



Report to the Chairman, Subcommittee on National Security, International Affairs, and Criminal Justice, Committee on Government Reform and Oversight, House of Representatives

September 1995

# MILITARY BASE CLOSURES

## Reducing High Costs of Environmental Cleanup Requires Difficult Choices



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**National Security and  
International Affairs Division**

B-272218                   MILITARY BASE CLOSURES:  
                                  REDUCING HIGH COSTS OF  
September 5, 1996       ENVIRONMENTAL CLEANUP REQUIRES  
                                  DIFFICULT CHOICES

The Honorable William H. Zeliff, Jr.  
Chairman, Subcommittee on National Security,  
International Affairs, and Criminal Justice  
Committee on Government Reform  
and Oversight  
House of Representatives

Dear Mr. Chairman:

As requested, we reviewed the cost of the Department of Defense's (DOD) environmental cleanup efforts at bases being closed under the base realignment and closure (BRAC) process.<sup>1</sup> Specifically, this report addresses the (1) cost of cleanup efforts, (2) reasons that cleanups are so costly, and (3) potential opportunities for reducing costs and their impact on programmatic goals.

## Background

After the Cold War, DOD's base structure was larger than required to meet changing national security needs. Consequently, the Congress enacted two separate laws that instituted base closure rounds in 1988, 1991, 1993, and 1995.<sup>2</sup> Through these four BRAC rounds, DOD has closed or scheduled to close 311 bases, installations, and activities and realigned or planned to realign an additional 112 bases. Table 1 shows the number of closures and realignments for each BRAC round.

**Table 1: Closures and Realignment  
by BRAC Round**

BRAC round	Closures	Realignments
1988	89	10
1991	35	39
1993	119	38
1995	68	25
<b>Total</b>	<b>311</b>	<b>112</b>

Source: Defense Base Closure and Realignment Commission.

<sup>1</sup>Environmental cleanup in this report refers broadly to both compliance and restoration efforts. Typically, compliance refers to work required to ensure current operations comply with environmental laws and regulations, and restoration refers to work involving the cleanup of contamination caused by past disposal practices.

<sup>2</sup>Defense Authorization Amendments and Base Closure and Realignment Act of 1988 (P.L. 100-526) and Defense Base Closure and Realignment Act of 1990 (P.L. 101-510, title XXIX, part A).

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As a result of military base downsizing, DOD has had to phase down base operations, expedite the sale or transfer of unneeded base property for future reuse, properly account for cost and savings attributable to base closures, and perform environmental cleanup of contaminated property no longer needed. Because of congressional interest in the impact of base closures on DOD and affected states and communities, we have issued several reports on these issues. In August 1996, we reported on the status of bases closed during the BRAC 1988, 1991, and 1993 rounds.<sup>3</sup> In February 1995, we reported on the environmental impact at DOD closing bases.<sup>4</sup> In November 1994 and August 1995, we reported on property reuse issues arising from the BRAC 1988 and 1991 rounds.<sup>5</sup> In March 1993 and April 1996, we reported on BRAC cost and savings issues.<sup>6</sup>

The severity of contamination at a large number of BRAC bases has turned environmental cleanup into a major challenge for DOD. Before BRAC, DOD had begun addressing environmental contamination at its active military bases through ongoing compliance and restoration programs. Types of hazardous waste found at military installations include solvents and corrosives; paint strippers and thinners; metals, such as lead, cadmium, and chromium; and unique military substances, such as nerve agents and unexploded ordnance.<sup>7</sup> Contamination has usually resulted from storage and disposal practices that were accepted at the time but which have proved damaging to the environment.

Cleanup issues faced at closing bases are similar to those at active bases. Base closures have underscored the importance and urgency of environmental cleanup. Because cleanup is, in most instances, a prerequisite for the title transfer of BRAC property to nonfederal parties, DOD must begin to address environmental issues early in the closure process to expedite property transfer. In doing so, DOD must comply with existing federal and state laws and regulations. Two federal environmental

<sup>3</sup>Military Bases: Update on Status of Bases Closed in 1988, 1991, and 1993 (GAO/NSIAD-96-149, Aug. 6, 1996).

<sup>4</sup>Military Bases: Environmental Impact at Closing Installations (GAO/NSIAD-95-70, Feb. 23, 1995).

<sup>5</sup>Military Bases: Reuse Plans for Selected Bases Closed in 1988 and 1991 (GAO/NSIAD-95-3, Nov. 1, 1994) and Military Bases: Case Studies on Selected Bases Closed in 1988 and 1991 (GAO/NSIAD-95-139, Aug. 15, 1995).

<sup>6</sup>Military Bases: Revised Cost and Saving Estimates for 1988 and 1991 Closures and Realignment (GAO/NSIAD-93-161, Mar. 31, 1993) and Military Bases: Closure and Realignment Savings Are Significant, but Not Easily Quantified (GAO/NSIAD-96-67, Apr. 8, 1996).

<sup>7</sup>Ordinance that remains unexploded either through malfunction or design is capable of causing injury to personnel or damage to material. Types of unexploded ordnance include bombs, missiles, rockets, artillery rounds, ammunition, or mines.

statutes—the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA)—and state laws and regulations govern most of the environmental compliance and restoration activities at closing bases. In general, CERCLA governs the cleanup of inactive waste sites, and RCRA regulates the management of facilities that treat, store, and dispose of hazardous wastes. Appendix I summarizes selected federal and state laws and regulations pertinent to BRAC environmental cleanup.

The Congress established separate BRAC funding accounts to help ensure that DOD could devote high-priority attention to base closure and property transfer. Although the Congress appropriates overall funding for BRAC based on DOD budget requests and not directly for environmental cleanup purposes, it may specify either maximum (ceiling) or minimum (floor) dollar amounts to be used for environmental efforts in any given budget year.<sup>8</sup> DOD uses overall BRAC appropriations to allocate funds to the services based on requirements in each of several BRAC subaccounts, including the environmental subaccount. This subaccount includes multiyear funding for each of the BRAC rounds, thereby allowing the services greater flexibility in executing the environmental cleanup program. Further, with a floor, unneeded funds from other BRAC subaccounts may be transferred into the environmental subaccount throughout the year. With a ceiling, environmental funding can be shifted into other subaccounts. We review BRAC budget account issues on an annual basis; we issued our latest report in July 1996 on the validity of DOD's fiscal year 1997 BRAC budget submission.<sup>9</sup>

## Results in Brief

As of March 1996, DOD had allocated about \$3.4 billion for the BRAC environmental cleanup program. However, as more bases are closed and more cleanup actions are underway, program costs are likely to increase significantly. Although DOD has not computed a total cost estimate for the program, available DOD financial data indicate that program costs are likely to exceed \$11 billion.

