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SECTION 1
INTRODUCTION

1.1 STATEMENT OF PURPOSE

Fort Monmouth is a government-owned and operated (GOGO) military installation which provides command, administrative, and logistical support for Headquarters, United States Army Communications and Electrical Command (CECOM). CECOM is a major subordinate command of the United States Army Material Command (AMC) and is the host tenant of Fort Monmouth. The support provided by the installation is used by the tenant activities in the performance of research, development, procurement and production of prototype communications and electronics equipment for use by the United States Armed Forces.

This Plan establishes this installation's commitment to environmental leadership in pollution prevention (P2) by outlining the concepts and practices necessary to reduce the use of hazardous materials and the release of pollutants. This Plan is also meant to be used as a tool for the installation to document, track, and manage its P2 efforts in pursuit of achieving P2 goals.

1.2 BACKGROUND AND MISSION

Fort Monmouth is located in the central-eastern portion of New Jersey, approximately 47 miles south of New York City and 70 miles northwest of Philadelphia, Pennsylvania. Monmouth County is located between longitudes 73°58' and 74°37' west and latitudes 40°05' and 40°29'north. The New York metropolitan region consists of southern Connecticut and New York City and northeastern New Jersey. Because of its location, Monmouth County is subject to the metropolitan region's demographic and economic trends. The communities of Eatontown, Oceanport, Little Silver, and Tinton Falls bound Fort Monmouth military installation. The installation includes two operational areas that include the Main Post and the Charles Wood Area.

The Main Post encompasses approximately 630 acres and provides supporting administrative, training and housing functions as well as many of the community facilities for Fort Monmouth. The Charles Wood Area, comprised of approximately 511 acres, is used primarily for research, development and testing, and includes the majority of post housing units.

Fort Monmouth's mission is to develop, acquire and sustain superior information technologies and integrated systems, enabling battle space dominance for America's warfighters. Fort Monmouth's personnel research, develop, acquire, field and sustain technologically superior and integrated Communications, Command, Control, Computer, Intelligence, Electronic Warfare, Sensors and Information Management (C4IEWS&IM) capabilities for America's warfighter.

Fort Monmouth provides fully integrated solutions for C4IEWS&IM through combined efforts of its major centers, the Research, Development and Engineering Center (RDEC), Information Systems Engineering Command (ISEC), Software Engineering Center (SEC), Logistics and Readiness Center (LRC), Acquisition Center (AC), Systems Management Center (SMC), as well as the various installations and staff support organizations.

Fort Monmouth has teamed with Program Executive Offices (PEOs) and Program Managers (PMs) to form the C4IEWS&IM Team. The combined capabilities provide seamless communication and information flow from the battlefield to the Pentagon, and across all services. Powerful command and control systems help our commanders to out-think and out maneuver the enemy. Sensors and other advanced systems developed by Team C4IEWS&IM gather intelligence and send still and video images along with voice and data messages over satellite links worldwide.

1.3 DEFINITION OF POLLUTION PREVENTION

Pollution prevention encompasses those activities that reduce the quantity of hazardous, toxic, or industrial pollutants at the source by changing the production, industrial, or other waste generating process. In addition, P2 is not limited to hazardous pollutants released to air, water, and land, but also includes activities to reduce the amounts of non-hazardous commercial and household wastes.

The Pollution Prevention Hierarchy used by the Army consists of the following principals.Pollution should be prevented or reduced at the source; if not feasible, then

- Pollution should be recycled in an environmentally safe manner; if not feasible, then
- Pollution should be treated in an environmentally safe manner; if not feasible, then
- Pollution should be disposed of in a safe manner only as a last resort.

Pollution prevention is any mechanism that successfully and cost-effectively avoids, prevents, or reduces the sources of pollutant discharges or emissions other than the traditional method of treating pollution at the discharge end of a pipe or stack. A P2 project is one, which applies source reduction, recycling, or waste minimization in order to reduce pollution from an installation's current business practices, industrial processes, base operations, or other routine activities.

1.4 BENEFITS OF POLLUTION PREVENTION

As concern for the environment has risen in our society, increased environmental regulation and public awareness have raised the standards, costs, and potential liabilities of waste management practices. Waste and resource management programs that adopt P2 principles can realize benefits on many different fronts:

- Reduced costs associated with the procurement and storage of hazardous materials and subsequent disposal of hazardous waste.
- Reduced costs associated with the management, treatment, and disposal of hazardous wastes.
- Decreased use of energy and water resources.
- Enhanced relations with the public, neighboring communities, and regulators.
- Reduced costs of complying with environmental and hazardous materials regulations, and diminished risk of non-compliance.
- Reduced future compliance liability.
- Improved long-term environmental quality and prevention of environmental degradation.

SECTION 2
POLLUTION PREVENTION REGULATORY BACKGROUND

The Army's P2 policies originate in legislation enacted by the U.S. Congress. Executive Orders direct federal agencies, including the Department of Defense (DOD), to conform to Federal legislation and may impose non-legislated requirements as well. The DOD issues directives and instructions in response to the Executive Orders. These DOD policy statements are interpreted and promulgated in Army regulations, pamphlets, and other policy documents. In addition, Major Army Commands (MACOMs), Major Subordinate Commands, and individual installations may adopt supplemental policies. This section provides summaries of the major laws, executive orders, and DOD policy statements pertaining to P2. Due to the wide-reaching nature of P2 issues and frequent changes to laws and regulations, the list is not intended to be all-inclusive.

2.1 FEDERAL LEGISLATION

Federal legislation sets national standards to control and handle emissions, discharges and disposal of harmful substances. The major federal acts are listed below as they relate to P2.

2.1.1 Resource Conservation and Recovery Act (RCRA) of 1976

RCRA provided an early legal impetus for P2 practices when it stated "...It shall be a condition of any permit issued under this section for the treatment, storage, or disposal of hazardous waste on the premises where such waste was generated that the permitee certify, no less often than annually, that the generator of the hazardous waste has a program in place to reduce the volume or quantity and toxicity of such waste to the degree determined by the generator to be economically practicable."

2.1.2 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980

CERCLA required that generators of hazardous wastes evaluate and document procedures for controlling the environmental impacts of their operations. An integral part of SARA is the emergency planning and community Right-to-Know Act and the requirements for reporting of hazardous materials and releases of hazardous waste.

2.1.3 Hazardous and Solid Waste Amendments (HSWA) of 1984

This act required all RCRA-regulated generators of hazardous waste to develop waste minimization programs. It included a requirement for disposal of hazardous waste that banned various chemical compounds from landfills.

2.1.4 Pollution Prevention Act of 1990

The Pollution Prevention Act of 1990 required facilities reporting releases for the Toxic Release Inventory (TRI) under the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 to provide documentation of their procedures for preventing the release of or for reusing covered materials. However, this act goes beyond wastes designated as RCRA hazardous waste. The intent is to force industries to examine the potential for reducing or prevent pollution at the source, and plan for the implementation of these methods where practical. In addition to source reduction, it also emphasizes reuse and closed loop recycling whenever possible. The emphasis is fundamentally different from off-site recycling, treatment, and disposal as primary ways to handle waste. The Pollution Prevention Act was the first legislation to establish a comprehensive national policy on a pollution protection hierarchy as described in Chapter 1.

2.2 NEW JERSEY STATE POLLUTION PREVENTION LEGISLATION

The State of New Jersey defines P2 as a change in production technologies that results in the reduction of the demand for hazardous substances or natural resources per product produced. Specific applicable state legislation includes:

2.2.1 Pollution Prevention Act P.L. 1991, c.235

Pollution Prevention Act P.L. 1991, c.235, is codified as N.J.S.A. 13:1D-35 et seq. and 34:5A-1 et seq. This law applies to the use and release of hazardous substances and the generation of hazardous substance as non-product output from industrial facilities. Pollution prevention is encouraged by the reduction of:

1. Hazardous material in industrial and manufacturing processes.
2. Non-product hazardous waste.
3. Releases of hazardous substances to multimedia environments.

The act requires facilities to develop a facility wide and process-level tracking system for hazardous substances. This system must identify the use, generation, consumption and disposal of the hazardous substance from cradle to grave.

2.2.2 New Jersey Administrative Code Title 7 Chapter 1K (NJAC 7:1K) Pollution Prevention Program Rules

These rules were established by New Jersey and apply to hazardous substance generators/TRI chemical users. Certain threshold use quantities have to be exceeded in order for the rules to directly apply. All waste media streams are included. Out of process recycling does not count as P2 in New Jersey. A new concept, Non-Product Output (NPO) was defined in these rules. NPO is a waste stream before treatment. The desire was identify NPO and target it for source reduction planning before treatment. Written site-specific P2 plans are required to be kept on site with annual progress reports submitted to the state. These rules do not apply to Fort Monmouth because none of the regulatory thresholds have been triggered.

2.3 PRESIDENTIAL EXECUTIVE ORDERS

2.3.1 Executive Order 13101, "Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition," September 1998

This Executive Order (EO) requires federal agencies to implement acquisition programs aimed at procuring products that are environmentally preferable, energy efficient, and/or contain post-consumer recovered materials. This order supersedes EO 12873.

2.3.2 Executive Order 13123, "Greening the Government through Efficient Energy Management," June 1999

This EO establishes requirements intended to encourage efficient energy management in the Federal Government. Specific goals of this EO include:

- Reduce greenhouse gas emissions from facility energy use 30% by 2010 from a 1990 baseline.
- Reduce facility energy consumption 30% per square foot by 2005 and 35% by 2010 from a 1985 baseline.
- For industrial and laboratory activities, reduce energy consumption 20% by 2005 and 25% by 2010 from a 1990 baseline.

2.3.3 Executive Order 13148, "Greening the Government Through Leadership in Environmental Management," April 2000

By including many of the P2 elements of several previously existing executive orders, this executive order revokes the following: Executive Order 12843 of April 1993, Executive Order 12856 of August 1993, Executive Order 12969 of August 1995, and section 1-4 'Pollution Control Plan" of Executive Order 12088 of October 1978. Executive Order 13148 establishes goals that involve establishing an effective Environmental Management System (EMS) as well as goals that involve reaching measurable P2 milestones. The goals that pertain directly to P2 are:

- Reduce Toxic Release Inventory (TRI) Form R releases 10% annually or 40% by December 31, 2006 from a baseline year of 2001. In addition to this reduction goal, note that this EO requires federal facilities to fully comply with the requirements of the Emergency Planning and Community Right to Know Act (EPCRA).
- Reduce the use of Environmental Protection Agency (EPA) priority chemicals 50% by December 31, 2006. Note that the EPA Interagency Workgroup has not yet established the list of priority chemicals. The executive order allows the workgroup until February 2001 to complete the list. The baseline year for the 50% reduction will be the calendar year immediately following the year in which the workgroup establishes the priority chemical list.
- Develop a plan to phase-out the procurement of Class I Ozone Depleting Substances (ODS) by December 31, 2010. The facility must develop this plan by April 31, 2001. Note that the Army established a goal to eliminate all ODS from each Army installation by December 31, 2003 and to develop the phase-out plan by September 30, 2000 (discussed further below).
- Develop a plan that addresses the facility's contribution toward achieving the goals in this executive order. This plan must be developed by March 2002. Note that this P2 plan satisfies this requirement.
- Determine the feasibility of implementing a hazardous material pharmacy system at the facility. The facility must make this determination by April 2002.
- Institute environmentally and economically beneficial practices pertaining to landscaping activities. These practices must be based upon the Guidance for Presidential Memorandum on Environmentally and Economically Beneficial Landscape Practices on Federal Landscaped Grounds (60 Fed. Reg. 40837). Landscaping activities must conform to this guidance by October 2001.
- Establish an EMS using the concept of the ISO14001 standard pursuant to Department of the Army Memorandum.

2.3.4 Executive Order 13149, "Greening the Government Through Federal Fleet and Transportation Efficiency," April 2000

This EO establishes goals to improve the average fuel economy and to increase the use of alternative fuels for fleet vehicles. Note that this order exempts tactical military vehicles, law enforcement vehicles, and emergency vehicles. This EO supersedes EO 13031 of December 1996. This EO established the following specific goals:

- Reduce vehicle petroleum consumption 20% by the end of FY 2005 from an FY 1999 baseline.
- Increase the average EPA fuel economy rating of cars and light trucks by at least 1 mile per gallon (mpg) by the end of FY 2002 and by 3 mpg by the end of 2005 from an FY 1999 baseline.
- Ensure that alternative fuels account for at least 50% of the fuels used in dual-fuel, alternative fuel vehicles.
- Ensure that at least 75% of car and light truck procurements are alternatively fueled vehicles.

2.4 DEPARTMENT OF DEFENSE (DOD) DIRECTIVES AND INSTRUCTIONS

Specific relative and applicable DOD directives and instructions include:

2.4.1 DOD Instruction 4715.4, "Pollution Prevention," June 1996

This document provides explicit guidance on P2 activities. It reiterates the P2 hierarchy principle, and establishes the DOD P2 measures-of-merit for TRI releases reduction, hazardous waste reduction, non-hazardous solid waste diversion, and alternatively-fueled vehicles. Note that the TRI and hazardous waste reduction goals became obsolete on December 31, 1999. As a result, the DOD is currently developing new measures of merit that will be incorporated into this plan as soon as they become available.

2.4.2 DOD Memorandum, "New DOD P2 Measure of Merit," May 1998

This memorandum establishes a new solid waste measure of merit to replace those in DOD Instruction 4715.4 (above). The new measure of merit is to "ensure that the diversion rate for non-hazardous solid waste is greater than 40% while ensuring integrated non-hazardous solid waste management programs provide an economic benefit when compared with disposal using landfilling and incineration alone." This goal is to be attained by the end of fiscal year (FY) 2005.

2.4.3 Memorandum, Assistant Secretary for Installations, Logistics, and Environment, "Ozone-Depleting Chemicals (ODC) Elimination at Army Installations," 13 February 1996

With this memorandum, the Assistant Secretary of the Army for Installations, Logistics, and Environment established an Army-wide goal to completely eliminate Class I Ozone Depleting Substances (ODS) from all Army installations by December 31, 2003.

SECTION 3
INSTALLATION POLLUTION PREVENTION PROGRAM

3.1 POLICY

Fort Monmouth is committed to an active policy of protecting the environment through the following efforts:

- Reducing the use of hazardous substances
- Reducing releases of pollutants to the environment
- Conserving energy and natural resources
- Maximizing recycling efforts
- Promoting P2 through education, training, and awareness
- Reduce toxicity of hazardous substances used that can not be eliminated
- Providing a clean and safe environment in our community while striving for continuous improvement
- Establishing an EMS modeled after ISO14001 Standard
- Ensuring a safe and healthy workplace for our staff
- Complying with all applicable Federal, State and Local laws and regulations, and other requirements

To accomplish these objectives, Fort Monmouth shall continuously identify opportunities to reduce or eliminate pollution through source reduction and other prevention methods. This policy extends to all environmental media including air, water, and land.

Fort Monmouth is committed to reducing the amount and toxicity of pollution that it generates. As part of this commitment, Fort Monmouth shall give priority to source reduction. Where source reduction is not feasible, Fort Monmouth will investigate and implement other prevention measures such as recycling, treatment, and controlled disposal. Pollution prevention is the responsibility of everyone at this installation.

3.2 POLLUTION PREVENTION MANAGEMENT STRUCTURE

Fort Monmouth manages its overall environmental program through a series of defined responsibilities. As an important aspect of the environmental program, the installation also manages its P2 program in this manner. The various levels of responsibility for environmental management are as follows:

3.2.1 Command Level

With regards to the environmental program, installation command personnel are responsible for establishing overall policies, instituting regulations, and setting goals. In addition, they are responsible for establishing budgets and authorizing funding for the overall EMS program and for specific projects. Command and Directorate level personnel stay involved in environmental activities primarily through regular meetings of the installation Environmental Quality Control Committee (EQCC) that meets once per quarter.

3.2.2 Primary Level

The Fort Monmouth Environmental Office maintains the principal responsibility for environmental oversight and management. The environmental office consists of personnel who are each responsible for managing various environmental programs such as P2, hazardous waste, solid waste, air emissions, above and underground storage tanks, etc.

3.2.3 Support Level

Organizations and personnel at this level have the responsibility of furnishing the environmental office with the resources and/or data required to manage EMS programs. Participants at this level include the installation Command Staff and it's Directorates. Some specific examples of support level activities include: the Command Judge Advocate providing legal advice for permit registration; the Logistics Division overseeing hazardous material supply operations; The Directorate of Contracting providing policy and oversight for credit card hazardous material purchases, and the DPW maintaining environmental training records for installation personnel.

3.2.4 Task Level

Personnel consist primarily of contractors that provide the installation with specific work products, operate the hazardous substance management system, and manage the hazardous waste storage yards and record keeping.

3.2.5 Resource Level

Resources are typically regarded as various personnel on Fort Monmouth who have environmental training, experience, or knowledge and can contribute to specific aspects of environmental program management. Resources include those with extensive environmental knowledge such as environmental office personnel who are not directly responsible for a specific program but who may lend advice and assistance to that program's manager. Resources may also include personnel who serve in a limited environmental capacity such as those responsible for managing hazardous waste at industrial activities.

3.2.6 Operator Level

This level of personnel has the responsibility of providing technical information about the existing processes and potential process changes to operations and waste generation activities to the primary level personnel. Some specific examples of this level include the Motor Pool personnel and DPW shop personnel.

3.3 BASELINE DEVELOPMENT

The baselines for Fort Monmouth's P2 objectives are primarily derived from the pollution reduction goals established by "greening of the Government" executive orders and the Department of Defense Measures of Merit (MoM). These baselines integrate toxicity reduction into each waste type and source, and are based on the following metrics and are quantitatively identified in chapters 5-14 of this plan.

- Hazardous Waste: Total disposed (pounds)
- Solid Waste: Percent of total generated diverted to recycling (percent)
- Air Emissions: Amount emitted (tons)
- Water: Amount Consumed (gallons)
- Wastewater: Amount generated (gallons)
- TRI Form R Chemical Releases: Releases and off-site transfers (pounds)
- EPA Priority Chemicals: Purchases of individual target chemicals (pounds)
- Ozone Depleting Substances: Total inventory (pounds)
- Vehicle Fuel use: Amount of petroleum consumed (gallons)
- Amount of alternative fuel consumed (gallons)
- Energy: Electricity used (kWh) per total square feet of installation facilities
- Alternatively-Fueled Vehicles: number of vehicles leased/procured

3.4 OPPORTUNITY ASSESSMENTS

When reduction targets/goals are determined, options for meeting them must be identified. These options are identified through P2 Opportunity Assessments (P2OAs). P2OAs examine current processes and identify and evaluate alternatives for P2. Projects identified by P2OAs must have complete data to show the cost/benefit of the project.

P2OA are the method of identifying process improvements or options. Conducting an opportunity assessment involves examining all input sources, material usage, and waste generation by type and weight, and determining practical and economical options for reduction. This generally involves examining each process involving a targeted substance to determine ways to avoid use or minimize generation of that substance. Detailed baseline information characterizing material use and waste streams for each process may be gathered concurrently or subsequent to the assessment process depending on complexity and availability of the process. Opportunity assessments may be performed by trained post level or MACOM personnel, or contractors and, to be effective, must have the involvement of process-level personnel.

Fort Monmouth has already met all of the Army's goals shown in Section 3.5 below except for alternate fuel vehicles. Several new P2 projects consistent with Fort Monmouth's philosophy of pursuing continuous improvement are proposed. These projects utilize technology acquisition, recycling and material substitution to achieve goals.

3.5 POLLUTION PREVENTION GOALS

Sections 5-14 of this plan describe the installation's P2 goals with respect to each environmental media area. The installation developed these goals based on previously described environmental laws, executive orders, and Department of Defense policies. **Table 3.1** summarizes the P2 goals that are defined in the Guidance for Developing Army P2 Plans (June 2001).

3.6 IMPLEMENTATION AND EVALUATION

This section describes some of the methods and tools the installation uses to track and document its environmental efforts such as P2 projects and initiatives.

3.6.1 Environmental Quality Report

This report is part of an automated system used to collect a wide variety of installation environmental information, including compliance, conservation, program management, and P2 programs. The primary goal of the Environmental Quality Report (EQR) is to

TABLE 3.1
Summary of Pollution Prevention Goals

Media	Goal	Source of Goal	Baseline Year	Target Year
Hazardous Waste	Continuous annual reduction in disposal volume and toxicity	Proposed DoD MoM	NA	NA
Solid Waste	40% diversion to recycling	DoD MoM	NA	Dec 2005
Air Emissions	Continuous annual reduction in emissions	DoD MoM	NA	NA
Water Use	Continuous annual reduction in potable water use	---	NA	NA
Wastewater Generation	Continuous annual reduction in wastewater generation	---	NA	NA
TRI Releases	40% reduction	EO 13148	2001	Dec 2006
EPA Priority Chemicals	50% reduction in chemical use	EO 13148	2002	Dec 2006
ODSs	Eliminate Class I ODSs from inventory	Memorandum ASA IL&E	NA	Dec 2003
Vehicle Fuel	Increase fleet fuel efficiency by 3 miles per gallon	EO 13149	1999	Dec 2005
	Reduce vehicle petroleum consumption by 20%	EO 13149	1999	Dec 2005
	Ensure that alternative fuels account for 50% of fuels used in dual-fuel vehicles	EO 13149	NA	2005
	Ensure that 75% of vehicles procured in the target year and beyond are alternative fuel vehicles	EO 13149	NA	1999
Energy	Reduce facility energy consumption by 30%	EO 13123	1985	2005
	Reduce facility energy consumption by 35%	EO 13123	1985	2010
Affirmative Procurement	Train procurement officers and integrate AP into developing plans, work statements, and specifications	EO 13148	NA	NA

provide DOD with the information it requires as well as providing HQDA, MACOM, Major Subordinate Commands (MSC), and installations with critical management information while minimizing short suspense tasking to installation personnel. The EQR program is a result of the 1996 Defense Environmental Quality Program Annual Report to Congress, RCS DD-A&T (A) 1997. All data elements in the EQR are based on the DOD RCS-A&T (A) 1997 reporting protocol, and other law(s) and regulation(s) reporting requirements. All of these provide users and policy makers with periodic updates on critical data within the Army's environmental program. The EQR serves as the source of data for: annual environmental quality (EQ) reports to Congress; semi-annual EQ reports to the DoD; quarterly reports for the Quarterly Army Performance Review; MACOM EQ IPRs; Installation Management Steering Committee (IMSC) meetings; and semi-annual EO reports to MACOMs.

3.6.2 Army Environmental Program Requirements

Installation personnel use the EPR database to plan, program, budget and forecast costs to manage the environment; to practice good environmental stewardship; and to attain and maintain compliance with existing and pending federal, state, local environmental laws and regulations. It is used to show past expenditures; to track project execution and performance; to refine and validate requirements for the budget year; and to plan and program requirements and resources in the out-years.

3.6.3 Environmental Compliance Assessment System

The Environmental Compliance Assessment System (ECAS) is an Army-wide program that documents an installation's compliance status on a 3-year cycle. As a component of ECAS, assessors evaluate the installation's P2 program in terms of its compliance with many of the directives and executive orders described in Chapter 2. This evaluation is included as part of the Environmental Compliance Assessment Report (ECAR). After each environmental compliance assessment, the assessors write an ECAR and provide copies to the installation and its MACOM. The installation then works with the MACOM to develop an Installation Corrective Action Plan (ICAP). Developing the ICAP serves as an opportunity to consider and plan for P2 projects that can help achieve P2 goals and maintain compliance.

3.7 REPORTING REQUIREMENTS

The installation has the following P2 reporting requirements:

- RCRA Hazardous waste generator biennial or annual report
- Environmental Quality Report (EQR) hazardous waste disposal and recycling roll-ups, from AR 200-1
- Environmental Program Requirements (EPR) of programming, budgeting, and execution for all environmental projects, including P2, from AR 200-1
- ODS procurement approvals and determinations, from Section 326 of the National Defense Authorization Act for FY93
- Solid Waste Annual Report (SWAR)
- Installation Status Report Part II (Environment)
- EPRCA Tier I/II Reports

3.8 POLLUTION PREVENTION PROJECT FUNDING

Pollution prevention projects are funded from the appropriate account of the proponent's operating budget.

SECTION 4
COMPLIANCE THROUGH POLLUTION PREVENTION

4.1 DESCRIPTION OF COMPLIANCE THROUGH P2

Pollution Prevention can be a strong tool for an installation to use to reduce its compliance burden. Since the concept of P2 was first introduced, it has been accepted that P2 can improve an installation's compliance status. This section represents Fort Monmouth's efforts to categorize and document its potential compliance benefit. The following subsection illustrates the concept of compliance through P2.

4.2 COMPLIANCE SITES

A compliance site is a facility or process that falls under environmental regulation. A single area may have multiple compliance sites associated with it. For example, an industrial process may have a wastewater discharge point, permitted air emission sources, and a hazardous waste storage area. Some examples of compliance sites include permitted air emission sources, hazardous waste accumulation areas, regulated storage tanks, transformer substations, storm water discharge points, sanitary wastewater, etc.

