United States General Accounting Office

GAO

Report to the Subcommittee on the District of Columbia, Committee on Government Reform, House of Representatives

June 2002

ENVIRONMENTAL CONTAMINATION

Many Uncertainties Affect the Progress of the Spring Valley Cleanup

G A O

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GAO-02-556

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United States General Accounting Office
Washington, DC 20548

June 6, 2002

The Honorable Constance A. Morella
Chairwoman
The Honorable Eleanor Holmes Norton
Ranking Minority Member
Subcommittee on the District of Columbia
Committee on Government Reform
House of Representatives

During World War I, at a portion of American University and in other areas that became the Spring Valley neighborhood in Washington, D.C., the U.S. Army operated a large research facility to develop and test chemical weapons and explosives. After World War I, the majority of the site was returned to private ownership and was developed for residential and other uses. The site now includes, in addition to American University, about 1,200 private residences, Sibley Hospital, 27 embassy properties, and several commercial properties.

In 1993, buried ordnance was discovered in Spring Valley, leading to its designation by the Department of Defense (Defense) as a formerly used defense site (FUDS) currently comprising 661 acres. FUDS are properties that were formerly owned, leased, possessed, or operated by Defense or its components, and are now owned by private parties or other governmental entities. These properties, located throughout the United States and its territories, may contain hazardous, toxic, and radioactive wastes in the soil and water or in containers such as underground storage tanks. Other hazards, including unexploded ordnance and unsafe buildings, may also be present on the properties. Such hazards can contribute to deaths and serious illness or pose a threat to the environment.

Through fiscal year 2001, Defense had spent over $50 million to identify and remove hazards at the Spring Valley site. However, concerns persist over the extent of hazards remaining, and the U.S. Army Corps of Engineers (the Corps) is continuing to survey targeted properties for buried ordnance and explosives, and sample all properties in Spring Valley for arsenic-contaminated soil.

In response to your letter, and as agreed with your offices, this report provides information on the (1) specific roles and responsibilities of the government entities involved at the Spring Valley site, as authorized by

statute, regulation, or guidance, and as actually carried out, (2) progress the government entities have made toward identifying and removing hazards at the site, (3) health risks government entities have determined are associated with the hazards at the site and the impact of these risks on cleanup decisions, and (4) estimated cost and schedule of the remaining cleanup. In addition, you asked us to provide a list of sites in the District of Columbia where hazards resulting from federal activities have been found. We have included this list in appendix I. To address these objectives, we reviewed documents on activities conducted at the site during World War I, the progress of cleanup activities at the site, health risks, and estimated costs, and interviewed federal and District of Columbia government officials and other stakeholders. We also reviewed the statutes authorizing various cleanup activities. In addition, we visited the site to observe the activities first-hand and attended meetings of resident and other stakeholder groups formed to advise the cleanup process. We obtained and reviewed records from Defense, the Environmental Protection Agency, and the District of Columbia's Department of Health to develop a list of sites in the District of Columbia where hazards resulting from federal activities have been found.

Results in Brief

The principal government entities involved at the Spring Valley site are carrying out their roles and responsibilities in cleaning up the site primarily under the Defense Environmental Restoration Program (environmental restoration program), which was established by the Superfund Amendments and Reauthorization Act of 1986. Under the environmental restoration program, Defense is authorized to identify, investigate, and clean up environmental contamination at formerly used defense sites. The U.S. Army, through the Corps, is responsible for these activities at Spring Valley and is carrying out the physical cleanup. Defense is required under the environmental restoration program to consult with the Environmental Protection Agency (EPA), which has its own authority to act at the site under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980. Under the program, Defense's activities must also be consistent with a statutory provision that addresses, among other things, participation by the affected states—in this case, the District of Columbia. Under the Corps' program guidance for FUDS, the District of Columbia has a role in defining the cleanup levels at the Spring Valley site. According to the District of Columbia's Department of Health, the department assesses the human health risks associated with any exposure to remaining hazards at Spring Valley. In carrying out their roles, these government entities have, over time, formed an active partnership to make cleanup decisions. For example, the Corps leads the

effort to identify hazards, but in many cases it uses the recommendations of the District of Columbia and EPA to look for hazards buried at certain sites. The entities are currently reaching agreement as to a cleanup level—that is, how much contamination can be left in the soil without endangering human health and the environment. The partners expect to finalize this decision by early June 2002. While the entities have not agreed on all cleanup decisions, officials acknowledge that, by having formed a partnership, a means exists to foster communication and collaboration, and officials of all three entities stated that the partnership is operating effectively. Continued progress at the site will depend, in part, on the effectiveness of this partnership over the duration of the cleanup period.

The government entities involved at Spring Valley have identified and removed a large number of hazards, but the extent to which hazards remain is unknown. The hazards identified include buried ordnance; chemical warfare agents in glass containers; and arsenic-contaminated soil. Beginning in 1986, the U.S. Army searched records and reviewed photographs to identify locations where ordnance and chemicals might have been buried and concluded that there was no evidence of large-scale burials at the site. However, following the discovery of buried ordnance by a utility contractor in 1993, the U.S. Army identified and removed 141 pieces of ordnance, 43 of which were suspected chemical munitions (but most were destroyed before being tested). After the ensuing investigation of the site, the Corps concluded in 1996 that it was unlikely to discover additional hazards at the site. Since then, however, the Corps has found and removed 667 pieces of ordnance, 25 of which were chemical munitions, and 101 bottles of chemicals. Moreover, the Corps has discovered arsenic in the soil throughout the site that exceeds naturally occurring levels. As of April 2002, the Corps had identified and removed 5,623 cubic yards of arsenic-contaminated soil from three properties. The Corps has extensive work remaining to search for any additional hazards at the site, and, if found, remove them.

The primary health risks influencing cleanup activities currently at Spring Valley are the possibility of injury or death from exploding or leaking ordnance and containers of chemical warfare agents and potential long-term health problems from exposure to arsenic-contaminated soil, according to the government entities involved. Because of the immediacy of the risks, the partnership agrees that ordnance and containers must be removed as soon as possible after they are found. In contrast, the partners have disagreed over the immediacy of the health risk posed by arsenic-contaminated soil. The partners recognize that exposure to arsenic has been generally linked to cancers and other health conditions. A recent

study by the District of Columbia concluded that Spring Valley residents showed no increased incidence of certain cancers. A study by the Agency for Toxic Substances and Disease Registry (an agency of the Department of Health and Human Services) found no evidence of actual exposure to arsenic in the individuals tested. However, these studies, according to some residents, were not sufficiently broad. Additional studies to assess whether residents have actually been exposed to arsenic are ongoing. Over the past year, the partners have been in the process of reaching agreement on a single level of arsenic that may remain in the soil throughout the site and that is protective of human health and the environment.

As of April 2002, the U.S. Army estimated that the remaining cleanup activities at Spring Valley would cost $71.7 million and take 5 years to complete, but the reliability of these estimates is uncertain. Many factors—such as the discovery of additional hazards or changes in annual funding levels—make it inherently challenging to estimate the costs and schedule for cleaning up the site. Since fiscal year 1997, the Corps has continually needed to increase the scope of the remaining cleanup as more information about the hazards at the site became known. As a result, the Corps increased the total estimated cost for the Spring Valley cleanup six-fold over the same period, from about $21 million in fiscal year 1997 to about $125 million as of April 2002. On the other hand, the Corps has reduced its estimate of the time it will take to complete the cleanup since fiscal year 2000 (the first year the Corps made public this estimate) by increasing considerably the amount of annual funding it plans to devote to the site. It is unclear at this time how long the Corps will be able to accommodate the increasing funding needs at Spring Valley because funding the cleanup activities at the site is currently adversely affecting the pace and progress of cleanups at the approximately 2,800 other formerly used defense sites presently known to require remediation. Consequently, any significant increases in the cost of completing the Spring Valley cleanup, or decreases in the amount of available annual funding, would likely require the Corps to extend the completion date further into the future.

We provided a draft of this report to the Department of Defense, Environmental Protection Agency, and the District of Columbia's Department of Health for review and comment. These agencies generally agreed with the information presented in the draft and provided a number of technical comments, which we incorporated in the report as appropriate. Defense stated that, while they agreed that there are some uncertainties associated with the Spring Valley cleanup, it is important to note that such unknowns are not unique to Spring Valley. Defense also

stated that the partnership formed has been a model for regulatory relationships at other site cleanups. EPA stated that our report develops an accurate and unbiased appraisal of the problems and uncertainties present at the site. The District of Columbia's Department of Health stated that it is committed to continuing to work with the other governmental partners in order to protect human health.