<sup>8</sup>Before fiscal year 1996, legislation established a floor for the environmental subaccount that required DOD to spend at least the amount requested in the BRAC budget submission for environmental costs. Consequently, the specified minimum amount could not be shifted to other subaccounts. In fiscal year 1996, however, legislation established a ceiling for the environmental subaccount that prohibited DOD from spending more than the amount requested in the BRAC budget justification for environmental costs. The Secretary of Defense must notify the appropriations committees if more spending on environmental activities is found to be necessary.

<sup>9</sup>Military Bases: Potential Reductions to the Fiscal Year 1997 Base Closure Budget (GAO/NSIAD-96-158, July 15, 1996).

The key reasons for the high cost of closing base cleanups include (1) the large number of contaminated sites and difficulties associated with types of contamination, (2) requirements of federal and state laws and regulations, (3) lack of cost-effective cleanup technology for certain contaminants, and (4) intended property reuse. DOD has identified over 5,300 potentially contaminated sites at its BRAC bases. Also, the laws and regulations DOD must abide by in expediting property transfer for reuse have proven to be time-consuming, complex, and costly. Further, technology limitations in cleaning property of certain contaminants (such as unexploded ordnance) have proved costly.

Options for reducing cleanup costs at closing bases include (1) deferring or extending certain cleanup actions, (2) modifying existing laws and regulations, (3) adopting more cost-effective cleanup technologies, and (4) sharing costs with the ultimate user of the property. However, all of these options may adversely impact programmatic goals, thereby presenting decisionmakers with difficult choices in developing a cost-effective environmental cleanup program. Deferring or extending cleanup actions may delay property transfer and reuse, hurt the economic revitalization of communities affected by the closure process, and harm the environment and health as well. Modifying laws and regulations may increase environmental risk, thereby increasing public resistance and dissatisfaction. Adopting more cost-effective technologies may delay the program because new technologies currently under development may not be available for years and the new technologies may not be more cost-effective than existing technologies. Sharing costs with the ultimate user could present problems because of unknown future liabilities and difficulty establishing the value of the property.

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## Environmental Cleanup Is Costly

The cleanup of contaminated base property has been costly, and with the majority of base cleanup work still to be done, costs will continue to grow. Although \$3.4 billion had been allocated for BRAC environmental cleanup through March 1996, it is likely that costs will exceed \$11 billion before cleanups are completed well into the next century. In the earlier years of the BRAC program, the Congress had expressed concern about DOD's slow progress in obligating funds for environmental cleanup. Our analysis shows that in recent years DOD has greatly increased the rate at which it has obligated funds. As of September 1995, for example, DOD had obligated 96 percent of available funds, which was substantially higher than the 50-percent rate 2 years earlier.

Through March 1996, DOD had allocated \$3.4 billion, obligated \$2.8 billion, and expended \$1.6 billion on BRAC environmental cleanup. Tables 2 and 3 show these amounts by BRAC round and military component, respectively.

**Table 2: Environmental Cleanup Allocations, Obligations, and Expenditures by BRAC Round (as of Mar. 31, 1996)**

Dollars in thousands

BRAC round	Amounts			Percent of allocations obligated	Percent of obligations expended
	Allocated	Obligated	Expended		
1988	\$980,119	\$966,926	\$600,672	98.7	62.1
1991	1,391,779	1,100,520	676,134	79.1	61.4
1993	812,677	660,775	302,997	81.3	45.9
1995	177,601	43,868	1,817	24.7	4.14
<b>Total</b>	<b>\$3,362,176</b>	<b>\$2,772,089</b>	<b>\$1,581,620</b>	<b>82.5</b>	<b>57.1</b>

Source: Our analysis of DOD data.

**Table 3: Environmental Cleanup Allocations, Obligations, and Expenditures by Military Component (as of Mar. 31, 1996)**

Dollars in thousands

Military component	Amounts			Percent of allocations obligated	Percent of obligations expended
	Allocated	Obligated	Expended		
Air Force	\$1,314,620	\$1,033,337	\$599,644	78.6	58.0
Army	956,622	781,158	451,073	81.7	57.7
Navy	1,077,520	949,167	528,214	88.1	55.7
Defense agencies	13,414	8,427	2,689	62.8	31.2
<b>Total</b>	<b>\$3,362,176</b>	<b>\$2,772,089</b>	<b>\$1,581,620</b>	<b>82.5</b>	<b>57.1</b>

Source: Our analysis of DOD data.

Appendix II provides additional detail on allocations, obligations, and expenditures by military component for each BRAC round.

### Estimated BRAC Environmental Program Costs Will Be Substantial

The estimated cost for the BRAC environmental cleanup program is uncertain but will be much higher than amounts allocated thus far. The \$3.4 billion allocation through March 1996 included only initial funding for BRAC 1995 bases and was insufficient to complete cleanup at prior round BRAC bases. Even though the Congress has established a 6-year period for closing a base, there are no statutory deadlines for the cleanup process. All indicators point to cleanups extending well into the next century. At the time of our review, DOD did not have a total BRAC environmental

cleanup cost but was in the process of collecting the data to make such a projection. Our analysis showed that many base cleanups are expected to be very costly. Available DOD data indicate, for example, that cleanup costs for 27 closing bases will likely exceed \$100 million each. Further, with the use of available DOD financial data, we estimate that the total cost is likely to exceed \$11 billion, as shown in table 4.

**Table 4: Estimated DOD BRAC Environmental Cleanup Program Costs**

Dollars in millions			
BRAC round	Funds allocated through fiscal year 1995	Estimated cost to complete cleanups <sup>a</sup>	Total
1988	\$980.1	\$2,139.1	<b>\$3,119.2</b>
1991	1,066.8	1,656.5	<b>2,723.3</b>
1993	573.1	1,342.3	<b>1,915.4</b>
1995	0	3,577.4	<b>3,577.4</b>
<b>Total</b>	<b>\$2,620.0</b>	<b>\$8,715.3</b>	<b>\$11,335.3</b>

<sup>a</sup>The cost includes closing base estimates for fiscal year 1996 through completion, as shown in the Defense Environmental Restoration Program Annual Report to Congress for Fiscal Year 1995, and estimated program management costs. Certain Navy and Air Force environmental compliance costs are not included in the estimate.

Our total cost estimate was based on the best available data at the time of our review, but we believe the estimate is likely to be conservative for several reasons. First, environmental cleanup cost estimates for many of the 1995 BRAC bases are based on projected costs developed while they were active installations. DOD officials told us that cost estimates for these bases would likely increase as additional environmental studies are performed, more work is identified, and cleanup timelines are accelerated. Second, according to DOD officials, certain Navy and Air Force environmental compliance costs that are funded under the BRAC program are not included in the above estimate. Finally, previous DOD estimates were generally understated. For example, in September 1994, DOD reported that it would cost about an additional \$3.1 billion to complete base-level environmental cleanups of its 1988, 1991, and 1993 BRAC bases. However, in September 1995, that estimate had increased to \$4.7 billion.

