Final Report

A Brief History of the *American University Experiment Station* and *U.S. Navy Bomb Disposal School, American University*

Prepared under the
Defense Environmental Restoration Program
for
U.S. Army Engineer District, Baltimore

by
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Office of History
Headquarters, U.S. Army Corps of Engineers
June 1994

American University
Experiment Station

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American University

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The historical research project had three objectives. The first was to assist the Baltimore District, U.S. Army Corps of Engineers, in their on-site search for chemical and ordnance contaminants that the Bureau of Mines and the military might have left behind following their work at American University and the surrounding area during and immediately after World Wars I and II. That search and restoration effort is known as Operation Safe Removal. The second was to establish an information repository based on the documents submitted to the Baltimore District and supplemented as needed. The third was to produce this report, summarizing the information contained in the research in narrative form.

Brief Description

This report is both a brief history of military uses of the site and their impact (if any) on the community and, through the notes, a guide to the types and locations of documentation available. Researchers used a wide variety of sources, ranging from local real estate records to technical reports of research done at the American University Experiment Station in 1917-1918 that are now stored in the Fisher Library of the U.S. Army Chemical School at Fort McClellan, Alabama.

The research team, coordinated by the principal investigator, was structured so that each person worked in areas of his or her expertise and past experience. One historian specialized in land and municipal records, newspapers, and anecdotal research. A second concentrated on official records of Army and Bureau of Mines activities during World War I. A third studied the Navy's use of the American University campus in World War II. The organization of this report reflects that division of labor.

The report traces activities on the land from colonial days to the present. Tax assessment records show that the Government's activities did not decrease property values in the areas adjacent to American University. The report also shows what the Bureau of Mines and the Army did at the Experiment Station, where World War I chemical warfare activities were centered. Likewise, the Corps of Engineers' use of the adjacent Camp American University, later renamed Camp Leach, are covered insofar as they relate to the overall use of the land in and around the university. Finally, the report explains the Navy's use of the site in World War II.

Summary of Findings

- The Bureau of Mines was involved from the beginning of war gas investigations, acting on its own initiative as well as following Army and Navy requests, until President Woodrow Wilson turned control over to the Army's Office of Gas Service on June 25, 1918.

- Research and testing left three principal categories of potential contamination sites on the American University campus and in surrounding areas: permanent structures the Government left after the war; sites of temporary warehouse, testing, and laboratory facilities destroyed or removed by agreement with the university's board of trustees; and open areas where field tests were conducted.

- The Government's use of the land during World War I had no discernible effect on property values around American University during the period when its activities might have been known.

- The U.S. Navy's use of part of the American University campus during World War II involved chemicals in its research program.

Introduction

Project Objectives, Scope, and Methodology

The historical research project had three objectives.

The first was to assist the Baltimore District, U.S. Army Corps of Engineers, in their on-site search for chemical and ordnance contaminants that the Bureau of Mines and the military might have left behind following their work at American University and the surrounding area during and immediately after World Wars I and II. That search and restoration effort is known as Operation Safe Removal. The requirement established priorities for examining records, including cartographic and photographic documents.

The second was to establish an information repository. Thus, copies of all relevant documents found during the search were deposited at a repository created at Baltimore District's Spring Valley area office. Each document or group of documents was carefully marked to indicate its source. The only exception to the policy of making copies was for the 42 linear feet and 33 record center boxes of research reports, summaries, and histories at the Fisher Library of the U.S. Army Chemical School at Fort McClellan, Alabama. Although copies of selected documents were made there and sent to the depository, a dBASE IV inventory of all the reports was compiled rather than copying the estimated 10,000 reports in that collection. Because of the large number of repetitive reports, they were analyzed for several categories of the tests and organized so that the dBASE IV

inventory could serve as an index. Using the index, a person can request a copy of a specific report from the Fisher Library.

The third was to produce this report, summarizing the information contained in the research in narrative form. The report is both a brief history of military uses of the site and, through the notes, a guide to the types and locations of documentation available.

The scope of the historical effort was comprehensive. The goal was to ensure that all possible sources in the community as well as in municipal and Federal archives were examined for information or leads about the location of chemical and ordnance contaminants at the site. Historians sought and examined anecdotal evidence as seriously as they did traditional sources.

The research team was structured so that each person worked in areas of his or her expertise and past experience. The overall methodology emphasized oral history, iconographic and cartographic research, and the development of an electronic index based on source analysis, along with traditional documentary analysis.

A Corps of Engineers staff historian, Dr. Martin K. Gordon, who had been involved for several years in the study of Defense Environmental Restoration Program (DERP) sites and of Army record-keeping practices, oversaw the efforts of three other experienced historians.

Dr. Barry R. Sude, with experience in research into DERP sites, examined Federal textual and cartographic records at National Archives and Records Administration facilities in the Washington, D.C., area. His focus was on leases, boundaries, construction, operations, and the closing of the installation after World War I. Dr. Sude examined 2,049 archives boxes of Federal records as listed in Appendix B. He worked in close cooperation with the staff archivists at the National Archives.

Ms. Ruth Ann Overbeck, with substantial experience in researching and writing reports about sites in the District of Columbia, focused on local history, oral history, newspapers, and municipal research. She traced the history of changes

to the land (a knowledge of which would assist the cleanup), boundaries, and patterns in ownership and property values that would show the installation's impact on the community. Ms. Overbeck also helped determine Federal activities there. Appendix A summarizes the local, municipal, and related Federal records she researched.

Dr. Charles Hendricks, a staff historian with experience in military history, studied the Navy's use of the American University campus in World War II. He visited the Naval Historical Center, interviewed participants in the Navy's program at American University, and used an unofficial history of the program. Appendix C summarizes those sources.

The authors acknowledge the advice and assistance of Mark Baker of the Baltimore District, Jeffery K. Smart of the Chemical Biological Defense Command, and Dr. Daniel E. Spector of the U.S. Army Chemical School.

Summary of Previous Studies

The researchers considered three previous research efforts: research at and by American University during the mid-1980s; the 1986 report by the then U.S. Army Toxic and Hazardous Materials Agency (USATHAMA), done at the request of American University; and the work of Mr. Jeffery K. Smart, the Chemical Biological Defense Command historian, during Phase I of the efforts at the site in early 1993.

On March 11, 1993, Ms. Overbeck and Drs. Gordon and Sude participated in an on-site meeting that included representatives of USATHAMA, American University, and the Environmental Protection Agency to review their earlier studies. Dr. Gordon had also attended an earlier meeting at the Topographic Engineering Center with Mr. George D. Arnold from American University, who had written on the military history of the university. Copies of the research done were distributed at those meetings. All the documents and histories distributed were read by the historians. Newspaper accounts were of particular interest and were used to guide researchers to additional newspapers.

The USATHAMA study incorporated materials from American University and concluded that there was no evidence to confirm rumored large-scale burials of munitions. But it "did highlight two sites that would be likely candidate locations if burial *had* occurred. Although instances of small scale burial at American University were not documented *per se*, a prudent assumption would have been that such disposal did indeed occur, but with a frequency and location(s) that would be impossible to determine."[1]

Mr. Smart prepared several memorandums that were useful in the Corps of Engineers' search. They listed chemicals used at the site and suggested additional research possibilities.[2]

Overview of Sources

Record Group 175

As the American University Experiment Station was phased out, its records were transferred to the new Edgewood Arsenal, Maryland. At some point, the Experiment Station's administrative records were transferred ultimately to the National Archives, where they exist in Record Group 175, Records of the Chemical Warfare Service, although some might have been destroyed in the process (decimals 410–499, operations records, in Record Group 92, Records of the Office of the Quartermaster General, were definitely destroyed several years ago).

The research reports generated at the Experiment Station and its satellites were sent to the U.S. Army Military History Institute at Carlisle Barracks, Pennsylvania. Between August and October 1988, 8,000 pounds of records and packing material were sent from the Military History Institute to the Fisher Library.

In January 1993, the Military History Institute transferred its five remaining record center boxes of related records to the Office of History, Corps of Engineers, where they were evaluated and then transferred to the Fisher Library

for inclusion in the larger collection. Those records, consisting of approximately 10,000 reports, were sorted by geographic area and yielded 42 linear feet and 33 record center boxes of research reports, summaries, and histories related to research and testing at the Experiment Station. Less than four record center boxes full had remained classified, and they were declassified for this project. That sort yielded a report submitted in dBASE IV format on disks and searchable under several major fields. The guide to that database is in Appendix D.

In addition, more than 3,000 photographs of the activities of the Bureau of Mines and of the Chemical Warfare Service were screened, and copies of selected images were made for the research files at the Spring Valley area office.

Other Records

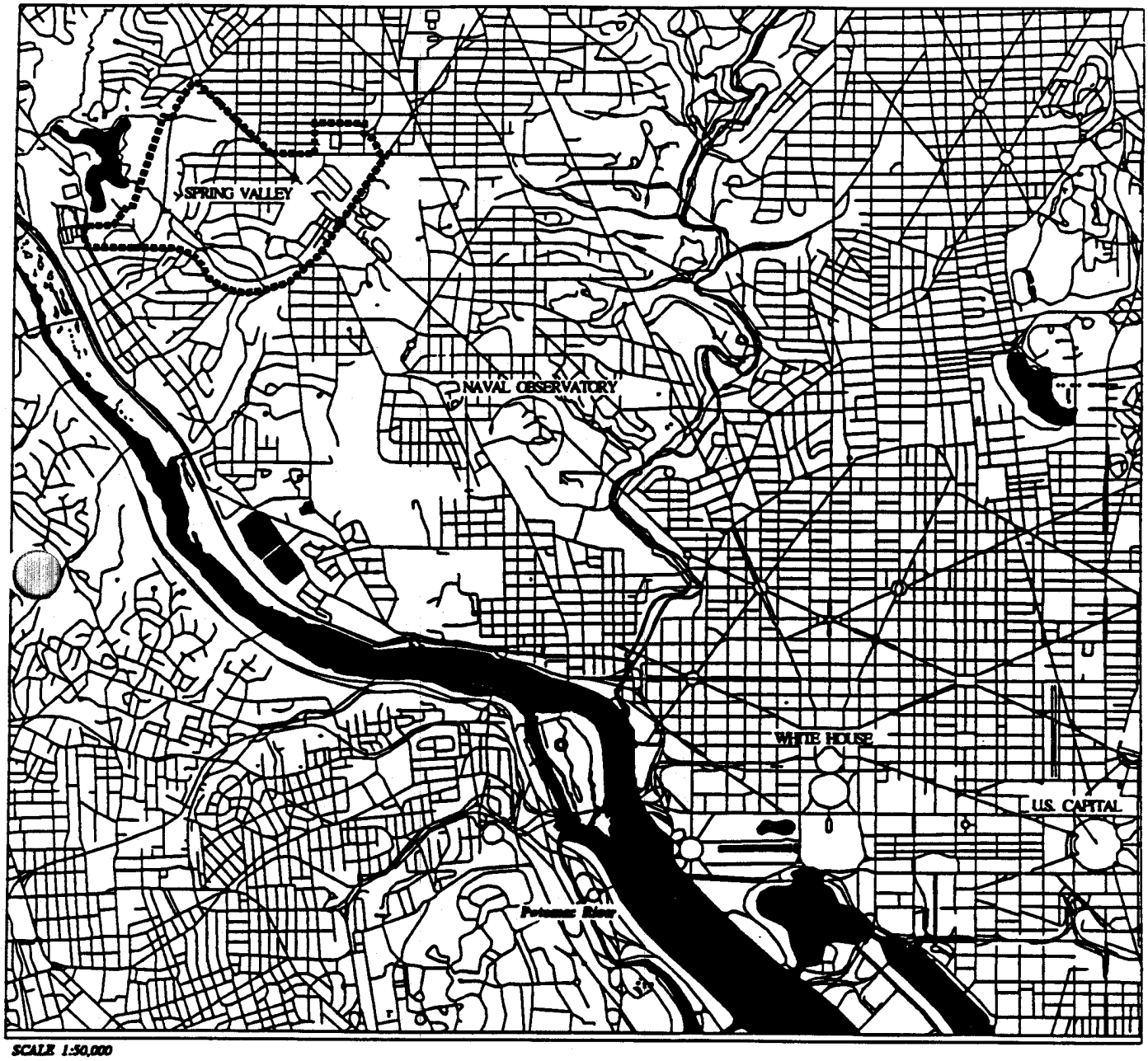
Besides Record Group 175, other record groups were examined at the National Archives in accordance with the Office of History's standard search pattern for DERP sites and with the advice of National Archives staff.

Local records examined included newspapers and ephemera at the Martin Luther King Jr. Public Library. Municipal records such as fire department files, utility permits for digging, and other permit files showed disturbances to the land.

The Historical Division of the Chemical Biological Defense Command, Aberdeen Proving Ground, Maryland, holds approximately 14 linear feet of technical reports and histories related to work at American University. Dr. Lawrence C. Smith of the Engineer Strategic Studies Center conducted research in that collection on March 10–12. He compiled a list of documents of interest, copied extracts, and requested photographs that were then included in the larger research effort.

Thus, the research effort included records held in the National Archives, Army historical and library collections, and municipal sources. The team used those documents to reconstruct activities at the Experiment Station from both local and national perspectives.

SPRING VALLEY PROJECT LOCATION



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History of Land Use

1713–1790

Most of the area of interest to Operation Safe Removal derives from the early colonial land patent known as Friendship, which was patented in 1713. By 1783, the patent had been divided, and Colonel John Murdock, with 1,562 acres, was the largest landowner in the area. The colonel built the area's first substantial country home and planted tobacco as his primary cash crop. More than two-thirds of his land lay fallow, the rest divided between improved farmland and meadows. While other landowners in the area had less land than Murdock, the essentials of their agrarian lifestyles were the same.[3]

1790–1860

On July 16, 1790, Congress authorized the establishment of the permanent seat of the Federal Government. When the District of Columbia was created on paper, the land in the corner formed by its western boundary and the Maryland bank of the Potomac River was still sparsely settled and still in the hands of farmers. To mark the division between the Federal District and Maryland, a series of shaped and inscribed stones was laid at one-mile intervals along the surveyed boundary. Two stones, designated Northwest No. 4 and Northwest No. 5, stand within the Dalecarlia Reservoir grounds.[4]

Except for farm use, few people were interested in the area until the beginning of the Civil War. The Federal Government, however, considered purchasing two tracts in the area and actually acquired one of them. Under the leadership of Montgomery C. Meigs, then a relatively junior officer, the U.S. Army Corps of Engineers developed a water system for the District during the 1850s. The Dalecarlia Reservoir was incorporated into that system and occupies part of the extensive acreage dedicated to it. Also, about 1850, the U.S. Government considered but rejected the area surrounding what is now the Friendship Recreation Center in American University Park as the site of the Soldiers' Home.[5]

The Civil War (1860–1865)

The Civil War disrupted farm life in the area. At least part of the impact can be attributed to the ring of fortifications that was built around the perimeter of the District of Columbia. The fortifications were the last line of defense for the capital if Confederates attempted a direct assault. Also at issue in the study area was the protection of two specific targets: the District's water supply and Chain Bridge, by which Confederates invading from Virginia could cross the Potomac River. Battery Vermont was the northernmost D.C. outpost overlooking the Potomac, and it was near the intersection of Little Falls Road and Conduit Road (now MacArthur Boulevard), approximately 100 yards from the present Operation Safe Removal trailer installation. Fort Gaines, a small fort near the present site of the Friendship Recreation Center, was also in the study area, while Battery Kemble was slightly to the south.

1865–1917

Following the Civil War, some of the farms were subdivided. For example, Alexander H. Loughborough, whose ancestors lived close to the Fort Gaines site, first sold a one-acre tract to a former slave. He then subdivided the balance of the tract into 11 parcels. At the same time that farm families were dividing their properties into smaller increments for resale, large-scale speculators and

developers were looking more closely at land in the rural parts of the District of Columbia. Full development northward to the District line took another 100 years to complete. By the mid-1890s Thomas E. Waggaman had platted the Wesley Heights subdivision, and in 1897 developers had progressed far enough with construction in American University Heights and American University Park to publish an elaborate promotional booklet. In addition, Charles C. Glover, real estate entrepreneur and president of Riggs National Bank, had begun to amass land in northwest Washington.[6]

1890s Institutions

In the 1890s, two large tracts of land were set aside for eleemosynary use. The Methodists bought 90 acres of what was known as the Davis farm and began construction of American University. The tract included the site of Fort Gaines. When the United States entered World War I in 1917, American University was still struggling to become a full-fledged university; in fact, it held its first graduation ceremony that year.[7] Because of the prominent role the university played in World Wars I and II, its history is treated more fully in the "Site Reuse in Peacetime" section of this report.

Also during the 1890s, a portion of the Federal reservation dedicated to the Dalecarlia Reservoir was set aside as the site for the National Training School for Girls. The school's buildings occupied the site where Sibley Memorial Hospital now stands, but its farmland extended above Little Falls Road well into the Dalecarlia Reservoir area. The institution's name appears in many variations, some of which insert the word "Negro" between "for" and "Girls." In 1912, Congress authorized expenditures for a cottage for "white girls" to be built at the previously segregated institution. During World War I, the first white girls were admitted to the institution, but its dominant population remained girls of African-American descent.[8]

World War I

At the start of World War I, the Dalecarlia Reservoir and surrounding Federal reservation, the National Training School for Girls, farms, and the beginnings of scattered suburban development accounted for the land use north of Loughborough Road and surrounding the American University campus. Public utilities and other urban amenities were scarce in the area. The city's water supply to the area was adequate for the small peacetime population but inadequate for the wartime expansion. When the military arrived at the campus, the university's 3-inch water main tapped into the District's 6-inch main that traveled along Nebraska Avenue. The Nebraska Avenue main served the houses along its route from a larger main at Wisconsin Avenue before it reached the university. Both volume and pressure were minimal.[9]

The nearest hard-surfaced road was 1.6 miles away, and local roads were macadamized at best.[10] Civilians and military personnel quickly realized that the quality of the roads was inadequate and that even the prewar quality could not be sustained. In the summer of 1917, one of the first problems the military noted with the roads was that they contained low spots that served as breeding places for mosquitoes. Within two weeks of receiving the military's complaint, the city responded to the Army that the problem areas had been filled or drained as needed.[11]

On a much larger scale, deterioration of the roads from the estimated 230 tons of traffic that the military generated daily spurred a vigorous correspondence between the Army and the D.C. Engineering Department. The city's water supply system also proved woefully inadequate to the demands of the camps.[12]

When the District stated that it could not undertake roadwork in the area in a timely manner, the Army proposed an alternative. It requested that road and bridge construction battalions of the Army's 42d and 43d Engineers be allowed to practice their techniques on the unimproved stretch of Massachusetts Avenue between Nebraska and Wisconsin Avenues. In the spring of 1918 the Army obtained permission to use the city's asphalt mixing plant to prepare paving for "Camp American University" roads and a portion of Massachusetts Avenue. The Army not only paid for materials used, but for associated costs, including utility

bills incurred during the operation of the plant and the salary of the District's representative who was on the ground while the plant was in the hands of the military.