Background

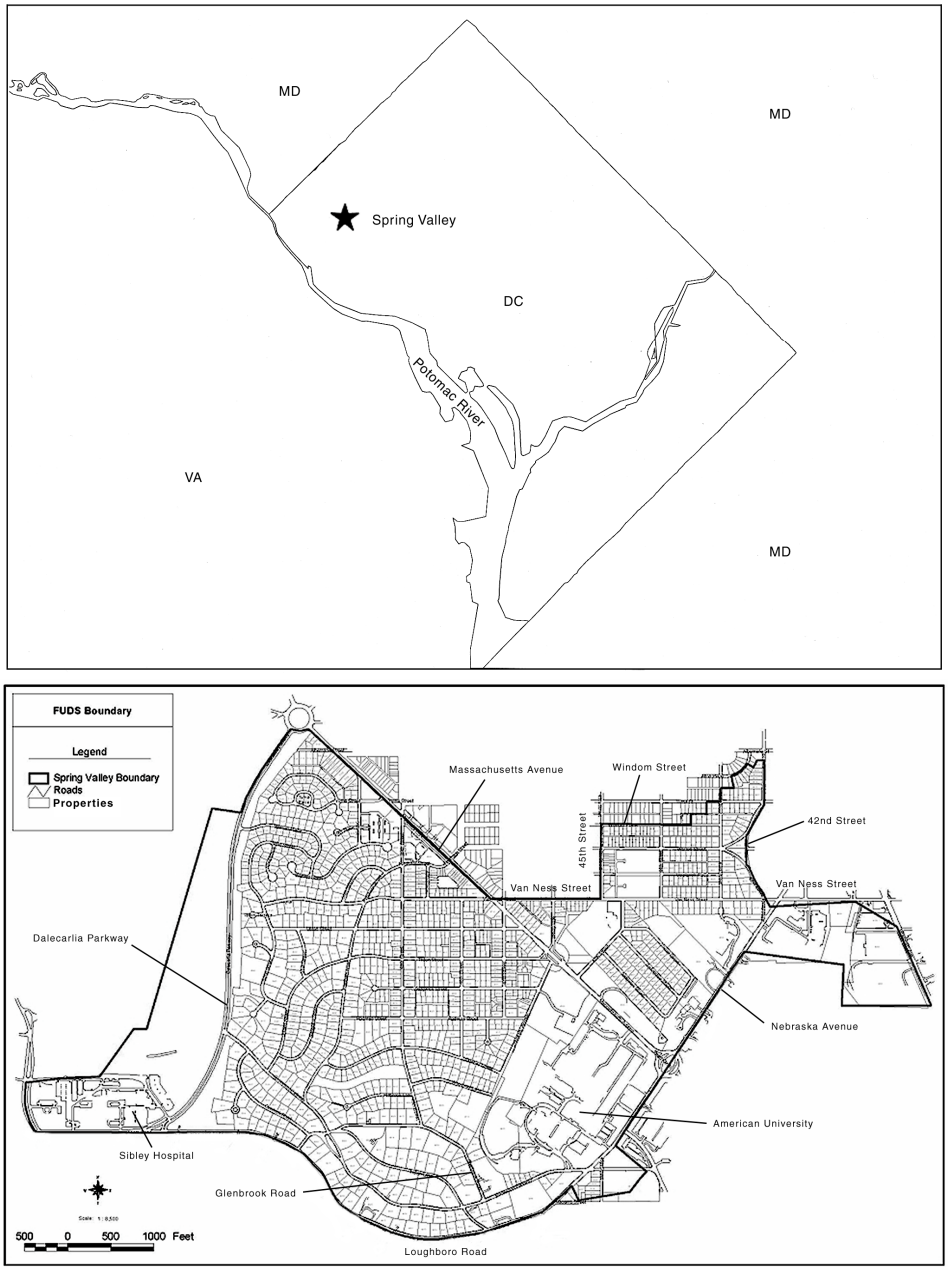
In 1917, the Bureau of Mines initiated the Chemical Warfare Research Program at American University, and in 1918, the research effort was transferred to the Chemical Warfare Service in the War Department. The Chemical Warfare Service used a portion of American University and other areas that became part of the Spring Valley neighborhood to operate a large research facility to develop and test chemical agents, equipment, and munitions. The U.S. Army used the remaining part of the area as a camp to house and train engineer troops. These two areas were known as the American University Experiment Station and Camp Leach (which includes Fort Gaines), respectively. Historical and archival information indicates that onsite development and testing of ordnance and chemical warfare materials occurred at the American University Experiment Station between 1917 and 1919, as shown in figure 1. The majority of the property was returned to private ownership by October 1920.

Figure 1: World War I-era Photograph of Two Soldiers Preparing to Test Chemical Munitions in a Trench Located in Spring Valley

Source: The Corps.

During the 1950s and 1980s, American University and others raised concerns about buried munitions in the Spring Valley neighborhood. Following an accidental discovery of buried ordnance in Spring Valley in 1993, the Corps designated the site as a FUDS. The Spring Valley FUDS includes, in addition to American University, about 1,200 private residences, Sibley Hospital, 27 embassy properties, and several commercial properties. According to the U.S. Army, Spring Valley is the only known FUDS where chemical agents were tested in what became a well-established residential neighborhood at the heart of a large metropolitan area. Figure 2 shows the location of the Spring Valley neighborhood in Washington, D.C.

Figure 2: Location of the Spring Valley FUDS in the District of Columbia



Source: The Corps.

To fund the environmental restoration program, the Superfund Amendments and Reauthorization Act of 1986 (SARA) established the Defense Environmental Restoration Account. Total spending for the FUDS cleanup program since fiscal year 1984 is $2.6 billion.[1] During the 5 most recent fiscal years (1997-2001), annual program funding for FUDS cleanup has decreased from about $255.9 million to about $231 million, with program funding estimated to decrease further to about $212.1 million by fiscal year 2003. By the end of fiscal year 2001, the Corps had identified 4,649 potential cleanup projects on 2,825 properties requiring environmental response actions. Through fiscal year 2001 (the latest figure available), the Corps had spent about $53.4 million on cleanup activities at Spring Valley. In addition, as of April 2002, EPA had spent about $800,000 on activities related to the site.

Government Entities Have Formed a Partnership Approach for the Spring Valley Cleanup

The principal government entities involved at the Spring Valley site are carrying out their roles and responsibilities in cleaning up the site under the Defense Environmental Restoration Program (environmental restoration program). The environmental restoration program was established by SARA, which amended the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). Under the environmental restoration program, Defense is authorized to identify, investigate, and clean up environmental contamination at FUDS. Defense is required to consult with EPA in carrying out the environmental restoration program; EPA, in turn, has established written guidance under CERCLA for its activities at FUDS. Activities under the environmental restoration program also must be consistent with another statutory provision[2] that addresses, among other things, participation by the affected states—in this case, the District of Columbia. Under the Corps' program guidance, the District of Columbia has a role in defining the cleanup levels at the Spring Valley site. According to a District of Columbia Department of Health official, the department assesses the human health risks

[1] The Department of Defense Appropriation Act, 1984 (P.L. 98-212) provided 1 year of funding for the cleanup of hazardous substances released from Defense properties and the removal of unsafe or unsightly Defense buildings and debris. Annual appropriations for these activities have continued, but since 1986, have been funded under the Defense Environmental Restoration Account established by the Congress as part of the Defense Environmental Restoration Program.

[2] Specifically, Defense's activities addressing hazardous substances, pollutants, or contaminants are required to be carried out consistent with section 120 of CERCLA.

associated with any exposure to remaining hazards at Spring Valley.[3] In carrying out their roles, these government entities have, over time, formed an active partnership to make cleanup decisions. For example, the Corps leads the effort to identify hazards, but in many cases it follows the recommendations of the District of Columbia and EPA to look for hazards buried at certain sites. The entities are currently finalizing decisions as to a cleanup level for arsenic that will determine how much contamination can be left in the soil throughout the site without endangering human health and the environment. While the entities have not agreed on all cleanup decisions, officials of all three entities state that the partnership has been working effectively in the recent past. Continued progress at the site will depend, in part, on the effectiveness of this partnership over the duration of the cleanup period.

Government Entities Are Authorized to Take Various Actions for Cleanup at the Spring Valley Site

Because Spring Valley was designated as a FUDS, Defense is authorized to carry out cleanup activity at the site under the environmental restoration program established by SARA. The environmental restoration program also provides for participation by other entities. Specifically, in carrying out the environmental restoration program, Defense is required to consult with EPA, which has its own authority under CERCLA to act at the site. Also, Defense must carry out the program consistent with section 120 of CERCLA. Section 120 addresses the cleanup of federal facilities and, among other things, provides for participation in cleanup decisions by the state (in this case, the District of Columbia) in which a federal facility is located. The following sections provide more detail on the entities' authorities.

- Under the environmental restoration program, Defense is authorized to identify, investigate, and clean up hazards at FUDS. In implementing the environmental restoration program, Defense has established guidance for the FUDS program. The FUDS program is intended to reduce the risk to human health and safety, and to the environment, resulting from past Defense activities at FUDS properties. Defense has delegated its authority for administering the FUDS program to the U.S. Army; in turn, the U.S. Army has delegated execution of the program to the Corps. The Corps' responsibilities include determining the eligibility of properties for

[3] The Department of Health defines exposure as any completed pathway through the air, water, or soil of the contaminant that results in an inhaled, ingested, or dermal-absorbed dose associated with adverse human health effects.

inclusion in the FUDS program, identifying the requirements for funding the FUDS program, conducting environmental restoration activities at eligible properties, and reporting on the cleanup progress. The Corps is responsible for the cleanup of environmental contamination related to past Defense activities at eligible sites.