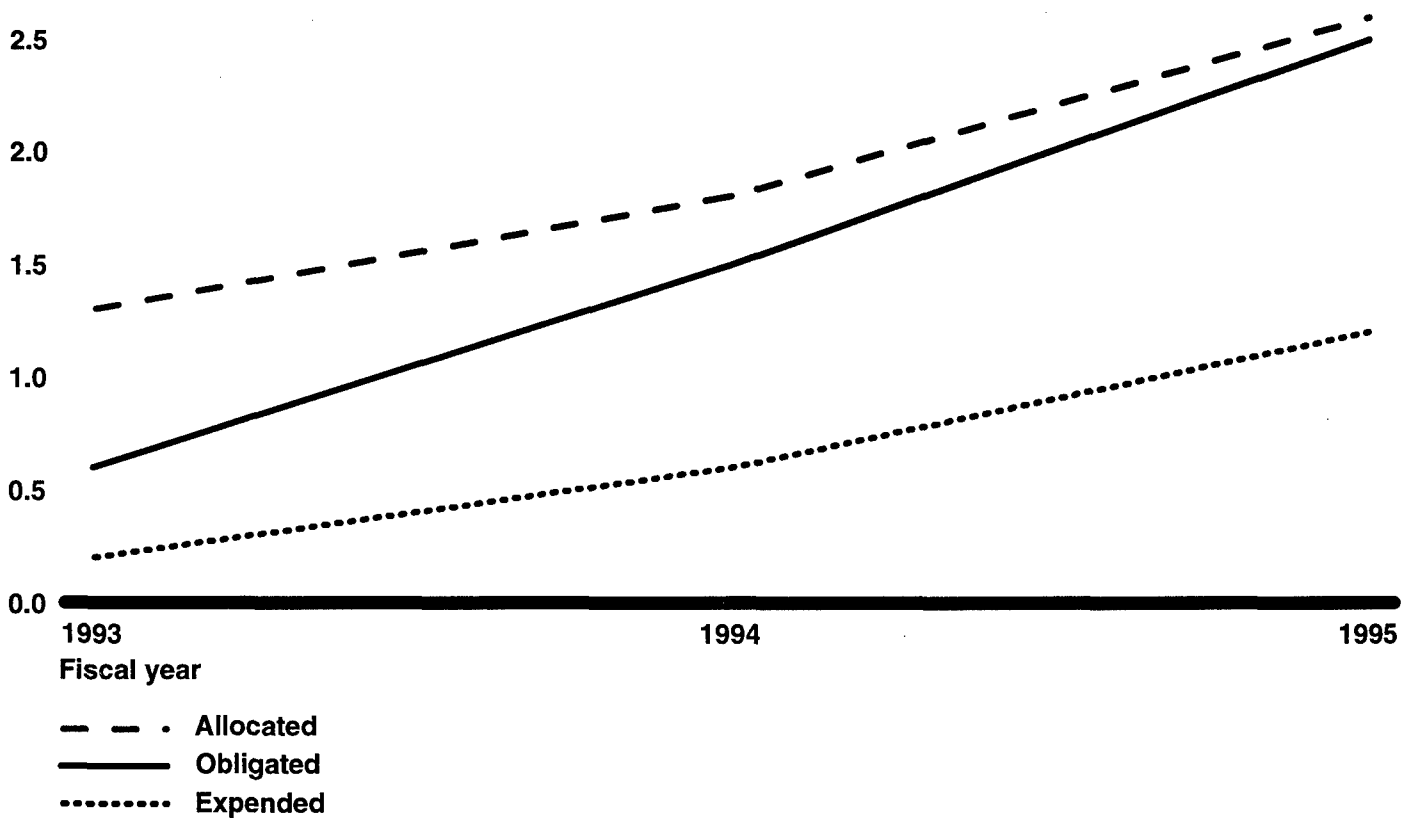
**Obligations Have Increased Recently, but Significant Funding Remains Unexpended**

In recent years, DOD has significantly increased the rate at which it has obligated environmental funds for the BRAC program. As shown in figure 1, DOD obligated \$2.5 billion, or 96 percent, of the \$2.6 billion available for the BRAC environmental program as of September 1995. In comparison, DOD

had obligated 50 percent of the funding available in September 1993. Low obligation rates in the early years of the BRAC program raised concerns on the part of the Congress.

**Figure 1: Comparison of BRAC Environmental Cleanup Allocations, Obligations, and Expenditures (Sept. 1993 Through Sept. 1995)**

3.0 Dollars in billions



DOD officials offered a variety of reasons for the low obligation rate in the early BRAC years and the high obligation rate in recent years. First, during the early BRAC years, DOD officials acknowledged they (1) were probably overly optimistic in the level of funds requested, (2) did not have all the

necessary expertise to better estimate requirements and timing, and (3) were slow in actually obligating funds through existing contract mechanisms. Second, because BRAC funds are available for use on a multiyear basis, there was no overriding pressure to quickly obligate funds. Due in large part to heightened congressional interest in the issue, however, DOD made a concerted effort to increase obligations. Further, with the expiration of BRAC 1988 funds on September 30, 1995, DOD focused its attention on obligating as much of the available money as possible for remaining BRAC 1988 cleanup requirements.

Although the obligation rate has increased and the relative amount of unobligated funds has decreased, a large unexpended balance of funds remains. As of September 1995, BRAC environmental expenditures were about 48 percent of obligations—a modest increase from the 34-percent rate existing in September 1993. DOD officials told us that the large amount of unexpended funds was typical of other environmental programs and were relatively low because of (1) widespread service use of large cost-reimbursable contracts for environmental work where major projects are in the early stages and (2) the lag involved in contractor payments and subsequent reporting in the financial system. DOD officials also told us that the services had been able to obligate funds quicker through the use of large cost-reimbursable contracts than through previous contracting vehicles. However, because the contracts are often for time-consuming studies or site cleanups, expenditures have a tendency to lag well behind the obligated amounts.

Further, the gap between expenditures and obligations has widened, since many projects are deferred or planned for execution in later years. As this practice continues, there is greater uncertainty as to when and how much of the funds will actually be spent. Charleston Naval Shipyard officials, for example, told us they were expending funds at a slower rate than expected because of uncertain cleanup requirements and state regulatory reviews that were delaying many contracted site contamination surveys. In addition, at Pease Air Force Base, BRAC officials, citing that available BRAC 1988 funds were due to expire, obligated about \$8 million in September 1995 for future environmental monitoring and operating requirements extending into fiscal year 1998. The amount of this money that will actually be spent will not be known for several years.