That upgrading sufficed at least temporarily for a part of Massachusetts Avenue, but left other parts in an unstable condition. On September 9, 1918, Major General William L. Sibert, Director of the Chemical Warfare Service, wrote to the D.C. Engineers' Commission to request a concrete surface for 1.6 miles of roadway. The city's superintendent of suburban roads replied that the roadway in question, which was macadamized, was in "serviceable though rough" condition. He further stated that such a condition was all that was practicable or necessary during the war. When Sibert pushed the issue, the Engineering Department stated that funds were not available for paving with concrete but committed the District to maintaining Massachusetts Avenue in adequate repair during the winter.[13]

Residents of the area remained in place throughout the war, with no known cases of relocation, voluntary or otherwise.[14] Lessors of the American University Experiment Station and Camp Leach were for the most part well-connected, affluent Washington businessmen who lived elsewhere. Charles C. Glover, whose home was located just below Nebraska Avenue and east of Massachusetts Avenue, lived nearer the campus than most of the lessors. The Misses Patton, whose farm was leased as part of the Camp Leach operations, and Mrs. H. C. Corbin were among the women lessors.[15]

U.S. entry into World War I diminished speculative interest in the area surrounding Camp American University (later renamed Camp Leach) but also provided opportunities for the enterprising. One nearby resident, a Mr. Bird, took advantage of his proximity to the camps and opened a barber shop. Government officials took two months to grant Bird's request for a temporary sewer hookup.[16]

On the other hand, the military's need for improved water service went unfilled throughout World War I. The Army urged upgrading to a 12-inch main and even testified to that effect before Congress. When the new service finally became operational on June 30, 1926, it was a 16-inch main.[17]

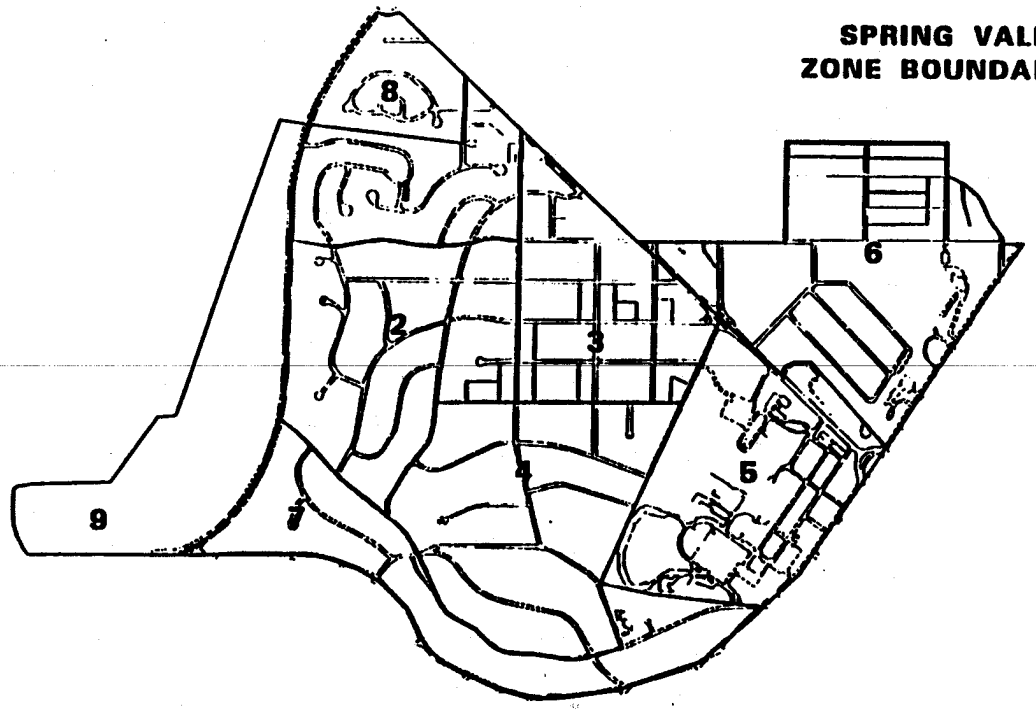
Other entrepreneurs installed a gasoline service station on Massachusetts Avenue. At least one billboard offering subdivision lots remained in place after the war began. Whether the heavy wartime traffic along the route benefited the developer is unknown.[18]

Except for some adjustments to accommodate the rigors of wartime, civilian lifestyles near the Army camp continued much as before the war. Staff and residents of the National Training School for Girls increased their farming activities because of the manpower shortage. They participated more actively in planting, tending, and reaping the crops, and they increased both the amount of crops produced and the amount of food they canned and preserved.[19]

Of potentially more serious import, former U.S. Senator Nathan B. Scott, his wife, and his sister were "gassed" by a "cloud" that escaped from the Experiment Station on August 3, 1918. The cloud resulted from an explosion of lab apparatus in the station's Manufacturing Shack No. 8, and it traveled southeast.[20]

At the time, the Scotts were occupying their "sometime residence" on Ridge Road across Nebraska Avenue from the Experiment Station. While Mrs. Scott stated that the trio was "slightly gassed," the Senator complained vigorously. Both he and his sister received medical treatment by the Experiment Station's doctor and at a local hospital. Others in the vicinity reported that they had noted the presence of the gas but had suffered no ill affects. Local press coverage, however, reflected the Senator's alarm.[21]

On October 30, 1918, the D.C. Board of Commissioners requested that tests be moved away from the Experiment Station. The board cited both the fact that the Senator had been "disagreeably affected" and that an unidentified party of motorists in the area had noticed that the air was tainted by gases. The Secretary of War wrote in response that work at the Experiment Station was confined to research problems and that larger experiments were being conducted at Lakehurst, New Jersey, and other proving grounds.[22]



Reasons for Inclusion in FUDS Determination

Zone 1 – 52nd Court, Points of Interest, historical lease references and maps
Zone 2 – Points of Interest, historical lease references and maps
Zone 3 – Points of Interest, historical maps
Zone 4 – Points of Interest, historical lease references and maps
Zone 5 – Points of Interest, historical lease references and maps
Zone 6 – Points of Interest, historical lease references and maps
Zone 7 – Historical lease references and maps
Zone 8 – Historical maps, Points of Interest, Proximity to 52nd Court
Zone 9 – Historical lease references and maps

World War I Years

American University Experiment Station

On April 30, 1917, in a letter addressed to President Woodrow Wilson, American University's board of trustees offered the U.S. Government the use of the university's campus and buildings in support of the war effort against Germany. The Secretary of War referred the offer to Major General William M. Black, Chief of Engineers, U.S. Army Corps of Engineers, for an opinion. Well aware of the need for additional engineer training facilities in the Washington area, Black recommended accepting the offer. The Secretary of War agreed and issued an order giving the Corps of Engineers exclusive control over the university's grounds and buildings. Following discussions with the university's board of trustees, the Corps of Engineers formally took control of the American University campus and facilities.[23]

American University consisted of the College of History Building and the uncompleted McKinley Memorial Ohio College of Government on 91 acres at the intersection of Massachusetts and Nebraska Avenues. The relatively isolated site was accessible by a local macadamized road (Massachusetts Avenue) and an electric car line running along that road. The site had access to city water and sewer lines and was surrounded by largely undeveloped properties.[24]

On May 28, two months before the Experiment Station was established, the Corps of Engineers established Camp American University on a portion of the property as the site for the organization and training of the 6th Engineer Regiment. Almost immediately thereafter, Camp American University was also designated

as a training school for engineer officers. The College of History Building was converted into a dormitory and office facility. In 1918, Camp American University was renamed Camp Leach to eliminate the growing confusion with the similarly named American University Experiment Station.[25]

In the following months, numerous engineer units were organized and trained at Camp American University, among them the 30th Engineer Regiment, which was later to become the 1st Gas and Flame Regiment; the 20th Forestry Regiment; the 40th Camouflage Regiment; the 1st and 10th Training and Replacement Regiments; the 78th and 79th General Construction Regiments; the 97th Supply Regiment; the 98th Roads Regiment; the 477th Depot Regiment; and the 29th, 38th, 76th, and 77th Regiments.[26]

The Mission and Bureau of Mines Involvement

Secretary of the Interior Franklin K. Lane and his staff recognized early in 1917 that the United States almost certainly would soon be drawn into the war in Europe, and he directed the Bureau of Mines to determine how the Bureau could assist the Government in the event war did break out. At a meeting on February 7, Van H. Manning, Director of the Bureau of Mines, and his principal assistants concluded that the Bureau, which had extensive experience with noxious mine gases and rescue equipment, could best serve the war effort through a large-scale investigation into the discovery, manufacture, and use of noxious gases in warfare as well as the development of effective gas masks.

Later that month, Manning brought to the attention of the War Department the Bureau of Mines' extensive studies into noxious and explosive mine gases, the use of rescue equipment and gas masks, and the methods for treating miners exposed to these gases. He offered the Bureau's facilities for further research in these areas, and a meeting was arranged between Bureau personnel and representatives of the Army War College. On the recommendation of the War College staff, the War Department accepted Manning's offer. Under the authority of the Noxious Gases Subcommittee of the Military Committee of the National Research Council, the Bureau of Mines proceeded to research methods for producing more efficient gas masks, as well as other, then-classified projects related to the development,

testing, and manufacture of toxic gases, toxic and incendiary munitions, defensive and offensive smoke mixtures, and signal flares.[27]

The Bureau of Mines carried out its initial research at its own limited facilities and at various university and industrial laboratories throughout the country. The entry of the United States into the war in Europe, however, spurred an enormous growth in the Bureau's chemical warfare research workload. Manning and his colleagues needed a large, centrally located laboratory where the Bureau could coordinate ongoing research at its various facilities and undertake various secret gas warfare investigations for the Army and Navy. After a thorough review of available sites in the Washington, D.C., area, Delaware, and New Jersey, they concluded that facilities and grounds at American University not currently being used by the Corps of Engineers were best suited to the Bureau's requirements.[28]

The Bureau aimed to establish a large-scale chemical warfare research center at American University with laboratories, test sites, and other facilities for studying the various chemical, physiological, and mechanical aspects of gas warfare.[29]

To facilitate this research, the Departments of the Army and Navy agreed in June 1917 to provide the Bureau with $175,000 to convert classrooms in the McKinley Memorial Ohio College of Government into laboratories and to hire additional chemists. On July 21, the Bureau officially established the American University Experiment Station under the direction of George A. Burrell, and the following months saw feverish construction activity at the site. The Bureau's research program was too urgent, however, to wait for completion of the required facilities. By September, Bureau chemists had set up their equipment in half-finished laboratories and begun their work.[30]

In their respective capacities as Director of the Bureau of Mines and Chief of the Experiment Station, Manning and Burrell organized and directed the approximately 600 Experiment Station chemists, chemical engineers, and mechanical engineers who were responsible for investigating the various chemical, manufacturing, pyrotechnic, mechanical, pathological, pharmacological, and other problems associated with gas warfare. The Chemical Research Division (Offense) worked on the development of new toxic substances, developed manufacturing methods for toxic substances of proven efficiency,

developed materials for use in incendiary and smoke weapons, and researched inorganic chemical problems. The Chemical Research Division (Defense) concentrated on four main problem areas: the absorption of toxic gases, the removal of toxic and irritating smokes from the air, defensive smoke production, and gas mask vision problems.

The Small-Scale Manufacturing Division (Offense) was responsible for developing methods and procedures for the production of toxic gases and chemicals, while the Manufacturing Development Division developed protective equipment against poisonous gases. The Pyrotechnic Division developed and field-tested various classes of gas shells, smoke clouds and equipment, mortars and Liven's projectiles, hand grenades, incendiary and flaming liquid weapons, and signal lights. The Mechanical Research Division designed and developed various types of defensive equipment for use in the event of an enemy gas attack, while the Gas Mask Research Division designed, developed, and tested various types of gas masks.[31]

By the fall of 1917, however, considerable sentiment had developed within the War Department for the consolidation of all chemical warfare research, development, and production in a centralized War Department agency to be established for that purpose. The Commander of the American Expeditionary Forces in Europe, Major General John J. Pershing, recommended strongly that all chemical warfare matters be centralized under the command of an Army officer of suitable rank and authority, as was the case in his own recently established Gas Service. On September 21, the Army War College submitted a memorandum to the Chief of Staff, recommending that a Gas Service be established within the War Department and that the American University Experiment Station be placed under its authority.

The Secretary of the Interior strongly disagreed, arguing that military control of the Experiment Station would limit the creativity of its research and threaten the esprit de corps of its research teams. On October 16, 1917, the Secretary of War authorized the establishment of the Gas Service (later called the Chemical Warfare Service), to be headed by an engineer officer with the rank of colonel and recommended by the Chief of Engineers, but left the issue of transferring the Experiment Station to military control to the President. On June 25, 1918,

President Wilson announced his decision in a formal executive order, directing the transfer of the Experiment Station from the Bureau of Mines to the War Department's eight-month-old Gas Service.

Contrary to the Interior Secretary's prediction, the President's decision had little effect on operations at the Experiment Station. Its mission remained the same: the investigation, development, testing, and manufacture of substances, materials, equipment, and weapons to determine their suitability for use in offensive and defensive gas warfare. Changes in organization and personnel were kept to a minimum. By the fall of 1918, there were 12 research sections: Defense, Offense, Pharmacological, Catalytic, Defense Chemical, Offense Chemical, Gas Mask, Pyrotechnic, Dispersoid, Small-Scale Manufacturing, Mechanical Research and Development, and Explosives. Of these, only the Catalytic Sections was new.[32]

Personnel (Sources, Military, Civilians, Numbers)

In July 1918, there were 1,155 Bureau of Mines civilian, Ordnance Corps, Corps of Engineers, Sanitary Corps, Signal Corps, Aviation Section, and Chemical Service Section personnel researching war gas problems: 554 of these were civilian scientists, technicians, and administrative employees; 114 were commissioned military officers; and 487 were enlisted men. The majority were stationed at the Experiment Station, while the rest conducted research at branch laboratories throughout the country, including Catholic University, Johns Hopkins University, Harvard University, the National Carbon Company, the National Electric Lamp Association, Massachusetts Agricultural College, Worcester Polytechnic Institute, Yale University, Princeton University, Ohio State University, Clark University, Columbia University, the Rice Institute, Massachusetts Institute of Technology, Iowa State University, Bryn Mawr College, and the Universities of Wisconsin, Washington, Michigan, Kansas, and California.[33] In addition to Manning and Burrell, key Experiment Station personnel included W. K. Lewis, who was responsible for investigations into gas warfare defense; Yandell Henderson, who was in charge of medical research; J. F. Norris, who directed chemical research; A. C. Fieldner, who was in charge

of gas mask research; George A. Richter, who directed pyrotechnic research; H. H. Clark, who headed the mechanical research division; E. P. Kohler, who was in charge of offensive gas warfare problems; and H. K. Marshall, who was responsible for pharmacological investigations.

President Wilson's order transferring the Experiment Station from the Bureau of Mines to the newly established Gas Service had only a limited effect on the station's personnel situation. The Director of the Gas Service, Major General William L. Sibert, offered senior Experiment Station personnel commissions in the Gas Service, and many accepted. Otherwise, Sibert made relatively few changes in the station's command structure. Burrell, now a colonel, remained in charge of the Experiment Station, while Drs. W. K. Lewis and E. P. Kohler were responsible for investigating Defense and Offense problems, respectively. Dr. Reid Hunt assumed the position of Adviser on Pharmacological problems, and Dr. Loesvanhart took over Pharmacological Research. Lieutenant Colonel W. D. Bancroft assumed responsibility for Editorial Work and Catalytic Research, and Lieutenant Colonel A. B. Lamb and Dr. L. W. Jones were now responsible for the Defense and Offense Chemical Research Branches, respectively. Majors A. C. Fieldner, G. A. Richter, H. C. Tolman, W. S. Roland, and B. B. Fogler were in charge of Gas Mask, Pyrotechnic, Dispersoid, Small-Scale Manufacturing, and Mechanical Research and Development Sections, respectively, while Captain G. A. Rankin was in charge of Explosives Research.

The Experiment Station itself became the centerpiece of the Gas Service's newly organized Research Division, which by the end of the war consisted of approximately 1,900 military and civilian personnel. Of these, 1,200 were scientists and engineers, while the remaining 700 were stenographers, clerks, accountants, purchasing agents, machinists, instrument makers, and the like.[34] As many as 1,000 of these personnel, principally the scientists and engineers, were stationed at the Experiment Station by the end of the war.[35] In addition, officers from the various engineer units stationed at Camp Leach often volunteered to take part in individual investigations about which they had special knowledge or interest.[36]

Construction and Buildings (Evolution of Layout)

When the Bureau of Mines and the Corps of Engineers made their independent decisions to accept the offer of American University's board of trustees to use university property and grounds for war-related endeavors, there were only two permanent buildings on the campus: the College of History Building and the McKinley Memorial Ohio College of Government (also known as the Ohio Building). The Bureau of Mines took over the Ohio Building and turned it into the nucleus of the Experiment Station. The Corps of Engineers converted the College of History Building into dormitories and offices for a training facility on the northeast portion of the campus that was first called Camp American University and later renamed Camp Leach.