4.2.1 Hazardous Waste Accumulation Areas

In FY 92, Fort Monmouth instituted a policy to limit the number of RCRA 90-day storage facilities to a maximum of three per compliance area. As of 2003, Fort Monmouth has exceeded that goal, currently having a total of only three such facilities, one each at the Main Post, Charles Wood and Evans areas. Fort Monmouth is expected to maintain three 90-day storage facilities in FY 03 due to operations and remedial actions.

Table 4.1 is provided to track the progress that Fort Monmouth has made in reducing its number of hazardous waste compliance sites. On Main Post, the three facilities are located in Buildings 121, 122, and 123. The Charles Wood Area RCRA 90-day storage areas are located in buildings 2630, 2631 and 2632. The Evans Area has one temporary building 9015 used to store hazardous waste.

The Evans Area is primarily a remediation site undergoing Base Realignment and Closure (BRAC) and it is anticipated that the area will be closed by the end of FY 2003. Remediation projects can cause large increases in hazardous waste in a given year. These projects are tracked separately from operational waste streams. During FY01 the hazardous waste from the Evans Area exceeded over 9,000,000 pounds.

TABLE 4.1
NUMBER OF HAZARDOUS WASTE STORAGE FACILITIES

Facility Type	Quantity				
	1999	2000	2001	2002	2003
Part B	0	0	0	0	0
90-Day[1]	3	3	3	3	3
Satellite[2]	30	30	30	30	30

1 Fort Monmouth in FY92 instituted a policy limiting the number of 90 Day storage sites.

2 Fort Monmouth numbers of satellite accumulation sites some times varies due to temporary mission changes but has been steady since FY97.

Centralized Hazardous Substance Management System (HSMS) will reduce the amount of hazardous waste generation, but this initiative is not expected to eliminate the need for three 90-day hazardous waste accumulation sites on the installation. However, reduction in the volume of hazardous waste generated will reduce the overall environmental management compliance burden at Fort Monmouth. This initiative will be implemented in FY04 and the HSMS is expected to include all installation activities. For more information on this initiative, see Section 5.4.2.

4.2.2 Permitted Air Emission Sources

Fort Monmouth currently has two Title V permits; one for the Main Post and the other for the Charles Wood Area. Since these two sites are not contiguous, it is probably not possible to combine these permits into one permit and as such no reduction in compliance sites can be anticipated. The only potential reduction would be closing of individual sources, which will be examined in Section 7 of this report. Several boilers in the Evans Area have individual permits and these will be eliminated by the BRAC activities during FY03.

4.2.3 Permitted Solid Waste Disposal Facilities

Fort Monmouth currently has no permitted solid waste disposal facilities on the Main Post or the Charles Wood Area. Therefore, no potential for the reduction in compliance site is anticipated. The Evans Area also does not have any solid waste facilities and the area will be eliminated by the BRAC activities during FY03.

4.2.4 Regulated Underground Storage Tanks

Fort Monmouth currently has 16 Underground Storage Tanks (USTs). Fort Monmouth has removed approximately 500 USTs during the past 10 years. The potential for further reduction in the number of USTs is considered low because of this aggressive removal program.

4.3 COMPLIANCE THRESHOLDS

Compliance thresholds are quantitative limits that trigger environmental compliance requirements once they are exceeded. An example of a compliance threshold includes the waste generation limits for determining hazardous waste generator status (greater than 2,200 LBS/mo is large quantity, less than 2,200 but greater than 220 lbs/mo is small quantity, and less than 220 lbs/mo is a conditionally exempt small quantity). Another example is the limit for TRI reporting. Facilities that use more than 10,000 pounds of a TRI chemical in a year must include that chemical in its TRI Form R report.

4.3.1 Hazardous Waste Thresholds

The operational waste stream at Fort Monmouth included 29,000 pounds of hazardous waste in FY 2002, or about 2,400 pounds per month, including waste generated by operations, R&D labs and one time events. Rates are variable. As such, Fort Monmouth is considered a large quantity hazardous waste generator. Reducing this amount to less than the 2,200 pounds per month threshold would allow the installation to be considered a small quantity generator. Past initiatives designed to do so are described below. Because of the potential for remediation projects on Fort Monmouth, the facility will probably remain a large quantity generator for the foreseeable future.

4.3.1.1 Initiatives to Reduce Generation to Below the Threshold

Aqueous Based Parts Washing.

Beginning in 1997, Fort Monmouth implemented a program that eliminated chlorinated solvents for parts washing. Since 2001, all parts washing is accomplished using aqueous-based cleaners. This program has reduced annual hazardous waste generation by approximately 6,500 pounds per year.

4.3.2 TRI Release Thresholds

Fort Monmouth currently reports zero pounds of TRI release per year, and as such, no compliance threshold benefits can be developed. It is the intention of Fort Monmouth to maintain that regulatory status.

4.3.3 EPA Priority Chemical Thresholds

EPA is preparing guidelines for reporting requirements for priority chemical usage. The reporting guidelines, and list of applicable priority chemicals, have not been finalized. Accordingly, Fort Monmouth does not report EPA Priority Chemicals per year and, as such, no compliance threshold benefits can be developed. Section 10 addresses this area in greater detail and discusses ways to reduce lead and mercury, which are expected to be on the final list.

SECTION 5
HAZARDOUS AND INDUSTRIAL WASTE

5.1 PREVENTION GOAL

The installation's hazardous and industrial waste reduction goal is to show a continuous annual reduction in the overall generation and disposal of these wastes. For the purposes of this plan, hazardous wastes include all wastes that fall under RCRA Subtitle C, have an assigned EPA hazardous waste code and require a hazardous waste manifest for disposal.

Industrial wastes are such things as universal waste or other waste not acceptable at a municipal landfill that are not always considered hazardous under RCRA but must be managed separately from municipal solid wastes. Since hazardous waste is regulated differently, it is important to separate the disposal totals for hazardous waste and for industrial waste. Examples might include used antifreeze, used batteries, used oil, etc. There are no major manufacturing operations at Fort Monmouth. Waste sources include research and analytical labs, maintenance shops, motor pools, and housing activities.

5.2 BASELINE AND PROGRESS

Table 5.1 provides the baseline for hazardous waste and **Table 5.2** provides the baseline for Non-hazardous waste for Fort Monmouth.

TABLE 5.1
OPERATIONAL HAZARDOUS WASTE (POUNDS DISPOSED PER CALENDAR YEAR)

BASELINE							TARGET: CONTINUOUS REDUCTION
1999	2000	2001	2002	2003*	2004*	2005*	2006*
37,500	23,719	27,311	26,584	NA	NA	NA	NA

* Estimated

Hazardous waste generation has decreased by approximately 20% since 1999. Progress has been made primarily due to material substitution, improved management methods and procedures, use of satellite storage areas, changes in construction and maintenance, and personnel training. Industrial waste generation has also been reduced by about 7% utilizing similar operational strategies.

TABLE 5.2
OPERATIONAL
NON-HAZARDOUS INDUSTRIAL WASTE
(POUNDS DISPOSED PER CALENDAR YEAR)

BASELINE							TARGET: CONTINUOUS REDUCTION
1999	2000	2001	2002*	2003*	2004*	2005*	2006*
91,000	78,000	85,000	90,000	NA	NA	NA	NA

* Estimated

Notes: Not included in the above are: Used oil (recycled off-site), chimney soot . Soot generation is irregular in amount. One time waste streams for remediation and closure of small areas on the site. In addition, no TSCA or other PCB waste streams are included.

5.3 DESCRIPTION OF MAJOR WASTE GENERATING ACTIVITIES

Major hazardous or industrial waste generating activities at Fort Monmouth result from the Research and Development mission and Base Operations. Industrial waste is defined at Fort Monmouth as wastes such as universal waste or other waste not acceptable at a municipal landfill. Mission generated waste streams include: research laboratory waste, prototype waste, and destructive testing of various equipment. Base Operation waste streams include: building maintenance activities, vehicle maintenance activities, hospital and dental clinic wastes, and the environmental test laboratory. **Table 5.3** is a list of buildings on Fort Monmouth where hazardous waste activities occur and their waste streams. **Table 5.4** specifically identifies hazardous waste, industrial non-hazardous waste, universal waste, TSCA waste and remediation waste at Fort Monmouth by waste type, amount and location.

5.4 CURRENT POLLUTION PREVENTION INITIATIVES

The State of New Jersey has a very aggressive recycling program coupled with strong enforcement of the regulations. Fort Monmouth has been very proactive in P2 since the early 1990's and has accomplished reduction and recycling ahead of DOD goals. Because of this, Fort Monmouth has been in the forefront of most federal facilities in some areas. Current and former P2 initiatives at Fort Monmouth for hazardous and industrial waste include:

1. Reduction of the number of underground storage tanks (USTs) on site from 521 to 16. All USTs meet present compliance standards.
2. Heating fuel was changed from fuel oil to natural gas. Cost savings are estimated at several hundred thousand dollars per year. Environmental benefits include the elimination of USTs, and thus potential remediation sites.
3. Best Management Practices (BMP) for hazardous material storage such as for fuel oil and transformers. The Fort has a Spill Prevention Control and Countermeasures

TABLE 5.3
GENERATING HAZARDOUS WASTE ACTIVITIES
FORT MONMOUTH, NEW JERSEY

Building Number	Building Activity	Activity	Type of Hazardous Waste
166	Sign Shop	Responsible for the maintenance of all signs on FM. Occasionally malfunctioning spray cans that contain product generate hazardous waste.	• Aerosol Lubricant Cans
173 &174	Environmental Laboratory	Environmental Laboratory responsible for analysis of samples from various Army Installations. Laboratory processes generate hazardous waste.	• Methylene Chloride • Non-Haloginated Solvents • Inorganic Acids • Inorganic Acids/w Metals • TPHC Soils • Inorganic Acids w/mercury • Caustic Waste • Cyanide Bearing Waste • Cyanide & Pyridine Waste • Sulfide Bearing Waste • Mercury Waste • Waste Phenols • Acetonitrile
279	HVAC/Heat/CPM Shop	Responsible for all maintenance activities for HVAC. Occasionally malfunctioning spray cans that contain product generate hazardous waste.	• Aerosol Paint Cans
280	Main Post Paint Shop	Responsible for all painting activities of various items and the storage of paints. The waste generated by the painting activities generates the hazardous waste.	• Waste Paint Thinner • Waste Paint Chips with Lead • Waste Oil Based Paint • Aerosol Paint Cans • Aerosol Solvent Cans

TABLE 5.3
GENERATING HAZARDOUS WASTE ACTIVITIES
FORT MONMOUTH, NEW JERSEY

Building Number	Building Activity	Activity	Type of Hazardous Waste
450	Fort Monmouth Marina	Routine boat maintenance and painting. The waste generated by the painting activities generates the hazardous waste.	• Waste Oil Based Paint
484	Recycling Shop	Residuals from the recycling activities from the antifreeze may be hazardous depending on the analysis.	• Waste Oil Based Paint • Aerosol Paint Cans • Aerosol Adhesive Cans • Spent Chlor-D-Tect Kits • Antifreeze residuals
699	AAFES Main Post Gas Station	Fuel dispensing and automotive repair services. Occasionally malfunctioning spray cans that contain product generate hazardous waste.	• Aerosol Lubricant Cans
750	Installation Transportation Motor Pool	Automotive logistics and repair services. Occasionally malfunctioning spray cans that contain product generate hazardous waste along with the spent gas fuel filters.	• Aerosol Lubricant Cans • Gas Fuel Filters
753	Automotive/Vehicle Repair Shop	Major repair and rebuilding of autos and tactical vehicles. Occasionally malfunctioning spray cans that contain product generate hazardous waste along with the spent gas fuel filters.	• Aerosol Lubricant Cans • Gas Fuel Filters
754	Forklift/Lawnmower Repair Shop	Repair of lawnmowers and forklifts for Fort Monmouth. Occasionally malfunctioning spray cans that contain product generate hazardous waste.	• Aerosol Lubricant Cans

TABLE 5.3
GENERATING HAZARDOUS WASTE ACTIVITIES
FORT MONMOUTH, NEW JERSEY

Building Number	Building Activity	Activity	Type of Hazardous Waste
760	Radio Repair Shop	Repair of electronics and radios for Fort Monmouth. Occasionally malfunctioning spray cans that contain product generate hazardous waste.	• Aerosol Lubricant Cans
814	Dental Clinic	Activities at the dental clinic that generate hazardous waste are related to the routine dental work for military and dependent personal. Occasionally malfunctioning spray cans that contain product generate hazardous waste.	• Lead Foil Wrap • Waste Fixer • Mercury Amalgam • Waste Developer • Aerosol Spray Cans
1075	Patterson Army Hospital	The hospital generates hazardous waste by the use of certain equipment that contains mercury. Additionally the development of X-rays and other medical imaging create a hazardous waste stream of chemical waste. The malfunctioning spray cans that contain product generate hazardous waste.	• Mercury Spill Debris • Aerosol Lubricant Cans
1122	Special Services Auto craft Shop	Area where Fort personal can work on their private automobiles	• Degreasing Solvents
1220	Main Post Boiler Plant	Fort Monmouth main boiler plant uses natural gas to generate steam. Occasionally malfunctioning spray cans that contain product generate hazardous waste.	• Aerosol Lubricant Cans

TABLE 5.3
GENERATING HAZARDOUS WASTE ACTIVITIES
FORT MONMOUTH, NEW JERSEY

Building Number	Building Activity	Activity	Type of Hazardous Waste
		Charles Wood	
2502	RDEC Sheet Metal Shop	Hazardous waste is produced by the use of paints and lubricants. Occasionally malfunctioning spray cans that contain product generate hazardous waste.	• Aerosol Lubricant Cans Aerosol Paint Cans
2503	RDEC Machine Shop	Hazardous waste is generated by the use of lubricants. Occasionally malfunctioning spray cans that contain product generate hazardous waste.	• Aerosol Lubricant Cans
2506	RDEC Paint Shop	Responsible for all painting activities of various items and the storage of paints. The waste generated by the painting activities generates the hazardous waste.	• Waste Paint Thinner • Paint Spill cleanup Debris • Waste Oil Based Paint • Aerosol Paint Cans
2506	RDEC Fabrication Shop	Occasionally malfunctioning spray cans that contain product generate hazardous waste.	• Aerosol Lubricant Cans
2507	Tactical Vehicle Repair Shop	Occasionally malfunctioning spray cans that contain product generate hazardous waste.	• Aerosol Lubricant Cans
2700 Room2D200	RDEC R&D Laboratory	Hazardous waste is generated by the research and development on batteries and electronic equipment.	• Mixed Solvents with no metals • Mixed Solvents with inorganic salts

TABLE 5.3
GENERATING HAZARDOUS WASTE ACTIVITIES
FORT MONMOUTH, NEW JERSEY

Building Number	Building Activity	Activity	Type of Hazardous Waste
2700 Room 2C201	RDEC R&D Laboratory Lab Area 1	Hazardous waste is generated by the research and development on batteries and electronic equipment.	• Mixed Solvents with no metals • Organic Acid Waste • Mixed Solvents with inorganic salts
2700 Room 2C201	RDEC R&D Laboratory Lab Area 2	Hazardous waste is generated by the research and development on batteries and electronic equipment.	• Mixed Solvents with no metals • Organic Acid Waste • Mixed Solvents with inorganic salts
2700 Room2C205	RDEC R&D laboratory	Hazardous waste is generated by the research and development on batteries and electronic equipment.	• Mixed Solvents with no metals
2700 Room 2C211	RDEC R&D laboratory	Hazardous waste is generated by the research and development on batteries and electronic equipment.	• Mixed Solvents with no metals • Inorganic Acid Waste • Reactive Salts • Inorganic Caustic Waste • Mercury Waste • Sulfuric Acids
2700 Room 2D212	RDEC R&D laboratory	Hazardous waste is generated by the research and development on batteries and electronic equipment.	• Mixed Solvents with no metals • Inorganic Acid Waste • Reactive Salts • Inorganic Caustic Waste

TABLE 5.3
GENERATING HAZARDOUS WASTE ACTIVITIES
FORT MONMOUTH, NEW JERSEY

Building Number	Building Activity	Activity	Type of Hazardous Waste
2700 Room 2D310	RDEC R&D laboratory	Hazardous waste is generated by the research and development on batteries and electronic equipment.	• Mixed Solvents with no metals • Potassium Hydroxide • HF & Organic Solvents • HF &HCL Waste • HCL &HNO3 Waste • Chormic Acids Waste • HCL &H2O2 Waste • Organic Acid Waste • NH4OH Bifluoride Waste • Potassium Cyanide Waste • Phosphoric Acid & Water
2700	Myers Center Loading Dock		• Aerosol Paint Cans • Aerosol Solvent Cans • Waste Oil Based Paint • Broken Fluorescent Lights
2700	Myers Center Self Service Supply Center		• Large Fluorescent Lights • Small Fluorescent Lights

TABLE 5.4
FORT MONMOUTH
HAZARDOUS AND INDUSTRIAL WASTES

WASTE CODE	MAIN POST[1]					CHARLES WOOD[1]					EVANS[1]					TOTAL[1]				
	1999	2000	2001	2002	TOTAL	1999	2000	2001	2002	TOTAL	1999	2000	2001	2002	TOTAL	1999	2000	2001	2002	TOTAL
D001FLAM GAS (AEROSOLS)	50	31	922	523	1,526	0	0	0	0	0	20	0	0	0	20	70	31	922	523	1,546
D001, U115FLAMMABLE GAS ETHYLENE OXIDE	6	0	0		6	0	0	0	0	0	0	0	0	0	0	6	0	0	0	6
D001FLAMMABLE LIQUID	135	60	0		195	25	30	0	0	55	0	0	0	0	0	160	90	0	0	250
D001FLAMMABLE LIQUID RUBBER CEMENT W/ HEPTANE	0	0	415		415	0	0	0	0	0	0	0	0	0	0	0	0	415	0	415
D001FLAMMABLE LIQUID (OIL BASED PAINT & LACQUER)	0	0	0		0	0	0	555	0	555	0	0	0	0	0	0	0	555	0	555
D001FLAMMABLE SOLID (TONERS & INKS)	240	0	0		240	0	0	0	0	0	0	0	0	0	0	240	0	0	0	240
D001FLAMMABLE SOLID (EPOXIES, RESINS & TARS)	1,200	0	0		1,200	0	40	0	0	40	0	0	0	0	0	1,200	40	0	0	1,240
D001WASTE FLAMMABLE SOLIDS, INORGANIC	0	0	0		0	10	0	0	0	10	0	0	0	0	0	10	0	0	0	10
D001FLAMMABLE LIQUID, TOXIC	60	0	0		60	0	0	0	0	0	0	0	0	0	0	60	0	0	0	60
D001OIL PAINT	2,000	0	0		2,000	0	0	0	0	0	0	0	0	0	0	2,000	0	0	0	2,000
D001Waste Petroleum Gases (LPGCANISTERS)	0	0	0	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	8	8
D001FLAMMABLE SOLIDS ADHESIVE, RESINS	0	0	0	1,152	1,152	0	0	0	0	0	0	0	0	0	0	0	0	0	1,152	1,152
DOO1WASTE PERCHLORATES (LITHIUM PERCHLORATES)	0	0	0	0	0	0	0	0	18	18	0	0	0	0	0	0	0	0	18	18
D001OIL PAINT (NO METALS)	0	587	0		587	0	0	0		0	0	0	0	0	0	0	587	0	0	587
D001,D002WASTE CORROSIVE OXIDZING LIQUID (HYRDOGEN PEROXIDE)	0	0	0	5	5	0	0	0	0	0				0		0	0	0	5	5
D001,D002WASTE CORROSIVE LIQUIDS, BASIC INORGANIC (HYRDOXIDE CLEANERS)	0	0	0	245	245	0	0	0	0	0	0	0	0	0	0	0	0	0	245	245
D001,D002WASTE CORROSIVE LIQUIDS (H_2SO_4, HCL)	0	0	0	210	210	0	0	0	0	0	0	0	0	0	0	0	0	0	210	210
DO001,D008FLAMMABLE LIQUID (OIL BASED PAINT 7LACQUER WITH LEAD)	0	0	0	459	459	0	0	0	0	0	0	0	0	0	0	0	0	0	459	459
D001, D009OIL BASE PAINT WITH MERCURY	0	0	0		0	0	377	0	0	377	0	0	0	0	0	0	377	0	0	377
D001OXIDIZING SOLID	65	0	0		65	15	0	0	0	15	0	0	0	0	0	80	0	0	0	80
D001WASTE OXIDIZING SOLID (SODIUM BICARBONATE / SODIUM NITRATE)	0	0	11		11	0	0	0	0	0	0	0	0	0	0	0	0	11	0	11
D001, D003WASTE ORGANIC PEROXIDE, TYPE B LIQUID	100	0	0		100	0	0	0	0	0	0	0	0	0	0	100	0	0	0	100
D001, D003WASTE OXIDIZING CORROSIVE LIQUID	0	0	0		0	30	0	0	0	30	0	0	0	0	0	30	0	0	0	30
D001, D008OIL BASE PAINT WITH LEAD	400	0	860		1,260	0	0	0	0	0	0	0	0	0	0	400	0	860	0	1,260
D001, D008WASTE FLAM LIQUIDS (CORROSIVE WATER INORGANIC ACIDS, H2SO4, HCL, ETHYL ETHER)	0	0	35		35	0	0	0	0	0	0	0	0	0	0	0	0	35	0	35
D001, F002WASTE FLAM LIQUIDS (FREON, SURFACTANTS)	0	0	430		430	0	0	0	0	0	0	0	0	0	0	0	0	430	0	430
D001, D018, D021, D022, D035, D039, D040, F002, F003, F005 WASTE FLAM LIQUIDS (ISOPROPYL ALCOHOL, METHYLENE CHLORIDE)	0	0	450		450	0	0	0	0	0	0	0	0	0	0	0	0	450	0	450
D001, D011WASTE FLAMMABLE SOLIDS, (ADHESIVES, EPOXIES, RESINS)	400	0	0		400	0	0	0	0	0	0	0	0	0	0	400	0	0	0	400
D001,U122WASTE FORMALDEHYDE	190	0	0		190	0	0	0	0	0	0	0	0	0	0	190	0	0	0	190
D002CORROSIVE LIQUID ACIDIC, INORGANIC	3,480	3,145	2,530	0	9,155	240	88	0	29	357	3,525	0	0	0	3,525	7,245	3,233	2,530	29	13,037
D002CORROSIVE LIQUID ACIDIC, ORGANIC	180	0	0		180	0	400	0	0	400	0	0	0	0	0	180	400	0	0	580
D002CORROSIVE LIQUID BASIC, INORGANIC	537	154	0	104	795	90	10	0	0	100	0	0	0	0	0	627	164	0	104	895
D002CORROSIVE LIQUID BASIC, ORGANIC	110	0	0		110	30	750	0	0	780	0	0	0	0	0	140	750	0		890
D002 SODIUM HYDROXIDE SOLUTION	0	0	0	0	0	0	0	0	35	35	0	0	0	0	0	0	0	0	35	35
D002 WASTE CORROSIVE LIQUID ACID, INORGANIC	0	0	0	2,994	2,994	0	0	0	0	0	0	0	0	0	0	0	0	0	2,994	2,994
DOO2 WASTE SULPHURIC ACID (.51%)	0	0	0	0	0	0	0	0	30	30	0	0	0	0	0	0	0	0	30	30
D002, D003CORROSIVE LIQUID BASIC, ORGANIC	0	151	0		151	0	0	0	0	0	0	0	0	0	0	0	151	0	0	151
D002, D003CORROSIVE LIQUID ACIDIC, INORGANIC	0	24	0		24	0	0	0	0	0	0	0	0	0	0	0	24	0		24
D002, D006, D008 WASTE CORROSIVE LIQUID, TOXIC (HCL, ARSENIC AND LEAD)	0	0	0	32	32	0	0	0	0	0	0	0	0	0	0	0	0	0	32	32
D002, D006, D008 WASTE CORROSIVE LIQUID, ACIDIC (HCL, H_2SO_4 WITH CADMIUM)	0	0	0	433	433	0	0	0	36	0	0	0	0	0	0	0	0	0	469	469
D002, D006, D007 WASTE CORROSIVE LIQUID , INORGANIC	0	0	0	520	520	0	0	0	0	0	0	0	0	0	0	0	0	0	520	520
D002,D006, D009 WASTE CORROSIVE (BASIC INORGANIC CAUSTIC SODA WITH MERCURY AND CADMIUM)	0	0	0	60	60	0	0	0	0	0	0	0	0	0	0	0	0	0	60	60
D002, D007CORROSIVE LIQUID ACIDIC, INORGANIC W/ CHROMIUM	0	0	0		0	0	20	0		20	0	0	0	0	0	0	20	0	0	20
D002, D007WASTE CORROSIVE LIQUID ACIDIC, ORGANIC (ACETIC ACID PHOTOBATH MIX)	0	0	0	0	0	0	0	0	46	46	0	0	0	0	0	0	0	0	46	46
D002, D007, D009,D011 WASTE CORROSIVE LIQUID ACIDIC, (HCL WITH METALS)	0	0	0	378	378	0	0	0	0	0	0	0	0	0	0	0	0	0	378	378
D002, D009CWASTE ORROSIVE LIQUID ACIDIC, INORGANIC (HCL)	0	0	0	45	45	0	0	0	0	0	0	0	0	0	0	0	0	0	45	45
D002, D010 WASTE CORROSIVE LIQUID (HCL WITH SELINIUM)	0	0	0	622	622	0	0	0	252	252	0	0	0	0	0	0	0	0	874	874
D002HYDROFLUORIC ACID	0	0	0		0	0	0	10	0	10	0	0	0	0	0	0	0	10	0	10
D002WASTE CORROSIVE LIQUIDS (MIXED HYDROXIDE BASED CLEANERS)	0	0	45		45	0	0	0	0	0	0	0	0	0	0	0	0	45	0	45
D002WASTE HYPOCHLORITE SOLUTIONS	0	0	0		0	0	0	2,500	0	2,500	0	0	0	0	0	0	0	2,500	0	2,500
D002WASTE TRICHLORACETIC ACID	0	0	16		16	0	0	0	0	0	0	0	0	0	0	0	0	16	0	16
D002, D008, D009CORROSIVE LIQUID ACIDIC, INORGANIC W/ METALS	0	400	2,010		2,410	0	0	0	0	0	0	0	0	0	0	0	400	2,010	0	2,410
D002, U188TOXIC SOLID, CORROSIVE ORGANIC	240	0	0		240	0	0	0	0	0	0	0	0	0	0	240	0	0	0	240
D002, D009WASTE CORROSIVE LIQUIDS HCL, MERCURY, PHOSPHORIC ACID	0	0	705		705	0	0	0	0	0	0	0	0	0	0	0	0	705	0	705
D002, F002CORROSIVESOLVENTMETHYLENE CHLORIDE & WATER	2,640	0	6,710		9,350	0	0	0	0	0	0	0	0	0	0	2,640	0	6,710	0	9,350