## Key Factors Drive the High Cost of Cleanup

Our review of selected base closure sites and other analysis showed that BRAC environmental costs are driven by several key factors. Among these factors are (1) the large number of contaminated sites and associated extent of contamination, (2) the requirements of federal and state environmental laws and regulations, (3) the lack of cost-effective cleanup technology, and (4) property reuse plans.

## Identifying Full Extent of Contamination at BRAC Sites Is Difficult and Costly

The sheer magnitude of the BRAC program, coupled with the severe soil and water contamination that has developed over decades of base operations, is a key cause for the high cost of cleanup. The closing bases have a large number of contaminated sites, and it often becomes very difficult and costly to determine the full extent and severity of site contamination. Further, the number of BRAC contaminated sites has grown as more bases have been selected for closure and additional contaminated sites have been identified. In addition, further study often reveals a number of areas of environmental concern on the bases, thereby increasing fund expenditures to resolve the concerns. DOD officials told us that typically after a base is slated for closure, the likelihood increases that additional contaminated sites will be identified as more investigative work is performed. For example, before the closure of Pease Air Force Base, Air Force officials had identified 18 contaminated sites; as the closure process progressed and more investigative work was performed, the number of sites grew to 55. Table 5 shows the number of BRAC contaminated sites and their disposition.

**Table 5: Contaminated Sites at BRAC Closing Bases (as of Sept. 30, 1995)**

BRAC round	Sites completed <sup>a</sup>	Sites in progress <sup>b</sup>	Total
1988	503	735	1,238
1991	287	1,044	1,331
1993	110	796	906
1995	552	1,310	1,862
<b>Total</b>	<b>1,452</b>	<b>3,885</b>	<b>5,337</b>

<sup>a</sup>These sites have either been cleaned or do not need any further action.

<sup>b</sup>These sites are either awaiting cleanup funding or have some ongoing work.

Source: DOD.

DOD officials told us that the extent of site contamination is often difficult, time-consuming, and costly to detect and may not be fully determined until environmental cleanup is actually underway. At Pease Air Force Base

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landfill sites, for example, it was not known whether contaminants existed below the water table level until excavation was underway. Also, according to Army officials, the Army spent over \$45 million—\$20 million more than originally estimated—for radioactive contamination cleanup at the Army Material Technology Laboratory in Massachusetts. The cost underestimation was due largely to difficulties in accurately determining the extent of the contamination caused by the reactor.

Unexploded ordnance is another concern for many closing bases. At Mare Island Naval Shipyard, for example, potential unexploded ordnance sites, which include dredge ponds and the waterfront, are the result of decades of ordnance manufacturing, storage, and disposal. Navy engineers estimate that cleaning up these sites could cost about \$60 million.

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## Environmental Laws and Regulations Contribute to High Costs

The requirements of federal and state environmental laws and regulations have a significant impact on the cost of environmental cleanup. Under the existing environmental legal framework, DOD must comply with cleanup standards and processes associated with existing laws, regulations, and executive orders in conducting assessments and cleanups of its base closure property. Although CERCLA and RCRA are two of the primary drivers for the BRAC environmental program and the ones that impact most closing bases, other laws or executive orders, such as the Endangered Species Act or Executive Order 11990 (Protection of Wetlands), are directed to more unique areas of concern that may exist at a BRAC base. At Pease Air Force Base, for example, BRAC officials had to consider threatened and endangered species, sensitive habitats, wetlands, and historic sites in their cleanup plans. In response to the requirements to protect wetlands, these officials were creating a 2.5-acre wetlands parcel at a cost of about \$100,000 to replace wetlands destroyed during cleanup at another site. Further, environmental laws and regulations vary by state and often have more stringent requirements that tend to increase cost. For example, California's standard for clean drinking water is 10 times more stringent than the federal standard, thereby increasing cleanup costs when this standard is applied.

BRAC officials told us that the current assessment and cleanup process, as dictated by legal requirements, was complex, costly, and time-consuming. This description is consistent with our findings in our review of high-priority site cleanup efforts at active bases.<sup>10</sup> For example, under

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<sup>10</sup>Environmental Cleanup: Too Many High Priority Sites Impede DOD's Program (GAO/NSIAD-94-133, Apr. 21, 1994).

CERCLA, DOD follows a detailed four-phase process—preliminary assessment, site inspection, remedial investigation/feasibility study, and remedial design/remedial action—in cleaning up property for transfer. Embodied in the process are extensive requirements for documentation, studies, and the need to interact frequently with Environmental Protection Agency (EPA) and state officials and the public. BRAC officials told us that cleanups could require sustained action over many years—10 years in many cases—to achieve targeted goals. Site studies can take 4 or more years to complete, remedial designs may require 3 years, and cleanup may take another 3 years. Delays are frequent as federal and state regulators review and approve documents.

An inherent part of the process that has undergone criticism is the amount of time and money devoted to base contamination studies. Our prior work on environmental issues, for example, showed that DOD has spent large amounts of money on studies but that actual cleanup progress has been slow.<sup>11</sup> We recognize that the cleanup process is driven largely by regulation and involves time-intensive steps. Therefore, many of the BRAC sites have not reached the actual cleanup stage while several sites have been closed out as a result of study. The Congress has expressed concern and directed DOD to establish a goal to limit, by the end of fiscal year 1997, spending for administration, support, studies, and investigations to 20 percent of the funding for its active base program.<sup>12</sup> No such restriction has been enacted for the BRAC program. Although DOD does not have readily available data that show overall funding devoted to studies at BRAC bases, officials have stated that the amount has been substantial. However, DOD now states that more funding is being devoted to actual cleanups, particularly for earlier round BRAC bases. Our review of the six bases we visited indicated considerable amounts of money are being expended on studies. Pease Air Force Base officials estimated, for example, that about one-half of the \$140 million they expected to spend would be for studies.

### Available Cleanup Technology Is Not Always Cost-Effective

The technology used to clean contaminated property can be a key cost factor. In many cases, a cost-effective cleanup technology may not be available. Cleaning up unexploded ordnance, for example, may be not be practical or affordable, especially when there are large parcels of property. Removal work can involve burning and clearing thousands of acres to

<sup>11</sup>Environmental Cleanup: Too Many High Priority Sites Impede DOD's Program (GAO/NSIAD-94-133, Apr. 21, 1994).