Contractors worked throughout the summer of 1917 to convert Ohio Building classrooms into laboratories for the Bureau's Experiment Station. It soon became apparent, however, that additional facilities would be needed to accommodate such station activities as the storage of chemicals, gases, and materials; field tests to determine the effectiveness of gases, gas masks, and weapons; and housing for the goats, dogs, and other animals used in field tests. To provide for these needs, 124 temporary, mostly wooden, structures[37] were erected on the grounds adjacent to the Ohio Building, and to provide additional office space, most of the College of History Building was taken over as well.[38]

It was recognized almost at once that field tests of gases and weapons posed a threat not only to those conducting them, but also to the surrounding community, and that in many cases lightly constructed temporary structures were not large or strong enough to contain that threat. For this reason, the Bureau of Mines requested permission from the university's board of trustees to construct underground concrete pits for testing bombs. The pits were built both on university grounds and on an adjacent property owned by Charles A. Spalding. To facilitate access to these pits, a boardwalk was constructed to link them with the Ohio Building.[39]

After the 6th Engineer Regiment departed for Europe in the fall of 1917, the Corps of Engineers planned a major expansion of Camp American University to

accommodate the organization and training of additional engineer units for service with General Pershing's army in France. On learning of the rapid growth of the Experiment Station's activities at American University, the Chief of Engineers expressed considerable concern that any further expansion of the station would interfere with his plans for the development of Camp American University. He brought the problem to the attention of both the Bureau of Mines and the War Department and requested that the Adjutant General inform all interested Government Departments of the Secretary of War's recent order giving the Corps of Engineers exclusive control over American University grounds and facilities. The Bureau of Mines replied that its use of the grounds and facilities was based on agreements negotiated directly with the university's board of trustees.

On December 1, after several weeks of correspondence over the issue, the two agencies arrived at a compromise, under which the university's grounds and facilities were effectively divided in half, one half under the control of the Bureau of Mines and the other under the jurisdiction of the Corps of Engineers.[40] The boundary line ran from Nebraska Avenue, through Massachusetts Avenue, then through the intersection formed by the southwestern line of the College of History Building and the southeastern line of the Ohio Building and then to University Avenue.[41] The Experiment Station would have control over grounds and buildings to the west of the line, while the Corps of Engineers would have complete possession of the part of the campus to the east. It was understood that future adjustments of the boundary would require the agreement of both parties.[42]

The agreement was a timely one. The Corps of Engineers immediately embarked on a large-scale construction program, and by the end of the war, Camp American University contained some 67 structures, including facilities sufficient to quarter, feed, and train 4,400 troops. When space was required for additional drill fields and training trenches, the Construction Division of the Quartermaster Corps leased adjoining properties owned by Mary E. Patton, Charles C. Glover, and other area residents.[43]

Until the spring of 1918, the Experiment Station relied mostly on the construction of temporary structures to meet its ever-expanding needs. By May, however, it was obvious to both the Bureau of Mines and the War Department that additional permanent construction was required if the Experiment Station was to continue

its work. The Army and Navy Departments authorized the construction of a new chemical laboratory, a concrete shell pit, machinery storage sheds, a smoke laboratory, an explosive service building, an incendiary laboratory, three storage buildings, a munitions plant, an addition to the shell-loading factory, four chemical engine sheds, a pharmacological laboratory, a regimental storehouse, two wooden shell pits, a concrete storage pit, and several other storage facilities. In addition, money was allocated to construct two shacks to house research on toxic organic substances.

The most important facility was the chemical laboratory, which was urgently needed to relieve serious overcrowding that was hampering important chemical investigations and tests under way in the Ohio Building. On May 25, the Constructing Quartermaster and the Chief Engineer of the Bureau of Mines met on the Experiment Station's grounds to determine the exact site for the chemical laboratory. The site chosen was almost exactly halfway between the College of History Building and the Ohio Building, and because it straddled the boundary between the areas controlled by the Bureau of Mines and the Corps of Engineers, permission from the Corps of Engineers was required before construction could begin. Permission was quickly obtained when in response to the concerns of Camp Leach's commanding officer that the location of the new building would hamper normal activities at the training camp, the Chief Engineer of the Bureau of Mines and the Constructing Quartermaster agreed to a change in the angle of the site. On May 27, ground was broken for the laboratory, and by June construction was well under way on the other structures.

In November 1918, most of the buildings were ready for occupancy by the Chemical Warfare Service. The only major exception was the chemical laboratory, where construction operations had to be suspended because the Chief Engineer of the Bureau of Mines had seriously underestimated construction costs.[44] By the war's end, there were 153 structures of various sizes and types spread throughout the campus and adjoining properties,[45] including the tract owned by Spalding and, to a lesser extent, the Charles C. Glover, Horace D. Waters, Louis Cunningham, Robert D. Weaver, Agnes V. and John R. Scott, and National Training School for Girls properties.[46]

Specific Activities and Operations

Operations at the Experiment Station, first under the Bureau of Mines and then under the Chemical Warfare Service, fell into several comprehensive, if sometimes overlapping, categories: gas mask research, offensive and defensive toxic chemical investigations, medical research, pyrotechnic investigations, and mechanical investigations. The Experiment Station's Chemical Research Division (Offense) studied the properties and efficiency of toxic substances—mustard gas, phosgene, superpalite (trichloromethyl chloroformate)—already in use in Europe. It suggested, developed, and submitted for testing literally hundreds of new chemical and solid toxic substances—including new types of mustard gas, cyanogen chloride, and bromobenzyl cyanide—for possible use in gas warfare. The division also investigated and developed smoke mixtures for Navy smoke screens and colored smokes for Army signaling on the battlefield, as well as incendiary materials for use in bombs, shells, projectiles, darts, and hand grenades. In addition, it investigated the problem of obtaining resistant linings suitable for gas shells; devised methods for manufacturing inorganic compounds for use in new explosives and as new toxic and corrosive shell fillers; and invented new methods for analyzing the effectiveness of new materials developed for use in gas warfare. It conducted extensive tests related to the toxicity and symptomology of various classes of mustard gas and similar compounds; developed a method for determining the tear-producing effects of toxic substances on humans; and contributed to various aspects of gas mask research.

The Chemical Research Division (Offense) also devised methods for the preparation, manufacture, and use of such toxic materials as acrolein, martonite, nitrosomethylurethane, chloroacetic anhydride, diphenylchloroarsine, adamsite, phenylbromoacetonitrile, methyldichloroarsine, thionyl fluoride, methyldichloroarsine, lewisite, bromobenzyl cyanide, phenylimidophosgene, thiophosgene, sulfur monochloride, sulfur dichloride, superpalite, cyanogen chloride, cyanogen bromide, diethyl sulfide, diphenyl sulfide, chloropicrin, acetylene-arsenic trichloride, acetyl fluoride, acetyl chloride, chloroacetyl chloride, acetophenone, chloroacetophenone, zinc arsenide, calcium arsenide, magnesium arsenide, arsenic trifluoride, bromine trifluoride, boron trifluoride, sulfur hexafluoride, iodine pentafluoride, aluminum chloride, titanium tetrachloride, and mustard gas.[47]

The Chemical Research Division (Defense) specialized in investigations related to the development, testing, and manufacture of gas masks and similar equipment to be used by troops in the event of noxious gas attacks. It studied, developed, and field-tested significantly improved variants of charcoal and soda lime for absorbing noxious gases and developed new methods for their large-scale manufacture; developed, at the request of the Navy, materials for absorbing carbon monoxide and ammonia; and discovered a special material for use as an absorbent against the various classes of arsine gas.[48] Other division activities included the development of methods for filtering toxic and irritating smokes from the air; experiments for the Navy Department in producing defensive smoke clouds; field, chamber, and laboratory tests of various toxic substances on both men and animals to determine the limits of their toxicity; field tests of gas mask canisters to determine their efficiency against toxic gas shells and incendiaries; and an intense effort to develop a dependable nondimming eyepiece for gas masks.[49]

The Small-Scale Manufacturing Division developed methods for the manufacture of mustard gas, hydrocyanic acid, superpalite, cyanogen bromide (bromocyanide), cyanogen chloride, bromobenzyl cyanide, magnesium arsenide, kendallite, strontium chlorate, strontium permanganate, butyl mercaptan, nitrogen peroxide, crude benzyl cyanide, aluminum arsenide, chloroacetophenone, diphenylchloroarsine, liquid arsine, and ammonium cyanide. It also was responsible for procuring and stocking rare and toxic chemicals for use throughout the Experiment Station. The Manufacturing Development Division developed horse masks and boots for the Army; constructed and supervised the operations of the Army Hydrogen Plant at Langley Field, Virginia; developed methods and procedures for testing gas masks and protective clothing against mustard gas; developed and turned over to the Gas Service clothing and gloves for use in the presence of mustard gas; developed blankets and dugout curtains that were impermeable to toxic gases; assisted in the development of filters for use against mustard and other toxic gases; coordinated testing at the Experiment Station's various laboratories; assisted in the testing of antidimmer compounds; helped develop methods and procedures for the production of charcoal and batchite for gas masks; analyzed the efficiency of gas mask canisters in absorbing toxic substances; and developed a method for the hydrolysis of sulfuric acids.[50]

The Pyrotechnic Division had responsibility for gas shell, smoke cloud, munitions and general ordnance, hand grenade, incendiary, flaming liquid (flamethrower), signal light, and oil investigations. The division's Gas Shell Section conducted experiments with toxic solids; developed armor-piercing gas shells for the Navy; statically test-fired Liven's projectiles loaded with phosgene, phosgene and pumice, chloropicrin, chloropicrin and phosgene, and cyanogen chloride to determine the concentration, limits, and persistency of gas clouds in a standard trench.[51] The section also field-tested toxic fillers for Liven's projectiles—including cyanogen chloride, phosgene, phosgene and pumice, chloropicrin, superpalite, ethyl mercaptan, butyl mercaptan, and mustard gas—and investigated linings for gas-filled shells and projectiles. It statically test-fired 75-millimeter shells filled with pure mustard gas, crude mustard gas, diphenylchloroarsine, methylchloroarsine with Livenstein crude mustard gas, and diphenylchloroarsine with phosgene gas to determine the toxicity, effective range, effectiveness, and persistence of the gas clouds produced; and it developed and field-tested shrapnel gas shells.[52]

The Pyrotechnic Division's Smoke Cloud Section developed smoke funnels and float boxes for the Navy, developed smoke signals for Army and Navy bombs, designed and field-tested portable smoke sets, developed and field-tested smoke mixtures for Army shells and trench smoke candles, pioneered the use of oleum to create smoke screens and clouds, developed Liven's-type smoke bombs, investigated and tested smoke grenades and tracer shells, investigated the use of sulfur trioxide for smoke production, and designed a noiseless nozzle for gas wave attacks.[53] The Munitions and General Ordnance Section designed and developed new forms of Stokes mortars, investigated the feasibility of flaming projectiles, and field-tested Liven's projectiles. The Hand Grenade Section investigated the use of picrates, sulfocyanides, and kendallite in toxic gas grenades; studied and tested the potential of trinitrotoluene (TNT), amatol, victorite, parazol, chlorates, perchlorates, and analite as explosives for grenades and other Army and Navy weapons; designed new grenades with enhanced fragmentation; and developed specifications for shell lacquers.[54]

The Pyrotechnic Division's Incendiary Section perfected the Mark I scatter-type incendiary bomb and the Mark II intensive-type incendiary bomb for Army Ordnance; developed and tested the incendiary dart; designed and tested an

incendiary artillery shell and an incendiary Liven's gun projectile; designed and tested incendiary grenades for use against such targets as ammunition dumps and supply depots; and investigated explosives and mechanical improvements for a proposed device for the destruction of aircraft.[55] The Flaming Liquid Section developed portable flaming liquid guns, investigated the potential of flaming bayonets, and conducted fuel mixture and propellant studies in connection with flaming liquid weapons. The Signal Light Section carried out intensive investigations into the design and development of colored flares; colored smokes; signal rifle grenades; and, for the Navy, illumination floats and signal devices for use on board submarines. The Oil Research Section developed spontaneously flammable liquids and recoil oils, while the Miscellaneous and Laboratory Sections carried out investigations into shell linings for brom compounds, methods for analyzing pyrotechnic materials, materials for powder containers, gas shell cements and packings, gas shrapnel shells, smoke grenades, and smoke shells for the Navy.

The Mechanical Research Division developed a box respirator for the Army; investigated the manufacture in the United States of the French cloth gas mask; developed a horse mask based on a British design for possible use by the Gas Defense Service; designed trench sprayers and fans for possible use in Europe; designed various gas defense equipment, including a Tissot-type gas mask, canisters for absorbing carbon monoxide, smoke filters, box canister baffles, and screens; developed gas masks for the Navy and protective equipment for poison gas plants; and conducted research into various pyrotechnic problems, including the development of a pressure firing device.

The Gas Mask Research Division sampled hundreds of kinds and grades of charcoal and soda lime for absorbing noxious gases in gas masks; tested canisters for Gas Defense Service gas masks to determine their effectiveness in removing poison gases; conducted tests on humans to develop a filter cartridge against mustard and other gases; determined the permeability of more than 1,000 fabrics for possible use in gas masks and protective clothing; conducted comparison tests of the effectiveness of American and foreign gas masks; developed methods for testing absorbent materials for use in canisters; and developed protective gloves and shoes for use against mustard gas and protective clothing for use in plants manufacturing toxic and corrosive liquids.

The Toxicology Division devised new methods for determining the effect of toxic gases and liquids on animals; studied the effects of dilute concentrations of various toxic substances on men; developed quantitative methods for determining the effectiveness of skin irritants; conducted tests on animals to determine the toxicity of various substances; determined the efficiency of various substances as lacrimators; and studied the effects of mustard gas on the lungs.[56] The Dispersoid Division designed equipment for toxic smoke experiments; developed methods for preparing and detonating toxic smoke mixtures; and designed, developed, and tested new weapons, including smoke candles filled with adamsite and other toxic substances.[57]

The Pharmacological Division devised methods for testing the toxicity of gases and liquid vapors on mice; exposed larger animals (including dogs, rabbits, guinea pigs, rats, and cats) to toxic gases and liquid gases to determine the pharmacological and toxicological effects; determined the lacrimatory power, odor, and sternutatory effect of various toxic gases by exposing men to very dilute concentrations; conducted tests to determine the skin irritant action of various toxic substances and vapors; tested fabrics for permeability to mustard gas; and determined the cutaneous sensitivity of men to mustard gas. Among the substances tested were cyanogen chloride, cyanogen bromide, and mustard gas.[58]

Locations of Specific Activities (Transportation, Testing, Ordnance, and Chemical Materials)

The Chemical Research Division (Offense) undoubtedly conducted the bulk of its investigations into the development of new chemical and solid toxic substances in its Ohio Building laboratories, the Chemical Research Laboratory, and the organic research shacks. When necessary, the division could also conduct research at other Experiment Station laboratories—the Dispersoid Laboratories, the Pharmacological Laboratory and Laboratory Annex, the Physiological Laboratory, the Incendiary Laboratory, the Special Pyrotechnic Laboratory, the Explosives Laboratory, the Canister Laboratory, the Bacteriological Laboratory, the Photo Chemical Laboratory, the Fire and Flame Laboratory, and the

Electrolytic Laboratory. The division may well have used all these laboratories at one time or another because it was involved in the development of smoke mixtures for use as signals and screens; chemicals for use in toxic smokes; incendiary material for use in bombs, shells, hand grenades, and similar weapons; and improved types of gas masks.[59]

Field tests to determine the effectiveness of toxic chemicals and substances, incendiaries, smoke mixtures, and the like were conducted at various sites on the campus and adjoining properties, including the several bomb and gun pits, fields and other open areas, and trenches specially constructed for the purpose.[60] Field tests were also conducted at such off-campus locations as the Montgomery County (Maryland) Country Club; Fort Foote, Maryland; Berlin, Maryland; and Langley Field, Virginia.[61]

The Pyrotechnic Division's investigations on behalf of the Army and Navy Ordnance Departments were conducted in the Incendiary, Special Pyrotechnic, Explosives, Dangerous Explosives, Photo Chemical, Smoke, and Fire and Flame Laboratories and the Volatile Inflammable Building. Shells, bombs, projectiles, and incendiary darts were filled at the shell-loading plant. Field tests of smoke mixtures, toxic smokes, incendiary weapons, gas-filled shells, and signal lights were held in Experiment Station bomb and shell pits, the armor-plated bomb proof, the fragmentation box, the explosive chambers, on-campus fields and open areas, and off-campus locations along the Potomac River and in Maryland and Virginia.[62]

Pharmacological Division and Toxicological Division investigations into the efficiency and actions of toxic chemicals and solids were conducted at various sites on the campus and the adjoining Spalding and Weaver properties, including division laboratory facilities, Experiment Station bomb pits, shell pits, trenches, and the dog test house and at the Naval Proving Ground at Indian Head, Maryland.[63] Small-Scale Manufacturing Division and Mechanical Research Division activities were conducted in the Experiment Station Machine Shop, the General Shop, the Mechanical Building, and various sheds designated for those purposes. Gas Mask Research Division and Chemical Research Division (Defense) operations were carried out at Experiment Station man test chambers, the man test building and house, various laboratories, the bomb pit, trenches, the

Weaver farm, and other open areas.[64] Some of these tests were performed at Conduit Road Field and Bradley Field. Dispersoid Division investigations took place in division laboratories and laboratory sheds, bomb and shell pits, and Experiment Station open areas.[65]

Toxic chemicals and solids, weapons, munitions, and similarly dangerous items were stored in various temporary structures erected for the purpose, notably the fireworks storage shed, the toxic storage sheds, the general storehouse, the acid storage shed, the explosives and powder magazines, the Dispersoid Division storage laboratory, the concrete storage pit, the mustard storage shed, and the oil storage shed.[66] Experiment Station transportation facilities were limited to access by Massachusetts and Nebraska Avenues and on-campus paths and roads. Existing roads were improved and new ones constructed to handle the continuous flow of trucks carrying equipment and supplies to the Experiment Station and to Camp Leach.