- Defense's policies for administering FUDS are outlined in its environmental restoration program management guidance, which cites CERCLA as the statutory framework. Additionally, under the Corps' guidance, efforts should be made to accommodate standards, requirements, or criteria requested by EPA, states, and local authorities where they are consistent with CERCLA. Both of these guidance manuals recognize the importance of involving EPA, the state government, and the public, among others. Defense consults with EPA and the states on cleanup decisions at specified points in the environmental restoration process, such as developing a site-wide sampling plan. Also, at Spring Valley, the Corps was urged to form an advisory board to involve the community and others. According to the Corps, these efforts have the overall goal of ensuring that decisions regarding environmental restoration activities reflect a broad spectrum of advice, expertise, and stakeholder concerns in making cleanup decisions.
- As with any hazardous waste site, EPA has its own authority under CERCLA to act, including investigating the site and carrying out a removal action.[4] EPA has established written policy for its activities at FUDS.[5] The policy states that EPA intends to minimize duplication of effort, but may become more involved at a site if conditions warrant EPA action. EPA has not listed Spring Valley on its national priorities list of hazardous waste sites. According to EPA officials, if a site is not listed and there is no "imminent and substantial endangerment" or the releases are being adequately addressed by others, EPA may limit its role. According to EPA officials, EPA has the flexibility to increase its role should it later determine that greater participation is warranted. At Spring Valley, EPA has chosen not to investigate and remove hazards because Defense is carrying out the cleanup, and because the Corps has expertise in munitions and has responsibility for ordnance-related cleanups. EPA

[4] Removal actions are generally short-term responses to address immediate and significant dangers at any hazardous waste site but are not necessarily final solutions.

[5] *EPA Policy Toward Privately-Owned Formerly Used Defense Sites*, which notes that, while the policy focuses on authorities available to EPA under CERCLA, "nothing in this policy should be construed as limiting EPA's or a State's authorities" under other applicable environmental statutes, such as the Resource Conservation and Recovery Act or the Clean Water Act.

receives no targeted resources for FUDS. At Spring Valley, EPA primarily consults with and provides technical assistance to Defense and the District of Columbia. For example, EPA has consulted with the Corps to interpret aerial photography and test soil to locate potential buried hazards and contaminated soil. The Corps notes that EPA has been fully engaged in the decision making process at the site.

- According to EPA, CERCLA provides that federal cleanup standards be used at sites covered by the statute, unless a promulgated state-wide standard exists which is more stringent than the federal standard. According to District of Columbia Department of Health officials, they are establishing cleanup standards for hazardous wastes under the Brownfield Revitalization Amendment Act of 2000, which contains some provisions comparable to CERCLA. As of the end of April 2002, the standards were in draft form. Although these standards were not yet final, a District of Columbia Department of Health official told us that the lack of formal standards would have no effect on the cleanup decisions made at Spring Valley.

Government Entities Have Formed an Active Partnership

Over time, the Corps, EPA, and the District of Columbia formed a partnership in order to reach accord on important cleanup decisions. Early on in the cleanup, EPA and the District of Columbia collaborated with the Corps, but they did not always agree with the Corps' decisions. Further, there were concerns about the extent of collaboration on decision-making. For example, according to a senior District of Columbia Department of Health official, in the mid-1990s the District of Columbia environmental officials were not consulted on important cleanup decisions.[6]

In the past several years, the partnering process for reaching cleanup decisions has become increasingly more formalized and active. EPA has provided assistance in identifying possible buried hazards by using photographic interpretation of aerial maps and providing technical expertise with regard to the presence of hazards in soil, water, and air. The Corps now routinely coordinates with EPA and the District of Columbia on technical and health-related issues. In terms of cleanup levels, EPA has proposed how much contamination may remain in the soil without endangering human health and the environment. Under the Corps'

[6] In commenting on our report, the Corps stated that the reason the environmental officials were not included was that the Mayor of the District of Columbia had expressly designated a different agency as the point of contact for Spring Valley.

guidance, the District of Columbia has a role in defining the cleanup levels at the Spring Valley site. According to the District of Columbia's Department of Health, the department assesses the human health risks associated with any exposure to remaining hazards at Spring Valley. In addition, the District of Columbia, together with the Agency for Toxic Substances and Disease Registry (ATSDR), is studying whether residents have actually been exposed to arsenic in the soil.[7] The government entities currently collaborate on the process of selecting a cleanup level, addressing health risks posed by hazards, and communicating with the public.

Additionally, in the past year, advisory entities have been created to further facilitate the partnering process and ensure buy-in from all partners and community members. Important decisions, such as the cleanup levels at Spring Valley and the plan to prioritize cleanup, are now routinely discussed among these entities. The Restoration Advisory Board (the Board) and the Scientific Advisory Panel (the Panel) are two active advisory entities in which partners exchange information and collaborate as to cleanup decisions and potential health risks. The Board, created in May 2001, consists of residents of Spring Valley as well as representatives from the Corps, EPA, the District of Columbia, and American University, among others. The District of Columbia created the Panel in March 2001 to advise the District of Columbia and other partners on health risks associated with the hazards at Spring Valley. The Panel is currently evaluating data and is expected to make a recommendation as to the proposed cleanup level of arsenic in soil at the Spring Valley site. This recommendation was announced at the Panel's May 29, 2002, meeting. The partners expect to finalize this decision by early June 2002.

Officials acknowledge that, by having formed a partnership, a means exists to foster communication and collaboration, and stated that the partnership has been effective in the recent past. Continued progress at the site—which includes, among other things, finalizing a cleanup level for arsenic in soil—will depend on the effectiveness of this partnership over the duration of the cleanup period.

[7] ATSDR is an agency of the Department of Health and Human Services. It was created by CERCLA, and its mission is to take responsive public health action and provide public health information to prevent harmful exposures and diseases related to toxic substances.

Government Entities Have Identified and Removed a Large Number of Hazards, but the Extent of Hazards Remaining Is Unknown

The Corps, in partnership with EPA and the District of Columbia, has identified and removed a large number of hazards from areas within the Spring Valley site. However, the extent to which hazards remain throughout the site is unknown. Since 1986, the U.S. Army has twice concluded that no large burials of ordnance remained on the site, but subsequent investigations discovered additional ordnance in large burial pits and widespread arsenic-contaminated soil. The Corps is continuing to search for hazards.

U.S. Army Twice Concluded That No Large-Scale Hazards Remained at the Site

The U.S. Army concluded in 1986 and again in 1996 that it had not found any evidence of large-scale burials of hazards remaining at Spring Valley.[8] In March 1986, American University was preparing to begin the largest construction project in its history, but it was concerned that chemical munitions might have been buried on campus. After the results of the university's search of its own and available government records proved inconclusive, the university contacted the U.S. Army for assistance. The U.S. Army's Toxic and Hazardous Materials Agency reviewed the work done by the university and interviewed the university officials who had done the work, reviewed documentation from additional sources, such as military and university libraries and historical centers and the National Archives, and contracted with EPA's Environmental Photographic Interpretation Center to review available aerial photographs of the site taken during the World War I era. However, the photographs were not received or reviewed by EPA headquarters or Region III prior to 1993, according to EPA officials. Based on the results of its review, in October 1986, the U.S. Army concluded that if any materials were buried in the vicinity of the university, the amounts were probably limited to small quantities and no further action was needed. In August 1986, the U.S. Army agreed to a plan to ensure safety in the event that ordnance was actually discovered during the construction project. This plan included an onsite support presence before, during, and after any excavation activities. According to the university, no buried ordnance was found before or during the construction project.

[8] We are currently reviewing the Corps' process for assessing the need to clean up FUDS nationwide and will issue a report this summer.

In January 1993, a utility contractor accidentally uncovered buried ordnance at another location in the Spring Valley site. The U.S. Army's Chemical and Biological Defense Command immediately responded and, by February 1993, had removed 141 pieces of ordnance, 43 of which were suspected chemical munitions (but most were destroyed before being tested). Immediately following this removal, the Corps began to investigate the site. To focus its investigation, the Corps revisited the documents reviewed by the Toxic and Hazardous Materials Agency in 1986, including the results of the photographic analysis performed by EPA's Environmental Photographic Interpretation Center, and reviewed additional information. The Corps identified 53 locations with the greatest potential for hazards. The Corps decided that if it found contamination in any of these locations, it would expand its investigation around each contaminated location.

During the investigation, the Corps used two techniques to look for potential hazards: (1) a subsurface (geophysical) soil survey with metal detectors to identify buried ordnance and (2) an analysis of soil samples to identify chemical contamination. The Corps surveyed soil for ordnance at about 490 properties, including 37 of the 53 potentially hazardous locations that the Corps considered to be potential ordnance burial sites. These surveys identified over 2,000 buried metallic objects that could be pieces of ordnance, which, upon further review by the Corps, were narrowed down to about 840 warranting further excavation. These excavations led the Corps to identify and remove one piece of ordnance containing suspected chemical agent, ten expended pieces of ordnance, an empty bomb nose cone, and several fragments of ordnance scrap. Concurrently with the Corps' investigation, a builder found another piece of ordnance during construction activities, and two pieces of ordnance were anonymously left for the Corps to find. As for soil sampling, the Corps, in conjunction with EPA, sampled for a variety of chemicals at 15 of the 53 potentially hazardous locations where historical documents indicated field-testing, development, or accidental releases of chemical agents were known or believed to have occurred.[9] No chemical warfare agents, explosives, or Defense-related chemicals whose only source could

[9] In addition, the Corps sampled soil for a variety of chemicals at a number of locations at American University and at the location where a piece of ordnance containing suspected chemical agent was found. Total potentially hazardous locations surveyed and sampled do not add to 53 because some locations were both surveyed and sampled, some were either surveyed or sampled but not both, while others were neither surveyed nor sampled because they were either buildings or under a large concrete reservoir.

be chemical warfare agents or explosives were found in any soil samples collected at these locations, according to the Corps. Some metals were detected at levels exceeding both EPA's screening levels (levels that EPA estimates are associated with a one in a million increased risk of causing cancer) and naturally occurring levels; but risk assessments, which consider many factors such as the levels of the chemicals, the likelihood of exposure to the chemicals, and the toxicity of the chemicals, indicated that no remedial action was needed, according to the Corps.