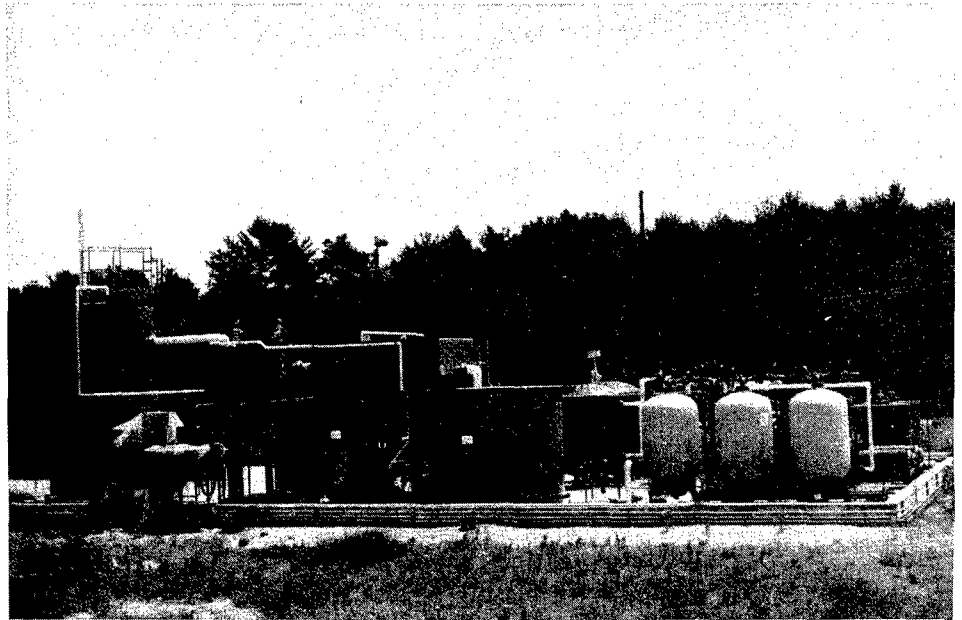
<sup>12</sup>This goal was set forth in the National Defense Authorization Act for Fiscal Year 1996 (P.L. 104-106, Sec. 323).

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apply existing cleanup techniques, which are labor-intensive, dangerous, time-consuming, and costly. For example, preliminary estimates by the Army Corps of Engineers indicate that cleaning up unexploded ordnance at Fort Ord may cost over \$200 million. Most of the cost would be attributable to an 8,000-acre impact range.

“Pump and treat” systems, which are shown in figure 2 and commonly used to treat groundwater contamination, can also cost millions and, depending on site conditions, be only marginally effective in some cases. Further, such systems may need to operate for decades after the base has closed and the property has been transferred. As this occurs, DOD continues to incur costs for operating and maintaining the system as well as monitoring water quality results. At Norton Air Force Base, for example, the Air Force spent over \$10 million between 1980 and 1992 to investigate contamination of a groundwater plume that extends beyond the base boundary and threatens water supplies in a nearby community. A small-scale pump and treat system was initially installed in 1989; beginning in 1991, a larger-scale pilot system was constructed and subsequently upgraded in 1995. Further, in March 1993, the Air Force contracted for a \$5.5-million pump and treat system to be located near the base boundary, and in August 1994, it increased the funding by \$1.6 million. Even though the project was costly, its effectiveness was not certain, and Air Force officials agreed to modify the system to treat the off-base water or reimburse the community if the remediation action was not effective.

**Figure 2: Pump and Treat System at Pease Air Force Base**



## Property Reuse Plans Impact Costs

Intended property reuse can also increase the costs associated with cleaning up contaminated property. In particular, reuse plans are a major determinant most often in the cleanup standard levels (e.g., residential or industrial) used as criteria in cleanup plans. Cleanup of a site that will be transferred to the Department of Interior for nonpublic use, for example, will typically not be as thorough or costly as a site that will be used for residential purposes.

We noted several cases in which reuse or public concern associated with reuse has, or could, impact costs. For example, the Air Force has been conducting site investigations since 1982 in search of radioactive wastes in soils and groundwater on or near Norton Air Force Base. In fiscal year 1995, it obligated \$2.7 million, and in May 1996 was planning to obligate an additional \$185,000. The Air Force cited high community interest, scrutiny, and review as significant in its search for the waste. At Lowry Air Force Base, a change the community has proposed for the 77-acre landfill site could cost the Air Force an additional \$1 million to \$5 million for cleanup. The Air Force had originally planned for limited use (e.g., nature trails) at the site; however, in March 1996, the redevelopment authority identified alternative uses for the property, such as a golf course and facility to be used along with the adjacent existing golf course or polo and soccer fields.

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Air Force officials told us they were studying these alternatives because they would require more extensive and costlier remediation actions.

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## Opportunities for Reducing Cleanup Costs and Their Impact on Programmatic Goals

Potential options exist for reducing the cost of cleanup. We are not taking a position on these options because of policy and legislative implications associated with them. Rather, we are presenting them in the context of tradeoffs they represent so that congressional and defense decisionmakers have the information for their consideration as they explore ways to reduce program costs while achieving environmental cleanup goals. The options we analyzed are (1) deferring or extending certain cleanup actions, (2) modifying existing laws and regulations, (3) adopting more cost-effective cleanup technologies, and (4) sharing costs with transferees.

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## Deferring or Extending Cleanup Actions

Deferring or extending certain cleanup actions for those sites where there is no immediate danger to human health or the environment has the potential for reducing environmental costs at closing bases. Under current policy, DOD is advocating an expedited approach to BRAC cleanups in the interest of making property quickly available to communities and others for reuse. Because of the higher priority given to cleanups, DOD officials told us that preclosure cleanup schedules are typically accelerated after a base is slated for closure. However, although accelerating cleanup may offer faster transfer possibilities, it may also cause program cost increases, according to DOD officials. For example, McClellan Air Force Base officials estimate that their cleanup efforts, originally targeted to cost between \$705 million and \$925 million through fiscal year 2034, could cost \$1.2 billion to \$1.8 billion under an accelerated program ending in fiscal year 2018. The officials said longer time frames allow for more cost-effective sequencing of the cleanup work and the use of new technologies that become available.

Deferring or extending cleanup within acceptable bounds of risk may decrease costs but not without programmatic tradeoffs and cost risks. It would delay transfer of property to users and be contrary to the spirit of the President's base closure community reinvestment program, announced in July 1993, for the economic recovery of those communities affected by the closure process. Delaying cleanup could promote significant community dissatisfaction and delay reuse—even for clean parcels that may be adjacent to contaminated property.

It must be recognized that, on a case-by-case basis, deferring or extending cleanups may increase costs. Because DOD may be required to retain unneeded property for a longer period of time, it may incur added caretaker costs. However, according to DOD officials, the caretaker costs would be relatively minor in comparison to the cleanup cost. Further, environmental costs may increase if contamination spreads or is not otherwise contained while cleanup is deferred.