1. All units given in pounds.
2. Material counted as hazardous waste through 1999 after that counted as universal waste.

TABLE 5.4
FORT MONMOUTH
HAZARDOUS AND INDUSTRIAL WASTES

HAZARDOUS WASTE

WASTE CODE	MAIN POST[1] 1999	2000	2001	2002	TOTAL	CHARLES WOOD[1] 1999	2000	2001	2002	TOTAL	EVANS[1] 1999	2000	2001	2002	TOTAL	TOTAL[1] 1999	2000	2001	2002	TOTAL
D003 (CESIUM AND WASTE CYANIDE)	0	0	0	75	75	0		0	0	0	0	0	0	0	0	0	0	0	75	75
D003WASTE THIONYL CHLORIDE	0	0	0	0	0	0	0	0	25	25	0	0	0	0	0	0	0	0	25	25
D003WASTE CYANIDE SOLUTIONS	35	0	25		60	0	0	0	0	0	0	0	0	0	0	35	0	25	0	60
D003 WASTE PHOSPHORUS PENTOXIDE	0	0	0		0	0	0	15	0	15	0	0	0	0	0	0	0	15	0	15
D003LITHIUM BATTERIES[2]	0	0	0		0	650	0	0	0	650	0	0	0	0	0	650	0	0	0	650
D006 PARTS CLEANER WITH CADMIUM	0	0	0	402	402	0	0	0	0	0	0	0	0	0	0	0	0	0	402	402
D006CADMIUM ACETATE	0	25	0		25	0	0	0	0	0	0	0	0	0	0	0	25	0	0	25
D006, D007HAZARDOUS WASTE LIQUID CHROMIUM CADMIUM	0	0	0		0	0	0	200	0	200	0	0	0	0	0	0	0	200	0	200
D006, D008, D018D027, D039, D040SAFETY KLEEN CARBURETOR CLEANER	275	349	0		624	0	0	0	0	0	0	0	0	0	0	275	349	0	0	624
D006, D008OPTICAL GLASSES W/ LEAD & CADMIUM	0	0	0	0	0	0	0	1,200	1,950	3,150	0	0	0	0	0	0	0	1,200	1,950	3,150
D006, D008, D027, D039, D040WASTE COMPOUND, CLEANING LIQUID (MONO-ETHANOLAMINE)	0	0	105		105	0	0	0	0	0	0	0	0	0	0	0	0	105	0	105
D008PAINT CHIPS	2,400	3,520	0	208	6,128	0	0	0	0	0	0	0	0	0	0	2,400	3,520	0	208	6,128
D008LEAD APRONS	50	146	0		196	0	0	0	0	0	0	0	0	0	0	50	146	0	0	196
D008LEAD SHOT	0	108	0		108	0	0	0	0	0	0	0	0	0	0	0	108	0	0	108
D008OIL W/ LEAD	0	0	0		0	0	354	0	0	354	0	0	0	0	0	0	354	0	0	354
D008HAZARDOUS WASTE LIQUID (LEAD, PARTS WASHER SOLUTION)	0	0	400	428	828	0	0	0	0	0	0	0	0	0	0	0	0	400	428	828
D008LEAD (PIGS, PAINT CHIPS, VESTS)	0	0	2,450		2,450	0	0	0	0	0	0	0	25	0	25	0	0	2,475	0	2,475
D009LAMPS[2]	6,410	0	0		6,410	4,660	0	0	0	4,660	0	0	0	0	0	11,070	0	0	0	11,070
D009CRUSHED FLUORESCENT LAMPS[2]	0	0	160	217	377	0	0	0	0	0	0	0	0	37	37	0	0	160	254	414
D009MERCURYBATTERIES[2]	120	0	0		120	0	100	0	0	100	0	0	0	0	0	120	100	0	0	220
D009WASTE MERCURIC CHLORIDE	0	0	8		8	0	0	0	0	0	0	0	0	0	0	0	0	8	0	8
D009MERCURY IN MANUFACTURED ARTICLES	80	20	17	36	153	0	0	25	0	25	30	0	13	6	49	110	20	55	42	227
D009WASTE MERCURY	0	0	0	3	3	0	0	0	0	0	0	0	5	0	5	0	0	5	0	8
D009MERCURY WASTE (BROKEN LAMPS & THERMOMETERS)	360	183	0		543	10	275	0	0	285	0	0	0	0	0	370	458	0	0	828
D009HAZARDOUS WASTE LIQUID (LATEX PAINT W/ MERCURY)	400	0	0		400	0	0	0	0	0	0	0	0	0	0	400	0	0	0	400
D010 HAZARDOUS WASTE LIQUID (PHOTO FIXER WITH SILVER AND SELENIUM)	0	0	0	38	38	0	0	0	0	0	0	0	0	0	0	0	0	0	38	38
D011WASTE PHOTO FIXER	760	1,360	0		2,120	0	0	0	0	0	0	0	0	0	0	760	1,360	0		2,120
D011WASTE PHOTO FIXER W/ SILVER	0	0	2,450	683	3,133	0	0	200	0	200	0	0	0	0	0	0	0	2,650	683	3,333
D011SILVER AMALGAM	20	0	0		20	0	0	0	0	0	0	0	0	0	0	20	0	0	0	20
D020, U036WASTE TOXIC LIQUIDS CHLORDANE	0	0	0		0	0	0	90	0	90	0	0	0	0	0	0	0	90	0	90
D022 WASTE CHLOROFORM	0	0	0	46	46	0	0	0	0	0	0	0	0	0	0	0	0	0	46	46
D022,D039 HAZARDOUS WASTE LIQUID (CHLOROFORM, TETRACHLOROETHYLENE PARTS CLEANER)	0	0	0	413	413	0	0	0	0	0	0	0	0	0	0	0	0	0	413	413
D022WASTE TOXIC LIQUID ORGANIC	30	0	0		30	0	0	0	0	0	0	0	0	0	0	30	0	0		30
D039,D008 HAZARDOUS WASTE LIQUID (TETRACHLOROETHYLENE PARTS CLEANER WITH LEAD)	0	0	0	798	798	0	0	0	0	0	0	0	0	0	0	0	0	0	798	798
D040WASTE TOXIC LIQUID	0	800	0		800	0	450	0	0	450	0	0	0	0	0	0	1,250	0		1,250
D0401-5% TRICHLOROETHYLENE 95-99% ACTIVATED CARBON	0	0	0		0	0	0	1,140	0	1,140	0	0	0	0	0	0	0	1,140		1,140
F001, D008CHLORINATED WASTE OIL	0	2,800	0		2,800	0	0	0	0	0	0	0	0	0	0	0	2,800	0	0	2,800
F002HAZARDOUS WASTE LIQUID	0	0	0		0	400	0	0	0	400	0	0	0	0	0	400	0	0	0	400
F002HAZARDOUS WASTE SOLID	0	600	0		600	0	0	0	0	0	0	0	0	0	0	0	600	0	0	600
F002SPENT HALOGENATED SOLVENT	0	1,362	0		1,362	0	0	0	0	0	10	0	0	0	10	10	1,362	0	0	1,372
F002LABORATORY HOOD FILTERS	650	325	0		975	0	0	0	0	0	0	0	0	0	0	650	325	0	0	975
F002 WASTE TOXIC LIQUIDS METHYLENE CHLORIDE	0	0	0	2,548	2,548	0	0	0	0	0	0	0	0	0	0	0	0	0	2,548	2,548
F002SPENT SOLVENT METHYLENE CHLORIDE VIALS	50	150	0		200	0	0	0	0	0	0	0	0	0	0	50	150	0	0	200
F002WASTE DICHLOROMETHANE	0	0	1,001	2,827	3,828	0	0	0	0	0	0	0	0	0	0	0	0	1,001	2,827	3,828
F002WASTE TOXIC LIQUIDS (METHYLENE CHLORIDE VIALS)	0	0	106	90	196	0	0	0	0	0	0	0	0	0	0	0	0	106	90	196
F002WASTE TOXIC SOLIDS (FILTERS, SOIL, ROCKS, DEBRIS 0-10% METHYLENE CHLORIDE)	0	0	800	696	1,496	0	0	0	0	0	0	0	0	0	0	0	0	800	696	1,496
F002, D002METHYLENE CHLORIDE, HCL, H2SO4, & WATER	2,400	4,001	0		6,401	0	0	0	0	0	0	0	0	0	0	2,400	4,001	0		6,401
F003,D001 WASTE FLAMMABLE LIQUIDS 9NON-HALOGENATED SOLVENTS0	0	0	0	721	721	0	0	0	0	0	0	0	0	0	0	0	0	0	721	721
F005, F002, F003, D001, D018, D022, D035, D039, D040SPENT HALOGENATED & NON-HALOGENATED SOLVENTS	0	220	0		220	0	0	0	0	0	0	0	0	0	0	0	220	0	0	220
F002, F003SPENT HALOGENATED & NON-HALOGENATED SOLVENTS	445	0	0		445	0	0	0	0	0	35	0	0	0	35	480	0	0	0	480
F002, F003, D001, D021SPENT HALOGENATED & NON-HALOGENATED SOLVENTS	55	0	0		55	0	0	0	0	0	0	0	0	0	0	55	0	0	0	55
F003, D001SPENT NON-HALOGENATED SOLVENTS	0	20	0		20	0	5	0	0	5	30	0	0	0	30	30	25	0	0	55
F003, F005, D001WASTE FLAMMABLE LIQUID	0	0	0		0	35	0	0	0	35	0	0	0	0	0	35	0	0	0	35
F005, D001SPENT NON-HALOGENATED SOLVENTS	0	0	0		0	15	0	0	0	15	60	0	0	0	60	75	0	0	0	75
F005, D001, D038SPENT NON-HALOGENATED SOLVENTS	0	27	0		27	0	0	0	0	0	0	0	0	0	0	0	27	0	0	27
F005, D001,D003 WASTE FLAMMABLE LIQUID TOXIC (POTASSIUM CYANIDE)	0	0	0	45	45	0	0	0	0	0	0	0	0	0	0	0	0	0	45	45
U122,D001 WASTE FORMALDEHYDE SOLUTION	0	0	0	48	48	0	0	0	0	0	0	0	0	0	0	0	0	0	48	48
F003, F003, F005, D001, D018, D022, D035, D039, D040TOXIC, FLAMMABLE SOLVENTS	0	220	0		220	0	0	0	0	0	0	0	0	0	0	0	220	0	0	220
P098, D003 WASTE POTASSIUM CYANIDE	35	0	0		35	0	0	0	0	0	0	0	0	0	0	35	0	0	0	35
X910DEACT. LITHIUM BATTERIES	0	0	0		0	2,880	0	0	0	2,880	0	0	0	0	0	2,880	0	0	0	2,880
U188WASTE PHENOL SOLUTION	0	0	7	8	15	0	0	0	0	0	0	0	0	0	0	0	0	7	8	15
U196,D001, D038WASTE FLAM. SOLIDS (PPE, ABSORBENTS, DEBRIS)	0	0	35		35	0	0	0	0	0	0	0	0	0	0	0	0	35	0	35
U219TOXIC WASTE LIQUID	0	0	0		0	10	0	0	0	10	0	0	0	0	0	10	0	0	0	10
U248TOXIC WASTE SOLID INORGANIC	0	32	0		32	0	0	0	0	0	0	0	0	0	0	0	32	0	0	32
HAZARDOUS WASTE TOTAL	26,608	20,820	22,703	18,120	88,251	9,100	2,899	5,935	2,421	20,319	3,710	0	43	43	3,796	39,418	23,719	28,681	20,584	112,366
D009DEBRIS CONTAMINATED WITH MERCURY	0	0	0	0	0	0	0	0	0	0	3,790	0	0	0	3,790	3,790	0	0	0	3,790
D008LEAD DEBRIS -- INDOOR PISTOL RANGE	0	0	0	0	0	0	107,070	0	0	107,070	0	0	0	0	0	0	107,070	0	0	107,070

1. All units given in pounds.
2. Material counted as hazardous waste through 1999 after that counted as universal waste.

TABLE 5.4
FORT MONMOUTH
HAZARDOUS AND INDUSTRIAL WASTES

	WASTE CODE	MAIN POST[1] 1999	MAIN POST[1] 2000	MAIN POST[1] 2001	MAIN POST[1] 2002	MAIN POST[1] TOTAL	CHARLES WOOD[1] 1999	CHARLES WOOD[1] 2000	CHARLES WOOD[1] 2001	CHARLES WOOD[1] 2002	CHARLES WOOD[1] TOTAL	EVANS[1] 1999	EVANS[1] 2000	EVANS[1] 2001	EVANS[1] 2002	EVANS[1] TOTAL	TOTAL[1] 1999	TOTAL[1] 2000	TOTAL[1] 2001	TOTAL[1] 2002	TOTAL[1] TOTAL
REMEDIATION WASTE	D009HAZARDOUS WASTE REMEDIAL DERIVED SOIL CONTAINING MERCURY, 0-260 PPM	0	0	0	0	0	0	0	0	0	0	0	0	1,240	0	1,240	0	0	1,240	0	1,240
REMEDIATION WASTE	U151DEBRIS CONTAMINATED WITH MERCURY	0	0	0	0	0	0	0	0	0	0	15,135	0	0	0	15,135	15,135	0	0	0	15,135
REMEDIATION WASTE	SOIL WITH PCB >500 PPM (REMEDIATION)	0	0	0	0	0	0	0	0	0	0	0	67,520	325,500	123,688	516,708	0	67,520	325,500	123,688	516,708
REMEDIATION WASTE	SOIL WITH PCB 50-499 PPM (REMEDIATION)	0	0	0	0	0	0	0	0	0	0	0	906,750	5,321,208	4,921,080	11,149,038	0	906,750	5,321,208	4,921,080	11,149,038
REMEDIATION WASTE	SOIL WITH PCB <50 PPM (REMEDIATION)	0	0	0	0	0	0	0	0	0	0	0	3,316,579	3,945,109	5,916,440	13,178,128	0	3,316,579	3,945,109	5,916,440	13,178,128
REMEDIATION WASTE	SOIL WITH PCBS >50 PPM	0	0	0	0	0	0	0	0	0	0	61,502	0	0	0	61,502	61,502	0	0	0	61,502
REMEDIATION WASTE	SOIL WITH PCBS <50 PPM	0	0	0	0	0	0	0	0	0	0	31,890	0	0	0	31,890	31,890	0	0	0	31,890
REMEDIATION WASTE	SOIL WITH PCBS <40 PPM	0	0	0	0	0	0	0	0	0	0	0	0	0	1,753,840	1,753,840	0	0	0	1,753,840	1,753,840
REMEDIATION WASTE	PCBS LEAKING LIGHT BALLASTS	0	0	0	0	0	0	0	0	0	0	0	0	0	46	46	0	0	0	46	46
REMEDIATION WASTE	ID72WELL DEVELOPMENT WATER	0	0	3,332	0	3,332	0	0	6,664	0	6,664	0	0	0	0	0	0	0	9,996	0	9,996
REMEDIATION WASTE	ID 72PURGE WATER < 500 PPB TRICHLOROETHYLENE	0	0	0	0	0	0	0	525	0	525	0	0	0	0	0	0	0	525	0	525
REMEDIATION WASTE	D040PURGE WATER 500-600 PPB TRICHLOROETHENE	0	0	0	0	0	0	0	400	406	806	0	0	0	0	0	0	0	400	406	806
REMEDIATION WASTE	P004, P037, P051, P059, U036, U060, U061, U129PESTICIDE CONTAMINATED SOIL (REMEDIATION)	1,910,265	0	0	0	1,910,265	0	0	0	0	0	0	0	0	0	0	1,910,265	0	0	0	1,910,265
REMEDIATION WASTE	D008 LEAD (REMEDIATION)	50,720	0	0	0	50,720	0	0	0	0	0	0	0	0	0	0	50,720	0	0	0	50,720
REMEDIATION WASTE	D008SOIL CONTAINING LEAD (REMEDIATION)	0	0	0	0	0	0	0	0	0	0	0	1,101,700	0	164,620	1,266,320	0	1,101,700	0	164,620	1,266,320
	REMEDIATION WASTE TOTAL	1,960,985	0	3,332	0	1,964,317	0	107,070	7,589	406	115,065	112,317	5,392,549	9,593,057	12,879,714	27,977,637	2,073,302	5,499,619	9,603,978	12,880,120	30,057,019
UNIVERSAL WASTE	UNIVERSAL WASTE ALKALINE BATTERIES	0	1,198	2,245	1,179	4,622	0	1,220	1,050	1,535	3,805	0	0	0	0	0	0	2,418	3,295	2,714	8,427
UNIVERSAL WASTE	UNIVERSAL WASTE DE-ACTIVATED LITHIUM BATTERIES	0	300	2,150	0	2,450	0	3,350	1,100	0	4,450	0	0	0		0	0	3,650	3,250	0	6,900
UNIVERSAL WASTE	UNIVERSAL WASTE ACTIVATED LITHIUM BATTERIES	0	2,017	0	4,244	6,261	0	1,871	1,750	1,055	4,676	0	0	0	0	0	0	3,888	1,750	5,299	10,937
UNIVERSAL WASTE	UNIVERSAL WASTE NICAD BATTERIES	0	1,290	325	459	2,074	0	1,220	0	0	1,220	0	0	0	0	0	0	2,510	325	459	3,294
UNIVERSAL WASTE	UNIVERSAL WASTE SILVER CHLORIDE BATTERIES	0	0	50	0	50	0	13,405	0	0	13,405	0	0	0	0	0	0	13,405	50	0	13,455
UNIVERSAL WASTE	UNIVERSAL WASTE LEAD ACID BATTERIES	0	0	2,425	5,373	7,798	0	111	22,215	15,039	37,365	0	0	0	2,520	2,520	0	111	24,640	22,932	47,683
UNIVERSAL WASTE	UNIVERSAL WASTE MERCURY BATTERIES	0	0	102		102	0	200	0		200	0	0	0	0	0	0	200	102		302
UNIVERSAL WASTE	UNIVERSAL WASTE MERCURY CONTAINING LAMPS, FLORESCENT LAMPS	0	3,455	5,100	5,879	14,434	0	2,245	4,220	4,758	11,223	0	0	0	478	478	0	5,700	9,320	11,115	26,135
UNIVERSAL WASTE	UNIVERSAL WASTE MERCURY THERMOSTATS	0	0	0	0	0	0	0	5	0	5	0	0	0	0	0	0	0	5	0	5
UNIVERSAL WASTE	UNIVERSAL WASTE ZINC BATTERIES	0	0	0	0	0	0	0	500	420	920	0	0	0	0	0	0	0	500	420	920
	UNIVERSAL WASTE TOTAL	0	8,260	12,397	17,134	37,791	0	23,622	30,840	22,807	77,269	0	0	0	2,998	2,998	0	31,882	43,237	42,939	118,058
NON-HAZARDOUS WASTE	ID 27NON-RCRA SOLID CONCRETE	0	0	0	0	0	0	0	0	157,400	157,400	0	0	855,360	0	855,360	0	0	855,360	157,400	1,012,760
NON-HAZARDOUS WASTE	ID 27NON-RCRA LIMESTONE	0	0	0	0	0	0	0	0	69,160	69,160	0	0	0	0	0	0	0	0	69,160	69,160
NON-HAZARDOUS WASTE	ID 27 FIXER/DEVELOPER	0	0	0	46	46	0	0	0	0	0	0	0	0	0	0	0	0	0	46	46
NON-HAZARDOUS WASTE	ID 27 TOXIC SOLID, INORGANIC (LITHIUM HEXAFLUOROPHOSPHATE)	0	0	0	0	0	0	0	0	15	15	0	0	0	0	0	0	0	0	15	15
NON-HAZARDOUS WASTE	NON-HAZARDOUS TONER	0	0	0			0	0	0	0	0	0	0	0	663	663	0	0	0	663	663
NON-HAZARDOUS WASTE	ID72USED OIL	0	0	77,327	64,861	142,188	0	0	8,334	7,427	15,761	0	0	36,236	0	36,236	0	0	121,897	72,108	194,185
NON-HAZARDOUS WASTE	ID 72RAIN WATER	0	0	0		0	0	0	0		0	0	0	2,006	0	2,006	0	0	2,006	0	2,006
NON-HAZARDOUS WASTE	AEROSOL, NON-FLAMMABLE, TICK SPRAY	0	0	45	0	45	0	0	15	0	15	0	0	0	0	0	0	0	60	0	60
NON-HAZARDOUS WASTE	X910NON-HAZARDOUS WASTE SOLIDS	153	0	0	0	153	0	0	0	0	0	2,080	0	0	0	2,080	2,233	0	0	0	2,233
NON-HAZARDOUS WASTE	X910NON-HAZARDOUS WASTE INSECT REPELLENT	0	17	0	0	17	0	0	0	0	0	0	0	0	0	0	0	17	0	0	17
NON-HAZARDOUS WASTE	X905NON-HAZARDOUS AEROSOLS	75	0	0	0	75	0	15	0	0	15	0	0	0	0	0	75	15	0	0	90
NON-HAZARDOUS WASTE	USED OIL	0	46,024	0	0	46,024	0	17,845	0	0	17,845	0	0	0	0	0	0	63,869	0	0	63,869
NON-HAZARDOUS WASTE	#2 OIL TANK BOTTOMS	0	1,276	0	0	1,276	0	0	0	0	0	0	0	0	0	0	0	1,276	0	0	1,276
NON-HAZARDOUS WASTE	ID27 MAGNESIUM	0	0	225	0	225	0	0	0	0	0	0	0	0	0	0	0	0	225	0	225
NON-HAZARDOUS WASTE	ID27CHIMNEY SOOT	0	0	4,000	0	4,000	0	0	14,580	0	14,580	0	0	0	0	0	0	0	18,580	0	18,580
NON-HAZARDOUS WASTE	ID 27 OIL SPILL DEBRIS	0	0	11,275	1,994	13,269	0	0	1,320	196	1,516	0	0	0	72	72	0	0	12,595	2,262	14,857
NON-HAZARDOUS WASTE	ID 27TIRE SEALING COMPOUND	0	0	400	0	400	0	0	0	0	0	0	0	0	0	0	0	0	400	0	400
NON-HAZARDOUS WASTE	ID 27POTASSIUM CHLORIDE, COBALT CHLORIDE	0	0	10	0	10	0	0	0	0	0	0	0	0	0	0	0	0	10	0	10
NON-HAZARDOUS WASTE	ID 27SILVER ZINC CHLORIDE	0	0	50	0	50	0	0	0	0	0	0	0	0	0	0	0	0	50	0	50
NON-HAZARDOUS WASTE	ID 27SPENT CARBON BASED TONER	0	0	2,775	0	2,775	0	0	1,325	663	1,988	0	0	0	0	0	0	0	4,100	663	4,763
NON-HAZARDOUS WASTE	ID 27POTASSIUM IODINE, EUROCHROME BLACK, SODIUM THIOSULFATE, NN-DIETHYL-P-PHENLENEDIONINE OXALATE	0	0	18	0	18	0	0	0	0	0	0	0	0	0	0	0	0	18	0	18
NON-HAZARDOUS WASTE	ID 27CORROSIVE SOLID BASIC, INORGANIC AMMONIA	0	0	120	0	120	0	0	0	0	0	0	0	0	0	0	0	0	120	0	120
NON-HAZARDOUS WASTE	ID 27SODIUM HYPOCHLORITE	0	0	60	0	60	0	0	0	0	0	0	0	0	0	0	0	0	60	0	60
NON-HAZARDOUS WASTE	ID 27DRAINED OIL FILTERS	0	0	1,500	2,100	3,600	0	0	0	0	0	0	0	0	0	0	0	0	1,500	2,100	3,600
NON-HAZARDOUS WASTE	ID 27RINSED SYRINGES & BROKEN GLASS FROM GIC ANALYSIS	0	0	0	0	0	0	0	5	0	5	0	0	0	0	0	0	0	5		5
NON-HAZARDOUS WASTE	ID 27LEAD FOR RECYCLING (SHOT, SLAB, PELLET)	0	0	0	2,600	2,600	0	0	130	0	130	0	0	0	0	0	0	0	130	2,600	2,730
NON-HAZARDOUS WASTE	ID 27CHEMICALS, PPE, DEBRIS	0	0	0		0	0	0	200	0	200	0	0	0	0	0	0	0	200		200
NON-HAZARDOUS WASTE	ID 27CHEMICALS, TEFLON	0	0	0	0	0	0	0	30	37	67	0	0	0	0	0	0	0	30	37	67
NON-HAZARDOUS WASTE	ID72 CFC OIL	400	100	0	0	500	0	0	0	0	0	0	240	0	0	240	400	340	0	0	740
NON-HAZARDOUS WASTE	ID72ETHYLANE GLYCOL SOLUTION	0	0	8,322	0	8,322	0	0	0	0	0	0	0	0	0	0	0	0	8,322	0	8,322
NON-HAZARDOUS WASTE	ID72NON REGULATED	800	120	0	0	920	0	0	0	0	0	0	0	0	0	0	800	120	0	0	920
NON-HAZARDOUS WASTE	ID72PHOTO FIXER	7,120	3,016	0	0	10,136	3,840	3,265	0	0	7,105	0	0	0	0	0	10,960	6,281	0	0	17,241
NON-HAZARDOUS WASTE	ID72PHOTO FIXER W/ NO SILVER	0	0	2,450	2,429	4,879	0	0	800	572	1,372	0	0	0	0	0	0	0	3,250	3,001	6,251
NON-HAZARDOUS WASTE	ID72TONER	0	0	0	0	0	800	1,449	0	0	2,249	0	0	0	0	0	800	1,449	0	0	2,249
NON-HAZARDOUS WASTE	ID 72INSECT REPELLENT	0	0	23	0	23	0	0	0	0	0	0	0	0	0	0	0	0	23	0	23
NON-HAZARDOUS WASTE	ID 72REFRIGERANT OIL	0	0	500	0	500	0	0	0	0	0	0	0	0	0	0	0	0	500	0	500
NON-HAZARDOUS WASTE	ID72PARTS WASHER	2,676	7,312	0	0	9,988	267	0	0	0	267	0	0	0	0	0	2,943	7,312	0	0	10,255
NON-HAZARDOUS WASTE	ID72OFF SPEC GASOLINE	1,600	775	2,260	851	5,486	400	0	290	400	1,090	0	0	0	0	0	2,000	775	2,550	1,251	6,576
NON-HAZARDOUS WASTE	ID72SCINTILATION VIALS	0	0	0	0	0	825	300	0	0	1,125	0	0	0	0	0	825	300	0	0	1,125
NON-HAZARDOUS WASTE	ID 72COLIFORM SOLUTION	0	0	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	5	0	5
NON-HAZARDOUS WASTE	ID 72SODIUM THIO CYANATE , SODIUM THIOSULFATE	0	0	400	0	400	0	0	0	0	0	0	0	0	0	0	0	0	400	0	400
NON-HAZARDOUS WASTE	ID 72LATEX PAINT	0	0	875	1,865	2,740	0	0	500	0	500	0	0	0	0	0	0	0	1,375	1,865	3,240
NON-HAZARDOUS WASTE	ID 72SILICONE OIL BASED DISPERSANT FLUID	0	0	800	0	800	0	0	0	0	0	0	0	0	0	0	0	0	800	0	800
NON-HAZARDOUS WASTE	ID 72TONER OIL	0	0	0	0	0	0	0	50	0	50	0	0	0	0	0	0	0	50	0	50
NON-HAZARDOUS WASTE	ID 72AQUEOUS BRAKE CLEANER	0	0	498	0	498	0	0	0	0	0	0	0	0	0	0	0	0	498	0	498