Potential Contamination Sites

Potential contamination sites on the American University campus and surrounding properties fall into three principal categories: permanent structures abandoned when the Chemical Warfare Service and other Government agencies completed their various investigations; sites of temporary warehouse, testing, and laboratory facilities destroyed or removed by agreement with the university's board of trustees; and open areas where field tests involving toxic substances were conducted.

The first category includes the underground concrete bomb pits on the Spalding property and the concrete gun pit and other permanent research and storage facilities constructed in the summer and early fall of 1918.

The second category includes the bulk of the 124 temporary, mostly wooden, structures erected on the campus to meet the needs of Experiment Station

researchers. During the Experiment Station's brief existence, many of these structures were used to store enormous quantities of toxic chemicals, gases, and similar substances, while others housed laboratories and test facilities used by the Experiment Station's various research divisions. Still others, notably the wooden gun and bomb pits, were the sites for indoor testing of the effectiveness of toxic gases and weapons. In accordance with agreements with the university's board of trustees, most of these temporary structures were either destroyed or removed after the war.

The third category includes the field or fields on the Weaver property that were used for the open-air testing of the efficiency of mustard and other toxic gases and of the gas masks developed to counter their effects. The campus itself was the site of numerous open-air tests of toxic gases, toxic smokes, and toxic and incendiary weapons and munitions. Testing was carried out either in open areas, one of which was the Conduit Road Field, or in specially constructed trenches.

Post–World War I Era

On November 9, 1918, the German Government officially accepted President Woodrow Wilson's terms for an armistice, and two days later the fighting in Europe ceased. From the perspective of the U.S. Army Corps of Engineers, the cessation of fighting rendered Camp Leach's unit organization and training mission superfluous. In anticipation of the armistice, the War Department had already disapproved an ambitious plan for the construction of new facilities for four additional engineer regiments.[67] On December 3, the Chief of Engineers ordered the immediate suspension of all construction there, pending a decision by the War Department regarding the future of the camp.[68]

The Adjutant General of the Army officially notified the commanding officer at Camp Leach on December 23 that with the end of the war in Europe, there was no further need for the camp and ordered the immediate cessation of operations there. Supplies, equipment, and transportation were to be suitably disposed of, temporary buildings were to be salvaged as quickly as practicable, and engineer units were to be demobilized in accordance with applicable regulations.[69] Following demobilization, the site was to be turned over to the Demobilization Committee of the Operations Division of the General Staff for salvage and final disposition.[70]

Once salvage operations were completed, the grounds were to be returned to the American University board of trustees and the owners of the nearby properties included within the camp's boundaries. Existing agreements with the university and the individual property owners required that the grounds be restored as completely as possible to the condition they were in before occupation by the Corps of Engineers. To that end, the Chief of Engineers directed the immediate filling of trenches, pits, dugouts, and similar works.[71]

Changes in and Conclusion of Mission

The postwar mission of the American University Experiment Station proved much more difficult to define. Chemical Warfare Service officers believed that the research conducted there was important enough to warrant permanent retention of the installation; they argued that the substantial investment already made in the facilities was justification enough for such a decision.[72] In fact, as early as September 1918, the Chemical Warfare Service had discussed the possibility of purchasing the entire American University campus for that purpose.

The university's board of trustees had been receptive, but War Department appraisers ruled that the board's offer to grant the Government permanent possession of the university for $2 million far exceeded the property's actual value and recommended that the purchase be disapproved.[73] Adding his weight to those recommending disapproval, the Chief of Engineers strongly criticized continued use of American University for chemical warfare research. He argued that such investigations might prove dangerous to the growing number of

residents of one of the District of Columbia's most beautiful and healthful suburbs and would certainly hurt the area's property values and future development.[74] Others in the War Department maintained that the upcoming conclusion of hostilities greatly lessened the need for such research.[75]

The Secretary of War agreed with those recommending disapproval. On November 16, the Adjutant General notified the Director of the Chemical Warfare Service that further use of American University's grounds and buildings by the Service was disapproved and directed him to investigate immediately the possibility of securing a more isolated location for its research program.[76] Faced with the fact that the War Department General Order establishing the Service also provided for its demise within six months of the cessation of hostilities, the Director, Major General William L. Sibert, abandoned efforts to retain the American University Experiment Station as a permanent installation. Instead, he immediately issued orders for the cessation of all operations at the Experiment Station as of December 31, 1918, stipulating that the few investigations still under way be completed by that date. Investigations assigned to the Service in the remaining months of its existence would be carried out at Edgewood Arsenal.[77]

In July 1919, Congress directed the War Department to retain the Chemical Warfare Service as a branch of the Army for another 12 months, and with the passage of the National Defense Act of 1920, the Service became a permanent part of the military establishment.[78] One result of these congressional actions was the extension of operations at the Experiment Station through August 1920.[79] Before transferring the bulk of its personnel and equipment to Edgewood Arsenal on November 1, 1919, the Chemical Warfare Service continued to carry out investigations into various aspects of gas warfare for the Navy, the Ordnance Corps, and other War Department agencies.[80]

In April 1919, the Chief of the Chemical Warfare Service authorized the transfer of the Ohio Building and various Experiment Station laboratories and storage facilities to the Ordnance Corps for the establishment of a fixed-nitrogen research laboratory.[81] For the next two years, this facility carried out extensive investigations into methods for producing nitrogen and nitrates for use in the manufacture of various classes of explosives.[82] The Department of the Interior also expressed interest in obtaining control of vacant Experiment Station facilities

for use by the Bureau of Mines, arguing that the Bureau had long needed a central research facility in Washington in which to coordinate the work of its various laboratories. The Secretary of the Interior stressed that the proposed facility could perform important research related to the use of chemicals for both military and civilian purposes.[83] The War Department was opposed, however, and its view that Experiment Station facilities should remain under the control of the military until the campus was returned to the university's board of trustees prevailed.[84]

Same as for World War I Years Emphasizing Changes

In the months following the signing of the armistice, the number of Research Division scientists, engineers, and technicians stationed at the Experiment Station fell from more than 1,200 to an average of just 18 in June 1919. These few researchers were expected to carry out all chemical warfare research required by the Army, Navy, and other War Department agencies. In reality, however, the Experiment Station's research establishment was now too small to do more then investigate such technical problems as the development of boosters for gas and smoke shells and the determination of bursting charges.[85]

Demobilization of the Site

Acting on the widespread but mistaken belief that the signing of the armistice eliminated for all time the need for chemical weapons, the War Department ordered, on November 29, 1918, the immediate and complete demobilization of the Chemical Warfare Service. Under this order, the Experiment Station suffered not only a drastic reduction in personnel, but also the dismantling of much of its sophisticated research and manufacturing equipment for shipment to Edgewood Arsenal.[86] A year later, the War Department ordered the Chemical Warfare Service to immediately vacate the Experiment Station, and the remaining personnel, equipment, and material were transferred to Edgewood, where the bulk of the Service's research program was now being carried out.[87]

Although the Ordnance Corps's request to establish a fixed-nitrogen research laboratory in the buildings vacated by the Chemical Warfare Service was approved, the War Department made it clear that the facility was to operate only as long as it would take to negotiate an agreement for the return of the campus to the university's board of trustees. Representatives of the Construction Division of the Quartermaster Corps and the board of trustees discussed the matter throughout the spring of 1920, and agreements were drawn up specifying the responsibilities of the U.S. Government for the salvage of buildings remaining on the campus and the full restoration of university grounds. Under these

agreements, the Government would remove or otherwise salvage most of the temporary structures on the campus, pay the university $120,382.75 in return for allowing the Government to leave standing the unfinished laboratory building and several temporary structures, repair and restore campus roads and walkways, and restore insofar as practicable the university's grounds to the condition they were in before their use by the Government.[88]

It was spring of 1921 before the Construction Division could begin the agreed-on salvage and restoration work. Temporary structures not wanted by the university were removed or demolished, while those so impregnated with mustard and other toxic gases that their removal would be dangerous were burned instead. Permanent structures—including the shell pits, powder magazines, detonator house, and explosives service building on the Spalding property—were boarded up and enclosed with fences or barbed wire to prevent access. The grounds, roads, and walkways were restored to the extent possible.[89]

Site Reuse in Peacetime 1926–1993

American University

In 1889–90, John F. Hurst, Methodist bishop of Washington, acted on behalf of the General Conference of the Methodist Episcopal Church and selected a site for a national Methodist postgraduate university. The 90-acre tract was a part of the old Friendship patent and included the site of Fort Gaines. At the time the Methodists purchased it, it was known as the Davis farm. In 1893 Congress approved and President Benjamin Harrison signed the school's charter. The ground-breaking ceremony for the first building, Hurst Hall, was held in 1896.[90]

The initial campus plan, as illustrated in the *Evening Star* in 1895, called for a romantic landscape with no interior streets. Winding paths led from the two Massachusetts Avenue traffic circles and from the angle of University Avenue. Rows of trees lined the paths as they led into the heart of the campus to connect the university's projected buildings.[91]

Washington real estate tycoon Charles C. Glover, numerous financiers in other cities, Congressmen, and Senators were among the initial 36 members of the board of trustees, as well as ex officio members the President and Vice President of the United States, and the Chief Justice of the Supreme Court. Mrs. John A. Logan, one of Washington's most socially influential women, also served on the board. Mrs. Logan's particular interest was "to organize the women of America

in the interest of the University." Certainly, women were among the early contributors, as indicated by an 88-year-old woman's contribution of a gold watch and chain.[92]

Still, donations did not keep pace with expectations, so the institution grew slowly. By 1901, however, funds justified the construction of the McKinley Building, and President Theodore Roosevelt laid its cornerstone. The next major event on the campus occurred in 1914 when President Woodrow Wilson dedicated the graduate school, which had an initial enrollment of 27 students. In 1916 the university awarded its first degrees: two Ph.D.'s and an M.A.

When the United States entered World War I, in 1917, the university offered its facilities to the Nation. A training film made at Camp American University shortly after the war began depicts a bucolic setting of rolling hills and trees. It was little altered from the 1890s and ideally suited for the training of the Army's first "Lumberjack" Regiment of the 10th Reserve Engineers.[93] The Army's wartime use of the campus is well documented elsewhere.

After the war ended, some of the laboratories were retained by the university. Other buildings and structures were assessed for long-term use. Those suitable for reuse were offered at public auction, to be removed by the end of 1919. As bidders were few and the purchase prices they offered low, virtually all the surplus buildings were transferred to American University.[94] Approximately 17 wooden buildings and one icebox, however, were deemed too contaminated for further use, and the Army burned them to the ground before vacating the premises. While the Army was in charge of the burning, the D.C. Fire Department was on hand in case of emergency.[95]

At the end of the war, American University's graduate school moved to a newly purchased location in the 1900 block of F Street, NW. Six years later, the university's undergraduate school, the College of Liberal Arts, opened on the original 90-acre "uptown" campus.[96] When the undergraduates arrived, the Roaring Twenties were in full swing. The university thrived, in both population

and contributions. The halcyon days didn't last long, however. Even though Washington has long been thought recession proof, the university suffered significant financial and scholastic downturns during the early and mid-1930s.

Just as the university's recovery from the Depression was well under way, the United States entered World War II, and the undergraduate male population dropped precipitously.[97] Once more, officials of American University volunteered its facilities to the U.S. Government. Students moved to buildings the university owned in downtown Washington, and the Navy took charge of the uptown campus. This time the campus housed three facilities: the Navy Bomb Disposal School, a Red Cross center, and quarters for Waves.[98]

The post-World War II boom in higher education generated a veritable flood of GIs and other students at American University. By 1950, the faculty consisted of 150 full-time and 300 part-time instructors for a student population of 5,000. Eighty percent of the students attended downtown classes. In 1953, the university owned eight major buildings valued at $4 million. President Dwight D. Eisenhower gave the university's commencement address in 1957 and then broke ground for the university's new School of International Service.[99]

During the second half of the 20th century, the university consistently met the challenges and needs of a changing educational and social environment. In 1988, 11,000 students attended the university and were taught by 1,000 full-time and part-time faculty. Degree programs were available in the College of Arts and Sciences, the Keogh College of Business Administration, the School of International Service, the School of Public Affairs, and the Washington College of Law.[100]

American University Park

At war's end, speculation returned with vigor. Current American University Park residents accept neighborhood boundaries of Massachusetts, Nebraska, Wisconsin, and Western Avenues. This is larger than AU Park, as it is popularly called, was platted to be in 1897 and larger even than it was deemed to be in the immediate post-World War I era. These expanded boundaries encompass the Camp Leach

portion of the Operation Safe Removal study area. According to oral tradition, the first owners of post-World War I houses in AU Park found their backyards pocked with shell holes and dugouts left by the Army at the end of Camp Leach's occupation of the area.[101]

Development of AU Park was exceedingly slow. Small farms remained in the area until the 1930s but disappeared by the 1940s. In the late 1920s Monroe Warren began to build two-story brick colonial single-family houses in the vicinity of 44th and Yuma Streets, NW. These virtually identical houses sold for $8,000 to $10,000.[102]

Between 1940 and 1950 the population of AU Park doubled as buyers eagerly sought the moderately priced new brick houses. Another generation of purchasers discovered the neighborhood in the late 20th century. Young professionals who worked in downtown Washington found AU Park an easy commute by Metro. The blocks of identical houses have been customized with stone and wood fronts, and additions have expanded their living space so that the median-priced house sold for $185,000 in 1987.[103]

W. C. & A. N. Miller Company[104]

In contrast to American University Park, with its rows of identical houses targeted to a middle-income market, most of Spring Valley was designed as a higher priced subdivision of custom-built houses. The major players in Spring Valley were two brothers known as the Miller boys, who incorporated their business in the 1920s under the name of W. C. & A. N. Miller Company.

Even while the founders were alive, the Miller corporate name appears in many variations. The brothers consistently used a letterhead in the form of "W. C. and A. N. Miller" bracketing an ink drawing of their office at 1119 17th Street, NW. The only other identification was the words "Realtors" and "Builders."

William C. and Allison N. Miller were born in Washington, D.C. They, the company they founded and named after themselves, and their heirs dominated Spring Valley's development.[105]

The brothers joined forces and in 1912 they built two speculative houses at 749 and 751 Kenyon Street, NW. They turned next to building speculative houses in the Cleveland Park area and near the Soldiers' Home. When their early residences moved too slowly, they served as contractors to other developers and built houses throughout the city. After a short hiatus for their World War I military service, the Millers pursued their own development plans with new vigor by resuming their operations in Cleveland Park. In 1919 they hired architect Gordon MacNeil to head the architectural department of their real estate development company. The following year they bought and built on two blocks of undeveloped land in Woodley Park. They later acquired a substantial amount of ground in the Wesley Heights area from the estate of noted developer Thomas E. Waggaman.[106]

Wesley Heights was the Millers' stepping-stone to Spring Valley, and in fact as late as 1932 they considered Spring Valley a "section of Wesley Heights."[107] The expertise they acquired in the early 1920s with the original Wesley Heights development served the Millers well when they moved north of Loughborough Road. For example, in Wesley Heights they offered no vacant lots for sale, only lots with houses they had built. They built increasingly more expensive houses in response to public demand. While their first group of Wesley Heights houses was priced at $8,000 to $11,000, less than a decade later new houses there sold for $75,000. Although the inflation of the 1920s contributed to the higher prices, the later houses also were designed and built with a more affluent clientele in mind. Through their Wesley Heights project the Millers learned not only to fine-tune the price range, but to preserve some of the area's natural beauty. In a day when Washington developers routinely chopped down entire forest areas and leveled the terrain with steam shovels, the Millers avoided wholesale alteration of the natural environment.[108]

The rhythm the Millers established in Wesley Heights suited them, and they pursued it avidly. Their next target was north and west. By 1928, W. C. & A. N. Miller Company had purchased approximately 300 acres of land in Spring Valley. The company platted the land as the Spring Valley subdivision, and according to Washington's *Evening Star* newspaper, the plat was based on "new

ideas in modern community planning."[109] In fact, the ideas were not new to city planners and developers at the national level, but they were a major departure from Washington's officially approved grid system of streets.

Spring Valley's plat was designed to preserve the area's natural beauty and to develop a street system that followed the land's natural contours. Before the developers could implement the plan, however, they had to obtain approval from the newly formed National Capital Park and Planning Commission. The Commission was vested with the authority to approve or disapprove any alterations to the accepted street system as well as the designs of Government buildings.[110]

The Spring Valley plat called for old country roads to be closed, the number of and distance between cross streets to be diminished, streets to be laid out in sweeping curves, and trees to remain in place wherever possible. Substantial stone arched bridges would be built to carry streets across ravines and streams. In addition, the plans called for all possible wires and electric light and telephone poles to be hidden. Wires were to be laid underground and the poles hidden at the rear of the deep lots.[111]

Although Spring Valley's plan was designed to take advantage of the natural landscape, it still required a significant amount of grading, filling, trenching, and other work. Because the terrain was relatively uneven, with heavily wooded areas that needed to be protected, much of the work could not be done with heavy equipment. The alternative techniques to create Spring Valley as it was originally conceived involved extensive hand labor.[112]

When working on private land in areas where land for streets had not yet been dedicated to the city, large-scale developers were responsible for preparing their tracts according to the accepted plat. Thus, private contractors hired by the Miller Company made the necessary terrain alterations in preparation for new construction. Utility companies and the city provided services only after the land had been prepared to receive water and wastewater systems, paving, sidewalks, and the like.[113] In areas such as Spring Valley, water and wastewater lines that connected the houses to the mains in the streets ran across private property, so much of that documentation is not in the official records. Once subdivision plans

were accepted, government involvement was limited to oversight and regulation of compliance with the D.C. code.