Following this investigation, in June 1995, the U.S. Army determined that no further action was required at the Spring Valley site, except for a portion of the site referred to as the Spaulding/Captain Rankin Area, which was then still under investigation. This area contained concrete shell pits or bunkers that were used during World War I to test explosives and chemical warfare agents. Subsequent sampling detected arsenic in the layer of soil on the bunkers' concrete floors and debris at levels exceeding both EPA's screening and naturally occurring levels, but risk assessments indicated that no remedial action was necessary, according to the Corps. Therefore, in June 1996, the Corps recommended that no further action be taken at the Spaulding/Captain Rankin Area. With both investigations, the U.S. Army maintained that it would remain responsible for taking any actions necessary if DOD-related hazards were discovered at the site.

Follow-on Investigations Found Additional Large-Scale Hazards

In 1997, the District of Columbia completed a report of the actions taken at the Spring Valley site that raised a number of concerns about how the Corps had completed its investigation. In response, the Corps reviewed its work at the site and concluded that it had incorrectly located 1 of the 53 potentially hazardous locations it had previously investigated, which should have been situated on a property owned by the Republic of Korea (South Korea) on Glenbrook Road. [10]

According to the Corps, in February 1998, it surveyed the soil on the South Korean property and identified two potential burial pits. Excavation initiated in March 1999 and completed in March 2000 yielded 288 pieces of ordnance, 14 of which were chemical munitions; 175 glass bottles, 77 of which contained various chemicals, including mustard and lewisite; and 39 cylinders and 9 metal drums. Soil sampling conducted by EPA in mid-1999

[10] According to a District of Columbia official, the Corps had discovered this error in 1994 and had found a possible buried ordnance pit, but did not undertake a cleanup action at the time. However, the Corps disagrees and stated that it did not find any indication of a possible ordnance burial pit at the site in 1994.

resulted in the discovery of elevated levels of arsenic at the South Korean property and two adjacent properties on Glenbrook Road. Subsequent analyses concluded that arsenic was present in the soil at these properties at levels exceeding both EPA's screening level for residential areas and the naturally occurring levels for Spring Valley. The Corps decided that contaminated soil needed to be removed from this site. By May 2001, the Corps had removed arsenic-contaminated soil from the South Korean property and the adjacent property. It has not yet conducted soil removal at the third property, which is the American University President's residence. As of April 2002, the Corps had completed most restoration (i.e., landscaping) activities at the South Korean property, but is still working at excavating a pit that extends from the South Korean property into the adjacent property on Glenbrook Road. In total, the Corps had removed about 4,560 cubic yards of contaminated soil from these properties.

After the discovery of hazards on the Glenbrook Road properties, and consistent with the rationale it employed during the investigation, in January 2000, at the request of the District of Columbia, the Corps expanded its arsenic investigation to include about 60 nearby residences and the southern portion of the American University campus. Sampling at these locations found elevated levels of arsenic at the American University Child Development Center and other locations on the American University campus, and on 11 residential properties. As of April 2002, the Corps had removed about 1,063 cubic yards of contaminated soil from American University. The Corps is finalizing plans to address arsenic contamination in soil at other locations on American University.

Agencies Have Initiated Extensive Additional Investigations for Hazards

At a public meeting in February 2001, community members urged testing the entire Spring Valley neighborhood for arsenic, a request first made by the District of Columbia in its 1997 report. The Corps, in consultation with EPA and the District of Columbia, agreed to sample soil for arsenic on all 1,483 properties within the Spring Valley site, with more intensive sampling at selected properties located where historical documents indicated that chemical weapons testing may have occurred. This expanded sampling effort, begun in May 2001, was completed at 1,316 properties, as of April 2002. About 160 of these sampled properties will require some degree of cleanup. Currently, seven of these properties are identified for priority removals of arsenic-contaminated soil because they present relatively higher risks of exposure, according to the Corps. The priority removals are scheduled to begin by late June 2002. In addition, the Corps has sampled for additional chemicals in selected locations depending on information it has about what type of research activities

might have occurred at the locations in the past. The results of the sampling are currently under review, but preliminary results have not identified any additional chemicals of concern.

In May 2001, at the urging of the District of Columbia and EPA, the Corps began to investigate an additional burial pit on the property line between the South Korean property and the adjoining residence on Glenbrook Road. The Corps discovered this pit by conducting a number of exploratory excavations at the adjoining property to determine whether any additional buried ordnance might be present. The Corps is continuing to investigate the burial pit, and as of January 2002, had found 379 pieces of ordnance, 11 of which contained the chemical warfare agents mustard and lewisite; fragments of another 8 pieces of ordnance; 60 glass bottles and 3 cylinders, 24 of which contained mustard, lewisite, and acids; and 5 metal drums that showed signs of leakage.[11]

Concurrently with the efforts to expand the arsenic investigation, the Corps is planning to expand its efforts to survey properties for buried ordnance. EPA's Environmental Photographic Interpretation Center has reviewed archives and several additional aerial photographs of the area. This review and subsequent surveying activities performed by the Corps identified two properties on Sedgwick Street where buried metallic objects that could possibly be pieces of ordnance need to be excavated. The Corps plans to begin excavating these properties by September 2002. In addition, the Corps, in conjunction with EPA and the District of Columbia, is developing a list of properties to be geophysically surveyed for potential buried ordnance. Along with the results of the review performed by EPA's Environmental Photographic Interpretation Center, other site-specific information, such as the results of previous arsenic sampling and the extent of prior landscaping work, will be factored into determining priorities for surveying these additional sites. As of April 2002, the Corps had estimated that a total of 200 properties would be surveyed for ordnance. The government entities recognize that the extent that hazards remain may never be known with certainty due to the technical limitations associated with sampling and geophysically surveying soil.

[11]In January 2001, the Corps also removed oil filters, glass, and lab equipment, along with soil contaminated with elevated levels of lead and arsenic from a small surface disposal area discovered on American University property adjacent to the South Korean property. However, according to the Corps, it was not possible to determine whether these hazards resulted from past Defense research activities, or from another source.

Risks from Buried Hazards and from Arsenic-Contaminated Soil Drive Cleanup Decisions

At Spring Valley, as at other FUDS, cleanup decisions depend on the immediacy of the safety and human health risks presented. If disturbed, unexploded or leaking ordnance or containers filled with chemical warfare agent may present an immediate risk, and the partners have agreed to remove these hazards as soon as possible after their discovery. In contrast, exposure to arsenic-contaminated soil poses a long-term health risk and the partners have, in the past, disagreed about the level and extent of the risk at Spring Valley. Over the past year, the partners have been in the process of reaching agreement on the level of arsenic that may remain in the soil and that is protective of human health and the environment. The partners have agreed on a proposed cleanup level and are awaiting input from the Panel before finalizing the decision.

Ordnance Removal Generally Takes Priority Because of the Immediacy of Risk

Throughout the cleanup of the Spring Valley site, identification and removal of buried ordnance have been and continue to be the government entities' top priorities in terms of human health concerns and cleanup decisions. Because of the immediacy of the potential risk posed by human contact with ordnance, for example by the detonation of unexploded ordnance or skin exposure to a leaking container of a chemical warfare agent such as lewisite, the government entities agree that ordnance and containers must be removed as soon as possible after they are found to avoid the risk of immediate injury or death. Accordingly, since early on in the cleanup effort at Spring Valley, removal of buried ordnance has taken priority over other tasks. For example, shortly after the accidental discovery of buried ordnance in January 1993, the U.S. Army initiated an emergency response action to identify and remove ordnance buried at the site. Four weeks after that initial discovery, the U.S. Army had removed 141 pieces of ordnance, and the Corps, in conjunction with EPA and the District of Columbia, began its comprehensive investigation of the entire site, including soil sampling.

Arsenic-contaminated Soil Cleanup Depends on Ultimate Risk Determination

The partners also attempt to set priorities for cleaning up properties containing elevated levels of chemicals or metals in soil on the basis of the risk the hazards pose. As noted previously, after the Corps completed the emergency removal of ordnance in 1993, it began to sample soil for contamination. The Corps collected 260 soil samples from 15 locations, and with EPA, tested and analyzed the samples. No chemical warfare agents, explosives, or chemicals whose only source could be chemical warfare agents or explosives were found in any of the samples; however, several metals were identified at levels that exceeded EPA's standards. The Corps used EPA's criteria to assess the health risks associated with

these hazards to determine whether further sampling or soil removal was necessary. This assessment found no elevated health risk requiring remedial action. Arsenic was not identified as a contaminant of potential concern for the risk assessment, since, according to the Corps, the sampling results of the level of arsenic in the soil were not significantly different from naturally occurring levels. In commenting on a draft of this report, EPA noted that it was involved in the oversight of the cleanup and did not object to the decision made at the time.