1. All units given in pounds.
2. Material counted as hazardous waste through 1999 after that counted as universal waste.

TABLE 5.4
FORT MONMOUTH
HAZARDOUS AND INDUSTRIAL WASTES

		MAIN POST[1]					CHARLES WOOD[1]					EVANS[1]					TOTAL[1]				
	WASTE CODE	1999	2000	2001	2002	TOTAL	1999	2000	2001	2002	TOTAL	1999	2000	2001	2002	TOTAL	1999	2000	2001	2002	TOTAL
	ID72AQUEOUS PARTS WASHER SOLUTION	0	0	2,399	1,143	3,542	0	0	0	0	0	0	0	0	0	0	0	0	2,399	1,143	3,542
	ID 72ULTIMA GOLD (ALKYLN APHTHALENES)	0	0	0	0	0	0	0	825	618	1,443	0	0	0	0	0	0	0	825	618	1,443
	ID 72 CLEANING SOLUTION	0	0	0	355	355	0	0	0	0	0	0	0	0	0	0	0	0	0	355	355
	ID72 NEUTRAL MIXED ACID	0	0	0	505	505	0	0	0	0	0	0	0	0	0	0	0	0	0	505	505
	ID 72 SEPTIC TANK WATER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24,798	24,798
	ID 72FIRE FIGHTING FOAM	0	0	0	0	0	0	0	1,500	0	1,500	0	0	0	0	0	0	0	1,500	0	1,500
	CHLORINE CYLINDERS	0	0	600	0	600	0	0	0	0	0	0	0	0	0	0	0	0	600	0	600
	X900LATEX PAINT	3,600	400	0	0	4,000	400	0	0	0	400	0	0	0	0	0	4,000	400	0	0	4,400
	X900SAFETY KLEEN BRAKE CLEANER	1,642	1,162	0	0	2,804	0	0	0	0	0	0	0	0	0	0	1,642	1,162	0	0	2,804
	X900OILY WATER	0	9,960	0	0	9,960	0	0	0	0	0	0	3,146	0	0	3,146	0	13,106	0	0	13,106
	X910OIL FILTERS	2,088	1,800	0	0	3,888	0	0	0	0	0	0	0	0	0	0	2,088	1,800	0	0	3,888
	X910SPILL DEBRIS	6,800	4,681	0	0	11,481	400	800	0	0	1,200	0	0	0	0	0	7,200	5,481	0	0	12,681
	X910CARBON FILTERS	400	700	0	0	1,100	0	0	0	0	0	0	0	0	0	0	400	700	0	0	1,100
	X910LAB FILTERS	0	200	0	0	200	0	0	0	0	0	0	0	0	0	0	0	200	0	0	200
	WASTE OIL	52,523	0	0	0	52,523	18,341	0	0	0	18,341	12,297	0	0	0	12,297	83,161	0	0	0	83,161
	#2 OIL TANK BOTTOMS	2,000	0	0	0	2,000	0	0	0	0	0	0	0	0	0	0	2,000	0	0	0	2,000
	X910CHEMICAL ANTIDOTE KIT	537	0	0	0	537	0	0	0	0	0	0	0	0	0	0	537	0	0	0	537
	X910 ACID FILTERS	55	0	0	0	55	0	0	0	0	0	0	0	0	0	0	55	0	0	0	55
	X910GREASE	0	0	0	0	0	245	0	0	0	245	80	0	0	0	80	325	0	0	0	325
	X910LEAD FOR RECYCLING	0	51	0	0	51	0	1,200	0	0	1,200	0	0	0	0	0	0	1,251	0	0	1,251
	X910 SODIUM BICARBONATE	0	45	0	0	45	0	0	0	0	0	0	0	0	0	0	0	45	0	0	45
	NON-HAZARDOUS WASTE TOTAL	82,469	77,639	116,937	78,749	355,794	25,518	24,874	29,904	236,488	316,784	14,457	3,386	893,602	735	912,180	122,444	105,899	1,040,443	340,590	1,584,758
TSCA WASTE	TRANSFORMER OIL WITH PCBS	2,002	0	0	0	2,002	0	0	0	0	0	0	0	0	0	0	2,002	0	0	0	2,002
	PCB CONTAMINATED DEBRIS	121	0	0	0	121	0	0	0	0	0	450	0	0	0	450	571	0	0	0	571
	PCB <500 PPM TRANSFORMERS	7,638	0	0	0	7,638	0	0	0	0	0	0	0	0	0	0	7,638	0	0	0	7,638
	X910 BALLASTS NON PCB	4,800	0	0	0	4,800	7,000	0	0	0	7,000	0	0	0	0	0	11,800	0	0	0	11,800
	NON PCB OIL	36,941	0	0	0	36,941	0	0	0	0	0	0	0	0	0	0	36,941	0	0	0	36,941
	TRANSFORMER OIL WITH PCB >50 PPM	0	1,200	0	0	1,200	0	0	0	0	0	0	0	0	0	0	0	1,200	0	0	1,200
	PCB CONTAMINATED DEBRIS >50 PPM	0	20	0	0	20	0	0	0	0	0	0	0	0	0	0	0	20	0	0	20
	PCB1PCB LIQUID (TRANSFORMER OIL > 50 PPM)	0	0	501	0	501	0	0	0	0	0	0	0	1,203	0	1,203	0	0	1,704	0	1,704
	PCB1PCB SOLID (METAL, PCB)	0	0	0	0	0	0	0	0	0	0	0	0	9,138	0	9,138	0	0	9,138	0	9,138
	PCB2PCB SOLID (SOIL, DEBRIS)	0	0	20	0	20	0	0	0	0	0	0	0	30,052	0	30,052	0	0	30,072	0	30,072
	PCB2PCB, SOLID (SOIL, ASPHALT)	0	0	0	0	0	0	0	0	0	0	0	0	401	0	401	0	0	401	0	401
	ID 27NON-LEAKING LIGHT BALLAST	0	0	5,391	2,634	8,025	0	0	1,725	2,740	4,465	0	0	0	2,096	2,096	0	0	7,116	7,470	14,586
	ID 27DRAINED TRANSFORMERS	0	0	201	0	201	0	0	0	0	0	0	0	2,002	0	2,002	0	0	2,203	0	2,203
	X910 BALLASTS TSCA EXEMPT	0	1,686	0	0	1,686	0	600	0	0	600	0	0	0	0	0	0	2,286	0	0	2,286
	ID 72< 50 PPM PCB TRANSFORMER OIL	0	0	0	0	0	0	0	0	0	0	0	0	13,306	0	13,306	0	0	13,306	0	13,306
	NON PCB TRANSFORMER OIL <50 PPM	0	7,263	0	0	7,263	0	0	0	0	0	0	0	0	0	0	0	7,263	0	0	7,263
	TSCA WASTE TOTAL	51,502	10,169	6,113	2,634	70,418	7,000	600	1,725	2,740	12,065	450	0	56,102	2,096	58,648	58,952	10,769	63,940	7,470	141,131
																YEARLY TOTAL	2,294,116	5,671,888	10,780,279	13,291,703	32,013,332

1. All units given in pounds.
2. Material counted as hazardous waste through 1999 after that counted as universal waste.

FIGURE 5.1 TRANSFORMER PAD NEAR BUILDING 978

(SPCC) plan (dated October 2001) that provides design, emergency response and handling procedures in case of a spill.

4. Diked tanks, concrete pads, and secondary containment have been provided for all above ground tanks.
5. Transformer pads are constructed of concrete pads, bermed, and have secondary containment such as Location 978 shown in **Figure 5.1**.
6. Base-wide use of low VOC paints.
7. Development and implementation of specific P2 procedures and training for environmental testing lab.
8. Development and implementation of site wide P2 policies, procedures and training.
9. On-site recycling of ethylene glycol.
10. Drum washing (treatment of water and drum recycling).
11. Implementation of Hazardous material BMP for storage and delivery of fuels (dikes, full secondary containment, and concrete pads) as well as transformer pads.
12. Change from solvent-based to aqueous parts washers.

13. Engine oil/filter recycling.
14. A P2 training module was added to the existing annual site-personnel hazardous waste refresher training program.

5.5 POTENTIAL POLLUTION PREVENTION INITIATIVES

5.5.1 Centralized Hazardous Material Management

5.5.1.1 Description

Through the Directorate of Public Works, the installation is in the process of establishing a Hazardous Material Management System (HAZMART) and control center to serve as a centralized point for hazardous material procurement, tracking, and management.

5.5.1.2 Technical Evaluation

Under the new electronic system, the installation will employ a hazardous material/waste management contractor to review and pre-approve the purchase of all hazardous materials used at Fort Monmouth. Materials will be purchased by the end-user using the existing direct procurement system. Purchased materials will be received, inventoried, bar-coded and initially stored in building 482, to be distributed to the end-user upon request. Empty containers will be returned to inventory control where the container will be deleted from existing inventory. Returned excess, unused hazardous materials from post activities will be stored in building 482 as well. This usable material will be electronically inventoried and offered to end-users at Fort Monmouth and other military facilities as suitable applications become known. Matching will occur, in part, through the HAZMART pre-approval process. Centralizing the hazardous material management and reuse efforts at other military installations has reduced the amount of hazardous material by significant amounts. Ultimately, unused hazardous materials may be disposed of hazardous waste if suitable applications can not be found.

5.5.1.3 Environmental Evaluation

This initiative is expected to reduce the amount of hazardous waste having to be disposed of as a result of shelf-life expiration. Currently there are three hazardous waste 90-day accumulation sites to store waste while awaiting pick-up for disposal. Additionally, there is only limited tracking of the amount of hazardous material purchased.

5.5.1.4 Economic Benefit

Centralized management of hazardous materials for activities post-wide allows such materials to be purchased in bulk or other appropriate sized containers. This may reduce the overall cost of hazardous material procurement. In addition, reducing the amount of shelf-life expired wastes will reduce the installation's overall hazardous waste disposal fees.

5.5.2 Rechargeable Alkaline Batteries

5.5.2.1 Description

Most units and activities with equipment requiring small standard sized batteries (AAA through D-cells) dispose of their alkaline batteries as a non-hazardous industrial waste. To minimize this waste stream, activities could use rechargeable alkaline batteries. These batteries have a much longer life than traditional alkaline batteries. Using these batteries would in turn reduce the amount of used batteries being purchased and disposed of. Renewable batteries are available in sizes AAA through D-cells, as well as other specialty sizes such as 6V and 9V.

5.5.2.2 Technical Evaluation

Implementing this alternative would require all user groups of alkaline batteries to procure battery-recharging devices. It would also involve establishing a procedure to ensure that spent batteries are properly recharged and that a minimal but adequate supply of charged batteries be available for emergencies.

5.5.2.3 Environmental Evaluation

Rechargeable alkaline batteries can be expected to last at least 25 times as long as disposable batteries. Waste generation records indicate that the installation disposes of about 3,295 pounds of used alkaline batteries per year. Assuming that the rechargeable batteries can last 25 times longer, fully implementing this initiative could reduce battery disposal from 3,295 pounds to 132 pounds per year for a net reduction of 3,163 pounds of waste.

5.5.2.4 Economic Evaluation

Implementation Costs

Batteries. As described above, the installation generates about 3,295 pounds of used alkaline batteries per year. Assuming that there is an average of 2.7 alkaline batteries per pound, this equates to an annual battery use of 9,000 batteries. At an average purchase cost of $2.50 per rechargeable battery, purchasing 9,000 batteries would cost $22,500.

Rechargers. Units/activities using these batteries would need to purchase a number of recharging units depending on the types and quantities of batteries they use. These devices typically cost about $25 each and a unit would probably need about two rechargers. An estimated 10 units/activities (based on disposal records) would be qualified candidates for using renewable alkaline batteries. This would bring the total implementation cost to $500 for the entire installation.

Initial costs for this initiative include purchasing rechargeable alkaline batteries as well as recharging equipment. Implementation costs total $23,000.

Recurring Costs

Recurring costs will result from having to periodically buy new rechargeable batteries and dispose of unusable ones. These costs will total an estimated $1,145 per year.

Battery Purchase. Renewable alkaline batteries typically cost about three times as much as regular non-rechargeable alkaline batteries. However, as described above, they can be expected to last at least 25 times as long. As such, fully implementing this initiative could reduce the annual purchase of 9,000 batteries per year to 360 per year. At an average cost of $2.50 per rechargeable battery, purchasing 360 replacement rechargeable batteries per year would cost $900.

Battery Disposal. Disposing of 360 rechargeable batteries equates to about 132 pounds of waste. Current disposal cost for alkaline batteries is approximately $0.57 per pound, or $205 per year at the projected generation rate.

Recurring Cost Savings

Savings would result from reduced purchase and disposal of traditional alkaline batteries. These savings total $9,620.

Purchase. Implementing this initiative would result in no longer having to purchase the estimated 9,000 non-rechargeable alkaline batteries per year. At an average cost of $0.83 for a traditional alkaline battery, this would save $7,470 per year.

Disposal. Currently, the installation spends $0.57per pound to dispose of used alkaline batteries. Eliminating the disposal of 3,163 pounds of traditional alkaline batteries per year would, therefore, save an annual total of $1,803.

Payback Period

The payback period is calculated by dividing the implementation cost by the net cost savings. Note that the net cost savings is the difference between the recurring costs and the recurring cost savings.

$$\frac{\$23{,}000}{\$9{,}273/\text{yr} - \$1{,}145/\text{yr}} = 2.83 \text{ years}$$

Implementation Status – Currently pursuing funding

Environmental personnel will evaluate this project for implementation and will include this initiative in future EPR submittal if management concurs.

5.5.3 Process Change at Myer Center Photography Process Laboratory

5.5.3.1 Description

The photo processing laboratory at the Myers Center was based on a wet chemical process that uses either a silver bromide solution or other hazardous chemical solutions. Approximately 5,000 8"x10" and 18,000 4"x6" photographs are processed annually at the laboratory. Myers photo (chemical) lab was converted to digital technology in 2003. This change eliminated this source of silver and ID72 Photo-fixer waste streams.

5.5.3.2 Technical Evaluation

Photographic waste from the wet chemistry method typically contains elevated concentrations of heavy metals, organic compounds and other toxic constituents. This waste stream must be treated or disposed of as a hazardous waste. Fort Monmouth currently recovers silver to comply with DOD directive 4160.21-M, however the waste stream is still considered a hazardous waste. Conversion to digital photography eliminates the hazardous waste stream and digital technology. This change is now possible due to the improvement of the technology, which is now comparable in quality to wet chemistry photo processing.

5.5.3.3 Environmental Evaluation

The Myers Center photo lab is a digital lab and no longer generates silver or ID 72 waste streams. As a result, an overall hazardous waste reduction of approximately 200 pounds is expected. In FY 2001, 200 pounds of silver hazardous waste and 800 pounds of non-hazardous ID 72 waste were generated at the Myers lab. Digital technology generates toner cartridges that can be recycled and as such create less waste.

5.5.3.4 Economic Evaluation

Implementation Costs

Initial costs for this initiative include purchasing the necessary hardware and software. Implementation costs were estimated by Fort Monmouth personnel at a total of $60,000.

Recurring Costs

Recurring costs will result from having to periodically buy new toner cartridges and dispose of unusable ones. These costs will total approximately $20,500 per year.

Recurring Cost Savings

Savings would result from reduced purchase and disposal of photo fixer and other supplies. The recurring cost savings would total approximately $71,700.

Payback Period

The payback period is calculated by dividing the implementation cost by the net cost savings. Note that the net cost savings is the difference between the recurring costs and the recurring cost savings.

$$\frac{\$60{,}000}{\$71{,}700/\text{yr} - 20{,}500} = 1.17 \text{ years}$$

Implementation Status

The project has been implemented. It was included in the FY03 EPR.

5.5.4 Block-digester for Laboratory

5.5.4.1 Description

Analytical Sample preparation in the environmental testing laboratory includes digestion prior to chemical analysis. Graphite Block Digestion technology (SCP SCIENCE) is used to provide the cleanest sample preparation system. The non-metallic construction and graphite-heating block ensure that no cross-contamination occurs from the digestion system to the samples.

5.5.4.2 Technical Evaluation

To reduce the amount of waste generated for metals preparation, alternate digestion procedures were investigated. Due to the constraints of the analytical methods, the choices were limited. Since the amount of acid to sample ratio could not be changed, the only way to reduce the waste was be to reduce the sample size. The system chosen was a Digestion Block manufactured by SCP Science. With this technology the sample size can be reduced by half thereby decreasing the amount of acid use by half.

5.5.4.3 Environmental Evaluation

The amount of samples processed varies from year to year, so the exact amount of reduction is difficult to establish. The average amount of samples is projected to be around 3,000 annually. The new digestion method will save about 15 liters of Nitric Acid and 5 liters of

Hydrochloric Acid. This process will also reduce the amount of acidified waste by 200 liters annually.

5.5.4.4 Economic Evaluation

Implementation Costs

The cost to purchase the block-digester is approximately $6,000.

Recurring Costs

The recurring cost in acids is about $500 and other supplies (filter papers, glassware ,etc.) are approximately $1,200. Total annual recurring cost projected by Fort Monmouth is approximately $1,700.

Recurring Cost Savings

The recurring cost savings in acids is about $500 and other savings (filter papers, glassware that is no longer needed) is approximately $2,400 and cost to dispose of 200 L of acid waste is about $250. Total annual saving projected by Fort Monmouth is approximately $3,150.

Payback Period

The payback period is calculated by dividing the implementation cost by the net cost savings. Note that the net cost savings is the difference between the recurring costs and the recurring cost savings.

$$\frac{\$6{,}000}{\$3{,}150\text{yr} - \$1{,}700/\text{yr}} = 4.13 \text{ Years}$$

Implementation Status This unit was purchased in FY03 and is currently being used.

SECTION 6
SOLID WASTE

6.1 GOAL

According to the DOD MOM, the goal is to ensure that the diversion rate for recycling of non-hazardous solid waste is greater than 40% by December 2005. Note that this goal does not have a baseline amount; the 40% diversion rate represents 40% of the total amount of solid waste generated in 2005 and is independent of previous years' diversion amounts.

6.2 BASELINE AND PROGRESS

As discussed in this section, the diversion rate is the ratio of the weight of recycled material to the weight of refuse. For FY 02, the recycled weight does not include construction or demolition debris, which are considered one-time events.

Table 6.1 Solid Waste (percentage diverted from disposal to recycling)

1999	2000	2001	2002	2003*	2004*	2005* Target 40%
50%	47%	59%	40.9%	N//A	N/A	N/A

* Estimated

Figure 6.1 is a graphical representation of solid waste collection totals (tons) and the percentage diverted from disposal to recycling in FY 2002.

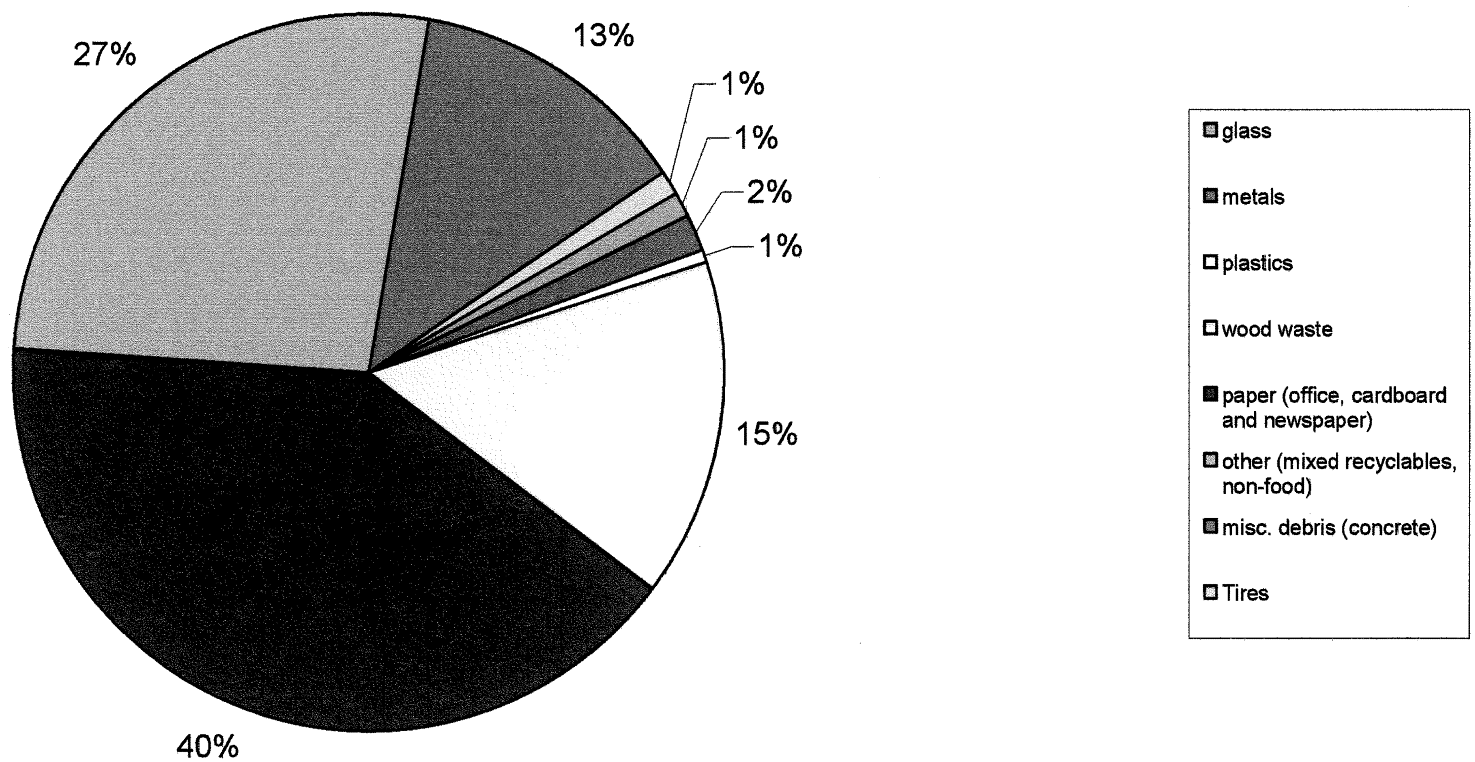
The 40% diversion rate goal has been achieved every year since 1992, well ahead of the scheduled 2005.