The Millers set their construction schedule for these custom-designed dwellings to respond to the demands of the affluent clients who constituted their market. Development proceeded slowly, purportedly because of the Miller brothers' desire to build for specific clients rather than on speculation.[114] The economics of the Great Depression also may have slowed growth. Essentially, the residential portion of the subdivision was developed northward from Loughborough Road, and one of the first streets for which the Miller Company dedicated the land was Rockwood Parkway. The city accepted the dedication on September 6, 1928.[115] The next step after grading was the installation of a water main, which was laid in the parkway between Fordham Drive and a point south of Glenbrook Road by January 12, 1931.[116]

One of the first houses in the subdivision was built at the point where Rockwood Parkway and Indian Lane meet.

Throughout the history of Spring Valley, the Miller family has remained intimately involved with its development. In the early years, the Miller brothers themselves were in control, and their signatures appear on most of the firm's correspondence to the city Department of Engineering. The department's files also refer to meetings and conversations with the Millers. Moreover, because William built his own residence in Spring Valley, he had a very close view of operations there. Even Allison, who lived on Cathedral Avenue, NW, rode horseback through the area.[117]

By 1932 development had progressed unevenly, but far enough north to focus on Quebec Street.

By 1965 only the northern 42-acre tract of the Millers' holding remained to be developed. It was bounded by Van Ness and Albemarle Streets, Massachusetts Avenue, and Dalecarlia Boulevard and was zoned for single-family residences. It is on this tract that Operation Safe Removal began in 1993.[118]

World War II
1942–1945

The U.S. Navy Bomb Disposal School at American University

Military activities returned to the campus of American University on July 8, 1942, when the Navy Bomb Disposal School moved from Building 202 at the Washington Navy Yard, where it had first convened in January 1942, to more spacious quarters on five acres abutting the Music Conservatory on the campus. With a staff of about 90 Navy officers and enlisted personnel, roughly equally divided between the two, the school soon outgrew the 10 buildings that it initially occupied at American University. The Navy erected 18 more buildings there during World War II. Under the leadership (until May 1943) of Lieutenant (later Rear Admiral) Draper L. Kauffman, the school instructed classes of either about 15 officers or 15 enlisted men in the handling and disposal of unexploded bombs.[119]

The instructional course at the Navy Bomb Disposal School lengthened from an initial 8-week program to a 14-week curriculum. Roughly 25 percent of the students' instructional time was devoted to practical work in handling ordnance on airplanes, simulated disposal techniques, and the use of equipment; performance in this area counted heavily in students' grades. Much of this practical work was conducted on a two-acre plot near the classrooms at the

university. However, as naval authorities prohibited live bombs at the university compound, the stripping of live fuses and any actual demolitions were conducted at the Navy's Stumpneck Ordnance Investigation Laboratory on the Potomac River at Indian Head, Maryland. Instructors at the Bomb Disposal School used small amounts of fulminate of mercury to produce a harmless "bang" in practical exercises at the school's American University facilities.[120]

The Bomb Disposal School added a seven-week advanced fuse and explosive ordnance course to its curriculum in February 1943. The following summer, the school began to provide training for instructors in the Navy's Mobile Unit Training Program. Almost all the students who attended the school were Navy or Marine Corps personnel, since the Army had established its own bomb disposal school at Aberdeen, Maryland.[121]

By the end of the war, a new basic class was entering the Bomb Disposal School every two weeks. At its peak, the school was simultaneously using eight classrooms for the basic bomb disposal course, two for the advanced fuse and explosive ordnance course, and one for civilian scientists studying booby traps. At the same time, a class would be engaged in practical work on the American University grounds and another would be at the Stumpneck Ordnance Investigation Laboratory engaged in demolitions work.[122]

Both staff and students were housed on or immediately adjacent to the school grounds. Staff officers and student officers resided in separate buildings just outside the corner of the fenced school grounds nearest the main university quadrangle. Enlisted personnel, both student and staff, were housed in two barracks buildings adjacent to the classroom area on the school grounds. Navy women (Waves) could relax in a separate lounge building. There were no mess facilities in the school compound, so all Bomb Disposal School staff and students ate in the university dining hall. Other facilities in the Navy compound included a work shack and booby trap house in the wooded practical work area; a wood shed, paint locker, and carpentry shop; an administrative building; an intelligence building; and three museums exhibiting unarmed German, Italian, Japanese, British, and American bombs.[123]

In addition to the Bomb Disposal School's instructional program, its Intelligence

Department issued books and bulletins on Allied and enemy bombs and on the wartime development of ordnance and ordnance disposal techniques. The school's Research Department meanwhile developed tools and methodologies to extract or otherwise render harmless a wide variety of bomb fuses and explosive charges. Several chemical agents, including a urea-formaldehyde resin solution and hydrochloric acid, were found to be useful in this work.[124]

While surviving instructors recalled no incidents of live bombs being brought to the American University compound during World War II, J. Phillip David, who commanded the school from April 1944 until it closed on October 31, 1945, remembered two incidents of hazardous activity. One day an instructor, in violation of policy, brought a live 50-millimeter shell onto the school grounds and fired it into or over the adjacent neighborhood. No reports of injury or damage ensued. Another time, some school personnel who had been drinking discharged pistols in the compound, again without apparent injury.[125]

The last class at the Navy Bomb Disposal School entered July 9, 1945, and graduated September 17, 1945. The school ended its existence October 31, 1945. Lieutenant Commander David had by then transferred the equipment the Navy was retaining to the Stumpneck Ordnance Investigation Laboratory. Upon its departure, the Navy sold American University a substantial quantity of furniture, fixtures, office supplies, laboratory equipment, and chemicals. Included in the transferred materials were 269 copper beakers (250 cc), 16 pounds of hydrochloric acid, 100 pounds of acetic acid, and 1.5 pounds of mercury. The university paid more than $4,800 for the transferred items, almost as much as the Navy's $5,000 annual rental payment for use of the compound.[126]

Summary

On April 30, 1917, shortly after the United States declared war on Germany, American University's board of trustees offered the campus to the Government in support of the war effort. Major General William M. Black, Chief of Engineers of the Army, urged acceptance of the offer, knowing the Engineers' need for additional training facilities in the Washington metropolitan area. Secretary of War Newton D. Baker then accepted the university's offer and gave control of the campus and its buildings to the U.S. Army Corps of Engineers. On May 28, 1917, the Corps of Engineers assumed control of the northeast section of the campus, establishing Camp American University for the organization and training of engineer regiments.

Meanwhile, Secretary of the Interior Franklin K. Lane, eager to have his Department participate in the war effort, offered the Bureau of Mines' expertise in noxious and explosive mine gases to the War Department. The War Department accepted Lane's offer. Then, in need of a new large research complex, the Bureau of Mines also took advantage of American University's offer and established its efforts at the university, naming its facility the American University Experiment Station.

Although the Corps of Engineers' site was already designated Camp American University, the establishment two months later of the Bureau of Mines' American University Experiment Station on the remainder of the university grounds generated considerable confusion about the natures and missions of the two distinctly different installations. Therefore, in 1918, the Corps of Engineers

redesignated Camp American University as Camp Leach. Both installations grew, and the boundary between them changed to allow for that.

On October 16, 1917, the Army activated the Office of Gas Service as a start toward consolidating all Army gas-related activities. On June 25, 1918, President Woodrow Wilson transferred control of the Experiment Station from the Bureau of Mines to the Gas Service. There were only minimal changes in organization and personnel as a result of that transfer. Key sections of the Experiment Station included gas warfare defense, medical research, chemical research, gas mask research, pyrotechnic research, mechanical research, offensive gas warfare, and pharmacological investigations. The Experiment Station, however, did become the headquarters of the Gas Service's new research division, with branches in different parts of the country.

Both installations continued to expand. Finally, the Corps of Engineers negotiated a formal agreement with the Bureau of Mines dividing the campus between them. Both organizations, though, had to lease land to meet their needs. For example, as part of the Bureau of Mines' growth, it built underground concrete pits on both university and rented land—primarily the leased Spalding property—so that it could conduct tests without endangering the surrounding community. By November 1918, the Experiment Station had 153 temporary and permanent structures throughout the campus and adjacent areas.

The Bureau worked for both the Army and the Navy, testing a wide variety of toxic and nontoxic chemicals for both offensive and defensive purposes. Its scientists used gun and bomb pits, sheds, trenches similar to those on the Western Front in France, and open fields in an effort to understand the mechanics and effects of the gases under study. That research and testing left potential contamination sites on the campus and surrounding areas that fall into three principal categories: permanent structures the Government left after the war; sites of temporary warehouse, testing, and laboratory facilities destroyed or removed by agreement with the university's board of trustees; and open areas where field tests were conducted.

Residents of the area remained in place throughout the war with no known cases of relocation, voluntary or otherwise. Except for adjustments to accommodate the rigors of wartime, civilian lifestyles near the campus continued much as before the war. Although there were several fires and explosions at Experiment Station facilities, only one, on August 3, 1918, resulted in a substantial release of noxious gas. On this occasion, the explosion of lab apparatus in a manufacturing shack sent noxious chemicals into the atmosphere, which resulted in the accidental gassing of three adults living across Nebraska Avenue from the Experiment Station. These persons required immediate medical attention but not hospitalization.

Speculation returned with vigor to the area after the war, even though according to oral tradition, the first owners of postwar houses in American University Park found their backyards pocked with shell holes and dugouts left by the Army at the end of Camp Leach's occupation of that area. Small farms remained until the 1930s but were replaced by housing construction by the end of the 1940s.

In contrast to American University Park, with its rows of identical houses targeted to a middle-income market, most of Spring Valley was designed as a subdivision of custom-built homes. W. C. & A. N. Miller Company, incorporated in the 1920s, increasingly focused its development work in that area. By 1928, the Miller Company had purchased approximately 300 acres of land in Spring Valley. The company platted the land as the Spring Valley subdivision. The Miller family, company, and heirs have remained prominent in the development of Spring Valley for about 65 years.

By 1965 only the northern 42-acre tract of the Millers' holdings remained to be developed. It was on that tract that Operation Safe Removal began in January 1993.

Military activities returned to the campus on July 8, 1942, when the Navy Bomb Disposal School moved from the Washington Navy Yard to five acres abutting the Music Conservatory on the campus. The school taught handling and disposal of unexploded ordnance. But the stripping of live fuses and any actual demolitions were conducted at the Navy's Stumpneck Ordnance Investigation Laboratory on the Potomac River at Indian Head, Maryland. The school's

Research Department, however, did use chemicals including mercury and various acids in its work. The school ended its existence on October 31, 1945, selling a quantity of its supplies, chemicals, furniture, and related items to the university and completing the history of the service of American University and its campus in two world wars.

Endnotes

Introduction

[1] "American University: Summary of USATHAMA Investigations Conducted in 1986," January 25, 1993, 1. Compiled by the U.S. Army Toxic and Hazardous Materials Agency. Copy in Office of History Spring Valley files.

[2] Memorandum for the Corps of Engineers, Subject: Historical Information Gathered During Operation Safe Removal, 5 Jan–1 Feb 93; Memorandum for Record, Subject: Chemical Agents, Toxins, Smoke, Incendiary, and Detonator Materials Investigated at American University Experiment Station During World War I. Copies in Office of History Spring Valley files.

History of Land Use

[3] Janice B. Artemel, Jeffrey Parker, and Elizabeth A. Crowell, Preliminary Archeological Survey, 23 Recreation Centers, Washington, DC, 1983. Documentation prepared for the D.C. Department of Recreation. Original copy also filed at the office of the D.C. Historic Preservation Division.

[4] U.S. National Capital Planning Commission, *Boundary Markers of the Nation's Capital,* Washington, DC: Government Printing Office, 1976, 3–9, 17–18.

[5] Gary A. Burch and Steven M. Pennington, editors, *Civil Engineering Landmarks of the Nation's Capital,* Washington, DC: National Capital Section American Society of Civil Engineers, 1982, 15–20. Meigs's plan for the project proved so valuable that he was appointed "first engineer" for it and received a promotion from lieutenant to captain.

[6] Artemel et al., Preliminary Archeological Survey, 81–85; *Map of the District of Columbia and Portions of Maryland and Virginia,* Washington, DC: Thomas J. Fisher and Co., 1891. See also clipping files for Wesley Heights and American University Park housed at the Washingtoniana Collection, Martin Luther King Jr. Public Library.

[7] *The American University and the General Conference of the Methodist Episcopal Church, Omaha, Nebraska, May, 1892,* Omaha: Rees Printing Co., 1892, 59; *Evening Star* (Washington, DC), March 4, 1895, 10; William J. Mayer, "The Rise of American U.," *Washington Star Pictorial Magazine,* February 15, 1953, 1–4.

[8] U.S. Congress, Senate, *Reform School for White Girls in the District of Columbia,* Sen. Doc. 979, 62d Cong., 3d Sess., 1912; National Training School for Girls clippings file, Washingtoniana Collection, Martin Luther King Jr. Public Library.

[9] District of Columbia, Engineering Department, File E.D. 140829. Original in the District of Columbia Archives; Memorandum, Captain J. R. Harris, QMRC, to Brigadier General F. V. Abbot, May 4, 1918; Memorandum, D.C. Engineer Commissioner John G. D. Knight to Captain J. R. Harris, Constructing Quartermaster, American University, May 28, 1918; Memorandum, P. R. Davis, Battalion Chief, to Chief Engineer, D.C. Fire Department, December 31, 1919; Letter, Daniel E. Garges, Secretary, Board of Commissioners, to Dr. E. M. Frampton, Business Manager, Fixed Nitrogen Research Laboratory, January 9, 1920, E.D. 140829, Record Group 17, Records of the District of Columbia Department of Public Works, D.C. Archives, Washington, DC.

[10] District of Columbia, Engineering Department, File E.D. 134953.

[11] Ibid., File E.D. 141462.

[12] Ibid., File E.D. 135953; Memorandum, Sup't. Water Dep't to The Honorable, The President of the Board of Commissioners, District of Columbia, April 9, 1924, E.D. 140829, Record Group 17, Records of the District of Columbia Department of Public Works, D.C. Archives, Washington, DC.

[13] Files E.D. 135953 and 145614, Record Group 17, Records of the District of Columbia Department of Public Works, D.C. Archives, Washington, DC.

[14] District of Columbia, Tax Assessor's Office, General Assessments, 1913–1922; *Boyd's Directory of the District of Columbia,* Washington, DC: R. L. Polk & Co., 1913–19. Tax assessment records provide only the names of property owners, while the city directory listed renters as well as owners. Names that appeared on real estate maps associated with parcels in the study area were cross-referenced in other sources.

[15] "Patton" is spelled variously in official records. Mrs. Corbin had to resolve a problem with back property taxes on her property before her lease could be executed, District of Columbia, Tax Assessor's Office, General Assessments, 1913–1922.

[16] Memorandum, Henry Jervey, Colonel, Corps of Engineers, to Department of Sewers, June 30, 1917; 1st Endorsement, Superintendent of Sewers, July 2, 1917; Letter, C. W. Kuhn, Engineer Commissioner, to Colonel Henry Jervey, July 6, 1917; Memorandum, Inspector of Plumbing to Superintendent of Sewers, August 10, 1917, E.D. 141178, Record Group 17, Records of the District of Columbia Department of Public Works, D.C. Archives, Washington, DC. Even though the idea generated a considerable amount of positive correspondence, the city still took three weeks to approve the relocation of a fire alarm box nearer to the entrance of the Experiment Station. Letter, Lauson Stone, Superintendent, Experiment Station, to Frank J. Wagner, Chief Engineer, Fire Department, April 23, 1918; Letters, Lauson Stone to Warren B. Hadley, Electrical Engineer, D.C., May 4, 1918, and July 10, 1918; Letter, Hadley to Stone, July 11, 1918; Transfer Voucher, Actg. Auditor, D.C., October 29, 1918, E.D. 140829, Record Group 17, Records of the District of Columbia Department of Public Works, D.C. Archives, Washington, DC. Note that during the course of this correspondence the letterhead of the installation at American University changed from "Department of the Interior Bureau of Mines Experiment Station" to "War Department Chemical Warfare Section Research Division Experiment Station."

[17] 2nd Endorsement, J. S. Garland, Supt., Water Department, June 16, 1917; 5th Endorsement, J. S. Garland, July 25, 1917; Memorandum, Dabney H. Maury, Major, ERC, to Engineer Commissioner, January 25, 1918; Memorandum, J. S. Garland to Col. Loving, Acting Engineer Commissioner, January 28, 1918; Memorandum, Office of Engineer Commissioner to Major Dabney H. Maury, January 28, 1918; Memorandum, J. S. Garland to Engineer Commissioner, November 20, 1918; Letter, Board of Commissioners of the District of Columbia to Honorable Newton D. Baker, Secretary of War, November 25, 1918; Letter, Henry Jervey, Major General, Office of the Chief of Staff, to Honorable Louis Brownlee, President, Board of Commissioners, December 12, 1918; Memorandum, Timothy J. Donohoe, 4th Battalion Chief, to Chief Engineer, D.C. Fire Department, May 5, 1919; Memorandum, C. C. Wolz, Lieut [Fire Department], to Chief Engineer, D.C. Fire Department, May 5, 1919; 2nd Endorsement, J. S. Garland, May 14, 1919, E.D. 140829, Record Group 17, Records of the District of Columbia Department of Public Works, D.C. Archives, Washington, DC.

[18] U.S. Department of Agriculture, *First "Lumberjack" Regiment: 10th Reserve Engineers (Forest)*, Forest Service, ca. 1917, Record Group 33, Motion Picture Collection, National Archives, Washington, DC.