Since early 1999, with the additional discovery of buried ordnance and elevated levels of arsenic-contaminated soil at the South Korean property, the levels of arsenic in soil have become the primary focus of soil cleanup efforts by the partners. Although many chemical agents were tested at Spring Valley during World War I, of those contaminants now present at elevated levels, arsenic is deemed to pose the greatest risk to human health and therefore is the contaminant of most concern to the partners. The partners recognize that arsenic exposure at certain doses in drinking water has been generally linked to cancers and other adverse health conditions.[12] Based on scientific studies, the District of Columbia has identified lung cancer, bladder cancer, and skin cancer as effects associated with the long-term ingestion of arsenic. However, the extent to which arsenic is present and residents are exposed through ingestion, inhalation, or external contact at Spring Valley is unknown. The District of Columbia has requested technical assistance from ATSDR, which has conducted an exposure investigation of residents who have high arsenic levels on their property. Through soil sampling, the partners have attempted to detect levels of arsenic in the soil to ascertain health risks and to set priorities for cleanup. The partners agree that soil containing elevated levels of arsenic poses a greater health risk than does soil with lesser levels of arsenic. As such, properties with greater levels of arsenic in soil generally have cleanup priority over properties with lesser levels of arsenic.

After the Corps tested and confirmed elevated arsenic soil levels at American University's Child Development Center, at the request of the District of Columbia, ATSDR conducted an exposure study to determine the extent of arsenic exposure in children and employees at the site. After

[12] For example, EPA recently established a more stringent standard for arsenic in drinking water. See U.S. General Accounting Office, *Environmental Protection Agency: Use of Precautionary Assumptions in Health Risk Assessments and Benefits Estimates*, GAO-01-55 (Washington, D.C.: Oct. 16, 2000).

testing hair samples, ATSDR concluded that the children and employees had had no significant exposure to arsenic. Spring Valley residents then requested comprehensive soil sampling, extending to every residence in the Spring Valley site. The Corps, in consultation with EPA and the District of Columbia, responded with a plan to sample for arsenic on every property in Spring Valley, with more intensive sampling in selected locations. Efforts are still underway to determine the extent of arsenic present at Spring Valley and the extent to which residents are likely to have been exposed to that risk. At the request of the District of Columbia, ATSDR is conducting another exposure study (biomonitoring), in which it is studying the level of arsenic present in biological samples from residents on Spring Valley properties with the highest levels of arsenic in the soil. The individual results from the biological samples collected during the exposure investigation were mailed to the residents May 16, 2002, and were reviewed and discussed by the Panel on May 29, 2002.

The District of Columbia has also conducted descriptive epidemiological studies in an attempt to assess the arsenic-related health effects in Spring Valley compared with two control groups. The studies examined the incidence of bladder, skin, lung, liver, and kidney cases. However, the number of cases of liver and kidney cancers at Spring Valley was too small to conduct a meaningful statistical analysis. Of bladder, skin, and lung cancers, however, the District of Columbia observed no excesses of cancer incidence and mortality in Spring Valley as compared to U.S. national rates, and one of these control groups.

Residents have raised concerns about the extent of the population studied and completeness of data used for these exposure and epidemiological studies. For example, some residents have voiced concerns that the full suite of hazards present at Spring Valley, even at trace levels, has not been factored into exposure and epidemiological studies and that arsenic is the sole hazard considered for exposure studies. The District of Columbia and the Corps have indicated that mustard agent was found in containers in the pit discovered at Glenbrook Road in May 2001. The District of Columbia's Department of Health does not plan to study exposure to mustard agent, however, because it did not identify a pathway of exposure to mustard agent that could produce a dose resulting in adverse human health effects. The District of Columbia's Department of Health has told Spring Valley residents that, if necessary, it will expand the investigation to hazards other than arsenic, if the hazard is found at levels of concern in Spring Valley.

As of April 2002, because of the safety risks associated with the ordnance burial pit on Glenbrook Road, the Corps had temporarily redirected other investigation and cleanup efforts, such as soil surveying and removal, to the removal of known buried ordnance. To identify other locations of potential remaining buried hazards, the Corps, after consulting with the partners, has proposed a classification scheme that attempts to prioritize the properties most likely at risk for the presence of hazards. The plan takes into account the results of preliminary arsenic sampling, aerial photography interpretation, and other characteristics. In conjunction with EPA and the District of Columbia, the Corps is developing a priority list of properties for additional geophysical surveys. Once comprehensive sampling is complete and soil removal commences, where necessary, arsenic in soil will be reduced to a cleanup level that is now being finalized by the partnership.

The partners gather feedback on health risks from residents in several ways and consider this information when making cleanup decisions. In the past year, a communication process has been put in place to address residents' concerns about the health risks associated with Spring Valley. The District of Columbia publishes a periodic newsletter that has included information from ATSDR and updates residents on the latest information regarding the District of Columbia's efforts to address the issues in Spring Valley, including the Scientific Advisory Panel meeting agenda. A hotline gives residents an opportunity to voice their concerns or share anecdotal information about exposure to hazards. Moreover, in November 2001, the District of Columbia and ATSDR conducted a focus group comprised of Spring Valley residents to, among other things, discuss community health concerns. The partners have also sponsored public meetings and distributed questionnaires. The District of Columbia has used anecdotal information from the residents about health effects they have experienced and compared that information to scientific literature concerning symptoms of certain cancers related to arsenic exposure.

The Corps' Estimated Cost and Cleanup Schedule May Change as More Information about the Site Is Known

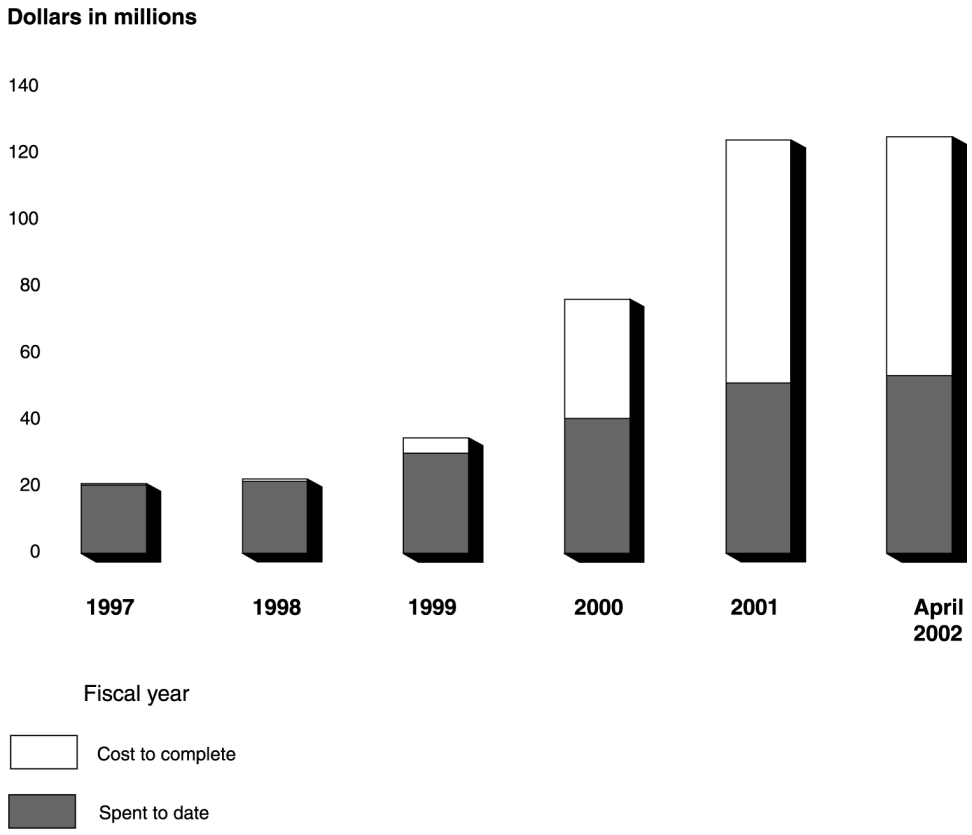
As of April 2002, the Corps estimated that the Spring Valley cleanup would cost another $71.7 million, including fiscal year 2002, and take 5 years beyond fiscal year 2002 to complete, but these estimates are uncertain. Factors, such as the potential discovery of additional hazards, make it inherently challenging for the Corps to estimate the cost for completing cleanup activities at the site, as evidenced by periodic estimated cost increases. Further, the Corps' estimated schedule for completing the cleanup necessarily depends on projections of available annual funding, which may be different from actual funding. Consequently, any significant increases in the estimated cost of completing the cleanup or decreases in the amount of available funding would likely require that the Corps extend the completion date for Spring Valley.