6.3 DESCRIPTION OF MAJOR SOLID WASTE STREAMS

Generation of solid waste at Fort Monmouth comes from such sources as: administrative offices, industrial shops, food service, facility engineer contractor shops and other tenant activities. The facility engineer conducts the routine services as part of the department of public works, which includes the following shops:

1. Plumbing,
2. Carpentry,
3. Roads and Grounds,
4. Entomology (pest control),

FIGURE 6.1
FY02 Solid Waste Recycling (%)



5. HVAC; and,
6. Other miscellaneous shops.

Additionally, construction contractors will generate construction debris during construction projects.

Solid waste streams at Fort Monmouth consist of general refuse, universal waste, class D materials, compost, scrap metal, electronic bulky equipment, bi-metal cans, and paper. General refuse can be further segregated into the following waste streams: food waste, food service paper waste, cardboard, packaging, wood and other miscellaneous materials. Universal waste consists of fluorescent lamps, mercury switches, batteries and other miscellaneous materials that meet the definition of universal waste. Compost consists of grass cuttings and leaves or other plant material. Bi-metal cans are collected and crushed and sold to a recycler. Lead acid batteries are collected and stored at one of the 90-day hazardous waste storage facilities and picked up by a local recycler. Construction debris has been tracked separately as it is generally part of a contractor responsibility under the construction contract.

6.4 CURRENT P2 INITIATIVES

A total of 3,796 tons of solid waste for Fiscal Year (FY) 2002 was collected; approximately 40.9% was recycled. Current P2 recycling initiatives include the following:

1. Paper
2. Aluminum cans
3. Glass container
4. Cardboard
5. Toner cartridges

6.4.1 Paper Recycling P2 Initiative

6.4.1.1 Description

Currently Fort Monmouth has a paper-recycling program that recycles white and colored paper, computer paper, bond paper, cardstock, newspaper and other non-glossy paper. Information on the amount of recycled paper is provided by the contractor to the DPW facility management staff on an annual basis. In FY 2002 an estimated 724 tons of paper were recycled. Recycling containers are conveniently placed though out the buildings of Fort Monmouth and a contractor services these containers. The effectiveness of the recycling programs varies; however, it is thought that almost 90% of the recycled paper is being collected.

6.4.1.2 Technical Evaluation

Paper recyclables are materials that still have useful physical or chemical properties after serving their original purpose and can, therefore, be reused or remanufactured into new products. Collecting recyclables reduces waste disposal costs. Subject to market demands recycling can actually provide revenue through the sale of collected materials. In addition, collecting recyclables helps to ensure an adequate supply of raw materials for manufacturing recycled products.

6.4.1.3 Environmental Benefits

Environmental benefits for recycling waste paper include conservation of natural resources (i.e. trees, water and energy), decreasing the amount of material sent to landfills, reducing the amount of air and water pollution due to the manufacturing of virgin paper. One ton of recycled paper can save 17 trees according to the EPA. The energy used to produce and process a ton of paper is equivalent to 462 gallons of oil. A ton of waste paper takes up approximately 6.7 cubic yards of landfill space. Since most of the waste paper was recycled, Fort Monmouth did not use approximately 4,150 cubic yards of landfill space in FY 2002. Company support of recycling also can improve customer and employee relations by demonstrating a company's commitment to environmental protection.

6.4.1.4 Economic Benefits

Currently Fort Monmouth is paying approximately $60 per ton for disposal of general refuse generated at the site. The estimated cost for waste paper recycling is approximately $60 per ton as well. The cost difference between disposal and recycling is essentially zero. To achieve 100% effectiveness it will take a commitment by all employees at Fort Monmouth to recycle all appropriate paper. To encourage 100% participation Fort Monmouth should implement a cubical collection system to augment the current system.

Implementation Cost

The cost to implement a cubical collection system include the capital cost of purchasing individual boxes for each cubical for 10,000 employees. This item can range from a Rubber Maid blue recycle receptacle for $5 a unit to a cardboard box printed with the word recycle for a bout $0.50 per unit. The capital cost would range from $5,000 to $50,000.

Recurring Cost

Recurring cost would be replacing the cardboard boxes at a rate of 10% a year ($500/year).

Recurring Cost Savings

Savings result from the difference in the disposal cost versus the cost of recycling the waste paper. The ten percent increase in recycling would not result in any additional savings.

Payback Period

The payback period is calculated by dividing the implementation cost by the net cost saving. Note the net cost saving is the difference between the recurring cost and the recurring cost saving. Since there is no savings, there is no payback period.

Implementation Status Because of the aggressive recycling program at Fort Monmouth the additional cost to achieve 100% participation is not cost effective and this initiative will not be funded.

6.4.2 Lead Acid Battery Recycling

6.4.2.1 Description

As of December 2002, lead-acid batteries are classified by USEPA and NJDEP as universal waste. The batteries are used at Fort Monmouth in the shops located throughout the facility. The Battery Laboratories (Building 2700) is the largest generator of batteries of all types. The function of the battery laboratory is to test lead acid batteries for life cycle, durability and performance in extreme temperatures and moisture conditions. A total of 24,640 pounds of lead-acid batteries were turned in for recycling facility-wide in FY 2001. Batteries are manifested to an authorized recycler.

6.4.2.2 Technical Evaluation

Lead-acid batteries are banned from landfills and a very successful industry for recycling has emerged. The typical new lead-acid battery contains 60 to 80 percent-recycled lead and plastic material. Spent batteries are collected, shipped to a permitted recycler where, under strict environmental regulations, the lead, acid and plastic are reclaimed and sent to a new battery manufacturer. The recycling cycle for lead acid batteries goes on indefinitely.

6.4.2.3 Environmental Benefits

Environmental benefits for recycling used lead acid batteries include reducing the use of natural resources (lead), and eliminating or reducing the amount of lead and sulfuric acid entering the environment. A typical lead acid battery contains between 15 and 20 pound of lead and 1 to 2 gallons of sulfuric acid.

6.4.2.4 Economic Benefits

Implementation Cost

The cost to implement a lead acid battery collection center was estimated at $10,000.

Recurring Cost

Recurring cost is labor associated with collecting lead-acid batteries. This labor is estimated at 4 hours per month at a rate of $50 per hour. The annual recurring cost is approximately $2,400.

Recurring Cost Savings

Recurring cost savings would be the disposal cost at an average rate of $0.30 per pound. Fort Monmouth disposes of approximately 1,250 lead-acid batteries, each weighing approximately 30 pounds. Total disposal cost approximately $11,250.

Payback Period

The payback period is calculated by dividing the implementation cost by the net cost savings. Note the net cost savings is the difference between the recurring cost and the recurring cost saving.

$10,000/$11,250-$2,400 = 1.13 years

Implementation Status – This initiative was instituted at Fort Monmouth many years ago and has proven to be an effective means of reducing solid waste.

6.5 POTENTIAL P2 INITIATIVES

Fort Monmouth has been very aggressive in its approach to P2, implementing many initiatives. Fort Monmouth will have to be very creative in finding new meaningful initiatives. Potential P2 initiatives for solid waste at Fort Monmouth examined include rest room paper waste reduction.

6.5.1 Rest Room Paper Waste Reduction

6.5.1.1 Description

Approximately 9% of the general refuse is composed of paper towel wastes or 100 tons of paper towel waste generated by Fort Monmouth in FY 2002.

6.5.1.2 Environmental Benefits

Environmental benefits for changing from paper towels to hand dryers would decrease the amount of landfill space used; reduce the amount of raw material and decrease air and water pollution due to the manufacturing of paper towels. A ton of paper towels takes up approximately 6 cubic yards of landfill space. If the paper towels had not been used at Fort Monmouth, then 6,000 cubic yards of landfill space would not have been used in FY 2002.

6.5.1.3 Economic Benefits

Implementation Cost

Implementation cost would include the cost of purchasing approximately 750 electric hand dryers for the restrooms located on Fort Monmouth. Additionally, the labor cost to install and wire the units would need to be included. A typical hand dryer can be purchased for approximately $350 per unit and the approximate labor time to install and wire each unit is 16 hours. Capital Cost would be approximately $262,500 and the labor cost would be approximately $600,000. Total implementation cost would be $862,500.

Recurring Cost

Recurring cost would include the additional electricity used and some maintenance time for servicing the hand dryers. The electrical cost was estimated from a web site that listed cost per thousand used for their product based on an electrical cost of 8 cents per kilowatt hour. Based on the number of people the annual total would be 10,000,000 uses for an estimated amount of $5,000 of additional electricity. It is estimated that 15% of the units would require 2 hours of maintenance annually. Thus the labor cost would be approximately $11,250 annually. Total recurring cost is estimated to be $16,250.

Recurring Cost Savings

Current cost of paper towels was estimated based on 10,000 people using 8 paper towels per day times 250 days, which generates 20,000,000 sheets annually. A typical sheet weighs 0.006 pounds thus generating 124,800 pounds or 62.4 tons of paper towel waste. The cost of paper towels would be approximately $229,000 annually. The cost for the disposal of the paper towel waste is approximately $3,750 annually. Total cost saving would be $232,750.

Payback Period

The payback period is calculated by dividing the implementation cost by the net cost saving. Note the net cost saving is the difference between the recurring cost and the recurring cost saving.

$862,500/$232,750- $16,250= 4.0 Years

Implementation Status – This initiative is not warranted at this time and is not recommended for implementation.

SECTION 7
AIR EMISSIONS

7.1 GOAL

The installation's goal is to show a continuous annual reduction in air emissions.

7.2 BASELINE AND PROGRESS

The switch from diesel fuel to natural gas is an effective method of reducing air pollution. Reduction in air emissions for nitrogen oxides (NO_x), Carbon Oxide (CO) and Sulphur Dioxide (SO_2) are considerable. NO_x reductions are approximately 30% range and SO_2 are approximately 99%. CO reductions are typically more variable and range from -10 to 40% depending on the type of unit and operating conditions. **Table 7.1** shows significant reductions in NO_x and SO_2 and an increase in CO.

TABLE 7.1
AIR EMISSIONS
(TONS EMITTED PER CALENDAR YEAR)

							TARGET: CONTINUOUS REDUCTION
POLLUTANT	1997	1998	1999	2000	2001	2002	2003*
PM10	NA	NA	NA	NA	1.16	1	
TSP	2.79	2.52	0.89	0.97	1.16	1	
SO2	0.28	0.19	0.35	0.17	0.05	0.05	
CO	5.38	5.09	9.85	10.61	12.97	12	
NOX	24.36	22.45	12.62	13.03	15.49	15	
VOCS	9	7.6	2.07	2.34	2.32	2.3	

* Estimated

1. Air emissions are variable depending on weather and fuel supplies. There has been approximately 25% reduction in total emissions since 1997. Sulfur Dioxide has decreased 85% and NO_x has decreased 40%.
2. Fort Monmouth does not use any Hazardous Air Pollutants (HAPs) except as lab-sized quantities.

7.3 DESCRIPTION OF MAJOR EMISSION SOURCES

Air emissions at Fort Monmouth come from such sources as industrial shops, facility engineer contractor shops and other tenant activities. The largest source of air emissions on Fort Monmouth comes from the gas fired boilers used to generate heat for various buildings. Fort

Monmouth converted all large boilers greater than 1Million British Thermal Units (MBTU) from diesel fuel to natural gas over the last 10 years.

Metal fabrication is conducted in various buildings. This activity includes a paint spray booth for the painting of parts to complete tanks. The paint booth has emission control technology as air is drawn through a filter prior to discharge to the atmosphere. The change of fluids in parts washers from solvents to aqueous base has also decreased the VOCs.

The facility engineer contractor conducts the routine services for the DPW and includes the following shops:

1. Plumbing,
2. Carpentry,
3. Roads and Grounds,
4. Entomology (pest control),
5. HVAC; and,
6. Other Miscellaneous shops.

7.4 CURRENT P2 INITIATIVES

The current initiatives at Fort Monmouth consist of proper and effective maintenance of the new gas combustion systems and the geothermal systems. Major P2 improvements were achieved in previous years.

7.4.1 Gas Fired Boilers for Steam Heat

7.4.1.1 Description

Fort Monmouth has undertaken an ambitious program over the last 10 years switching from diesel fuel to natural gas on the boilers that provide heat. Several dozen units greater than 1MMBTU/Hr were considered significant and were converted from diesel to natural gas. These boilers supply heat for some of the larger buildings or complexes.

7.4.1.2 Environmental Benefits

The switching from diesel fuel to natural gas is an effective method of reducing air pollution. Reduction in air emissions for nitrogen oxides (NO_x), Carbon Oxide (CO) and Sulphur Dioxide (SO_2) are considerable. NO_x reductions are in the approximately 30% range and SO_2 are approximately 99%. CO reductions are typically more variable and range from -10 to 40% depending on the type of unit and operating conditions. **Table 7.1** shows significant reductions in NO_x and SO_2 and an increase in CO.

7.4.1.3 Economic Benefits

Implementation Cost

Implementation cost was not tracked under the Environmental department budget; therefore, no detailed cost benefit is provided for this initiative.

7.4.2 Geothermal Systems

7.4.2.1 Description

Fort Monmouth has undertaken an ambitious program over the last 10 years to install geothermal systems. Geothermal systems consist of three main parts: 1) the heat pump includes the compressor, blower, air and water coils, 2) liquid heat exchange medium which is either well water, pond, lake or river water, or a buried earth loop filled with water and glycol, and 3) air delivery system (ductwork). The systems installed at Fort Monmouth are closed loop systems that contain an environmentally safe product, which is a mixture of water and alcohol.

7.4.2.2 Technical Evaluation

Geothermal Heat Pumps have been in practical use for over 50 years. Extensive studies have proven that LIQUID SOURCE, (GEOTHERMAL) Heat Pumps have a life almost double that of conventional air type units such as conventional air conditioners. The energy cost savings compared to fossil fuels are up to 20% for natural gas and up to 60% for propane or fuel oil depending on the cost of electricity. There is no other heating/cooling system available today that can give you pure fresh filtered warm and cool air. Since there are no fossil fuels involved, there is no danger from carbon monoxide, leaking raw gas, or air pollution.

7.4.2.2 Environmental Benefits

Where a fossil fuel furnace may be 60-90% efficient, a geothermal heat pump is about 350%. A study by the Environmental Protection Agency found that GeoExchange Systems are much more efficient than competing fuel technologies when all losses in the fuel cycle, including waste heat at the power plants during the generation of electricity, are accounted for. High-efficiency GeoExchange systems are on average 48% more efficient than the best gas furnaces and more than 75% more efficient than oil furnaces. The best GeoExchange systems even outperformed the best gas technology, gas heat pumps, by an average of 36% in the heating mode and 43% in the cooling mode.

The Department of Energy has endorsed Geothermal Heat Pumps because they are environmentally friendly and they conserve fossil fuels. Ground water is a renewable energy source. Geothermal Heat Pumps use a small amount of electricity while extracting most of the cooling and heating energy from the earth.

7.4.2.3 Economic Benefits

Implementation Cost

This varies by the cost of electricity, oil and propane in an area. Generally on average, a geothermal heat pump can produce heat with average savings of 10-15% over natural gas, 40% savings over fuel oil, and 50% savings over propane. Air conditioning savings average 40-60% over conventional systems.

On Average the payback period is 1 to 3 years on open loops, and 5 to 7 years on closed loop systems. Payback will also vary depending upon the insulation used and how well the delivery systems (duct work) are designed.

Implementation cost was not tracked under the Environmental department budget; therefore, no detailed cost benefit is provided for this initiative. One large system and several small systems have been installed at Fort Monmouth at a cost of approximately $1,500,000. Energy saving in the amount of natural gas used for heating has been reduced by approximately 15 percent.

7.5 POTENTIAL P2 INITIATIVES

One new initiative that has been identified is the recovery of landfill gas from a local landfill for use at Fort Monmouth for generating electricity. This will be evaluated further in FY 03-04. Fort Monmouth should continue to track new "cleaner" technologies and consider implementation of those technologies that could increase energy efficiency and are cost-effective.

SECTION 8
WATER AND WASTEWATER

8.1 GOAL

The installation's goal is to show a continuous annual reduction in potable water consumption and in wastewater generation.

8.2 BASELINES AND PROGRESS

TABLE 8.1
WATER CONSUMPTION
(PER 1000 GALLONS)

1999	2000	2001	2002	2003*	2004*	2005*	TARGET: CONTINUOUS REDUCTION 2006*
146,913	133,494	143,747	148,169				

* ESTIMATED

TABLE 8.2
WASTEWATER GENERATION
(PER 1000 GALLONS)

1999	2000	2001	2002	2003*	2004*	2005*	TARGET: CONTINUOUS REDUCTION 2006*
138,724	161,372	153,694	143,271				

* ESTIMATED

1. Water use rate has decreased 17% since 1997. Though more subject to swings in amount generated, wastewater has similarly decreased since 1997. Both decreases are despite the amount of site personnel not decreasing.
2. There are no discharges to surface water bodies other than storm water. Storm water discharges are not included in the above numbers for wastewater. BMP is in place for storm water system such as dikes and secondary containment for hazardous material storage.

8.3 DESCRIPTION OF WATER AND WASTEWATER SYSTEMS

Currently Fort Monmouth purchases potable water from New Jersey American Water Company through 16-metered locations across the installation. Because water is not metered at each building, it is difficult to determine the water usage of each shop, housing unit, office or operation. Water is distributed throughout the installation by a series of water mains and feeder lines. The installation can be divided into three parts: Main Post, Charles Wood Area and Evans Area. The Evans area is in the process of being closed and transferred to a nongovernmental entity.

Approximately 10,000 people work at Fort Monmouth daily. It is assumed each person flushes the toilet four times per day. Each flush uses approximately 3.5 gallons of water with the current commodes. Approximately 35,000,000 gallons of water are used annually for domestic waste disposal.

EPA estimates typical household water use at approximately 70 gallons per day per person. The approximately 2,500 people living in housing at Fort Monmouth consume approximately 63,875,000 gallons annually. The various shops and the laboratories use the remaining water.

The Regional Two River Water Reclamation Authority receives all wastewater from Fort Monmouth and the rate is metered for Main Post and Charles Wood Area. Evans Area is connected to South East Regional Sewage Authority.

8.4 CURRENT INITIATIVES

Current initiatives at Fort Monmouth include public outreach on water conservation and mandatory water use restrictions during drought condition such as during FY 2002. Information is distributed to base personnel through base publications, fliers and bulletin boards.

8.5 POTENTIAL P2 INITIATIVES

The one purpose of the P2 plan is to determine if the use of natural resources has an impact on pollution. Clean, safe drinking water is becoming a scarcer commodity so ways to reduce water use were examined. Potential P2 initiatives for water and wastewater at Fort Monmouth could include:

1. Replace existing urinals with water free no flush urinals
2. Replace existing toilets with ultra low flush toilets
3. Inspect wastewater flow meters

8.5.1 Replace Existing Urinals With Water Free No Flush Urinals

8.5.1.1 Description

Currently Fort Monmouth uses water flush urinals, which consume approximately 10,500,000 gallons of water annually. This volume is calculated based on approximately 6,000 men working at Fort Monmouth, that on average use the urinal twice per day and that each flush uses 3.5 gallons of water. The total number of flushes from the current urinals is estimated at

3,000,000 annually. New technology has developed a flush-less urinal, which drastically reduces the amount of water used.

8.5.1.2 Technical Evaluation

The technology operates on the basic principle that a layer of lighter than-water fluid floats on top of the urine in a trap and additional urine runs through this layer and down the drain. This system offers both hygiene and maintenance advantages of not having anything to flush, in addition to the obvious water saving. Currently this technology may not be accepted by building codes, but more municipalities are adopting this technology to conserve water. Information on the flush-less urinals can be found in **Appendix A**. The Fort Monmouth wastewater system (whose total wastewater flow is low for its intended original design) requires a minimum wastewater flow in order to function properly so this initiative will not be recommended at this time.

8.5.1.3 Environmental Benefits

Environmental benefits for replace existing urinals with water free no flush urinals would include a decrease in the amount of water used and a reduction in the amount of wastewater generated.

8.5.1.4 Economic Benefits

Implementation Cost

Implementation cost will consist of purchasing 500 no flush water-less flush urinals and the cost of the installation of the urinals. Each no flush water-less urinal costs approximately $120 for a total cost of $60,000 capital cost. The labor cost to install each urinal is approximately $50 per hour times 4 hours per urinal for a total cost of approximately $100,000. Total implementation cost would be $160,000. This cost does not include the cost to upgrade the sewer system design for much lower waste water flow.

Recurring Cost

Recurring costs would consist of replacement traps and the maintenance to replace the traps. One manufacturer recommends that the traps be replaced after 7,000 uses, which equates to approximately 430 traps per year. Estimated cost for the replacement traps are approximately $35 per trap so the total cost would be $15,050. The labor cost to replace the traps is estimated by the manufacturer at $5 per trap for a cost of $2,150. Total recurring cost would be $17,200.

Recurring Cost Savings

Recurring cost savings would be generated by the reduction in the amount of water by approximately 10,500,000 gallons for a cost savings of $42,000 annually based on a water purchase price of $4 per 1,000 gallons. Additionally, approximately 9,000,000 fewer gallons of wastewater would be disposed of to the public owned treatment works (POTW). The charge rate for wastewater disposal to the POTW is $4 per 1,000 gallons, resulting in an additional $36,000 savings. Total recurring cost savings is approximately $78,000.

Payback Period

The payback period is calculated by dividing the implementation cost by the net cost saving. Note the net cost saving is the difference between the recurring cost and the recurring cost saving.

Payback period = $160,000/$78,000-$17,200= 2.63 years

Because the Fort Monmouth wastewater sewer system is designed for a much higher flow rate, in order to utilize these savings the sewer would have to be re-designed and upgraded. These costs would increase the above calculated payback period significantly. Based on the review of the Fort Monmouth DPW this recommendation will not be further investigated.

8.5.2 Replace Existing Toilets With Low Flush Toilets

8.5.2.1 Description

Currently Fort Monmouth uses conventional toilets that use 3.5 gallons per flush, which consume approximately 35,000,000 gallons of water annually. This is based on the figures that Fort Monmouth has approximately 10,000 people that on average use the toilet four per day and that each flush uses 3.5 gallons of water. New technology has developed a low flush toilet, which drastically reduces the amount of water used to an average of 1.6 gallons per flush.

8.5.2.2 Technical Evaluation

The low flush toilets have been mandated by EPA and most replacement units built since the mid 90's have met these standards except for commercial toilets. GSA carries the low flow flush toilets in their catalog. Information is provided in **Appendix B**. Fort Monmouth has been complying with the EPA mandate by replacing toilets during rehabilitation of the building as the work is scheduled. Procurement for replacement toilets is limited to low flow toilets.

8.5.2.3 Environmental Benefits

Environmental benefits for replacing existing toilets with low flush toilets include a decrease in the amount of water used and a reduction in the amount of wastewater generated.

8.5.2.4 Economic Benefits

Implementation Cost

Implementation cost will consist of purchasing 1,500 low flush toilets and the cost of the installation of the new toilets. Each low flush toilets cost approximately $250 for a total cost of $375,000 capital cost. The labor cost to install each low flush toilet is approximately $50 per hour times 4 hours per toilet for a total cost of approximately $60,000. Total implementation cost would be $435,000.

Recurring Cost

Recurring costs would be essentially the same regardless of what type of toilet was used.