Deferring or delaying cleanup at certain sites requires that a priority system be in place to provide decisionmakers with a means to determine the sequence in which projects are funded. The order in which sites are cleaned can impact the overall cost of environmental cleanup. DOD has stated that its highest priorities for BRAC environmental cleanup are for those sites that pose an immediate danger to human health or the environment or are needed for prompt reuse. With regard to protecting health and the environment, in September 1994, DOD issued guidance for a prioritization framework, referred to as Relative Risk Site Evaluation, that categorizes contaminated sites into high-, medium-, and low-relative risk groups. Relative risk is based on an evaluation of contaminants, hazards, pathways, and receptors in groundwater, surface water, sediment, and surface soils. Even though relative risk categorizations are important, service officials said that relative risk is one of many factors they consider in prioritizing funding at BRAC bases. Other considerations include reuse plans; cultural, social, and economic factors; and statutory requirements and legal agreements. These officials said that, with the exception of immediate health and safety threats, reuse plans are often the most important factor for funding and that some sites with lower environmental risk are funded in the interest of reuse.

Although most interested parties we spoke to endorsed the need for setting priorities, many had concerns about DOD's current efforts. For example, EPA officials were concerned about the (1) lack of objectivity in DOD's relative risk model, (2) large number of sites not included in the evaluation, and (3) lack of regulatory involvement in the development of the criteria. State environmental representatives were also concerned that a large number of sites, some of which may be high priority, had not been evaluated. One state official indicated many states had already established cleanup priorities that may differ from DOD's because of differences in risk evaluations. DOD officials told us that the use of Restoration Advisory Boards, as advisors in the prioritization process, have had strong input in community-based decisions, taking into account risk and other factors. We did not evaluate the effectiveness of these efforts.

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## Modifying Existing Laws and Regulations

Modifying laws and regulations that must be considered when performing environmental cleanup at closing bases could ease the severity of requirements and help reduce costs. However, the benefits of modifying certain aspects of existing laws and regulations may not be achieved without tradeoffs. For example, easing cleanup standards and associated requirements may increase environmental risk and create unacceptable danger to human health and the environment, thereby increasing public resistance and dissatisfaction.

DOD has supported a number of proposed legislative and administrative changes that would reduce the cost of environmental cleanup and expedite the closure process. Many of these have been debated by the Congress in the past and are still under consideration. In this regard, DOD supports efforts to improve the remedy selection process by using realistic site-based risk assumptions and foreseeable future land uses in the decision-making process. According to Navy environmental officials, emphasizing site-based risk assumptions over specific cleanup standards has the potential for reducing costs. Further, DOD supports wider use of generic or presumptive remedies in certain cases to reduce lengthy study time and cost. DOD also supports legislative revision as to what constitutes an uncontaminated parcel and further clarification that such parcels be excluded from placement on the National Priorities List.<sup>13</sup> This revision would reduce cost and allow more expedited transfer of uncontaminated property. EPA has indicated its support for many of DOD's proposals, but state officials and private representatives we talked to were more skeptical.

Changing regulatory requirements can have a significant impact on costs, as illustrated by recent changes being recommended in California's approach to remediating contamination resulting from leaking underground fuel storage tanks. In late 1995, a report by the Department of Energy's Lawrence Livermore National Laboratory, California, concluded that, where soil conditions were favorable, natural processes, rather than other cleanup actions, could be relied on to clean up petroleum contaminants left by leaking underground fuel storage tanks. The report estimated that traditional cleanup costs had been averaging \$150,000, thereby prompting state water control board officials to recommend the use of natural processes for cleanup of those sites where contamination was deemed to be of low risk.

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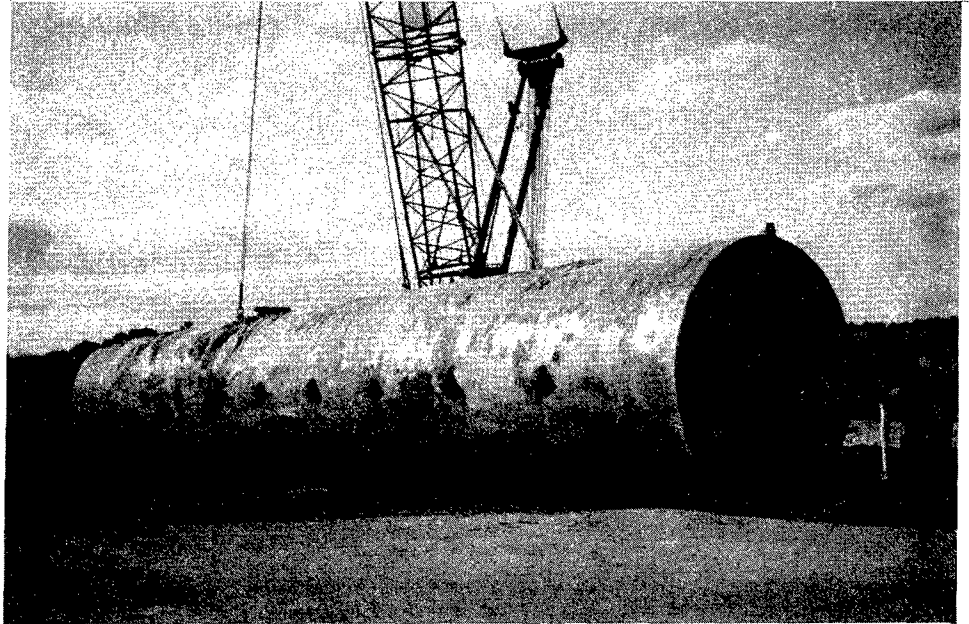
<sup>13</sup>The National Priorities List is EPA's list of highest priorities for further study and cleanup.

If these same procedures were used at DOD facilities where favorable soil conditions existed, costs could be reduced. At Norton Air Force Base, the Air Force has spent about \$5 million to remediate about 20,000 cubic yards of contaminated soil at former underground storage tank sites. Air Force officials estimate that about 20 percent of the cleanup may not have been needed and could have been left to natural processes. At Pease Air Force Base, officials estimated that about \$2.5 million was spent to clean up fuel contaminated soils around 10 pumphouses. Figures 3 and 4 show underground tank removal operations at Pease Air Force Base. At Mare Island Naval Shipyard, Navy officials estimate that about 50 underground storage tanks and about 42,000 feet of abandoned underground fuel lines require cleanup at an estimated cost of \$26.9 million. Under the new policy for underground storage tank cleanups, this estimate may be reduced to \$13.5 million. However, Air Force and Navy officials noted that the new policy is not statewide at this point and is being adopted only in certain regions of the state.

**Figure 3: Underground Fuel Storage Tanks at Pease Air Force Base**



**Figure 4: Underground Fuel Storage Tank Removal at Pease Air Force Base**



In another example, bases were once required, before the issuance of EPA guidance in September 1993, to develop cleanup plans for certain groundwater problems, even though the proper technology was not available. However, EPA guidance now recognizes that some groundwater cleanups are technically not possible. According to Air Force BRAC officials, the Air Force was thus permitted to cease further consideration of several remedial actions proposed for one site contaminated by a waste solvent that could not be removed with known technology. The officials said this change saved between \$2.3 million and \$7 million, depending on which remedial action alternative would have been selected.