[19] District of Columbia, *D.C. Commissioners Reports, 1916–1919*, Reports of the National Training School for Girls. The reports mentioned no adverse effects from the nearby military camps. Perhaps even more important, no complaints about the treatment of the young women

(13 to 21 years of age) were lodged with the Board of Commissioners of the Boards of Charities. This was the official body to which relatives and others lodged complaints when inmates of charitable institutions were mistreated. See also Minutes of the Board of Commissioners, Record Group 351, Item 159, at the National Archives. Relevant minutes are bound in volumes 3 and 4.

[20] Memorandum, W. L. Gilbert, Maj. Gen. Chemical Warfare Service, to Maj. Gen. W. M. Block, September 12, 1918; Memorandum, G. A. Burrell, War Department, Chemical Warfare Service, to Director of Chemical Warfare Service, September 5, 1918, Record Group 165, Records of War Department General and Special Staff, National Archives, Washington, DC.

[21] *Post* (Washington, DC), August 4, 1918; *Times* (Washington, DC), August 4, 1918. The Scotts wrote several other letters of complaint to the D.C. government, primarily about the condition of roads near their Ridge Road "cottage," about 1920. For example, see letter written on Mrs. Scott's behalf by G. W. Trowbridge to Hon. Commissioner-Engineer, District of Columbia, April 14, 1924, E.D. 175160, Record Group 17, Records of the District of Columbia Department of Public Works, D.C. Archives, Washington, DC.

[22] Letter, D.C. Board of Commissioners to Secretary of War, October 30, 1918, Record Group 175, Records of the Chemical Warfare Service, NARA Suitland Reference Branch, Suitland, MD. See also Commissioners of the District of Columbia to Secretary of War, October 30, 1918; Secretary of War to Board of Commissioners of the District of Columbia, November 8, 1918, Records of the District of Columbia Department of Public Works, D.C. Archives, Washington, DC.

World War I Years

[23] Memorandum on the Use of the American University Grounds by the United States, Major General W. M. Black, October 25, 1918, Record Group 77, Records of the Office of the Chief of Engineers, Camps and Posts, NARA Suitland Reference Branch, Suitland, MD.

[24] Memorandum, John V. Van De Mark to Major J. S. Holden, September 18, 1918, Record Group 92, Records of the Office of the Quartermaster General, Real Estate Records, NARA Suitland Reference Branch, Suitland, MD.

[25] Memorandum on the Use of the American University Grounds by the United States, Major General W. M. Black, October 25, 1918, Record Group 77, Records of the Office of the Chief of Engineers, Camps and Posts, NARA Suitland Reference Branch, Suitland, MD.

[26] Weekly Reports, Commanding Officer, Camp Leach, to Chief of Engineers, August–December 1918, Record Group 407, Records of the Adjutant General's Office, Camp Leach, National Archives, Washington, DC.

[27] Report to the Secretary of the Interior on the Research Work of the Bureau of Mines on Gases Used in Warfare, February 1, 1917, to March 1, 1918, Van H. Manning, Director, Record Group 407, Records of the Adjutant General's Office, National Archives, Washington, DC.

[28] Leo P. Brophy, Wyndham D. Miles, and Rexmond C. Cochrane, *The Chemical Warfare Service: From Laboratory to Field,* Washington, DC: Office of the Chief of Military History, 1959, 2–5.

[29] Report to the Secretary of the Interior on the Research Work of the Bureau of Mines on War Gas Investigations, July 1, 1917, to May 15, 1918, Van H. Manning, Director, Record Group 70, Records of the Bureau of Mines, NARA Suitland Reference Branch, Suitland, MD.

[30] Brophy et al., *Chemical Warfare Service,* 6.

[31] Report to the Secretary of the Interior on the Research Work of the Bureau of Mines on War Gas Investigations, July 1, 1917, to May 15, 1918, Van H. Manning, Director, Record Group 70, Records of the Bureau of Mines, War Gas Investigations, NARA Suitland Refernce Branch, Suitland, MD.

[32] Lt. Col. W. D. Bancroft, *History of the Chemical Warfare Service in the United States,* May 31, 1919, Research Collections, Office of History, Headquarters, U.S. Army Corps of Engineers, Fort Belvoir, VA.

[33] Report to the Secretary of the Interior on the Research Work of the Bureau of Mines on War Gas Investigations, July 1, 1917, to May 15, 1918, Van H. Manning, Director, Record Group 70, Records of the Bureau of Mines, War Gas Investigations, NARA Suitland Reference Branch, Suitland, MD.

[34] Bancroft, *History of the Chemical Warfare Service.*

[35] Memorandum, Commanding Officer, 1st Battalion, Chemical Warfare Service, to Commanding Officer, Camp Leach, August 29, 1918, Record Group 407, Records of the Adjutant General's Office, National Archives, Washington, DC.

[36] Bancroft, *History of the Chemical Warfare Service,* 55–59.

[37] The number of temporary structures on the American University campus is derived by subtracting the College of History and Ohio Buildings and the permanent structures built in 1917 and 1918 from the total number of buildings there when the Experiment Station was discontinued.

[38] Memorandum on the Use of the American University Grounds by the United States, Major General W. M. Black, October 25, 1918, Record Group 77, Records of the Office of the Chief of Engineers, Camps and Posts, NARA Suitland Reference Branch, Suitland, MD.

[39] Memorandum, William L. Sibert, Director, Chemical Warfare Service, to Director of Operations, War Department, October 27, 1918, Record Group 407, Records of the Adjutant General's Office, National Archives, Washington, DC.

[40] Memorandum on the Use of the American University Grounds by the United States, Major General W. M. Black, October 25, 1918, Record Group 77, Records of the Office of the Chief of Engineers, Camps and Posts, NARA Suitland Reference Branch, Suitland, MD.

[41] Paper, "Proposed Boundary Line Between American University Camp and Bureau of Mines," no date, Record Group 92, Records of the Office of the Quartermaster General, NARA Suitland Reference Branch, Suitland, MD.

[42] Memorandum on the Use of the American University Grounds by the United States, Major General W. M. Black, October 25, 1918, Record Group 77, Records of the Office of the Chief of Engineers, Camps and Posts, NARA Suitland Reference Branch, Suitland, MD.

[43] Completion Report, Project "Additional Accommodations Camp Leach," Harold O. Godwin, Constructing Quartermaster, November 23, 1918, Record Group 92, Records of the Office of the Quartermaster General, Real Estate Records, NARA Suitland Reference Branch, Suitland, MD.

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[45] List of Buildings—American University Experiment Station, no date, Record Group 92, Records of the Office of the Quartermaster General, Real Estate Records, NARA Suitland Reference Branch, Suitland, MD.

[46] Memorandum, Chief, Research Division, CWS, USA, to the Director, CWS, USA, November 26, 1918, Record Group 175, Records of the Chemical Warfare Service, NARA Suitland Reference Branch, Suitland, MD.

[47] Report to the Secretary of the Interior on the Research Work of the Bureau of Mines on War Gas Investigations, July 1, 1917, to May 15, 1918, Van H. Manning, Director; Paper, "Chemical Research (Offense Problems)," no date, Record Group 70, Records of the Bureau of Mines, NARA Suitland Reference Branch, Suitland, MD; History, Offense Research Section, Lauder M. Jones, no date, Fisher Library, U.S. Army Chemical School, Fort McClellan, AL.

[48] Report to the Secretary of the Interior on the Research Work of the Bureau of Mines on War Gas Investigations, July 1, 1917, to May 15, 1918, Van H. Manning, Director, Record Group 70, Records of the Bureau of Mines, NARA Suitland Reference Branch, Suitland, MD; Report, "Data on Field Concentrations of Toxic Substances," Gas Mask Research Section, Research Division, Chemical Warfare Service, American University Experiment Station, no date, Fisher Library, U.S. Army Chemical School, Fort McClellan, AL.

[49] Report, "Protection Afforded by Various Canisters Against Mixtures of DA and CG Detonated in Field Test," Gas Mask Research Section, Research Division, Chemical Warfare Service, American University Experiment Station, no date; Report, "Protection Afforded by Various Canisters Against Mark 2 Gas Grenades Detonated in Bomb Pit," Gas Mask Research Section, Research Division, Chemical Warfare Service, American University Experiment Station, no date, Fisher Library, U.S. Army Chemical School, Fort McClellan, AL.

[50] Report to the Secretary of the Interior on the Research Work of the Bureau of Mines on War Gas Investigations, July 1, 1917, to May 15, 1918, Van H. Manning, Director, Record Group 70, Records of the Bureau of Mines, NARA Suitland Reference Branch, Suitland, MD; Bancroft, *History of the Chemical Warfare Service*, 55-59.

[51] Report to the Secretary of the Interior on the Research Work of the Bureau of Mines on War Gas Investigations, July 1, 1917, to May 15, 1918, Van H. Manning, Director; Report, "Firing a Liven's Projectile Loaded With Phosgene and Pumice," no date; Report, "Firing a Liven's Projectile Loaded With Chlorpicrin and Phosgene," no date, Record Group 70, Records of the Bureau of Mines, NARA Suitland Reference Branch, Suitland, MD.

[52] Report, "Use of War Gases in Liven's Projectiles," Captain George A. Burrell, no date; Report, "Methyldichlorarsine-Mustard Gas Field Test," no date, Record Group 70; Report, "Field Test of Mustard Gas," no date; Report, "Diphenylchlorarsine in High Explosive Shell," no date, Record Group 70, Records of the Bureau of Mines, NARA Suitland Reference Branch, Suitland, MD.

[53] Report to the Secretary of the Interior on the Research Work of the Bureau of Mines on War Gas Investigations, July 1, 1917, to May 15, 1918, Van H. Manning, Director, Record Group 70, Records of the Bureau of Mines, NARA Suitland Reference Branch, Suitland, MD; Bancroft, *History of the Chemical Warfare Service*, 55-59.

[54] Report to the Secretary of the Interior on the Research Work of the Bureau of Mines on War Gas Investigations, July 1, 1917, to May 15, 1918, Van H. Manning, Director, Record Group 70, Records of the Bureau of Mines, NARA Suitland Reference Branch, Suitland, MD.

[55] Ibid.; Bancroft, *History of the Chemical Warfare Service*, 55-59.

[56] Report to the Secretary of the Interior on the Research Work of the Bureau of Mines on War Gas Investigations, July 1, 1917 to May 15, 1918, Van E. Manning, Director, Record Group 70, Records of the Bureau of Mines, NARA Suitland Reference Branch, Suitland, MD.

[57] Ibid.; Bancroft, *History of the Chemical Warfare Service*, 55-59.

[58] Report, "Pharmacological and Toxicological Sections, Summary of Achievements, 1917-1918," Research Division, Chemical Warfare Service, no date, American University Experiment Station, Fisher Library, U.S. Army Chemical School, Fort McClellan, AL.

[59] List of Buildings—American University Experiment Station, no date, Record Group 92, Records of the Office of the Quartermaster General, Real Estate Records, NARA Suitland Reference Branch, Suitland, MD.

[60] Paper, "Pyrotechnic Division, Status of Problems in the Gas Shell Unit," no date; Report, Pyrotechnic Section, "Gas Shells—Firing a Liven's Projectile Loaded With CG," no date; Report, "Main Report, Pyrotechnic Division," no date, Record Group 70, Records of the Bureau of Mines, NARA Suitland Reference Branch, Suitland, MD.

[61] Report, "Test of Liven's Projector," no date; Report, "Incendiaries-Intensive Bomb," no date, Record Group 70, Records of the Bureau of Mines, NARA Suitland Reference Branch, Suitland, MD.

[62] List of Buildings—American University Experiment Station, no date, Record Group 92, Records of the Office of the Quartermaster General, Real Estate Records; Monograph on the Use of War Gases in Liven's Projectiles, Captain George A. Burrell, December 1918, Record Group 175, Records of the Chemical Warfare Service, Technical Documents, NARA Suitland Reference Branch, Suitland, MD.

[63] Report, "Pharmacological and Toxicological Sections: Summary of Achievements, 1917-1918," no date, Record Group 175, Records of the Chemical Warfare Service, NARA Suitland Reference Branch, Suitland, MD.

[64] List of Buildings—American University Experiment Station, no date, Record Group 92, Records of the Office of the Quartermaster General, Real Estate Records; Report of Field Experiments on Persistency of G-34, no date, Record Group 175, Records of the Chemical

Warfare Service, Technical Documents, NARA Suitland Reference Branch, Suitland, MD; Report on Field Experiments on Persistency of War Gases, Paul W. Carleton, no date; Report, "Protection Afforded by Various Canisters Against DM Candles in Field Test at Berlin, MD, November 2, 1918," Fisher Library, U.S. Army Chemical School, Fort McClellan, AL.

[65] Report, "Protection Afforded by Various Canisters Against G-76 Detonated in Bomb Pit, October 4, 1918;" Report, "Protection Afforded by Various Canisters Against DA Shells in Tests at Bradley Field," no date; Report, "Protection Afforded by Various Canisters Against G-76 Candles in Conduit Road Field Test," no date, Fisher Library, U.S. Army Chemical School, Fort McClellan, AL.

[66] List of Buildings—American University Experiment Station, no date, Record Group 92, Records of the Office of the Quartermaster General, Real Estate Records, NARA Suitland Reference Branch, Suitland, MD.

Post-World War I Era

[67] Memorandum, Colonel Robert E. Wyllie, Army Operations Division, General Staff, to Chief of Construction Division, September 26, 1918, Record Group 92, Records of the Office of the Quartermaster General, Real Estate Records, NARA Suitland Reference Branch, Suitland, MD.

[68] Memorandum, Major General William M. Black, Chief of Engineers, to Chief of the Construction Division, December 3, 1918, Record Group 77, Records of the Office of the Chief of Engineers, Camps and Posts, NARA Suitland Reference Branch, Suitland, MD.

[69] Memorandum, The Adjutant General of the Army to the Commanding Officer, Camp Leach, December 28, 1918, Record Group 77, Records of the Office of the Chief of Engineers, NARA Suitland Reference Branch, Suitland, MD.

[70] Memorandum, Major General W. M. Black to the Assistant Secretary of War, January 3, 1919; Memorandum, Chief of Construction Division to Constructing Quartermaster, Army War College, Washington, DC, May 28, 1919; Memorandum, Chief, Construction Division to the Quartermaster General, April 28, 1920, Record Group 92, Records of the Office of the Quartermaster General, Real Estate Records, NARA Suitland Reference Branch, Suitland, MD.

[71] Memorandum, Chief of Engineers to the Commanding Officer, Camp Leach, November 30, 1918, Record Group 77, Records of the Office of the Chief of Engineers, Camps and Posts, NARA Suitland Reference Branch, Suitland, MD.

[72] Memorandum, Colonel R. E. Wyllie, Chief, Equipment Branch, Army Operations Division, General Staff, to Director of Chemical Warfare Service, September 30, 1918; 1st Endorsement, Record Group 92, Records of the Office of the Quartermaster General, Real Estate Records, NARA Suitland Reference Branch, Suitland, MD.

[73] Memorandum, Adjutant General to Director of Chemical Warfare Service, November 16, 1918; Memorandum, Director of Operations, General Staff, to the Assistant Secretary of War, November 4, 1918; Memorandum, Brigadier Hugh S. Johnson, Assistant to the Director of Purchase, Storage, and Traffic, General Staff, to the Director of Operations, General Staff, September 13, 1918, Record Group 92, Records of the Office of the Quartermaster General, Real Estate Records, NARA Suitland Reference Branch, Suitland, MD.

[74] Memorandum on the Use of the American University Grounds by the United States, Major General W. M. Black, Chief of Engineers, October 25, 1918, Record Group 77, Records of the Office of the Chief of Engineers, Camps and Posts, NARA Suitland Reference Branch, Suitland, MD.

[75] Memorandum, Major General Henry Jervey, Director of Operations, General Staff, to the Assistant Secretary of War, November 4, 1918, Record Group 394, Records of the Adjutant General's Office, National Archives, Washington, DC.

[76] Memorandum, Adjutant General to the Director of the Chemical Warfare Service, November 16, 1918, Record Group 394, Records of the Adjutant General's Office, National Archives, Washington, DC.

[77] Memorandum, Major General William L. Sibert, Director, CWS, to the Adjutant General, U.S. Army, December 4, 1918, Record Group 394, Records of the Adjutant General's Office, National Archives, Washington, DC.

[78] Brophy et al., *Chemical Warfare Service*, 24.

[79] Memorandum, Chief, Chemical Warfare Service, to Office of Public Buildings and Grounds, October 12, 1920, Record Group 175, Records of the Chemical Warfare Service, NARA Suitland Reference Branch, Suitland, MD.

[80] "Annual Report of the Chief of the Chemical Warfare Service, 1920," American University Archives, Washington, DC.

[81] The unofficial source for this information is an article of the period from the American University *Courier* describing the operations and achievements of the fixed-nitrogen research laboratory. Official Ordnance Corps records for this period provide no information about activities at that facility.

[82] Memorandum, Acting Chief, Research Division, Chemical Warfare Service, to Director, Chemical Warfare Service, April 21, 1919, Record Group 175, Records of the Chemical Warfare Service, NARA Suitland Reference Branch, Suitland, MD.

[83] U.S. Congress, House of Representatives, Document No. 1739, "Letter from the Secretary of the Treasury Transmitting Copy of Communication from the Secretary of the Interior Submitting a Supplemental Estimate of Appropriation Required by the Bureau of Mines for the American University Experiment Station, Fiscal Year 1920," Record Group 175, Records of the Chemical Warfare Service, NARA Suitland Reference Branch, Suitland, MD.

[84] Memorandum, Major General William L. Sibert, Director, Chemical Warfare Service, to the Chief of Staff, March 17, 1919, Record Group 175, Records of the Chemical Warfare Service, NARA Suitland Reference Branch, Suitland, MD.

[85] Brophy et al., *Chemical Warfare Service,* 24.

[86] "Chemical Warfare Service Demobilization History," no date, Record Group 394, Records of the Adjutant General's Office, National Archives, Washington, DC.

[87] "Annual Report of the Chief of the Chemical Warfare Service, 1920," American University Archives, Washington, DC.