Recurring Cost Savings

Recurring cost savings would be generated by the reduction in the amount of water by approximately 13,500,000 gallons for a cost savings of $54,000 annually. This number is based on the average cost of water per 1,000 gallons of $4.00. Additionally, there would also be a decrease in the cost of disposal of the wastewater for approximately 10,800,000 gallons of wastewater. The cost of wastewater disposal to the POTW is $4.00 per 1,000 gallons for a yearly cost saving of an additional $43,200. Total recurring cost saving is approximately $97,200.

Payback Period

The payback period is calculated by dividing the implementation cost by the net cost saving. Note the net cost saving is the difference between the recurring cost and the recurring cost saving.

Payback period = $435,000/$97,200-$0= 4.47 years

This initiative will be recommended to the EQCC for further cost analysis to determine if a more aggressive approach should be implemented.

8.5.3 Metered Wastewater Disposal

8.5.3.1 Description

Currently Fort Monmouth meters wastewater in three locations, one for each of the three areas: Main Post, Charles Wood, and Evans. A typical wastewater system should show approximately 70 to 90 percent of the water consumption returned as wastewater. Based on the review of the wastewater flow rates from FY 1999 to FY 2002 it appears that an extraneous source of wastewater is being metered in the system. Potential sources of this extraneous wastewater could be poorly calibrated meters, or improper storm water connections.

8.5.3.2 Technical Evaluation

Technical evaluation of the wastewater system should consider 1) calibration of all meters on an annual basis, 2) smoke testing of storm water and sanitary connections and 3) television surveys of the sewer mains and repairs of major sources of infiltration.

8.5.3.3 Environmental Benefits

Environmental benefits would include the reduction in wastewater being sent for treatment if the source is real and not in the calibration of the meters.

8.5.3.4 Economic Benefits

Implementation Cost

Implementation cost is assumed to be zero as no meters are expected to be replaced.

Recurring Cost

Recurring costs would be the cost of calibrating the meters, which would be approximately $ 1,000 per year.

Recurring Cost Savings

Recurring cost saving would be generated by the reduction in the amount of wastewater for potentially 10,000,000 gallons of wastewater per year based on the noted typical wastewater to potable water ratio. As noted, Fort Monmouth pays $4 per 1,000 gallons of wastewater disposed to the POTW. The annual cost reduction is thus $40,000.

Payback Period

The payback period was not calculated as this would result in a cost saving for every year of use of approximately $39,000.

SECTION 9
TOXIC RELEASE INVENTORY FORM R RELEASES

9.1 GOAL

Reduce TRI Form R chemical releases 40% overall by December 31, 2006 from a 2001 baseline.

9.2 BASELINE AND PROGRESS

EPA guidelines were used by Fort Monmouth to establish whether the facility was required to submit an EPCRA Section 313 report (Form R). Eligibility determination consists of the following steps. Step 1: Does the facility employ more than 10 fulltime equivalent employees (FTE)? Fort Monmouth has more then 10 FTE. Step 2: The facility is covered by a Standard Industrial Code (SIC) listed in the regulation or is a federal facility. Fort Monmouth is a federal facility. Step 3: Does the facility use or manufacture one of the listed chemicals in quantities greater than the reporting threshold in the regulation. Fort Monmouth has not exceeded any of the reporting thresholds.

9.3 DESCRIPTION OF FORM R RELEASES

No TRI Form R has been filed by Fort Monmouth from 2001 to the current.

9.4 CURRENT P2 INITIATIVES

No current P2 Initiatives are being conducted.

9.5 POTENTIAL P2 INITIATIVES

No potential P2 Initiatives are being planned.

SECTION 10
EPA PRIORITY CHEMICAL REDUCTION

10.1 GOAL

Reduce the use of EPA priority chemicals 50% by December 31, 2006 from a baseline of 2002.

10.2 BASELINE AND PROGRESS

The establishment of the list has been delayed in committee groups and therefore it is not possible to construct a final list. **Table 10.1** shows a draft EPA Toxic Priority Chemical Reduction List but that should not be released to the general public until finalized.

10.3 DESCRIPTION OF EPA PRIORITY CHEMICAL REDUCTION

EPA and the Workgroup shall develop a list of not less than 15 priority chemicals used by the Federal Government that may result in significant harm to human health or the environment and that have known, readily available, less harmful substitutes for identified applications and purposes. In addition to identifying the applications and purposes to which such reductions apply, the Administrator, in coordination with the Workgroup shall identify a usage threshold below which this section shall not apply. The chemicals will be selected from listed EPCRA section 313 toxic chemicals and, where appropriate, other regulated hazardous substances or pollutants. In developing the list, the Administrator, in coordination with the Workgroup shall consider:

1. Environmental factors including toxicity, persistence, and bio-accumulation;
2. Availability of known, less environmentally harmful substitute chemicals that can be used in place of the priority chemical for identified applications and purposes;
3. Availability of known, less environmentally harmful processes that can be used in place of the priority chemical for identified applications and purposes;
4. Relative costs of alternative chemicals or processes; and
5. Potential risk and environmental and human exposure based upon applications and uses of the chemicals by Federal agencies and facilities.

In identifying alternatives, the Administrator should take into consideration the guidance issued under section 503 of Executive Order 13101.

10.4 CURRENT P2 INITIATIVES

Specific guidance for EPA Toxic Chemical Reduction has not been issued, so the exact criteria for reporting or exemption is unknown. However, because mercury and lead will most likely be on the final list, current P2 Initiatives on Fort Monmouth include replacement of mercury thermometers or instruments found in the laboratories and lead paint encapsulation or removal. Minor amounts of lead or mercury containing chemicals may be in the labs for analytical purposes.

10.4.1 Mercury Reduction

Mercury thermometers/instruments in the labs are being replaced with non-mercury containing instruments, such as alcohol thermometers, as part of a continuing procurement process.

10.4.1.1 Description

Fort Monmouth has undertaken a program in the last 10 years to replace mercury-containing equipment. The initiative has resulted in the reduction of mercury released into the environment.

10.4.1.2 Technical Evaluation

Fort Monmouth has evaluated the use of non-mercury thermometers and has determined that they meet the sensitivity requirements for the typical use. Replacing mercury thermometers with non-mercury thermometers will reduce the risk of accidental releases of mercury by breakage.

10.4.1.3 Environmental Evaluation

Although the final list for EPA Priority Chemicals has not been released, it is expected that mercury will be included. Individual exposure to mercury on Fort Monmouth is relatively low with personnel at the laboratory having a slightly higher potential for exposure. Exposure to high levels of elemental mercury vapor can result in nervous system damage including tremors, and mood and personality alterations. Exposure to relatively high levels of inorganic mercury salts can cause kidney damage. Adult exposure to relatively high levels of methylmercury through fish consumption (several fish advisories exist in New Jersey) can result in numbness or tingling in the extremities, sensory loss and loss of coordination. Whether any of these symptoms actually occur, and the nature and severity of the symptoms, depend on the amount of exposure. The replacement of mercury thermometers with alcohol base thermometers will reduce the amount of mercury used at Fort Monmouth and reduce the potential for release into the environment. Other sources of mercury include fluorescents lights and mercury switches as discussed in sections 5 and 6.

10.4.1.4 Economic Evaluation

Cost benefit analysis was not conducted as the equipment is being replaced only when replacement items are necessary.

10.4.2 Lead Reduction

10.4.2.1 Description

Fort Monmouth has undertaken an ambitious program over the last 10 years to remove or encapsulate lead based paint. Encapsulation of existing lead painted houses will minimize lead exposure to the residents. No future housing units will use lead-based paint. Other activities that generate lead include the lead-acid batteries mentioned in Section 6 for recycling and reuse of the lead. These initiatives result in the reduction of lead into the environment.

10.4.2.2 Technical Evaluation

Fort Monmouth has developed a Lead Based Paint (LBP) Management Plan, which establishes a Project Team. The Project Team consists of representatives from DPW, Preventive Medicine, Garrison Safety and Base Operations (BASOP) Industrial Hygiene/Safety in conjunction with the Environmental Advisory Board Group (EMAG) to plan, execute and monitor projects with potential health/safety risks. The Project Team ensures that EPA's LBP package is given to all housing residents and new arrivals. The LBP Risk Assessment found most interior units were in good condition. The Project Team shall ensure that sampling and analysis on housing units is performed between occupancies. All samples (wipes and bulk) and analyses shall be performed in-house by BASOP NJDEP Certified Environmental Laboratory.

10.4.2.3 Environmental Evaluation

Although the final list for EPA Priority Chemicals has not been released, it is expected that lead will be included. People, animals, and fish are mainly exposed to lead by breathing and/or ingesting it in food, water, soil, or dust. Lead accumulates in the blood, bones, muscles, and fat. Infants and young children are especially sensitive to even low levels of lead. Although overall blood lead levels have decreased since 1976, infants and young children still have the highest blood lead levels. Children and others can be exposed to lead not only through the air, but also through accidentally or intentionally eating soil or paint chips, as well as food or water contaminated with lead.

10.4.2.4 Economic Evaluation

Economic evaluation for the removal of lead is not part of the environmental budget and is tracked under cost items in the DPW budget. Cost benefit analysis is not required as this is a maintenance issue on the older housing units.

10.5 POTENTIAL P2 INITIATIVES

No potential P2 Initiatives are being planned at this time until the list of chemicals is finalized at which time the EMAG shall determine future actions.

Table 10.1
DRAFT EPA TOXIC CHEMICALS
(pounds used per calendar year)

EPA Chemical	Baseline 2002	2003	2004	2005	2006	Target
1,2,4-Trichlorobenzene	0					
1,2,4,5-Tetrachlorobenzene	0					
2,4,5-Trichlorophenol	0					
4-Bromophenyl phenyl ether	0					
Acenaphthene	0					
Acenaphthylene	0					
Anthracene	0					
Benzo(g,h,i)perylene	0					
Dibenzofuran	0					
Endosulfan, alpha	0					
Endosulfan, beta	0					
Fluorene	0					
Heptachlor	0					
Heptachlor epoxide	0					
Hexachlorobenzene	0					
Hexachlorobutadiene	0					
Hexachlorocyclohexane, gamma-	0					
Hexachloroethane	0					
Methoxychlor	0					
Naphthalene	0					
Pendimethalin	0					
Pentachlorobenzene	0					
Pentachloronitrobenzene	0					
Pentachlorophenol	0					
Phenanthrene	0					
Pyrene	0					
Trifluralin	0					
Cadmium[1]	NA					
Lead[2]	2605					
Mercury[3]	73					
Total use	0					

Note that the EPA Interagency Workgroup will determine specific chemicals for this table in 2001.

1. The cadmium number from the FY2001 Hazardous waste report is not quantifiable with current information.

2. This number generated from the FY2001 Hazardous waste report using two categories lead pellets and lead (pigs, paint chips and vests). Not included is the lead in the optical glass and lead in the parts washer as it is not quantifiable with current information.

3. This number generated from the FY2001 Hazardous waste report using waste mercuric chloride, waste mercury contained in manufactured articles, waste mercury and universal waste mercury thermostats. Not included is mercury contained in fluorescent lights and mercury batteries.

SECTION 11
OZONE DEPLETING SUBSTANCES

11.1 GOAL

According to Memorandum ASA IL&E, (1996) the goal is to eliminate Class I ODSs from inventory by December 2010. Installation commanders must ensure that by the end of December 2003 they no longer commercially procure any Class I ODSs.

11.2 BASELINES AND PROGRESS

According to Memorandum ASA IL&E, dated January 7, 2003 the Army has changed the policy from total removal of Class I ODS by the end of FY03 to continued use in sealed units or recharging units with installation stock until exhausted. The goal of total removal by the end of FY2010 is still to be enforced.

TABLE 11.1

OZONE DEPLETING SUBSTANCES (ODSS) (POUNDS CONSUMED/LOST TO ATMOSPHERE PER YEAR)							TARGET: CONTINUOUS REDUCTION
POLLUTANT	1998	1999	2000	2001	2002	2003*	2010
CFC	4884	4897	5950	3046.6	3300	2000	0

*Estimated

11.3 DESCRIPTION OF ODS-CONTAINING EQUIPMENT

Class I ODSs are used in air conditioners and refrigerants at Fort Monmouth. . **Table 11.2** contains a list of the type and quantity of refrigerants, the cost and the year of replacement, and the current status of the replacement effort. Halon 1301 is used for fire suppression in six buildings on the Main Post, but they are scheduled to be replaced during FY03. Ozone depleting substances are used in air conditioners and refrigerators throughout the Fort as well as in the vehicle fleet.

11.4 CURRENT P2 INITIATIVES

An inventory of ODS sources has been conducted. The policies and procedures required to eliminate Class I ODS are in place. CFC consumption has been reduced by gradual replacement of old CFC units (refrigerators, air conditioners) with more ozone friendly units and attrition by 40% since 1998.

11.5 POTENTIAL P2 INITIATIVES

All Class I CFC units except tactical systems are scheduled to be replaced by December 2003. The only P2 initiative is to ensure the program aggressively replaces the old CFC units with new ozone friendly units.

Table 11.2
Status of Class I Ozone Depleting Substances
Fort Monmouth

BUILDING NUMBER	TYPE OF REFRIGERANT	YEAR OF REPLACEMENT [3]	COST OF REPLACEMENT OR REMOVAL [3]	REFRIGERAENT CHARGE REMOVED (POUNDS)	REFRIGERANT CHARGE REMAINING (POUNDS)	STATUS AS OF 15 FEBRUARY 03
1075	R-11	FY97	$33,000	[2]	0	Completed
1207	R-11	FY98	$83,000	[2]	0	Completed
GPE Energy	R-11	FY98[1]	$0	[2]	0	Completed
1075	R-11	FY99	$86,000	[2]	0	Completed
SUBTOTAL			**$202,000**	**4610[3]**	**0**	
1205	R-12	[2]	[2]	[2]	47	
702	R-12	[2]	[2]	[2]	7	
2000	R-12	[2]	[2]	[2]	51	(5)
Evans	R-12	FY02	[4]	68	0	
SUBTOTAL				**68**	**105**	
976	R-502	[2]	[2]	0	100	
689	R-502	[2]	[2]	0	4	
2000	R-502	[2]	[2]	0	38	
SUBTOTAL				**0**	**142**	
Evans Area	Halon 1301	FY97	$7,500	245	0	Completed
Bldg 2705/2707	Halon 1301	FY97	$15,000	590	0	Completed
199	Halon 1301	FY03	$10,000	0	1678	(6)
1150	Halon 1301	FY03	$21,250	0	303	(6)
1203	Halon 1301	FY03	$85,000	0	1061	(6)
1209	Halon 1301	FY03	$110,000	0	1379	(6)
2700	Halon 1301	FY00	$103,000	13,012	0	Completed
1210	Halon 1301	FY03	$125,000	0	6179	(6)
SUBTOTAL			**$476,750**	**13,847**	**10600**	
Material Storage	R-502	Na	Na	0	1,500	(7)
Total Class I ODCs Remaining as of the close of FY2002					**12,100**	

(1) This work was paid for by the utility company and not Fort Monmouth

(2) Detailed information not provided summary data only

(3) Information contained in the old P2 plan

(4) The Evans area is being closed under BRAC and most equipment was removed or transferred in FY2002

(5) Scheduled for removal during Kitchen remodeling in May 03

(6) Work to be completed by July 03

Na - Not applicable

SECTION 12
VEHICLE FUEL CONSERVATION

12.1 INTRODUCTION

Vehicle fuel conservation is necessary to address two major national issues 1) Air Quality and 2) Energy Security. Highway vehicles account for 60% of all pollution in urban areas and consume over 50% of all petroleum used in the United States. Energy security requires that we reduce our dependence on foreign oil by either reducing consumption or by finding more domestic oil. The use of alternative fuels is one means of reducing consumption.

Alternative fuels are also a means of addressing both issues simultaneously. The Energy Policy Act of 1992 (EPACT) defines alternative fuels as: methanol, denatured ethanol, mixtures containing up to 85% methanol or denatured ethanol, natural gas, propane (liquefied petroleum gas), hydrogen and electricity. The General Service Administration (GSA) has an alternative fuel vehicle (AFV) program named Drive Alternative Fuel Vehicles Easily (DAVE). Vehicles leased or purchased from GSA have the option of being either alternative fuel vehicles (AFV) or regular vehicles.

Fort Monmouth has had an active AFV program since 1998, specifically including dual use Ethanol 85 vehicles. However, due to the lack of availability of Ethanol 85 locally, these vehicles have continued to use gasoline exclusively. **Table 12.1** lists some of the commonly used AFV in service at Fort Monmouth.

12.2 GOALS

Vehicle fuel conservation has been a low priority goal of P2 programs. The Energy Policy Act of 1992 (EPACT) mandated the use of light-duty AFV in federal fleets with 50 or more vehicles that operate in metropolitan statistical areas (MSA). Fort Monmouth is within the New York-Northern New Jersey MSA and subject to the EPACT requirements. Fort Monmouth leases most of its vehicles through the GSA through the Director of Logistical. Fort Monmouth currently has approximately 260 leased vehicles, of which approximately 17 are AFV.

- Increase the average EPA fuel economy of cars and light trucks by at 1 mpg by the end of FY 2002 and 3 mpg by the end of FY 2005 from a FY 1999 baseline.
- Reduce vehicle petroleum consumption 20% be the end of FY 2005 from a FY 1999 baseline.

TABLE 12.1
FORT MONMOUTH
ALTERNATIVE FUEL VEHICLES

CLASS	YEAR	MAKE	MODEL	FUEL TYPE
G41-06044	1998	DODGE	CARAVAN	BI FUEL E85/GAS
G41-42715	1998	FORD	P/U TRUCK	BI FUEL E85/GAS
G41-42746	1999	DODGE	CARAVAN	BI FUEL E85/GAS
G41-42794	1999	DODGE	CARAVAN	BI FUEL E85/GAS
G41-42747	1999	DODGE	CARAVAN	BI FUEL E85/GAS
G41-42766	1999	DODGE	CARAVAN	BI FUEL E85/GAS
G41-42719	1999	FORD	P/U TRUCK	BI FUEL E85/GAS
G41-42714	1999	FORD	P/U TRUCK	BI FUEL E85/GAS
G41-42716	1999	FORD	P/U TRUCK	BI FUEL E85/GAS
G41-42734	1999	FORD	P/U TRUCK	BI FUEL E85/GAS
G41-55773	2001	DODGE	CARAVAN	BI FUEL E85/GAS
G41-47598	2001	DODGE	CARAVAN	BI FUEL E85/GAS
G62-14074	2002	CHEVY	TAHOE	BI-FUEL E85/GAS
G41-49165	2000	DODGE	CARAVAN	BI-FUEL E85/GAS
G41-67005	2002	DODGE	CARAVAN	BI-FUEL E85/GAS
G41-55779	2001	DODGE	CARAVAN	BI FUEL E85/GAS
G41-55753	2001	DODGE	CARAVAN	BI FUEL E85/GAS

- Ensure that alternative fuels account for at least 50% of the fuels used in dual-fuel, AFVs.
- Ensure that at least 75% of car and light truck procurements are AFV.

12.3 BASELINES AND PROGRESS

Executive Order 13031 reaffirmed the commitment to require federal agencies and federal fleets to comply with EPACT and set the base line year as 1999. This order also required federal agencies to comply with the law even if they use GSA to buy or lease their vehicles. **Table 12.2** provides information on fort Monmouth on fuel use, vehicle use, alternative fuel use and the rate of procurement of AFVs.

TABLE 12.2
FORT MONMOUTH
FLEET FUEL ECONOMY

Baseline	**(average fuel efficiency of non-tactical fleet in miles/gal)[1]**					Target: 16.8
FY 1999	2000	2001	2002	2003	2004	FY 2005
9.76	9.91	10.36	9.19	7.75		

VEHICLE FUEL USE

Baseline	**(total gallons consumed for non-tactical fleet vehicles)[2]**					Target: 20% less
FY 1999	2000	2001	2002	2003	2004	FY 2005
144,150	145,560	147,281	165,601	50,134		

ALTERNATIVE FUEL USE

(% of alternative fuel consumed in alternative-fueled vehicles)[3]						Target: 50%
1999	2000	2001	2002	2003	2004	2005
0%	0%	0%	0%*			

ALTERNATIVE FUELED VEHICLE PROCUREMENT

(% of vehicles procured that are alternatively fueled)[4]						Target: 50%
1999	2000	2001	2002	2003	2004	2005
3.5%	4.3%	5.8%	6.7%			

1. Mileage estimated based on information provided for GSA leased vehicles by users.

2. Information provided by contractors to Fort Monmouth DLA.

3. Currently no alternative fuels are provided on the Fort Monmouth.

4. Percentage based on the total number of AFV divide by the total number of vehicles assigned Fort Monmouth approximately 260 vehicles.

12.4 CURRENT P2 INITIATIVES

Fort Monmouth currently has approximately 17 AFVs that can use both gasoline and Ethanol 85; however, there is no Ethanol 85 fueling station within 25 miles of Fort Monmouth so gasoline is used.

12.5 POTENTIAL P2 INITIATIVES

Vehicle fuel conservation is a part of the P2 arena and potential P2 initiatives could include:

1. Increase the number of leased GSA vehicles that use compressed natural gas (CNG) and local fueling stations.
2. Construction of a CNG station on Fort Monmouth to be able to use fleet CNG vehicles for those vehicles that do not travel beyond the local area.
3. Install either a UST or AST and purchase Ethanol 85 in bulk quantities for use by fleet vehicles.

12.5.1 Leasing CNG Vehicles from GSA

The GSA offers full service for vehicle acquisition or leasing services for the Army vehicle requirements. The GSA offers alternative fuel vehicles (AFVs) to assist the Army in meeting the federal requirements outlined above. Fort Monmouth or its contractors use GSA for all vehicle acquisition or leasing. **Table 12.3** lists the CNG fueling sites within 25 miles of Fort Monmouth that are open to the public and government and **Figure 12.1** shows the locations of the CNG fueling sites.

12.5.1.1 Environmental Benefits

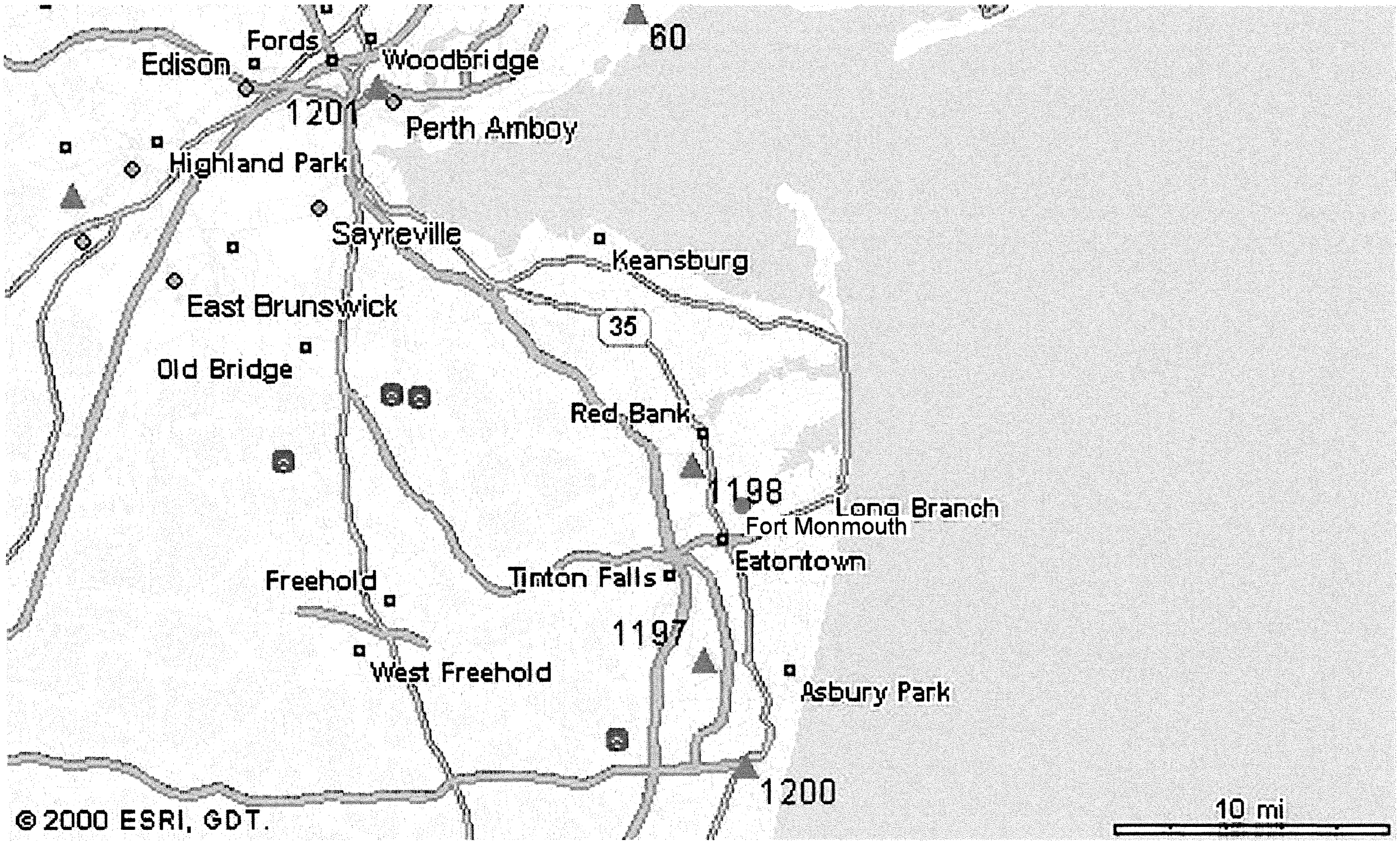
Environmental benefits from the use of AFVs include addressing two major national issues 1) Air Quality and 2) Energy Security. Highway vehicles account for 60% of all pollution in urban areas and consume over 50% of all petroleum used in the United States.