Estimated Cost to Clean up Spring Valley Has Increased by about Six Fold Since 1997

Under the environmental restoration program, the Secretary of Defense is required to report annually to the Congress on the progress the department has made in carrying out environmental restoration activities at military installations and FUDS. From fiscal years 1997 through 2001 (the most recent report available), the total estimated cost to clean up Spring Valley increased by about six fold, from about $21 million to about $124.1 million. In response to our request, the U.S. Army provided us with an update of the Corps' estimate, as of April 2002. The Corps had revised its estimate slightly to about $125.1 million, as shown in figure 3.[13]

[13] For this report, we focused on the revised cost figures that the Army provided to us in April 2002, as opposed to the figures reported in the fiscal year 2001 Defense Environmental Restoration Program report. According to the Corps, the revised figures more accurately reflect the costs incurred by the Corps through fiscal year 2001 and the Corps' estimate of the cost to complete cleanup activities at Spring Valley.

Figure 3: Total Estimated Cost to Clean up Spring Valley, Fiscal Years 1997 through 2001 and as of April 2002



Note: For April 2002, "spent to date" reflects the Corps' revised total of the dollars spent through the end of fiscal year 2001 (September 2001), whereas "cost to complete" reflects the Corps' revised estimate for fiscal years 2002 through 2007, as of April 2002.

Source: GAO's analysis of data from Defense's Defense Environmental Restoration Program annual reports to the Congress, fiscal years 1997 through 2001, and data from the Corps.

Costs have increased principally because the Corps needed to increase the scope of the remaining cleanup, as more information about the site became known (see table 1).

Table 1: Estimated Cost to Complete the Cleanup at Spring Valley, Fiscal Years 1997 through 2001 and as of April 2002

Dollars in millions

Year of estimate	Estimated cost to complete the clean up	Changes to scope of the cleanup
Fiscal year 1997	$0.5	The Corps discovered it had incorrectly identified one of the potentially hazardous locations it had previously investigated.
Fiscal year 1998	$0.6	The Corps surveyed two potential burial pits on the South Korean property.
Fiscal year 1999	$4.5	The Corps increased the scope to include removing buried ordnance and bottles of chemicals found on the South Korean property.
Fiscal year 2000	$35.8	The Corps increased the scope to include removing arsenic-contaminated soil from the South Korean property and two adjacent properties and subsequently expanding soil sampling efforts to about 60 nearby residences and the southern portion of the American University campus.
Fiscal year 2001	$72.9	The Corps increased the scope to include expanding sampling efforts to cover the entire Spring Valley site, surveying selected properties for buried ordnance, and completing additional work needed to remove buried hazards at one location.
April 2002	$71.7	The Corps lowered its fiscal year 2001 estimate as the preliminary results of the sitewide soil sampling yielded additional information about the extent of arsenic contamination.

Source: GAO's analysis of Defense's data.

As shown in table 2, the April 2002 estimate depends on assumptions the Corps has made about how many properties will require the removal of arsenic-contaminated soil and how many properties will need to be surveyed and excavated to remove possible buried hazards.

Table 2: Estimated Total Cost to Complete Cleanup Activities at Spring Valley, as of April 2002

Dollars in millions

Activities	Estimated cost
Ordnance removal and soil removal and restoration activities at the South Korean property and two adjacent properties	$13.1
Soil removal, landscape restoration, and other related activities at 11 properties subsequently found to have arsenic-contaminated soil	4.6
Soil removal, landscape restoration, and other related activities at an additional 150 properties estimated to have arsenic-contaminated soil	24.4
Soil excavation and restoration activities at 2 properties where buried metallic objects that could be pieces of ordnance were identified; subsurface soil survey, excavation, and restoration activities at another 200 properties estimated to contain such features; and other related activities	29.7
Total	**$71.7**

Note: Figures do not add to $71.7 million due to rounding.

Source: GAO's analysis of Defense's data.

Cost and Funding Uncertainties Suggest That Cleanup Schedule Could Change

Prior to fiscal year 2000, Defense's annual reports to the Congress did not provide any estimate of when the Corps planned to complete cleanup activities at Spring Valley. In Defense's fiscal year 2000 annual report to the Congress, the Corps estimated, for the first time, that it would complete such activities by the end of fiscal year 2012. However, as of April 2002, the Corps had moved up its estimate of the completion date by 5 years, to fiscal year 2007, even though it had doubled the estimated cost of the remaining cleanup.

As shown in table 3, the Corps plans to meet the shortened time frame by applying considerably more funding to the site in the near term.

Table 3: Levels of Annual Funding Specified in the Corps' Schedule for Completing Cleanup Work at Spring Valley, Fiscal Year 2000, Fiscal Year 2001, and as of April 2002

Dollars in millions

	Annual funding								
Year of estimate	Fiscal year 2001	Fiscal year 2002	Fiscal year 2003	Fiscal year 2004	Fiscal year 2005	Fiscal year 2006	Fiscal year 2007	Fiscal years 2008 to 2012	Total cost to complete the cleanup
Fiscal year 2000	$3.3	$2.5	$2.8	$2.5	$4.7	$7.4	$8.4	$4.2	**$35.8**[a]
Fiscal year 2001	10.7[b]	12.1	0[c]	1.2	2.4	2.4	1.8	53.1	**72.9**[d]
April 2002	12.9[e]	18.0 [f]	11.0	11.0	11.0	11.0	9.8	0	**71.7**[g]

[a]For the fiscal year 2000 estimate, the estimated total cost to complete the cleanup covers fiscal years 2001 through 2012.

[b]Figure denotes actual costs incurred during fiscal year 2001.

[c]According to the fiscal year 2001 Defense Environmental Restoration Program report, the U.S. Army planned to reprogram $11 million in funding not allocated to specific projects toward fiscal year 2003 costs and additional dollars in the outyears.

[d]For the fiscal year 2001 estimate, the estimated total cost to complete the cleanup covers fiscal years 2002 through 2012. Annual totals do not add to $72.9 million due to rounding.

[e]Figure denotes actual costs incurred during fiscal year 2001 as revised by the U.S. Army in April 2002.

[f]Includes a $5.2 million increase approved by the U.S. Army on April 9, 2002. According to the Corps, these funds were reprogrammed from possible use at other sites.

[g]For the April 2002 estimate, the estimated total cost to complete the cleanup covers fiscal years 2002 through 2007. Annual totals do not add to $71.7 million due to rounding.

Source: GAO's analysis of Defense's data.

However, the Corps may find it difficult to achieve its planned completion even if there are no further changes to the scope of work. As part of its April 2002 revised estimate, the Corps acknowledged that meeting the schedule would depend on the FUDS budget and the U.S. Army's ability to apply the specified funding to the Spring Valley site. In order to continue to meet these needs, the U.S. Army may have to reprogram funds from possible use at other sites nationwide in each of the remaining years of the cleanup. Furthermore, in fiscal year 2002, the Corps planned to allocate to Spring Valley about 8 percent of the national budget for FUDS—which has declined in recent years—and about 86 percent of the FUDS budget for the Baltimore District, which includes funding for FUDS in the District of Columbia and the states of Delaware, Maryland, New York, Pennsylvania, Virginia, and West Virginia. According to the U.S. Army, the provision of

funds for the Spring Valley cleanup is currently adversely affecting the availability of funding and progress at other sites.

As more information becomes available about the hazards at the site, the Corps will develop a clearer sense of how reliable its assumptions are on the extent of the hazards present and the cost of removing them. The Corps' experience with excavating buried hazards at two Glenbrook Road properties illustrates the difficulty of estimating the cost of removing buried hazards. In fiscal year 2002, the Corps determined that completing the removal would cost about $6 million more than anticipated at the end of fiscal year 2001. Furthermore, the Corps assumed that arsenic would remain the focus of its efforts to reduce the risks of exposure to contaminated soil, and based its cost estimate on the work needed to meet a proposed cleanup level for arsenic; as of April 2002, the partners had not finalized this level. As part of its expanded soil sampling efforts, the Corps could identify the presence of yet other chemicals and expand the scope of soil removal. Until more complete information is known about the actual types and extent of the hazards present throughout the site and the actual cost of removing them, the reliability of the Corps' estimate of the cost and schedule to complete the cleanup remains uncertain.

Observations

Uncertainties will continue to affect the progress of the Spring Valley cleanup. The unknowns are many: the potential that as-yet undiscovered hazards will come to light and expand the scope of necessary cleanup activities; the extent of soil removal or cleanup that will be needed, which depends, in part, on reaching final agreement on a cleanup level for arsenic in the soil; and the actual availability of funding for the site cleanup that the Corps has projected for future years. Further, these uncertainties are interdependent; for example, estimating the amounts of funding needed in future years requires some certainty about the scope of the cleanup—certainty that has proven to be elusive as additional hazards have been discovered in the past.

The Corps, EPA, and the District of Columbia have made progress by adopting a partnership approach to Spring Valley cleanup decisions. Importantly, they have established a systematic means of communicating information to, and receiving input from, the residents of Spring Valley and other interested members of the public. Progress depends on the continued effectiveness with which the government entities involved will sustain their partnership approach throughout the cleanup period. However, until some of the existing uncertainties are resolved, the government entities will not be able to provide the community with

definitive answers on any remaining health risks or the cost and duration of the cleanup.