### Developing and Using More Cost-Effective Technology

New and more cost-effective technology may offer cost reduction potential for cleaning up groundwater, unexploded ordnance, and other contaminants. The Congressional Budget Office has reported that (1) DOD could reduce costs by delaying expensive remediation projects when contamination posed no imminent threat and cost-effective technology was lacking and (2) in the long run, new cleanup technologies represented the best hope of addressing environmental problems with available DOD

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funds.<sup>14</sup> The replacement of many of the current remediation technologies with more cost-effective methods of environmental cleanup could have a significant effect on reducing the cost of cleanup.

However, although new technologies may offer significant cost reduction potential, there are programmatic tradeoffs or risks involved with awaiting for the emergence of more cost-effective technology. First, because many BRAC bases are being cleaned up under accelerated schedules, many new technologies now under development may not be available for widespread use for years after the technology is needed. Awaiting for new technology would thus delay program progress. Second, newer technology may not be more cost-effective than existing technology. Third, the outlook for DOD research and development funding of new technology may not be as optimistic as in previous years, as DOD's budget has been drastically reduced for this activity in the last 2 fiscal years. Last, contractors and regulators who have become comfortable with certain cleanup methods may be reluctant to adopt new technologies and unwilling to risk using an unfamiliar cleanup technology.

Our discussions with interested parties showed a wide range of views on environmental technology issues. The likelihood that entirely new technologies will quickly and inexpensively solve major contamination site problems is slim, according to Air Force and Navy environmental program managers. They said more gains could be made by improving and refining cleanup standards and existing technologies. Army officials told us that, with the exception of unexploded ordnance, they had the technology needed for addressing most contamination at their BRAC bases. EPA officials told us that new technology could reduce the costs of cleanup and that deferring cleanup until new technology becomes available might be an option in certain situations. One state regulator said that new technology was needed for many contaminants because no cost-effective treatment was available and some prevalent problems were not being addressed. Another state official said that, except for unexploded ordnance and groundwater contamination, the services had the necessary technology and should not delay cleanups.

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## Sharing Costs With Transferees

Allowing the receiving party, or transferee, to pay fully or in part for environmental cleanup would reduce DOD's costs, but there are several

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<sup>14</sup>Statement for the Joint Hearing on the Defense Environmental Program before the House National Security Committee (Mar. 24, 1995) and Statement on Environmental Cleanup Programs in the Departments of Defense and Energy before the Subcommittees on Military Procurement and Military Readiness, House Committee on National Security (Mar. 21, 1996).

barriers to achieving cost reduction in this manner. Existing legislation to encourage sharing costs has not been effective, in part, because of unknown future liabilities and difficulty establishing the value of the property. According to DOD officials, communities have not expressed an interest in assuming the cost of cleanup to receive property more quickly because there is apparently little incentive to do so.

Current legislation allows DOD to transfer property without cleaning it up, provided that the recipient agrees to do so. Specifically, section 2908 of the National Defense Authorization Act for Fiscal Year 1994 (P.L. 103-160) authorizes DOD to enter into an agreement to transfer by deed real property or facilities with any person who agrees to perform all environmental restoration, waste management, and all environmental compliance activities that are required under federal and state laws, administrative decisions, agreements, and concurrences. However, this transfer may be made only if DOD certifies to the Congress that cleanup costs are equal to or greater than the fair market value of the property or facilities. If, however, the cleanup costs are lower, the recipient must pay the difference between the fair market value and such costs. Although less revenue would be received from the property transfer, DOD would not incur the cost of cleanup.

Officials we talked to were unaware of any instances in which property had been transferred under the above provision. They cited a number of reasons for this situation, including (1) difficulty in determining the fair market value of property to be transferred, (2) little incentive for investors to assume the risks of unknown liabilities, and (3) stipulations that the transferee gives up the right for future indemnification if further contamination is found.

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## Agency Comments and Our Evaluation

We requested written comments on a draft of this report from DOD, but none were received. However, officials from the Office of the Deputy Under Secretary of Defense (Environmental Security), Under Secretary of Defense (Comptroller), and the Navy provided us with oral comments.

DOD concurred with the findings and the general tone of the report. The officials, however, offered a number of technical clarifications to improve the accuracy of the report. We considered their comments and have made changes as necessary in the appropriate sections of this report. For example, DOD commented that our use of specific environmental

terminology was inconsistent throughout the report. We agree and have clarified our use of the terms.

## Scope and Methodology

To determine the amount of money devoted to the BRAC environmental program, we interviewed DOD and military service comptroller officials and reviewed documentation that tracked BRAC financial information. We analyzed data to determine the relative growth over time in the amounts of money allocated, obligated, and expended for cleanup efforts. We inquired as to the rationale underlying financial growth trends. To determine the estimated total cost for the BRAC environmental program, we aggregated (1) actual DOD fund allocations through fiscal year 1995 for all BRAC rounds, (2) estimated base program completion costs reported in the Defense Environmental Restoration Program Annual Report to Congress for Fiscal Year 1995, and (3) estimated program management costs through completion.

To find out how funds are being used and gain insight as to why cleanup efforts are so costly, we visited six closing bases, interviewed DOD headquarters and base-level BRAC officials, discussed cleanup actions with selected state and community representatives, reviewed base cleanup documentation, and observed site cleanup actions underway. Our base-level visits were intended to get a mix of military services' 1988, 1991, and 1993 BRAC round bases that had obligated significant funds for environmental cleanup. We did not visit 1995 BRAC round bases because, at the time our review, DOD was in the early stages of the closure process at these bases and had not obligated significant BRAC funds for environmental efforts. We visited the following BRAC bases: Norton Air Force Base, California; Pease Air Force Base, New Hampshire; Army Material Technology Laboratory, Massachusetts; Fort Ord, California; Charleston Naval Shipyard, South Carolina; and Mare Island Naval Shipyard, California.

We also visited the following military service agencies involved in the award and management of contracts associated with environmental study and cleanup actions: Air Force Center for Environmental Excellence, Texas; Army Environmental Center, Maryland; Army Corps of Engineers, Sacramento District, California; and Naval Facilities Engineering Command, Engineering Field Activity (West), California.

To identify potential opportunities and tradeoffs for reducing environmental costs, we analyzed a number of cost reduction proposals

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that have surfaced in recent years. We reviewed documentation to include past work by us, DOD, the Congressional Budget Office, and the Congressional Research Service, along with congressional efforts to revise existing environmental legislation. We discussed cost and programmatic tradeoffs with affected parties, including BRAC officials; EPA officials; community environmental representatives; and state environmental officials overseeing BRAC issues in California, New York, South Carolina, and Texas.

We performed our work between April 1995 and May 1996 in accordance with generally accepted government auditing standards.