Use of AFVs will address both issues simultaneously. The Energy Policy Act of 1992 (EPACT) defines alternative fuels as: methanol, denatured ethanol, mixtures containing up to 85% methanol or denatured ethanol, compressed natural gas, propane (liquefied petroleum gas), hydrogen and electricity.

TABLE 12.3
COMPRESSED NATURAL GAS FUELING SITES
NEAR FORT MONMOUTH, NEW JERSEY

ID	Name	Phone	Address	City	State	Zip	Type of Access
1198	Pro Energy Corporation (Maintenance Facility)	732-219-0161	11 Apple St.	Tinton Falls	NJ	O7719	P
1197	Plaza Ford (Maintenance Facility)	732-922-6124	3401 Rte. 66	Neptune	NJ	O7719	P
1200	New Jersey Natural Gas Facility		1420 Wyckoff Rd.	Wall	NJ	O7719	G
1201	Paladin Chevrolet (Maintenance Facility)	732-815-2643	680 Pfeiffer Blvd.	Perth Amboy	NJ	O7719	P

P - Public
G - Govrnment



CNG REFUELING STATION

FIGURE 12.1

FT. MONMOUTH

CNG SITE LOCATIONS

THE PARSONS CORPORATION
DESIGN * RESEARCH * PLANNING

12.5.1.2 Economic Benefits

GSA leases AFVs as listed on their website: http://www.fss.gsa.gov/vehicles/leasing

Implementation Cost

The implementation cost consists of the differential of the cost of the lease for AFV versus a gasoline-powered vehicle according to the GSA schedule. **Table 12.2** shows a list of typical vehicles used by Fort Monmouth and the differential costs. For the sake of this opportunity assessment, Parsons assumed that half the vehicles would be trucks ($2,681) and the other half would be vans ($4,584). The implementation cost would be $67,000 for the trucks and $114,600 for the vans. The total cost would be $181,600.

Recurring Cost

Recurring cost consists of the purchase for the increased use of natural gas due to the switch from gasoline to CNG. Assuming that 50 vehicles are purchased or leased in the next year which use compressed natural gas at a cost of approximately $30,000 per year based on a rate of $1.30 per equivalent gasoline gallons (EGG). This assumes that the typical CNG vehicle fuel economy of 13 mpegg based on information from EPA/DOE or the manufacturer and that each vehicle is driven 6,000 miles annually.

Recurring Cost Savings

Recurring cost savings consist of the reduced purchase of gasoline for the 50 vehicles. Assuming that 50 vehicles are purchased or leased in the next year which use gasoline at a cost of approximately $31,000 per year based on a rate of $1.55 per gallon. This assumes that the typical gasoline vehicle fuel economy of 15 mpg based on information from EPA/DOE or the manufacturer and that each vehicle is driven 6,000 miles annually.

12.5.1.3 Payback Period

The payback period is calculated by dividing the implementation cost by the net cost saving. Note the net cost saving is the difference between the recurring cost and the recurring cost saving.

Payback= $181,600/$1,000=181.6 years

12.5.2 Construct CNG Vehicles Fueling Station

Construction of a CNG fueling station on Fort Monmouth would reduce the cost CNG from $1.30 gallon to about $0.85 gallon.

12.5.2.1 Environmental Benefits

Natural gas is one of the cleanest burning alternative fuels available and offers a number of advantages over gasoline. In light-duty applications, air exhaust emissions from natural gas vehicles are much lower than those from gasoline-powered vehicles. In addition, smog producing gases, such as carbon monoxide and nitrogen oxides, are reduced by over 90% and 60%, respectively and carbon dioxide, a greenhouse gas, is reduced by 30-40%.

For heavy-duty and medium-duty applications, natural gas engines have demonstrated over 90% reduction of CO and particulate matter and over 50% reduction of NO_x relative to commercial diesel engines.

12.5.2.2 Economic Benefits

<u>**Implementation Cost**</u>

Implementation cost is for a CNG refueling station manufactured by FuelMaker. The company has a GSA contract for the equipment and service, a vehicle-refueling appliance (FFQ-8-36), which compresses the natural gas and costs approximately $18,772 for a unit that can produce approximately 3.7 EGG per hour, and a storage and dispensing unit (FF-350A-PF-36), that can store up to 30 gallons of EGG, and costs $14,837. Additional equipment such as hose, gas dryer and pressure starter costs approximately $3,757. Installation cost would add another $10,000 based on the assumption that the refueling station would be located near the appropriate infrastructure. Total cost for purchase and installation would be approximately $47,366. The average cost of the CPG would be around $0.70 EGG and this cost includes natural gas and the electrical cost for operating the system.

The implementation cost consists of the cost for leasing AFVs noted above ($181,600) plus the CNG refueling station ($47,336). The total implementation cost would be $228,966.

Recurring Cost

Recurring cost consists of the purchase for the increased use of natural gas due to the switch from gasoline to CNG. Assuming that 50 vehicles are purchased or leased in the next year which use compressed natural gas at a cost of approximately $16,538 per year based on a rate of $0.70 per gallon. This assumes that the typical CNG vehicle fuel economy of 13 mpegg based on information from EPA/DOE or the manufacturer and that each vehicle is driven 6,000 miles annually.

Recurring Cost Savings

The recurring cost savings would be approximately $31,000, as described above.

Payback Period

The payback period is calculated by dividing the implementation cost by the net cost saving. Note the net cost saving is the difference between the recurring cost and the recurring cost saving.

Payback= $228,966/$14,846= 15.4 years

Currently there is a financial disincentive to convert to CNG system at this time, but Fort Monmouth will continue to explore options to increase the use of AFV.

SECTION 13
ENERGY CONSERVATION

13.1 GOAL

The P2 plan energy conservation goal is to reduce facility energy consumption 30% per square foot by 2005 and 35% by 2010 from a 1985 baseline. Note that the Executive Order 13123 allows for a separate, less stringent goal for industrial and laboratory activities. However, this installation does not track energy consumption separately for such activities. As a result, the 30-35% (more stringent) reduction goal will apply to the installation as a whole.

13.2 BASELINE AND PROGRESS

Table 13.1 Energy Consumption (KBTU/SF)

Baseline							**35% Target**
1985*	1997	1998	1999	2000	2001	2002*	2010*
170	126.44	113.33	117.28	105.31	107.91	105	105

* Estimated

Figure 13.1 is a graphical representation of energy consumption rates since 1991. Data is not available for 1985, the EO 13123 baseline for the goals. The energy consumption rate was projected backwards to 1985 using the available data; the 1985 baseline rate would be about 170 KBTU/SF. It is important to remember that the operation of heating units is directly proportional to the demands placed on the facility by the meteorological conditions of the season. Thus, some variability in the annual energy consumption rate is to be expected.

The 30% and 35% goal were achieved ahead of schedule in 2000. Since 1993, the energy consumption rate has decreased by approximately 30%. Fort Monmouth was able to achieve this energy reduction goal by replacing immovable boilers with new and more efficiently designed systems, by switching fuel sources from oil to gas and by the facility's use of geothermal systems. These changes have also resulted in significant air emission reductions, as discussed in Chapter 7.

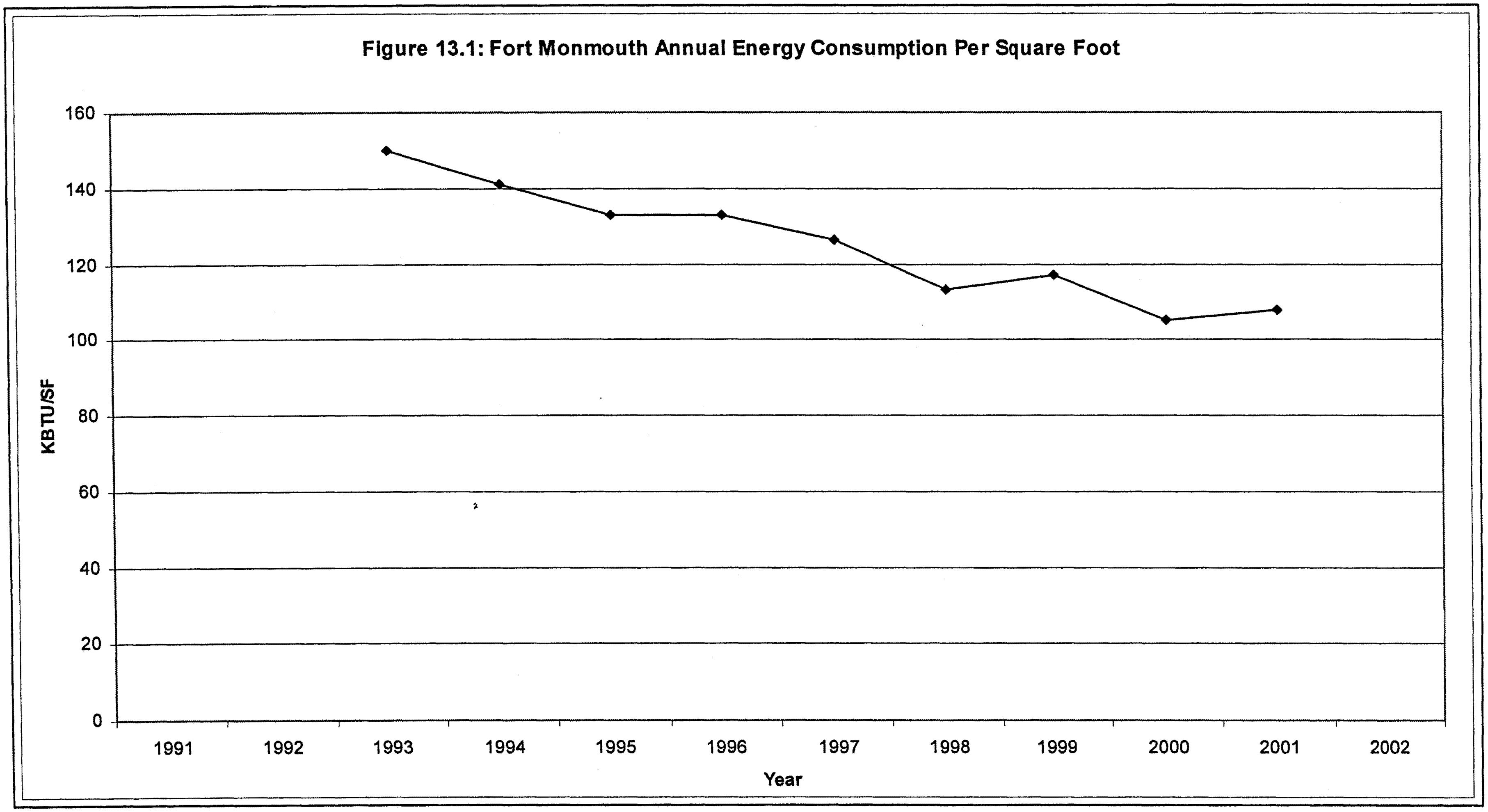


Figure 13.1: Fort Monmouth Annual Energy Consumption Per Square Foot
KBTU/SF
160
140
120
100
80
60
40
20
0
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
Year

13.3 CURRENT P2 INITIATIVES

The current initiatives at Fort Monmouth consist of proper and effective maintenance of the new natural gas combustion systems and the geothermal systems. Major improvements were achieved in previous years. Section 7 shows the P2 Initiatives for geothermal and fuel switching that also resulted in energy savings.

13.4 POTENTIAL P2 INITIATIVES

New potential initiatives for the future have not yet been identified. Fort Monmouth will continue to track new "cleaner" technologies and consider implementation of those technologies that could increase energy efficiency and are cost-effective.

SECTION 14
AFFIRMATIVE PROCUREMENT

14.1 BACKGROUND INFORMATION

Affirmative procurement is required under Section 6002 of the Resource Conservation and Recovery Act (RCRA) and this law requires federal agencies to purchase recycled products. EO 13101 and EO13148 require federal agencies to incorporate waste prevention and recycling into daily operations and to establish procurement programs to meet those requirements. Recycled products obtained from GSA and Defense Logistics Agency (DLA) meet or exceed EPA standards and have been reviewed for price, availability, and performance. Under the Secretary of Defense policy DOD agencies do not need to perform evaluation of purchases using GSA or DLA supplied products.

All Fort Monmouth consumers have the responsibility to be aware of the affirmative procurement requirements and to purchase U.S. EPA-designated items. IMPAC purchase cardholders are responsible to ensure that they follow the FM AAP. Three exemptions have been approved for FM APP and they are 1) use of recycled antifreeze, 2) use of recycled carpeting and 3) use of fly ash in concrete.

The goals of the APP are 1) to maximize Fort Monmouth recycled and bio-based purchasing, 2) reduce the amount of waste requiring disposal through the purchase of products containing recovered materials, 3) train procurement officers and 4) integrate AP into developing plans, work statements, and specifications.

14.2 CURRENT AFFIRMATIVE PROCUREMENT INITIATIVES

Fort Monmouth current affirmative procurement initiatives include purchasing items from the GSA catalog, DLA, Self Service Supply Center and training for personnel who purchase items for use at Fort Monmouth through the use of IMPAC purchase cardholders. Items carried by GSA or DLA have been reviewed for their recycle content and are in compliance with the EO on greening the Government. The Self Service Supply Center carries routine items used on the Fort and all office paper products meet the government-recycled content for use under the EO's. The Self Service Supply Center also carries other items that are made with recyclable material, but it is the responsibility of the purchaser to ensure that it meets the requirement for use and recyclability. Fort Monmouth provides some training or direction for all personnel that are issued IMPAC purchase cards that include information on the use of recyclable products.

- Contract for an installation wide program so as to return toner cartridges for recycling
- Purchase remanufactured toner cartridges whenever feasible

14.3 POTENTIAL AFFIRMATIVE PROCUREMENT INITIATIVES

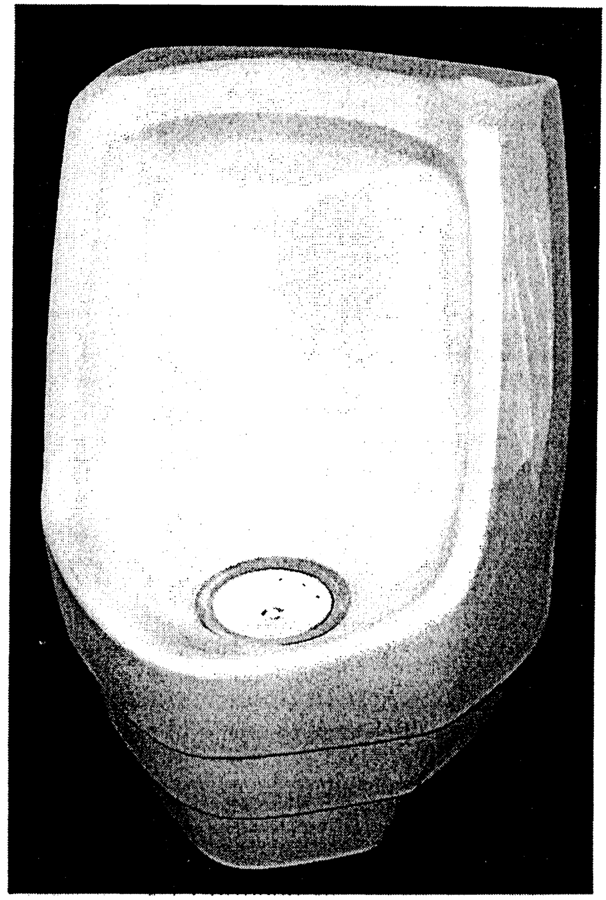
Greater emphasis on AP could result in increased environmental saving and reduced cost of material consumed at Fort Monmouth. Fort Monmouth's potential affirmative procurement initiatives could include:

- Purchase plastic desktop accessories that contain recovered materials
- Purchase plastic or recycled lumber for pallet construction
- Conduct additional AP awareness training

APPENDIX A
PRODUCT INFORMATION ON URINALS

FALCON WATERFREE TECHNOLOGIES™

WATERFREE URINAL U1
VITREOUS CHINA



COMPLIANCE CERTIFICATIONS: Meets the ANSI/ASME A112.19.2.M-1998 and A117.1(Section 605.2) for Vitreous China Fixtures. In compliance with IAPMO 1GC 161-2000.

FEATURES

- Touch-free operation
- Mechanical-free design
- Waterfree performance
- ADA-compliant, 28" full-size urinal
- Available in white and colors (Call for color selections)

BENEFITS

- No water or sewer costs
- No costly valve repairs
- Hassle-free maintenance
- Odor-free, clean environment
- Minimal care and easier cleaning
- Improved hygiene and safety

Falcon Waterfree urinals each save approximately 40,000 gallons per year, resulting in dramatically reduced water and sewer costs. Purchasing and installing Falcon Waterfree urinals is also much less expensive because flush valves, and the associated piping, are not required. Accordingly, maintenance costs associated with these valves are eliminated.

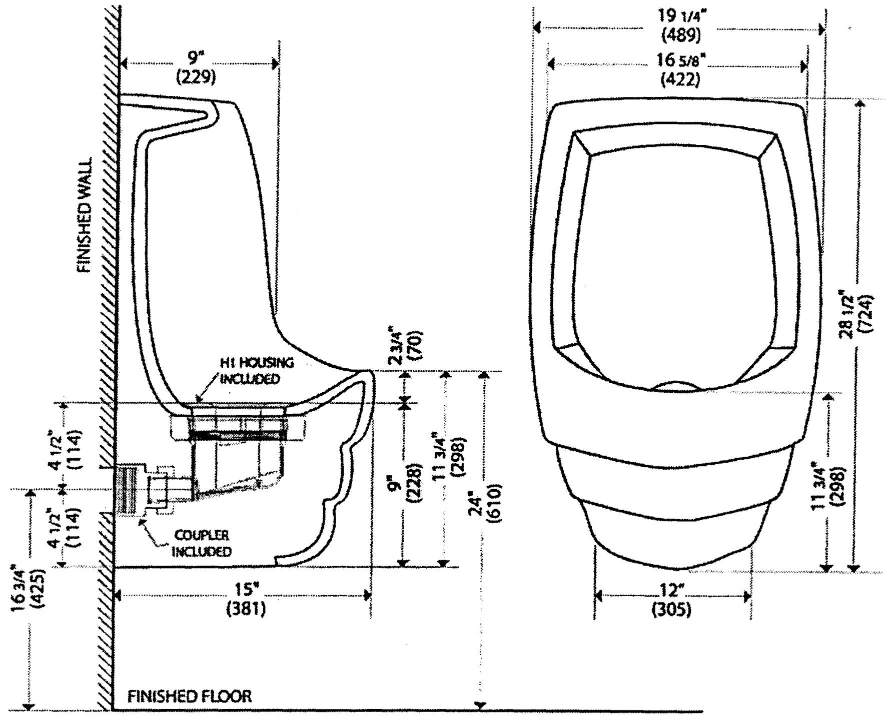
The Falcon Waterfree urinal incorporates smooth, non-porous surfaces, while eliminating corners and hard to clean areas. Flooding, running water and vandalism problems, associated with flush valves, are no longer an issue.

Falcon Waterfree Technologies LLC
10900 Wilshire Boulevard 15th floor
Los Angeles CA 90024
United States of America

Telephone: 310.209.7250
Facsimile: 310.209.7260
Email: info@falconwaterfree.com
Website: www.falconwaterfree.com

FALCON WATERFREE TECHNOLOGIES™

WATERFREE URINAL U1
VITREOUS CHINA



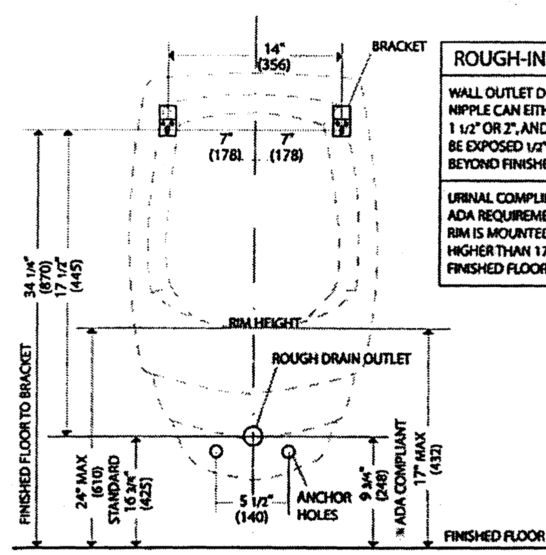
INCLUDES

- Fixture - available in white and colors*
- H1 Housing
- 1 Cartridge kit**
- 2 Wall hangers with anchors
- Adaptive coupler
- Tube of adhesive caulking
- Instruction sheet

*Call for color selections
**Cartridge kit is charged for separately

COMPLIANCE CERTIFICATIONS: In compliance with IAPMO IGC 161-2000.

MEETS THE AMERICAN DISABILITIES ACT GUIDELINES AND ANSI A117.1 ACCESSIBLE AND USABLE BUILDINGS AND FACILITIES - CHECK LOCAL CODES.



U1-P ROUGH-IN FOR NEW CONSTRUCTION

ROUGH-IN NOTES

WALL OUTLET DRAIN NIPPLE CAN EITHER BE 1 1/2" OR 2", AND SHOULD BE EXPOSED 1/2" to 3/4" BEYOND FINISHED WALL.

URINAL COMPLIES WITH ADA REQUIREMENT WHEN RIM IS MOUNTED NO HIGHER THAN 17" FROM FINISHED FLOOR.

Falcon Waterfree Technologies LLC
10900 Wilshire Boulevard 15th floor
Los Angeles CA 90024
United States of America

Telephone: 310.209.7250
Facsimile: 310.209.7260
Email: info@falconwaterfree.com
Website: www.falconwaterfree.com

Installation Data

Number of urinals	500	units
Total users per day	6,000	males
Daily average number of uses per user [1]	2	uses
Water volume per flush	2	gallons
Number of days used per week	5	days
Water charges	$ 3	per 1,000 gal
Sewer charges	$ 3	per 1,000 gal
Maintenance labor rate	$ 35	Calculate
Valve maintenance labor costs[2]	$8,750.00	
Valve overhaul and/or replacement costs[3]	$3,375.00	
Overflow/blockage/cleanup maintenance costs[4]	$17,500.00	

	Existing Water System		WaterFree System
Water Use			
Water use per day	24,000 gallons		0 gallons
Water use per year	6,240,000 gallons		0 gallons
Water & Sewer Cost			
Total water & sewer costs	$205,920.00		$0.00
Maintenance cost	$29,625.00		$1,458.33
Total trap cost	$0.00		$15,600.00
Total operational cost	$235,545.00	Traps:	$17,058.33

Annual savings with WaterFree System **$233,640.95**

Trap consumption

Trap life cycle:	7,000 uses	
Annual trap consumption:	445.71	
Total trap cost	445.71 units at: $35.00 Total:	$15,600.00

Important: This Payback Analysis is based on the number of users, and gallons used per flush. An infrared valve may consume more water on average.
This and other factors not mentioned may increase the water consumption rate.

1 Use an average 3 uses/day/adult male: United States Federal Energy Management Agency.

2 Assumes .5 hours per urinal per year for urinals with mechanical flush valves.
(Note - .75 hours per year per urinal for urinals with photo-electric/infrared automatic flush valves.)
Source: American Society of Plumbing Engineers.

3 Assumes a typical failure rate for flush valves is approximately 5% per year, and repair/replacement
parts average $35. Also assumes an estimated vandalism rate for flush valves at approximately 5% per year, and repair/replacement parts average $100 for mechanical valves.
Source: UCLA Maintenance Department.

4 Assumes average of 1 hour per year per flush urinal to cleanup overflows and/or remove line blockages.
Source: American Society of Plumbing Engineers.

Falcon Waterfree Urinals Compete with Waterless

From EBN Volume 11, No. 2 -- February 2002

Falcon Waterfree Urinals, the second no-flush urinal system to reach the U.S. market, are available in several vitreous china models and one acrylic model.

Photo: Falcon Waterfree Technologies

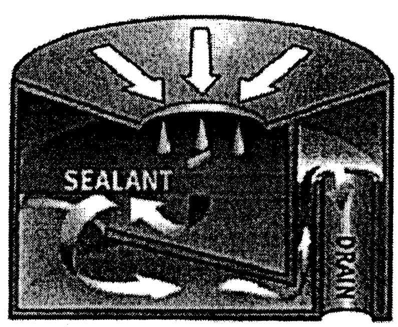
Agreeing to disagree and go their separate ways, two former partners developed competing designs for no-flush urinals. With a five-year noncompete clause now over, Falcon Waterfree Technologies is giving Waterless Company a run for its money and giving the building industry a choice in this specialized arena. While no-flush urinals are still working to gain code approval in many jurisdictions, the proliferation of successful installations and the market's new diversity are hastening the arrival of a time when a urinal with a flush-valve may seem quaint.