Agency Comments

We provided the Department of Defense, Environmental Protection Agency, and the District of Columbia's Department of Health with a draft of this report for review and comment. These agencies generally agreed with the information presented in the draft. They provided a number of technical comments, which we incorporated in the report as appropriate. Defense stated that, while they agreed that there are some uncertainties associated with the Spring Valley cleanup, it is important to note that such unknowns are not unique to Spring Valley, and that every environmental cleanup involves a number of unknowns, regardless of the locale, type of contaminant, or specific entity executing the cleanup. In addition, Defense stated that the partnership formed has been a model for regulatory relationships at other site cleanups. EPA stated that our report develops an accurate and unbiased appraisal of the problems and uncertainties present at the Spring Valley site, and that our report presents the substantive historical facts of this very complex and challenging site cleanup. The District of Columbia's Department of Health stated that it is committed to continuing to work with the other governmental partners to establish and fully implement any action and/or remediation plan it determines is required to protect human health. The letters from these agencies are included in appendixes II through IV.

Scope and Methodology

We performed our review at the Corps' project office at the site, U.S. Army's and EPA's headquarters in Washington, D.C., and the District of Columbia's Department of Health in Washington, D.C. We reviewed statutes, regulations, and appropriate guidance, as well as interviewed government entity program officials to determine the relevant statutory framework. We interviewed officials at Defense and U.S. Army headquarters responsible for overseeing the FUDS program and budget. We interviewed officials at EPA headquarters, including those from the Office of Solid Waste and Emergency Response responsible for developing EPA's guidance for FUDS, and the Office of Enforcement and Compliance Assurance responsible for investigating matters relating to Spring Valley. Further, we interviewed regional and project officials of both federal agencies, as well as officials from the District of Columbia's Department of Health, to understand their roles as actually carried out at the site. We reviewed historical information and agency data, as well as interviewed appropriate officials to identify hazards found at the site and the progress made toward cleaning up the site. We reviewed descriptive

epidemiological studies conducted by the District of Columbia and interviewed Department of Health officials to understand risks associated with hazards at the site. We also attended Restoration Advisory Board and Scientific Advisory Panel meetings to gain an understanding of the perspectives of the various stakeholders. We reviewed cost, budget, and schedule data from the U.S. Army and the Corps and interviewed appropriate officials to determine how much the Corps had spent to date at the site and understand the Corps' estimate of how much it would cost and how long it would take to complete the cleanup.

We conducted our work from October 2001 through May 2002 in accordance with generally accepted government auditing standards.

As we agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution of it until 30 days from the date of this letter. We will then send copies to other interested parties and make copies available to others who request them. In addition, the report will be available at no charge at GAO's Web site at http:www.gao.gov.

If you or your staff has any questions about this report, please call Peg Reese or me at (202) 512-3841. Key contributors to this report are listed in appendix VI.

David G. Wood

David G. Wood
Director, Natural Resources
and Environment

Appendix I: Properties in the District of Columbia Where Hazards Resulting from Federal Activities Have Been Found

Table 4 contains summary data on 44 properties in the District of Columbia where hazards resulting from federal activities have been found, using Defense data as of March 2002 and EPA data as of April 2002. For each property, the data include the name of the property, the agency or agencies responsible for leaving the hazards, the past or current use of the property, and the hazards found. Most sites are active Department of Defense (Defense) installations or formerly used defense sites (FUDS). For an active Defense installation, the host military branch of the installation is responsible for the cleanup while the U.S. Army Corps of Engineers (the Corps) is responsible for the cleanup of all FUDS. In addition, there are six properties involving other federal agencies that are being addressed through the Environmental Protection Agency's environmental cleanup programs.

Table 4: Properties in the District of Columbia Where Hazards Resulting from Federal Activities Have Been Found

Name of property	Agency or agencies responsible for leaving the hazards	Past or current use of the property	Hazards found
Defense, active installations (8)			
Bolling Air Force Base[a]	U.S. Air Force	Active installation	Polychlorinated biphenyls (PCB); petro hydrocarbons; benzene, toluene, ethylbenzene, and xylenes (BTEX); semi-volatile organic compounds (SVOC); lindane; dichlorodiphenyltrichloroethane (DDT); and heavy metals
Fort McNair[a]	U.S. Army	Active installation	Lead, BTEX, and total petroleum hydrocarbons (TPH)
Naval Station–Anacostia	U.S. Navy	Active installation	Acid, heavy metals, and other chemicals
Naval Observatory	U.S. Navy	Active installation	Petroleum, oil, and lubricants
Naval Research Laboratory	U.S. Navy	Active installation	Hazardous, toxic, and radioactive waste
Naval Security Station[a]	U.S. Navy	Active installation	Hazardous, toxic, and radioactive waste
Walter Reed Army Medical Center[a]	U.S. Army	Active installation	Fuel oil
Washington Navy Yard[a]	U.S. Navy	Active installation	Heavy metals, chlorinated solvents, and PCB
Defense, FUDS (30)			
Anti-Aircraft Artillery Site–Fort Reno	U.S. Army	Civil War fortification and anti-aircraft site	Civil War-era ordnance and explosive waste
Barney Circle	U.S. Army Corps of Engineers and National Park Service	Landfill	Lead
Camp Simms Military Reservation	Department of Defense	Military installation–small arms range	Ordnance and explosive waste, and hazardous, toxic, and radioactive waste
Catholic University–Offense Research Station	U.S. Army	World War I munitions research laboratory	Ordnance and explosive waste

Name of property	Agency or agencies responsible for leaving the hazards	Past or current use of the property	Hazards found
Chain Bridge Batteries Complex	U.S. Army	Civil War fortification	Civil War-era ordnance and explosive waste
Diamond Ordnance Fuze Laboratories[a]	U.S. Army and Department of Commerce	Former location of the National Bureau of Standards' ordnance research and development activities	Ordnance and explosive waste
Fort Baker	U.S. Army	Civil War fortification	Civil War-era ordnance and explosive waste
Fort Bayard	U.S. Army	Civil War fortification	Civil War-era ordnance and explosive waste
Fort Bunker Hill	U.S. Army	Civil War fortification	Civil War-era ordnance and explosive waste
Fort Chaplin	U.S. Army	Civil War fortification	Civil War-era ordnance and explosive waste
Fort Davis	U.S. Army	Civil War fortification	Civil War-era ordnance and explosive waste
Fort DeRussy	U.S. Army	Civil War fortification	Civil War-era ordnance and explosive waste
Fort Dupont Park Site	U.S. Army	Civil War fortification	Civil War-era ordnance and explosive waste
Fort Greble	U.S. Army	Civil War fortification	Civil War-era ordnance and explosive waste
Fort Kearny	U.S. Army	Civil War fortification	Civil War-era ordnance and explosive waste
Fort Lincoln[a]	U.S. Army	Civil War fortification	Civil War-era ordnance and explosive waste
Fort Mahan	U.S. Army	Civil War fortification	Civil War-era ordnance and explosive waste
Fort Ricketts	U.S. Army	Civil War fortification	Civil War-era ordnance and explosive waste
Fort Slemmer	U.S. Army	Civil War fortification	Civil War-era ordnance and explosive waste
Fort Slocum	U.S. Army	Civil War fortification	Civil War-era ordnance and explosive waste
Fort Snyder	U.S. Army	Civil War fortification	Civil War-era ordnance and explosive waste
Fort Stanton	U.S. Army	Civil War fortification	Civil War-era ordnance and explosive waste
Fort Stevens	U.S. Army	Civil War fortification	Civil War-era ordnance and explosive waste
Fort Totten	U.S. Army	Civil War fortification	Civil War-era ordnance and explosive waste
Fort Wagner	U.S. Army	Civil War fortification	Civil War-era ordnance and explosive waste
Naval Station–Anacostia Annex	U.S. Navy	Ordnance research, barracks, school	Ordnance and explosive waste
Rock Creek Park Troop Housing	[b]	[b]	[b]

Name of property	Agency or agencies responsible for leaving the hazards	Past or current use of the property	Hazards found
Shepherd Parkway	[b]	[b]	[b]
Spring Valley	U.S. Army	World War I munitions testing area	Ordnance and explosive waste and arsenic in soil
Washington Navy Yard[a]	U.S. Navy	Naval shipbuilding and ordnance production	Hazardous, toxic, and radioactive waste
Other federal agencies (6)			
Kenilworth Park Landfill Site[a]	National Park Service	Former municipal dump	PCB and polynuclear hydrocarbons
National Park Service–Anacostia Park Sections E & F[a]	Not available	Not available	Not available
Southeast Federal Center[a]	U.S. Navy	Administrative offices and storage facilities, ordnance research and manufacturing, and shipbuilding	Solvents, PCB, polyaromatic hydrocarbons, and heavy metals (including lead, arsenic, and chromium)
St. Elizabeth's Hospital[a]	Not available	Former federally owned and operated mental institution sold to the District of Columbia	Polynuclear hydrocarbons, perchloroethylene (PCE), toluene, chromium, cadmium, mercury, cobalt, and DDT
U.S. Department of Agriculture–National Arboretum[a]	U.S. Department of Agriculture	Agricultural research facility	Organochlorine, insecticide, herbicide, fungicides, wood preservatives, and solvents
Washington Gas Light Site[a]	Federal property affected by contamination from a private property	Equipment storage area for the District of Columbia's Department of Public Works, river debris removal staging area, and recreational use	Coke breeze, benzene, xylenes, toluene, naphthalene, fat chemco, carboseal, petroleum by-products, and polynuclear hydrocarbons

[a]Also listed as a Comprehensive Environmental Response, Compensation, and Liability Act site.

[b]Defense was unable to provide information on the agency or agencies responsible for leaving any hazards, the past or current use of the property, or whether or not hazards had been found at the site.