[88] Memorandum, Chief of Construction Division to Constructing Quartermaster, Army War College, Washington, DC, March 23, 1920, Record Group 92, Records of the Office of the Quartermaster General, Real Estate Records, NARA Suitland Reference Branch, Suitland, MD.

[89] Memorandum, Chief, Research Division, to Director, Chemical Warfare Service, January 25, 1919, Record Group 394, Records of the Adjutant General's Office, National Archives, Washington, DC.

Site Reuse in Peacetime

[90] *American University and the General Conference,* 59; *Evening Star* (Washington, DC), March 4, 1895, 10; *Washington Star Pictorial Magazine,* February 15, 1953, 1–4.

[91] *Evening Star* (Washington, DC), March 4, 1895, 10.

[92] *American University and the General Conference,* 59–60.

[93] U.S. Department of Agriculture, *First "Lumberjack" Regiment.*

[94] "Move and Disposal of the American University Experiment Station," no date; Robert B. Field, Captain, QM Corps, to Major Von Dem Bussche, Real Estate Division, April 22, 1921; W. B. Bancroft, Lt. Col., CWS, USA, to Director, Chemical Warfare Service, January 25, 1919, Record Group 92, Records of the Office of the Quartermaster General, NARA Suitland Reference Branch, Suitland, MD.

[95] *Post* (Washington, DC), January 27, 1921, 2; *Evening Star* (Washington, DC), January 26, 1921, 1. The total number of buildings burned varies from document to document, but figures range from 14 to 20.

[96] American University Archives, *Camp American University: A.U. and the U.S. Military 1861-1946,* 99522. Monograph housed at the American University Archives.

[97] Ibid.

[98] *Washington Star Pictorial Magazine,* February 15, 1953, 4.

[99] *Star* (Washington, DC), June 10, 1957. Copy housed in American University clipping file, Washingtoniana Collection, Martin Luther King Jr. Public Library.

[100] Kathryn Schneider Smith, editor, *Washington at Home: An Illustrated History of Neighborhoods in the Nation's Capital,* Chatsworth, CA: Windsor Publications, 1988, 281.

[101] Marc Fisher, "New Generation Finds AU Park," *Post* (Washington, DC), February 28, 1987, Metro Section, 1. This article mistakes American University Park for American University Heights, which was conceived and platted by the Methodists and abutted the north edge of the campus on the opposite side of Massachusetts Avenue from American University Park. American University Heights' development proceeded so slowly that it ultimately lost its identity as a subdivision. Fisher also reported that while the Army had stored explosives in the "dugouts" during World War I, area residents in 1987 would not find any explosives, since "they are buying the fruits of the labor of a generation of homeowners."

[102] Ibid.; Judith Beck Helm, *Tenleytown, D.C.,* 1981. Copy of latter item appears in American University Park clipping file, Washingtoniana Collection, Martin Luther King Jr. Public Library. No discussion of the preparation of the sites appears in any of these sources. It is, however, obvious to the trained eye that developers of American University Park used standard site-preparation procedures for moderate housing (i.e., wholesale removal of trees and extensive uniform leveling of the terrain with steam-powered earth-moving equipment). Fisher alludes to this practice by stating that the subdivision's trees have grown to 60 feet, a comment that would not have been necessary if the area had not been cleared. A second possibility is

that the trees were cut down by the soldiers stationed at Camp Leach.

[103] Ibid.

[104] This section was edited by the Spring Valley Project Office, U.S. Army Engineer District, Baltimore in May 1994. References in the April 1994 version of the historical report which commented on Miller activities, unrelated to any conceivable contamination of the site and unrelated to DOD activities during World War I or World War II were deleted at the request of commenting community Zone Captains.

[105] Obituary files, Washingtoniana Collection, Martin Luther King Jr. Public Library.

[106] This is a compilation from information about the Miller brothers that is located in clipping files titled W. C. & A. N. Miller Co., Wesley Heights, Spring Valley, and obituary files at the Washingtoniana Collection, Martin Luther King Jr. Public Library.

[107] Letter, David J. Howell, Engineer, to W. C. Hazen, Surveyor, April 6, 1932, E.D. 237240, Record Group 17, Records of the District of Columbia Department of Public Works, D.C. Archives, Washington, DC.

[108] *Evening Star* (Washington, DC), February 28, 1932. Clipping in Spring Valley file, Washingtoniana Collection, Martin Luther King Jr. Public Library.

[109] Ibid., July 27, 1929.

[110] In 1926 Congress passed the law that established the National Capital Park and Planning Commission. For more information about the events leading up to the establishment of the Commission and for information about the Commissioners who approved the Spring Valley plat, see Frederick Gutheim, *The Federal City: Plans & Realties*, Washington, DC: Smithsonian Institution Press, 1976, 40–42. Minutes of the Commission's meetings are housed at the National Archives in Record Group 328. Unfortunately, the collection begins a year after the Commission discussed and approved the Spring Valley plat.

[111] Surveyor, D.C., to the Director of Highways, July 10, 1933, E.D. 239204, Record Group 17, Records of the District of Columbia Department of Public Works, D.C. Archives, Washington, DC. The Millers closed the "old road" lying south of Squares 1475 and 1506 west of 48th Street, NW, sometime after January 1933. Blueprint copies of the plat are filed both with the Surveyor's Office of the District of Columbia and in D.C. Engineering Department files at the D.C. Archives. Also see "New Ideas Shown in Spring Valley," *Evening Star* (Washington, DC), July 27, 1929. Clipping in Spring Valley file, Washingtoniana Collection, Martin Luther King Jr. Public Library.

[112] Construction workers in other parts of the city were still using labor-intensive methods for site preparation, but for economic reasons rather than aesthetic ones. For a description of their tools, see Ruth Ann Overbeck, "The Deanwood Survey," 1986. The original manuscript copy is filed at the office of the D.C. Historic Preservation Division.

[113] 7th Endorsement, Sanitary Engineer to Captain Evans, Assistant Engineer Commissioner, July 10, 1929; 8th Endorsement, Assistant Engineer Commissioner to Engineer Commissioner, July 10, 1929; Memorandum, J. S. Garland, Supt., Water Dept., to Assessor, November 26, 1928; Letter, W. B. Ladue, Colonel, Engineer Commissioner, to William A. Elliott, December 21, 1928, E.D. 216326, Record Group 17, Records of the District of Columbia Department of Public Works, D.C. Archives, Washington, DC. This file illustrates the complexities of obtaining water service. See also Letter, David J. Howell, Engineer, to C. B. Hunt, Engineer of Highways, February 14, 1930, E.D. 225250, Record Group 17, Records of the District of Columbia Department of Public Works, D.C. Archives, Washington, DC, for the amount of work that W. C. & A. N. Miller Development Company anticipated it would have to do in conjunction with the intersection of Indian Lane and Nebraska Avenue.

[114] *Evening Star* (Washington, DC), July 27, 1929; "An Idea—Choose Your Home From the Air," *Times-Herald* (Washington, DC), February 25, 1940. Clippings in Spring Valley file, Washingtoniana Collection, Martin Luther King Jr. Public Library.

[115] Memorandum, Surveyor, D.C., to Engineer Department, D.C., September 6, 1928, E.D. 214681, Record Group 17, Records of the District of Columbia Department of Public Works, D.C. Archives, Washington, DC.

[116] Ibid.; 4th Endorsement, D. W. Holton, Supt., Water Dept., Jan. 12, 1931, E.D. 224588, Record Group 17, Records of the District of Columbia Department of Public Works, D.C. Archives, Washington, DC.

[117] Record Group 17 contains numerous signatures of the Millers on their correspondence; "Fall off Horse Fractures Back of A.N. Miller," *Herald* (Washington, DC), November 25, 1930. See also city directories of the 1930s for the address of William C. Miller.

[118] Clippings in Spring Valley file, Washingtoniana Collection, Martin Luther King Jr. Public Library.

World War II

[119] *History of U.S. Navy Bomb Disposal*, n.p.: Navy Explosive Ordnance Disposal Association, 1992, "The Bomb Disposal School," 1–2, and "U.S. Navy Instruction," 1. This book was

initially issued in typescript form about 1945. Copies of both the published and typescript versions of this history are available at the Naval Historical Center, Washington Navy Yard, Washington, DC.

[120] Ibid., "U.S. Navy Instruction," 1-2, and "BD School Curriculum," 2-3; Telephone Interview with Jack Hartman, Chief Instructor, Bomb Disposal School, 1942-43, conducted by Charles Hendricks on February 9, 1993; and Telephone Interview with J. Phillip David, Commander, Bomb Disposal School, 1944-45, conducted by H. Glenn Earhart, Resident Engineer, Spring Valley Resident Office, on March 16, 1994.

[121] *History of U.S. Navy Bomb Disposal,* "U.S. Navy Instruction," 1-3.

[122] Ibid., 4-5.

[123] Ibid., "Introduction," pp. 2-3; Contract NOd 3054, October 28, 1943, 3, in File AC 6204.5, Box 5, American University Archives.

[124] *History of U.S. Navy Bomb Disposal,* "Enemy Intelligence," 1-3, "Research and Development," 1, and "Research Programs," 1-6.

[125] Telephone Interviews conducted by Charles Hendricks with Jack Hartman, February 9, 1993, and J. Phillip David, February 10, 1993.

[126] *History of U.S. Navy Bomb Disposal,* "The Officers in Charge: J. Phillip David," and "U.S. Navy Instruction," 1; and Contract NOd 3054, October 28, 1943, and Supplement 1 thereto, October 20, 1945, in File AC 6204.5, Box 5, American University Archives.

[127] The lease boundaries depicted in the map were derived from several sources; specifically leases for the Perry and Patten tracts, a November 26, 1918 memorandum from G. A. Burrell to LTC W. J. Noonan identifying a list of lessors of property to the Federal Government, and a 1919 Baist map of the area.

Appendix A
"History of Land Use" and "Site Reuse in Peacetime"

Methodology

Research on land use and disturbances to the land was conducted in several repositories in and near Washington, D.C. Much of the documentation is housed in Federal or local government repositories, but other information, such as biographical details of the developers of the land encompassed by Operation Safe Removal, is part of the holdings of the Washingtoniana Collection of the Martin Luther King Jr. Public Library. Because of the disparate nature of the files, both topical and chronological approaches were taken to the research. Topics included subdivision, street, institutional, and personal names; street construction and utility installation by type; building permits for selected portions of the area under investigation; and government activities by agency, especially the National Capital Park and Planning Commission, the Engineering Department of the D.C. Department of Public Works, the D.C. Tax Assessor and Survey Offices, and the D.C. Fire Department.

Mr. Jimmy Rush and his staff assisted with access to Record Group 328, which contains the records of the National Capital Park and Planning Commission, and with Record Group 351, which contains selected records of the District of Columbia. Record Group 328 contains extensive material related to street plan

and grade changes and parkland. Record Group 351 contains important material pertaining to a variety of charitable institutions, including the National Training School for Girls, which abutted the test area. The record group also contains historic building permits.

Also of great assistance were members of the staff in charge of Record Group 33, the Motion Picture Collection. Record Group 33 contains a wide variety of films generated by and for the Federal Government. It includes material on military training and testing as well as land use and urban planning.

At the D.C. Archives, Dr. Philip Ogilvie and Ms. Dorothy Provine extended every courtesy. The research made extensive use of the material in Record Group 17, Records of Department of Public Works, which includes records of the D.C. Engineering Department related to projects such as street and road improvements, utility installations such as water, wastewater, gas, and electric lines. Records consist of maps, drawings, correspondence, payment authorizations, project completion reports, and the like.

The staff of the Map and Geography Division of the Library of Congress placed the requested maps on reserve and enabled the research team to review a consistent body of maps over an extended period. Among the maps used at the library were Boeske and various Civil War manuscript maps; maps and atlases published by Fisher, Hopkins, and Baist; and the maps of the U.S. Coast and Geodetic Survey.

Sources

I. National Archives and Records Administration, Washington, D.C.

1. Record Group 33, Motion Picture Collection.

   Card Index to Motion Picture Collection for selected topics.

   Motion Pictures. Watched 8 reels.

2. Record Group 328, Records of the National Capital Park and Planning Commission.

Notebook Indexes to Records of the Commission.

Minutes of Commissioners' Meetings from 1928 forward.

Files for topics including subdivision, changes to street plan, hearings, correspondence to and from the Commission. Examined 18 archives boxes.

Entries 95 and 96, Indexes to Building Permits and selected building permits. Examined 8 reels of microfilm.

Entry 159, Records of the D.C. Board of Charities. Minutes of the Board of Charities. Examined 2 archives boxes.

II. NARA Suitland Reference Branch, Suitland, Maryland.

1. Record Group 92, Records of the Office of the Quartermaster General.

Real Estate Records. Examined 3 archives boxes.

III. Library of Congress.

2. Geography and Maps Division.

Fisher, Hopkins, and Baist atlases.

U.S. Coast and Geodetic Survey Maps.

Boeske and other manuscript maps.

D.C. Street Maps Collection.

3. Periodicals Collection.

   Post, *Star*, and *Times-Herald* (Washington, D.C.) for selected dates, approximately 4 months of newspapers per publication.

IV. Martin Luther King Jr. Public Library, Washingtoniana Collection.

1. General reference works on development of District of Columbia, Civil War, D.C. government, urban planning in the District, civil engineering works. Examined approximately 30 volumes.

2. City directories, 1890 to present. Examined selected names and street addresses in 75 volumes.

3. Clippings files compiled under such topical headings as subdivision and street name, institution or agency, corporate or personal name, World War I, fires, etc. Examined 58 files.

4. District of Columbia.

   D.C. Commissioners Reports, 1916–19, 3 volumes.

   Reports of the National Training School for Girls, 3 volumes.

   D.C. Tax Assessors' Records, 1914–21, 4 volumes.

5. Photographic Collection by subdivision, street, and institutional, corporate, and personal name, approximately 18 items.

6. *Evening Star* (Washington, D.C.) Collection

   Index, 10 file drawers.

   Examined selected files by topic, 30 file folders.

IV. Office of the Historian of the U.S. Senate.

Biographical information about Senator Nathan B. Scott.

V. D.C. Archives.

1. Engineering Department Index by topics such as subdivision, street and road name, utility installation by type, correspondence, incidents such as fire and explosion, institutions and corporations, approximately 120 archives boxes.

   Engineering Department Files. Examined 265 record center boxes.

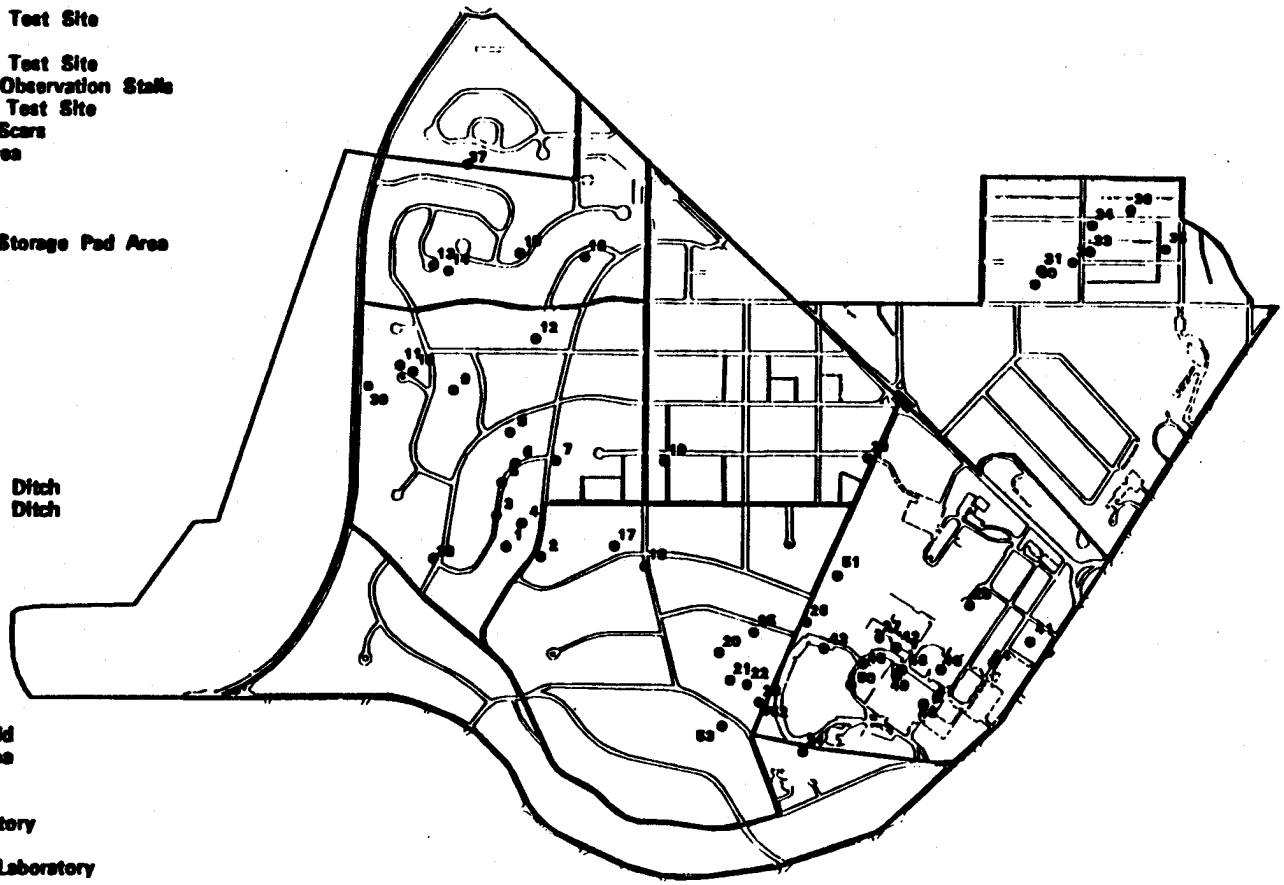
2. Photographic Collection. Examined 8 items.