Urinals from Falcon Waterfree and Waterless Co. (see **EBN Vol. 7, No. 2**) operate on the same basic principle: a layer of lighter-than-water fluid floats on top of the urine in a trap, and additional urine runs through this layer and down the drain (see **diagrams**). Both offer the hygiene and maintenance advantages of not having anything to flush, in addition to the obvious water savings. After using Waterless Co.'s urinal for three years in our office, we can attest to how well the system works.

Klaus Reichardt and Ditmar Gorges were partners in the Waterless Company in 1994, when Gorges developed a trap design that he preferred but Reichardt didn't like. The dispute was resolved, according to representatives of both companies, with a legal agreement that allowed Gorges to pursue his own version of the product but prevented him from using the name "Waterless" in the U.S. and from competing in the country for five years. Gorges sold his product elsewhere until September 1999, when the noncompete agreement ended and he was able to introduce the Falcon urinal in the U.S.

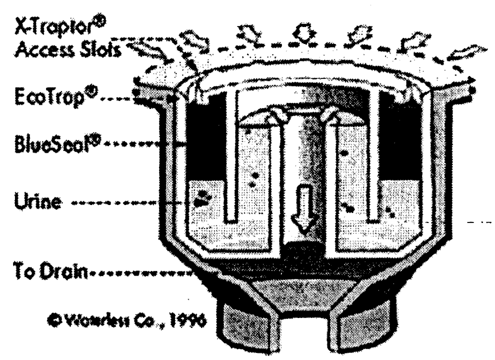
The main functional difference between the two products remains in the design of their traps. In Waterless urinals, the path taken by urine through the trap is relatively direct, and a little of the liquid sealant (called BlueSeal®) is washed down the drain with each use. As a result, the BlueSeal must be replenished periodically, between replacements of the trap. In the Falcon Waterfree design, a more circuitous route through the trap and a horizontal barrier keep the liquid seal from washing out. In both units, uric salts, hair, dust, and other sediments will collect in the trap over time, so both traps are designed as removable cartridges that must be replaced periodically (after 6,000 to 7,000 uses).

Cross-Section of Falcon Waterfree Trap



© Falcon Waterfree Technologies, 1999

Cross-Section of Waterless EcoTrap®



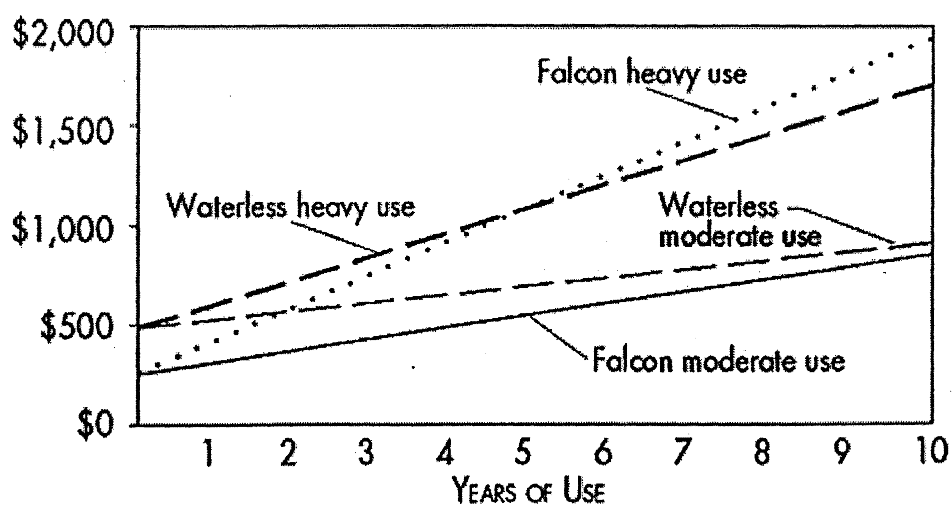
The trap design for the newer Falcon Waterfree urinals, on the left, creates a more circuitous route for the urine, which prevents the sealing liquid from being washed down.

Falcon urinals are available in three vitreous china models (one of which is actually manufactured by American Standard) and one in acrylic. The Waterless Co. has only fiberglass models but is developing vitreous china versions in response to market demand (in spite of their insistence that the fiberglass units are superior). The Falcon units are significantly less expensive, but their traps are more complex and cost a lot more (see table). Bill Slaughter of

Waterless acknowledges that Falcon's trap is more substantial, with a rubber gasket and locking mechanism, but he questions the need to invest so much in a cartridge that will be discarded after four months. Due to their less expensive traps, Waterless urinals are less expensive to own over time, especially in areas with heavy usage.

Of the two, Waterless urinals are more sensitive to lack of regular maintenance (they can start to smell if the BlueSeal isn't added in time). To make their product even more foolproof, Falcon is developing a trap with a built-in warning system in the form of an LED that illuminates after too many uses or when the outflow gets too slow. With proper attention, the maintenance requirements for both are minimal compared with the job of keeping flush mechanisms operational and leak-free. Frank Everton, chief engineer at Pro Player Stadium in Miami, has 18 Waterfree units installed and plans to install 200 more this year. He is thrilled about not having to maintain flushometers as he does for his other urinals. "The hard water we have takes a toll on rubber and other parts, so we have to rebuild the flush mechanisms every year," he reports.

Randy Fuchs, maintenance supervisor for Lake Washington School District in Seattle, has experimented with both types of urinals and prefers the Falcon for its vitreous china material, heavy-duty trap, and lower maintenance requirements. It also doesn't hurt that his cost for the urinals is zero, as he gets them for a super-low $120 each and the Seattle Public Utilities Commission pays a $120 rebate for installing each of the water-saving devices. His free ride ends when it comes to maintenance, however: "The only thing is the cartridges; that's where they get you," he notes. Fuchs also warns that some older urinals have higher outlets, so installing any new urinal in an existing bathroom can require an expensive remodeling job to lower the drain line.



Assumptions:

- *"Moderate use" = 10,000 uses/year; "Heavy use" = 30,000 uses/year.*
- *Initial cost based on average units pricing from manufacturers.*
- *Trap replacement cost for Falcon is assumed to be $35 per unit plus $5 labor, every 7,000 uses. For Waterless is $5.50 per unit plus $5 labor, every 6,000 uses. Waterless costs also include addition of liquid every 1,500 uses at $3.50 for materials and labor.*

Note: Under most assumptions for water and sewer rates, either no-flush unit is extemely cost-effective compared with conventional urinals.

Assuming both companies survive, the competition should prove healthy for this technology. Falcon reportedly has the backing of deep-pocketed and politically connected investors, which may help accelerate code approval from state and local agencies. Until now, the largest customer of no-flush urinals has been the Federal Government, which is exempt from local building regulations, according to Slaughter. Having two sources should also reassure designers that there is little risk in leaving supply lines out of the wall when no-flush urinals are specified. Reduced plumbing cost makes this great water-saving technology all the more attractive. -NM

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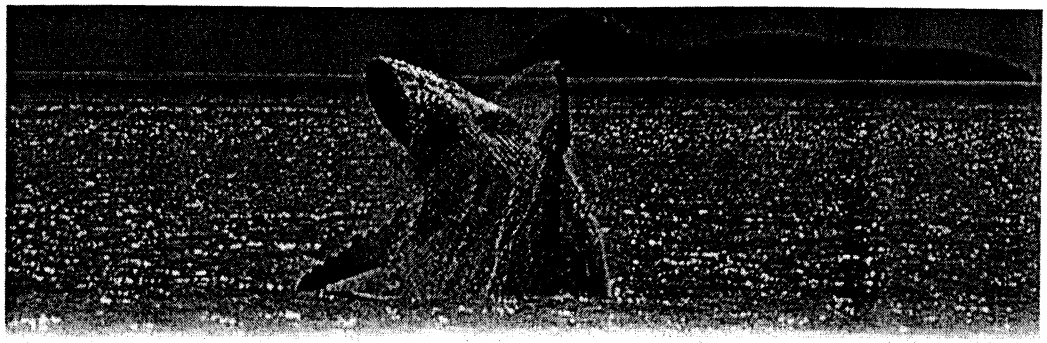
Del Mar, CA 92014
800/244-6364
858/793-5661 (fax)
www.waterless.com

Environmental Benefits



Preserving Our Resources

There are currently more than six billion people in the world, and this number continues to grow every second of every day. For centuries humans have used water to remove waste fi our direct contact. One standard flush urinal uses approximately 40,000 gallons of water pe year. The potential savings created by our waterfree urinals could have a tremendous impa on our fresh water supply. Our Falcon Waterfree System is not only smart, it's a crucial investment for our future generations.

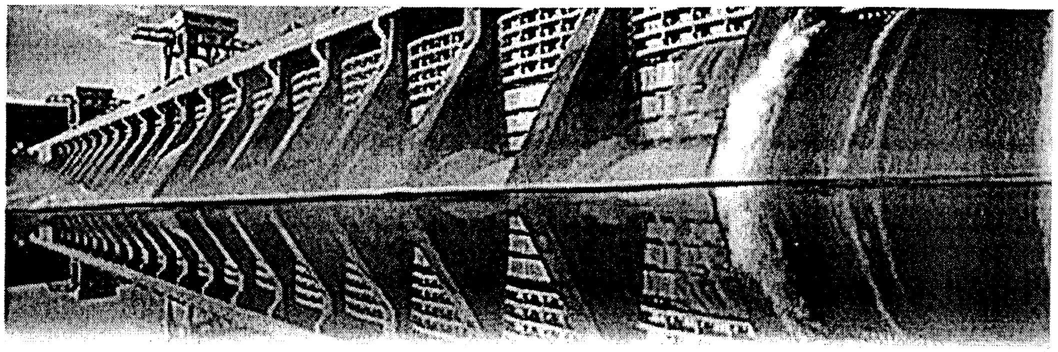
Remarkable Savings

An average tanker truck holds approximately 4,500 gallons of water. Amazingly, one of our urinals can save almost nine tanker trucks of water in a single year. This means one cartrid alone saves more than two full tanker trucks of water.

SAVES

- Our System
- Economic Benefits
- Environmental Benefits
- Our Products
- Installation/ Maintenance
- Our Clients
- Online Presentations
- Independent Research
- FAQ
- Sales Reps
- UCLA View Study

Economic Benefits

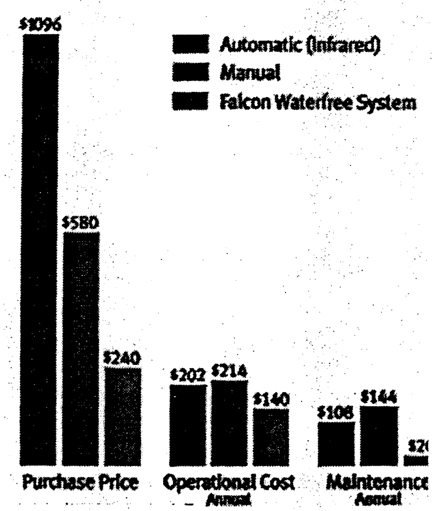


Stop Flushing Your Money

Although the Falcon Waterfree System is recognized as a revolutionary, environmentally friendly product, each one of our urinals also has the potential to save you hundreds of doll every year.

Three Areas We Can Save You Money

1. Purchase Price: The Falcon Waterfree System is less expensive to purchase and easier to install than conventional urinals because they have no flushing mechanism. All that is required is a drainage outlet, approximately twenty minutes to install the bowl, and seconds to insert the cartridge.



2. Operational Costs: Water expenses are non-existent because the urinal itself is waterfree, saving approximately 40,000 gallons of water per year, per urinal. In addition, significant savings result from zero or negligible sewer charges.

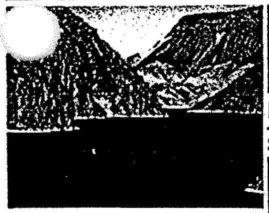
3. Maintenance Costs: Maintenance is reduced to a quarterly changing of cartridges and quick janitorial clean-up. Costs associated with valve repair, clogged sewer pipes, vandalism or any other repairs are minimal. The savings achieved with the Falcon Waterfree System can be used for more productive purposes.

Cost Savings Analysis

Want to know how much the Falcon Waterfree System can save you? Download our cost savings calculator to find out how much money you are currently flushing down the drain.

Savings Calculator

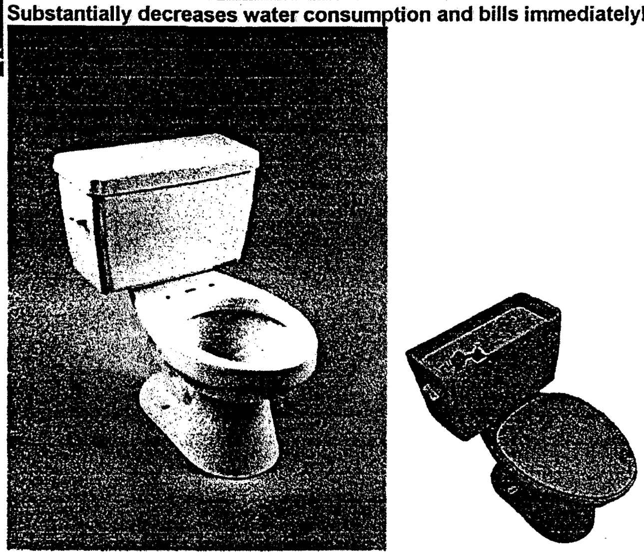
APPENDIX B
PRODUCT INFORMATION ON LOW FLOW FLUSH TOILETS



GREENCulture Water Conservation™

Flapperless Toilet

Substantially decreases water consumption and bills immediately!



The Flapperless ™ 1.6 GPF Toilet

Substantially decreases water consumption and bills immediately!

- Out-flushes all 3.5 gallon toilets
- No double-flushing, Period! One flush will thoroughly empty the bowl every time
- Maintenance free- no flapper, chain or lever to replace
- Huge 11" x 20" footprint designed to cover old replacements
- Fits both 10" and 12" rough-ins
- Large tank fills space where old toilet was removed-no wall touch-up required
- No leaks...ever! PLUS: no-sweat tank

Warranty: lifetime on porcelain/ 5 years on components

Specifications

Size Dimensions: Bowl: 27" x 15 3/4" x 16 1/4" 49 lbs. 4.12 cube
Tank: 21 1/2" x 10 1/4 x 15 1/2" 37.5 lbs. 1.77 cube

Warranty: lifetime on porcelain/ 5 years on components

Pricing

Flapperless Toilet	**$ 159.50**	1 Buy

Shipping

All orders will be sent best-way unless otherwise requested by customer.

GREENCulture™

United States Environmental Protection Agency
Office of Water Washington, D.C.
EPA 832-F-00-047 September 2000

EPA

Wastewater Technology Fact Sheet
High-Efficiency Toilets

INTRODUCTION

In 1992, Congress passed legislation requiring that all toilets sold in the United States meet a new water conservation standard of 1.6 gallons per flush (gpf). By 1992, in response to the growing need for conservation of drinking water supply resources, a number of metropolitan regions and 17 states had already instituted water conservation programs which included high-efficiency toilet requirements.

A national water use standard for a high-efficiency toilet was necessary to address the problems with different states and communities having established different toilet water use standards. A national standard eliminated the need for plumbing fixture firms to manufacture, stock, and deliver different products, and the difficulty for states in preventing the importation of high-water-use fixtures.

High efficiency designs have significantly improved since they were first introduced. Despite the improvements, the industry continues to refine this technology. Based on consumer surveys, the majority of users are satisfied with the performance of the current designs.

Because toilets use is the largest proportion of indoor water used in a household, high-efficiency toilets achieve real water savings.

The national high-efficiency toilet standard brings a range of questions and concerns for. This fact sheet is intended to assist in answering the questions that the consumer, property manager, plumbing contractor, and utility manager might have about the high-efficiency toilet standards.

ENVIRONMENTAL, PUBLIC, AND CONSUMER BENEFITS

Studies indicate that converting to water efficient toilets, showers and clothes washers, results in a household water savings of about 30% compared to conventional fixtures. A change to high-efficiency toilets alone, reduces toilet water use by over 50% and indoor water use by an average of 16%. This translates into a savings of 15,000 to 20,000 gallons per year for a family of four. Furthermore, more efficient plumbing products result in lower wastewater flow and increase the available capacity of sewage treatment plants and onsite wastewater disposal systems.

The general public also benefits directly from water conservation measures. Practiced on a wide basis, efficient use of water resources helps reduce the potential need during drought periods for water restrictions such as bans on lawn watering and car-washing. Savings to the consumer from lower water bills, depending on local water rates and actual use, can range from $50 to $100 per year. Many hotels, motels, and office buildings are finding that new fixtures are saving them 20 percent on water and wastewater costs.

DESCRIPTION OF THE TECHNOLOGY

The principles of high-efficiency toilet design and operation reflect the shift from remvoing waste by using flushwater *volume* to increasing flushwater *velocity* to remove waste.

The design of the bowl contour became more vertical design to achieve the necessary increased downward velocity. Nevertheless, the bowl contour must ensure a shallow but large water surface towards the front of the bowl for adequate waste immersion. Many consumers notice that high-efficiency bowl designs result in a flush that tends to swirl less than their previous toilet. This is because the drag, or friction, resulting from swirling water reduces the essential velocity.

Some manufacturers use an enhanced front jet towards the bottom of the bowl to assist in waste removal. But other toilets that have received top consumer survey ratings use no jet at the bottom.

Gravity-flow or pressure-assisted?

Two types of technology are available for both residential and commercial uses. The most widely available is a high-efficiency modification of the conventional gravity flow toilet. The other, the pressure-assisted toilet, utilizes pressurized air in the tank to achieve additional force.

The choice between gravity and pressurized toilets usually hinges on two factors: noise, and the distinction between whether the maintenance is provided by the homeowner or by a building manager. Pressure-assisted toilets are much less likely to clog than even the older, 3.5 gpf gravity toilets. While many of the more recent models of high-efficiency gravity toilets perform as well as pressure-assisted models in tests, maintenance issues for heavy-duty use, or responsibility for maintaining multiple toilets, may lead to the decision to install pressure-assisted toilets. Some states, such as New Jersey, require pressure-assisted toilets in commercial use.

Gravity toilets in buildings with cast-iron waste lines may clog more readily, because of the roughness of the interior of the pipe. New buildings use PVC pipe, through which waste flows more easily. Choosing pressure-assisted toilets for buildings served by cast-iron pipe may reduce maintenance needs.

However, the greater noise from pressure-assisted toilets is a factor to consider when locating toilets near sleeping or working quarters. And the pressure-assisted toilet is generally more costly than gravity-flow.

Gravity-flow toilets achieve the necessary enhanced water velocity largely through coordinated improvements of the siphoning features of the fixture. Indeed, some of the early experiences with high-efficiency toilets that clogged too easily were the result of designs that increased siphoning by choking down on the trap size. Manufacturers responded by re-sizing the trap diameter nearer its original dimensions, and instead are coordinating the rim dimensions, bowl contour, and trap size to work in concert to enhance the force of the water and the siphoning function.

Pipe slope standards

The issue has been raised as to whether existing pipe slope standards are adequate to carry these reduced flows. American Society of Mechanical Engineers (ASME) tests indicate that the existing standards exceed performance requirements for drainline carry minimums. Field studies similarly report very few complaints, representing problems with a few individual buildings. The standards are under constant review, and any changes indicated would be recommended through normal procedures.

HIGH-EFFICIENCY TOILET PERFORMANCE

Consumer surveys, performed by utilities that have been implementing high-efficiency toilet programs (such as rebates), have shown that the vast majority of 1.6 GPF, high-efficiency toilets work well. For example, 90 percent of San Diego, CA, customers, and 95 percent of Austin, TX, customers reported that they were "satisfied" or "very satisfied" with their high-efficiency toilets; 91 percent of Tampa, FL, ratepayers said they would purchase the 1.6 gallon toilet again. A review of multiple metropolitan area customer satisfaction surveys for the 1995-1998 period shows that, while performance among individual high-efficiency toilet models varied, the large majority were rated at least satisfactory in performance, with most rated better than satisfactory.

Some brands and models have drawn more positive responses from consumers than others, with specific models being withdrawn and added as research and design progress. Since 1992, when the national law was first passed, plumbing products have gone through several cycles of improvements, with each new generation bringing improved product performance and customer acceptance. The marketplace has responded to the move to the high-efficiency toilet standard so as to better serve customer requirements.

The two complaints most often made against the high-efficiency fixture are somewhat more frequent clogging, and the perceived need for more frequent double-flushing. A 1996 survey in New York City on customer satisfaction reported that building managers--who are responsible for maintaining a number of toilets--reported more frequent clogging, probably due to the smaller trap size of the toilet (designed to increase siphoning). The high-efficiency toilet designs, as discussed in the section on operation and maintenance, cannot accommodate extraneous waste materials and non-flushables such as paper towels. Building managers should communicate this to their tenants.

In a study of 100 homes in each of 12 North American cities, the incidence of double-flushing was virtually the same for homes with high-efficiency toilets as for those with conventional toilets.

LIMITATIONS

The consumer choice of a particular high-efficiency toilet model must take into account the specifics of the application. Key considerations include:

- To be sure the new toilet will cover the area, check the dimensions of the space in which the toilet is to be installed, including the 'footprint' of the old toilet.

- If the drainlines are made of cast-iron rather than PVC pipe, the toilet may be more likely to clog. Ensure adequate maintenance, or consider a pressure-assisted model.

- Pressure-assisted models tend to be more noisy than gravity-flush, so use caution when installing this type adjacent to sleeping quarters.

- Ensure the availability of electricity for electric-assisted models.

- Some toilets have a taller seat height, which should be evaluated based on anticipated users (some higher seats will be less accessible to children).

- Users in areas with high mineral content in the water should check rim hole dimensions, or consider a toilet with a holeless rim.

CONSUMER TIPS

Purchase: The buyer of the high-efficiency toilet should carry out the same type of research necessary for any significant purchase intended to be used for a long time. Refer to current issues of consumer magazines that evaluate water-efficient toilets (frequently under article listings for water conservation fixtures). Your water utility, individual plumbers, and the local plumbers' union or association may also be able to recommend certain models. Look for manufacturers' guarantees. By following these tips, purchasers of water conservation toilets can be fairly assured of getting a satisfactory product.

Installation: Proper installation is especially important for high-efficiency toilets. Licensed plumbers who guarantee their work will make sure fixtures are installed correctly. It is very important to follow the manufacturer's instructions. The proper flow cycle for high-efficiency toilets is shorter--usually about 45 seconds--than previous models.

If installing a water-conserving toilet to replace an old one, use new mounting bolts of the proper length, and be sure the old wax seal is completely removed before installing the new one. Check and clear drain lines while accessibility is open.

Operation and Maintenance: The common advice "Don't use your toilet as a trash bin" is especially important. High-efficiency toilets will not perform well if non-flushables, such as paper towels, are sent down the fixture. There has always been a need for plungers and plumbing "snakes," and their use should be considered first when the toilet overflows or does not refill completely.

Since flapper valves require replacement about every five years, proper selection of replacement valves is a key maintenance consideration. A study conducted by the Metropolitan Water District of Southern California found that proper flapper valve model selection is essential for continued performance. Of the physically compatible replacement flapper valves, half the models left a toilet with *less* than 1.6 gpf--and the resulting incomplete flush had insufficient water to do the job the toilet was designed to do. Since most hardware stores can stock only a few brands, there is no guarantee of compatibility. Industry standards groups are working to insure that after-market flappers will perform properly. Getting the right replacement flapper value is worth the effort.

A key problem affecting 1.6 gpf toilets is a result of the use of chemical in-tank toilet cleaners. All U.S. toilet manufacturers recommend against the use of chemical in-tank toilet cleaners, as the strong chemicals degrade the works within the toilet. Even with current toilets that include chemical-resistant materials, chemical cleaners still increase the specific gravity of water and slow flushing velocity, interfering with performance.

NOTE: Most major toilet manufacturers maintain 1-800 number Consumer Hotlines (call the distributor or 1-800-555-1212). These hotlines are set up to address both non-technical and technical questions relating to installation, operation, and maintenance of high-efficiency toilets.

COSTS

A wide range of toilets that perform well are available in all price ranges, although very inexpensive (less than $100) imports may not carry the American National Standards Institute (ANSI) design standard (different from the water conservation 1.6 gpf standard) and not function properly. In most cases, there is little relationship between price and performance. The consumer choice recommendations listed above under "Limitations" will help customers select the right model for them.

The choice to retrofit based on cost recovery from water savings can be easily calculated at the local level based on water rates and the price of the toilet. For average water/sewer rates, household savings for a typical four-person household is about $50/year.

REFERENCES

Other Related Fact Sheets

Other EPA Fact Sheets can be found at the following web address:

http://www.epa.gov/owmitnet/mtbfact.htm

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