Note: Table includes Defense active installations and FUDS listed as of March 2002 and properties involving other federal agencies as of April 2002.

Source: GAO's analysis of Defense's and EPA's data.

Table 5 contains data on 30 federal properties in the District of Columbia, on which remediation of leaking underground storage tanks was in process, as of January 2002, as well as the hazards found.

Table 5: Hazards Found at Leaking Underground Storage Tanks on Federal Properties in the District of Columbia Where Remediation Was in Process, as of January 2002

Federal property	Hazards found
Anacostia Naval Station–Building #353	Diesel fuel, gasoline, halogenated hydrocarbons, trichloropropane (TCP), and waste oil
Architect of the Capitol–Capitol Power Plant	Diesel fuel and heating oil
Architect of the Capitol–O'Neill House Office Building	Diesel fuel and gasoline
Architect of the Capitol–Rayburn House Office Building	Diesel fuel and gasoline
Architect of the Capitol–Senate Underground Garage	Diesel fuel and gasoline
Bolling Air Force Base	Diesel fuel and gasoline
Bolling Air Force Base–Army and Air Force Exchange Service's Service Station	Gasoline
Bolling Air Force Base–Car Care Center	Gasoline
Dalecarlia Water Treatment Plant	Heating oil
Edgewater Stable–U.S. Secret Service	Gasoline
Federal Triangle	Diesel fuel and gasoline
Former Architect of the Capitol Poplar Point Nursery	Gasoline
Fort McNair–Fitness Center	Heating oil and kerosene
Fort McNair–Gas Station	Gasoline, kerosene, and waste oil
Fort McNair–Parking Lot	Gasoline
Fort McNair–Quarters #20	Heating oil
The John F. Kennedy Center	Diesel fuel
National Park Service–1900 Anacostia Drive	Gasoline, heating oil, and waste oil
Naval Observatory–Building #52	Heating oil
Naval Observatory–Building #64	Gasoline
Park Police Anacostia Operation	Gasoline
Southeast Federal Center–Block H	Diesel fuel
Southeast Federal Center–Building #216, 2nd & M Sts., SE	Waste oil
U.S. Department of Agriculture National Arboretum–Building #014	Gasoline
U.S. Government Printing Office	Heating oil
U.S. Postal Service–Brightwood	Diesel fuel and gasoline
U.S. Postal Service–Vehicle Maintenance Facility	Diesel fuel, gasoline, and waste oil
Veterans Affairs Medical Center	Heating oil
Washington Navy Yard–Building #071	Diesel fuel, gasoline, and waste oil
Washington Navy Yard–Building #111	Heating oil

Note: Table excludes leaking underground storage tank cases where remediation was complete as of January 2002.

Source: GAO's analysis of the District of Columbia's data.

Appendix II: Comments from the Department of Defense

OFFICE OF THE UNDER SECRETARY OF DEFENSE

3000 DEFENSE PENTAGON
WASHINGTON DC 20301-3000

ACQUISITION AND TECHNOLOGY

MAY 20 2002

Mr. David G. Wood
Director,
Natural Resources and Environment
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Wood:

The Department of Defense (DoD) appreciates the opportunity to provide comments regarding the GAO draft report, GAO-02-556, 'ENVIRONMENTAL CONTAMINATION: Many Uncertainties Affect the Progress of the Spring Valley Cleanup', dated May 7, 2002 (GAO Code 360145).

The objectives and findings of the report focus on uncertainties at the Spring Valley site involving: 1) the extent of contamination remaining at Spring Valley; 2) the regulatory partnerships; 3) health risks from contaminated soils; and 4) funding, and the uncertainties impacts on the progress of cleanup. While we agree that there are some uncertainties associated with the Spring Valley cleanup, it is important to note that such unknowns are not unique to Spring Valley.

Every environmental cleanup involves a number of unknowns, regardless of the locale, type of contaminant, or specific entity executing the cleanup. The purpose of the site characterization process is to reduce the uncertainties associated with the nature and extent of contamination, risk to human health, and implementation of the appropriate response action. The site characterization process at Spring Valley has, in many respects, reduced many of these uncertainties, and the Army, with its regulatory partners, plans to continue to address each discovery in the same deliberative and responsive manner.

In addition, the cooperative relationship formed between the U.S. Environmental Protection Agency (EPA), the District of Columbia Department of Health (D.C. Health) and the Corps of Engineers has been, in our opinion, a model for regulatory relationships at other site cleanups. Each agency's dedicated commitment to the partnership, and participation in critical decisions throughout the cleanup process, is evidenced by the substantial progress made in addressing contamination arising from war preparation activities of almost a century ago. This collaboration, in contrast to enforcement, has resulted in a more timely and cost effective cleanup, and the Department has every reason to expect that this relationship will continue to be effective into the future.

In regard to funding, DoD has continually demonstrated a financial commitment to completing the cleanup at the Spring Valley site. Over the last ten years, and at the expense of other cleanups, the Army has allocated over $50 million to the cleanup of Spring Valley and, at the behest of stakeholders, will reprioritize another $70 million to complete the cleanup at this site.

The protection of human health and the environment is critical, and DoD will continue to work in partnership with EPA and the D.C. Health to ensure that the health and safety of the residents are protected, and that sufficient resources are made available. Our attached comments reflect this position.

My point of contact on this matter, Mr. Kurt Kratz (703) 697-5372, is available to discuss our responses to findings and additional comments provided on this document.

Sincerely,

Raymond F. DuBois, Jr.
Deputy Under Secretary of Defense
(Installations and Environment)

Enclosure

Appendix III: Comments from the Environmental Protection Agency

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

MAY 20 2002

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

David G. Wood
Director
Natural Resources and Environment
United States General Accounting Office (GAO)
Washington, DC 20548

Dear Mr. Wood:

Thank you for the opportunity to review and comment on the May 7, 2002, draft report entitled "Environmental Contamination - Many Uncertainties Affect the Progress of the Spring Valley Cleanup" (GAO-02-556). This letter transmits our comments on the draft report.

EPA believes the report has done an excellent job presenting the substantive historical facts of this very complex and challenging site cleanup. EPA appreciates the substantial effort made by the GAO in developing an accurate and unbiased appraisal of the problems and uncertainties present at the Spring Valley Site. However, there are several issues raised during our conference call on Monday, April 29 that were not addressed in the draft report. These concerns are the references to and the description of the relationship between the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), the Superfund Amendments and Reauthorization Act of 1986 (SARA) and the Defense Environmental Restoration Program (DERP). There are also some statements attributed to EPA that are inconsistent with our policy on privately-owned Formerly Used Defense Sites (FUDS). We hope these comments will be considered during your revision of the draft report.

All comments included in the enclosure are intended to improve the accuracy of the draft report. If you have any questions about these comments, please contact Renee Wynn, of my staff, at (202) 260-8366 or Hank Sokolowski, Region 3, at (215) 814-3348.

Sincerely,

Marianne Lamont Horinko
Assistant Administrator

Enclosure

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Appendix IV: Comments from the District of Columbia's Department of Health

Government of the District of Columbia
Department of Health

Office of the Senior Deputy Director
for Public Health Assurance

May 17, 2002

Mr. David G. Wood, Director
Natural Resources and Environment
United States General Accounting Office
Washington, DC 20548

Dear Mr. Wood:

The DC Department of Health (DOH) has received a draft copy from the United States Government Accounting Office (GAO) of the proposed report entitled "Environmental Contamination: Many Uncertainties Affect the Progress of the Spring Valley Cleanup" (GAO-02-556). The DOH's written comments were transmitted to you during our meeting with the GAO on April 26, 2002 and many have been included in your draft report.

The DOH has received additional information since our meeting on April 26th, regarding the collaborative investigation with the Agency For Toxic Substances and Disease Registry (ATSDR) that has been conducted with the participation of Spring Valley residents. The results of the Phase I exposure investigation suggest that arsenic contamination on properties in Spring Valley has not resulted in significant exposure by the residents. The interpretation is based on biological samples (urine, hair) collected from Spring Valley residents with the highest soil levels of arsenic on their properties. The results from the Phase I exposure investigation will be helpful as part of the ongoing assessment of Spring Valley residents by the DOH.

The District is committed to continuing to work with the other governmental partners to establish and fully implement any action and/or remediation plan it determines is required to protect human health. Using its available scientific resources and information, its monitoring and enforcement capabilities and authority, the District is confident that the objective of ensuring a timely response to protect human health will be achieved.

825 North Capitol Street, NE, 4th Floor, Washington, DC 20002 Tel: 202-442-8982 Fax: 202-442-4886

- 2 -

We appreciate the inclusion of our remarks in your report and the opportunity to comment on the initial draft.

Sincerely,

Theodore J. Gordon
Senior Deputy Director
for Public Health Assurance

cc: James Buford, Interim Director, DOH

825 North Capitol Street, NE, 4th Floor, Washington, DC 20002 Tel: 202-442-8982 Fax: 202-442-4886

Appendix V: GAO Contacts and Staff Acknowledgments

GAO Contacts

David G. Wood (202) 512-3841
Peg Reese (202) 512-9695

Acknowledgments

In addition to those named above, Ridge Bowman, Stephen Cleary, Margaret McDavid, and Carol Herrnstadt Shulman made key contributions to this report.

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