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Unless you publicly announce its contents earlier, we plan no further distribution of this report until 10 days after its issue date. At that time, we will send copies to other congressional committees; the Secretaries of Defense, the Air Force, the Army, and the Navy; the Director, Office of Management and Budget; the Administrator, EPA; and other interested parties. We will also make copies available to others on request.

If you have any questions, please call me on (202) 512-8412. Major contributors to this report are listed in appendix III.

Sincerely yours,



David R. Warren, Director  
Defense Management Issues



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**Abbreviations**

BRAC	base realignment and closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOD	Department of Defense
EPA	Environmental Protection Agency
RCRA	Resource Conservation and Recovery Act

# Selected Environmental Laws and Regulations Pertinent to Cleanup at Closing Bases

Title	Summary
<b>Primary sources of authority</b>	
Base Closure and Realignment Act of 1988 (P.L. 100-526, 102 Stat. 2623) and the Defense Base Closure and Realignment Act of 1990 (P.L. 101-510, 104 Stat. 1808), 10 U.S.C. 2687	Requires the Department of Defense (DOD) to comply with a variety of laws—including the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and National Environmental Policy Act—to effect federal real property disposal at most base realignment and closure (BRAC) installations.
CERCLA, section 120, 42 U.S.C. 9620	Defines the roles for the Environmental Protection Agency (EPA), state agencies, and DOD components. CERCLA section 120 compliance is required for all federal facilities, including BRAC bases. Requires for property transfer that all remedial action necessary to protect human health and the environment has been taken. Also requires the federal government to assume financial responsibility for any additional cleanup of DOD-caused pollution discovered in the future.
National Oil and Hazardous Substances Pollution Contingency Plan, 42 U.S.C. 9605	Sets criteria for an installation's inclusion on the National Priorities List (NPL).
Executive Order 12580	Authorizes DOD components to conduct site investigations and cleanups.
Superfund Amendments and Reauthorization Act, section 211, 10 U.S.C. 2701	Used as the basis for the Defense Environmental Restoration Program. Authorizes removal of unexploded ordnance and unsafe buildings and debris on BRAC bases.
National Environmental Policy Act, 42 U.S.C. 4331	Defines the process for examining potential impacts to the environment that may result from disposition of BRAC installation property. Requires that reuse alternatives are identified and characterized and that the environmental impacts associated with each are disclosed.
State laws and other statutes	CERCLA section 120(a)(4) states that "State laws concerning removal and remedial actions, including State laws regarding enforcement, shall apply to removal and remedial action at facilities owned or operated by a department, agency, or instrumentality of the United States when such facilities are not included in the National Priorities List."
<b>Other relevant federal environmental laws</b>	
Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 6901, et seq.	Establishes the framework for managing solid wastes, including hazardous substances. Applies to both NPL and non-NPL installations.
Toxic Substances Control Act, 15 U.S.C. 2601, et seq.	Regulates specific chemical substances, including polychlorinated biphenyls and asbestos.
Federal Water Pollution Control Act ("Clean Water Act"), 33 U.S.C. 1251, et seq.	Regulates discharges of pollutants into waters. Requires the establishment of criteria and standards to protect water quality. Requires federal permits for dredge and fill operations.
Safe Drinking Water Act, 42 U.S.C. 300f, et seq.	Establishes regulations to protect human health from contaminants in drinking water.
Clean Air Act, 42 U.S.C. 7418	Regulates releases of pollutants into the air.
Federal Insecticide, Fungicide, and Rodenticide Act, 7 U.S.C. 135, et seq.	Establishes a registration program for pesticides. Governs disposal of pesticides.
<b>Other selected federal laws impacting land use</b>	
American Indian Religious Freedom Act, 42 U.S.C. 1996	Protects and preserves access to religious sites of Native Americans.
Archaeological and Historic Preservation Act, 16 U.S.C. 469	Protects historic or archaeological resources threatened by federal dams or construction projects.

(continued)

**Appendix I  
Selected Environmental Laws and  
Regulations Pertinent to Cleanup at Closing  
Bases**

<b>Title</b>	<b>Summary</b>
Bald and Golden Eagle Protection Act, 16 U.S.C. 668	Governs activities and facilities that may threaten protected birds.
Coastal Zone Management Act, 16 U.S.C. 1451-1464	Requires federal agencies to observe state Coastal Zone Management Plans for activities near shorelines.
Endangered Species Act, 16 U.S.C. 1531-1544	Protects the habitat of threatened or endangered species by controlling land use and regulating construction.
Fish and Wildlife Coordination Act, 16 U.S.C. 663	Requires federal agencies to consider the effect of their land and water use activities on fish and wildlife.
National Historic Preservation Act, 16 U.S.C. 470	Establishes a program for the preservation of designated historic properties throughout the nation.
Water Resources Development Acts, 33 U.S.C. 2283 and 2317	Establishes a national goal of no net loss of wetlands. Provides for mitigation of negative effects of water resource projects on fish and wildlife.
Wild and Scenic Rivers Act, 16 U.S.C. 1271	Preserves and protects the free-flowing condition of designated rivers.

# Environmental Cleanup Allocations, Obligations, and Expenditures by BRAC Round and Military Component

Dollars in thousands

	BRAC				Total
	1988	1991	1993	1995	
<b>Air Force</b>					
Allocated	\$397,850	\$583,928	\$276,444	\$56,398	<b>\$1,314,620</b>
Obligated	394,974	458,497	172,082	7,784	<b>1,033,337</b>
Expended	273,604	264,189	61,785	66	<b>599,644</b>
<b>Army</b>					
Allocated	527,462	341,247	39,331	48,582	<b>956,622</b>
Obligated	522,954	227,380	26,328	4,496	<b>781,158</b>
Expended	302,474	135,421	13,033	145	<b>451,073</b>
<b>Navy</b>					
Allocated	54,807	466,604	488,154	70,955	<b>1,077,520</b>
Obligated	48,998	414,643	453,938	31,588	<b>949,167</b>
Expended	24,594	276,524	225,490	1,606	<b>528,214</b>
<b>Defense agencies</b>					
Allocated	0	0	11,748	1,666	<b>13,414</b>
Obligated	0	0	8,427	0	<b>8,427</b>
Expended	0	0	2,689	0	<b>2,689</b>
<b>Total</b>					
<b>Allocated</b>	<b>\$980,119</b>	<b>\$1,391,779</b>	<b>\$812,677</b>	<b>\$177,601</b>	<b>\$3,362,176</b>
<b>Obligated</b>	<b>\$966,926</b>	<b>\$1,100,520</b>	<b>\$660,775</b>	<b>\$43,868</b>	<b>\$2,772,089</b>
<b>Expended</b>	<b>\$600,672</b>	<b>\$676,134</b>	<b>\$302,997</b>	<b>\$1,817</b>	<b>\$1,581,620</b>

Note: Data are as of March 31, 1996.

Source: Our analysis of DOD data.

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