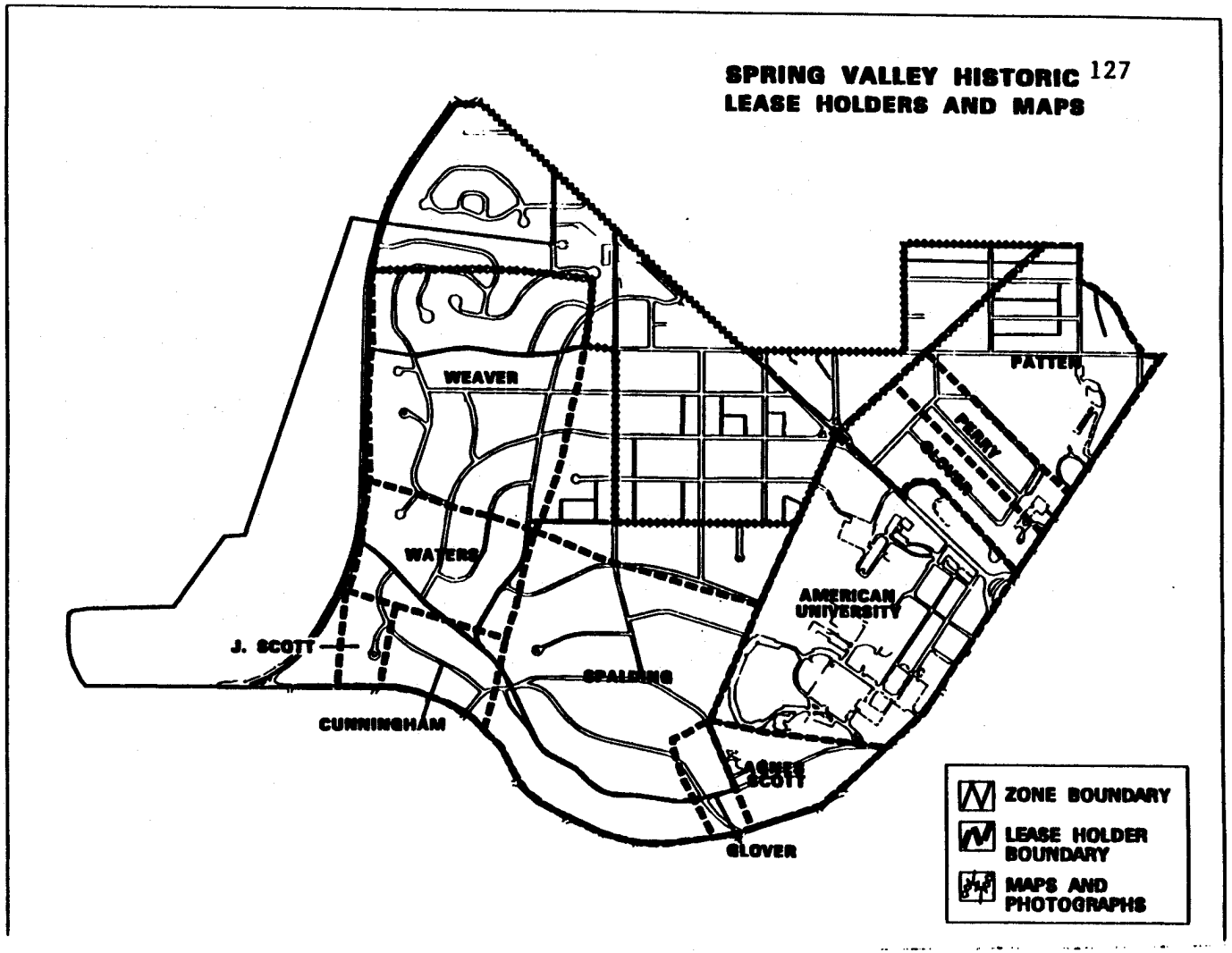
VI. D.C. Historic Preservation Division.

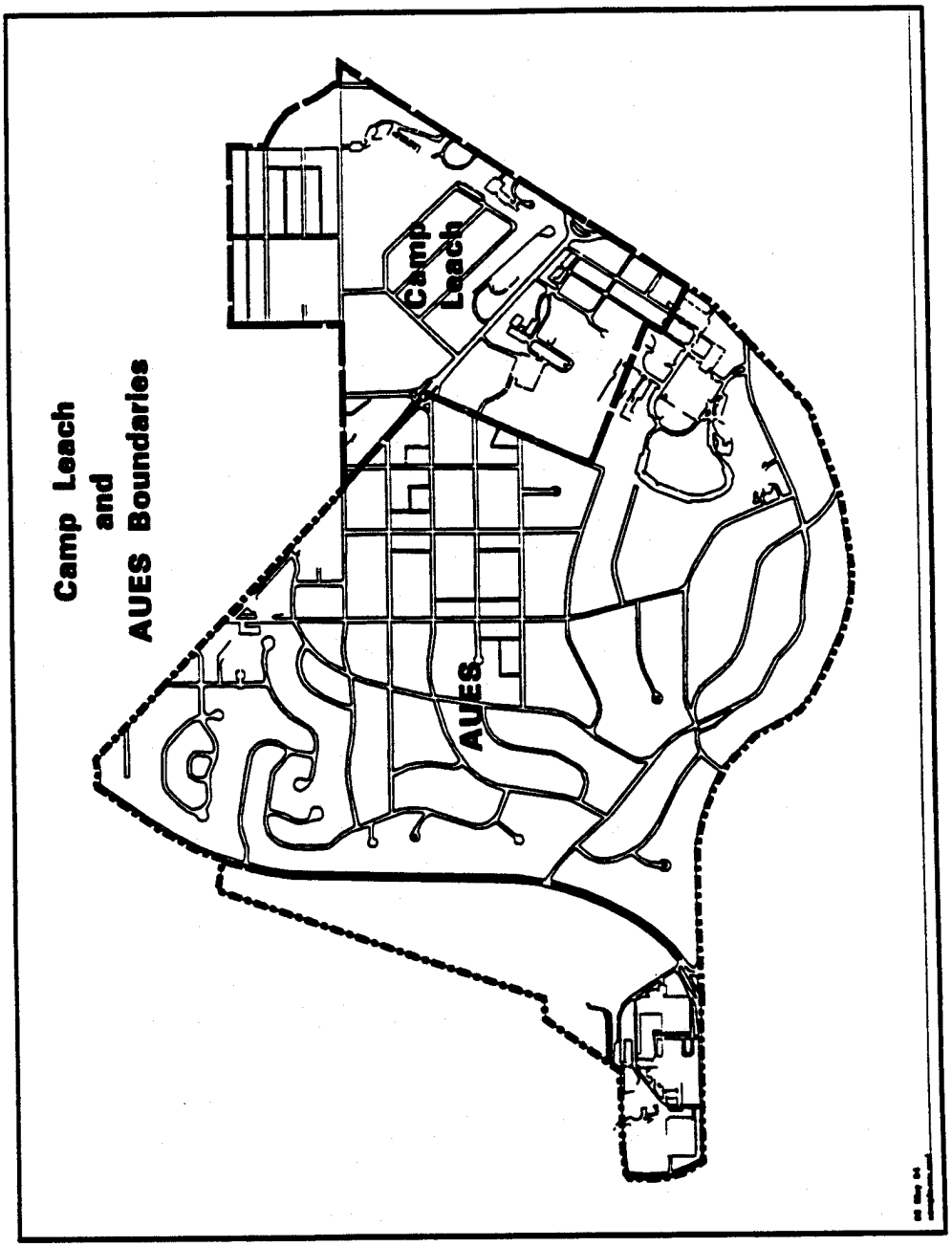
Archaeology Files, reports deposited with D.C. Historic Preservation Division that pertain to archaeological investigation conducted within the area of interest. Examined 1 file drawer.

SPRING VALLEY
POINTS OF INTEREST

1. Circular Trenches
2. Possible Pit
3. Small Crater Scars
4. Possible Pit
5. Possible Pit
6. Possible Target or Test Site
7. Possible Test Area
8. Possible Target or Test Site
9. Possible Firing or Observation Stalls
10. Possible Target or Test Site
11. Scattered Ground Scars
12. Possible Graded Area
13. Circular Trenches
14. Pit
15. Ground Scar
16. Possible Munition Storage Pad Area
17. Possible Pit
18. Small Crater Scars
19. Old Mustard Field
20. Ground Scar
21. Shell Pit
22. Shell Pit
23. Shell Pit
24. Probable Pit
25. Possible Trenches
26. Small Crater Scars
27. Probable Trench or Ditch
28. Probable Trench or Ditch
29. Ground Scar
30. Training Trenches
31. Training Trenches
32. Training Trenches
33. Training Trenches
34. Training Trenches
35. Training Trenches
36. Training Trenches
37. Mill Creek
38. Major Tolman's Field
39. Static Test Fire Area
40. Ohio Hall
41. History Building
42. Physiological Laboratory
43. Gun Pit
44. Chemical Research Laboratory
45. Explosives Laboratory
46. Canister Laboratory
47. Bacteriological Laboratory
48. Disperoid Laboratory
49. Pharmocological Laboratory
50. Gun Pit
51. Fire and Flame Laboratory
52. Electrolytic Laboratory
53. Baker (Arsenic) Valley




SPRING VALLEY HISTORIC 127
LEASE HOLDERS AND MAPS
WEAVER
WATERS
J. SCOTT
CUNNINGHAM
SPALDING
AMERICAN UNIVERSITY
PATTEN
PERRY
GLOVER
AGNES SCOTT
GLOVER
ZONE BOUNDARY
LEASE HOLDER BOUNDARY
MAPS AND PHOTOGRAPHS


Camp Leach
and
AUES Boundaries
Camp
Leach
AUES

Appendix B
"World War I Years" and "Post–World War I Era"

Methodology

Research into activities at the American University Experiment Station was conducted with the full cooperation of archivists at the Washington National Records Center at Suitland, Maryland, and the National Archives in Washington, D.C. At the NARA Suitland Refernce Branch, Dr. Richard Boylan, Chief of the Military Reference Branch, and David Pfeiffer, Reference Archivist, assisted in identifying and locating all pertinent records. To examine the voluminous correspondence files in Record Group 70, Records of the Bureau of Mines; Record Group 77, Records of the Office of the Chief of Engineers; Record Group 92, Records of the Office of the Quartermaster General; Record Group 156, Records of the Office of the Chief of Ordnance; and Record Group 175, Records of the Chemical Warfare Service, the *War Department Decimal File System,* 1943 edition, was used to identify specific decimals under which relevant records had been filed by the various originating agencies. These records, identified below, were examined in detail, and all important documents were photocopied for delivery to Operation Safe Removal.

Similar cooperation was received from archivists at the National Archives in Washington, where Reference Archivist Mitchell Yockelson used his expertise in

World War I-era records to identify pertinent materials in Record Group 77, Records of the Office of the Chief of Engineers; Record Group 165, Records of War Department General and Special Staffs; Record Group 393, Records of USA Continental Commands, 1821-1925; and Record Group 407, Records of the Adjutant General's Office. As at Suitland, all pertinent records were examined in detail and photocopied for delivery to Operation Safe Removal. During the period covered by this search, Dr. Sude examined 2,049 archives boxes.

Sources

I. NARA Suitland Reference Branch, Suitland, Maryland.

1. Record Group 70, Records of the Bureau of Mines.

   Index to Correspondence Files, 20 boxes.

   General Classified and Central Correspondence Files (Decimal File), approximately 155 boxes.

   War Gas Investigations, Entries 46, 47, and 48, including Semimonthly Reports, Reports and Other Records, and Summaries of Poison Gas Research, approximately 25 boxes.

2. Record Group 77, Records of the Office of the Chief of Engineers.

   Military: Decimal System, Camps, Posts, and Stations, Box 6 Entry 103A, Engineer Units at Camp Leach, Boxes 1087-1114.

   Entry 104, Military, Board of Engineer Troops, Boxes 1 and 2.

   Subject File, 1918-1945. Searched approximately 225 boxes using the following key decimals:
   - 323.7 (Boundaries, Extension and Contraction)
   - 354 (Camps)
   - 354.11 (Establishment of)
   - 354.12 (Discontinuance of)

600 (Buildings)
600.1 (Construction)
600.12 (Projects)
600.121 (Projects)
600.122 (Projects)
600.123 (Projects)
600.13 (Plans and Specifications)
600.4 (Buildings and Grounds, Changes)
600.92 (Blue Prints, Buildings and Grounds)
600.93 (Boundaries and Reservations)
600.97 (Destruction of)
600.971 (by Fire)
600.972 (by Other Means)
601 (Land Acquisition)
601.01 (by Deed)
601.2 (by Gift or Donation)
601.3 (by Cession or Grant)
601.53 (by Lease)
602 (Land Disposition)
602.01 (by Deed)
602.1 (by Abandonment)
602.2 (by Sales)
602.5 (by Return to Original Owner)
602.6 (by Restoration to Public Domain)
610 (Grounds, Drainage)
652 (Temporary Buildings)
685 (Camp Sites)
723.13 (Noxious Gases, Air Pollution)
723.22 (Pollution of Grounds)

Entry 409, 6 Field Survey Notebooks, Box 1, American University Experiment Station/Camp American University/Camp Leach.

3. Record Group 92, Records of the Office of the Quartermaster General.

Construction Division Completion Reports, 1917–1919, Boxes 4, 150.

General Correspondence—Geographic File, Box 1097.

Real Estate Records, 1917–1922, Boxes 144, 702, 722, 738, 743, 696.

General Correspondence—Subject File, 1917–1922, with help of Archivist, Dr. Richard Boylan, Chief of Military Branch, searched approximately 250 boxes using the following key decimals:

323.7 (Boundaries, Extension and Contraction)
354 (Camps)
354.11 (Establishment of)
354.12 (Discontinuance of)
600 (Buildings)
600.1 (Construction)
600.12 (Projects)
600.121 (Projects)
600.122 (Projects)
600.123 (Projects)
600.13 (Plans and Specifications)
600.4 (Buildings and Grounds, Changes)
600.92 (Blue Prints, Buildings and Grounds)
600.93 (Boundaries and Reservations)
600.97 (Destruction of)
600.971 (by Fire)
600.972 (by Other Means)
601 (Land Acquisition)
601.01 (by Deed)
601.2 (by Gift or Donation)
601.3 (by Cession or Grant)
601.53 (by Lease)

602 (Land Disposition)
602.01 (by Deed)
602.1 (by Abandonment)
602.2 (by Sales)
602.5 (by Return for Original Owner)
602.6 (by Restoration to Public Domain)
610 (Grounds, Drainage)
652 (Temporary Buildings)
685 (Camp Sites)
723.13 (Noxious Gases, Air Pollution)
723.22 (Pollution of Grounds).

Unfortunately, records under other key decimals in this correspondence series, specifically 410–499, are not available for examination. According to Dr. Boylan, they were disposed of several years ago.

4. Record Group 112, Records of the Office of the Surgeon General.

   Geographic File—Camps (Leach), Boxes 62–63.

5. Record Group 156, Records of the Office of the Chief of Ordnance.

   Reports, 2-volume report on weapons tests.

   Entry 36, General Correspondence, and Entry 39, Confidential Correspondence, reviewed approximately 450 boxes using the following key decimals:
   000.52 (Incendiaries)
   314.7 (Histories, Military Posts)
   400.7 (Disposition of Supplies and Equipment)
   413.77 (Pyrotechnics)
   441.2 (Chemicals)
   441.5 (Gases)
   470.22 (Gas Masks)
   470.6 (Gases and Chemicals for Fighting)

470.71 (Weapons, Gas and Chemical)
471 (Gas and Incendiary Ammunition)
471.6 (Incendiary Bombs)
471.86 (Explosives)
476 (Smoke Ammunition)
710 (Gases, Absorption of Deleterious)

6. Record Group 175, Records of the Chemical Warfare Service.

Index Briefs, 10 boxes.

American University Experiment Station, 1 box.

Entry 5, Edgewood Arsenal, Fragmentary Records of Field Units, 6 boxes.

Entry 6, Office Files, Records of Headquarters, Edgewood Arsenal, 1917–1943, approximately 4 boxes.

Entry 7, Edgewood Arsenal, 1917–1945, 6 boxes.

Investigations, 1 box.

Reports, 1 box.

Correspondence, Central Correspondence Files and Secret and Confidential Central Correspondence Files. Examined approximately 400 boxes using the following key decimals:

354 (Camps)
354.11 (Establishment of)
354.12 (Discontinuance of)
400.7 (Disposition of Supplies and Equipment)
441.2 (Chemicals)
441.5 (Gases)
470.6 (Gases and Chemicals for Fighting)
470.71 (Weapons, Gas and Chemical)

471 (Gas and Incendiary Ammunition)
600.93 (Boundaries and Restorations)
600.97 (Destruction of Buildings and Grounds)
601 (Land Acquisition)
601.01 (by Deed)
601.2 (by Gift or Donation)
601.3 (by Cession or Grant)
601.53 (by Lease)
602 (Land Disposition)
602.01 (by Deed)
602.1 (by Abandonment)
602.5 (by Return to Original Owner)
602.6 (by Restoration to Public Domain)
723.13 (Noxious Gases, Air Pollution)
723.22 (Pollution of Grounds)

Technical Documents Files, 1917-1920, 21 boxes.

7. Record Group 394, Records of USA Continental Commands, Engineer, Quartermaster, etc.

Correspondence Files, III Corps Area. Searched approximately 30 boxes using the following key decimals:
470.1 (Ammunition and Armament)
523.8 (Supplies, Ammunition and Explosives)
600.913 (Buildings)
601 (Land Acquisition)
602 (Land Disposition)

II. National Archives and Records Administration, Washington, D.C.

1. Record Group 77, Records of the Office of the Chief of Engineers.

Records of the Central Office, Correspondence, 1789-1942. Examined approximately 35 boxes.

Records of the Central Office, Correspondence, 1917-1945. Examined approximately 15 boxes.

Records of the Central office, Issuances, Orders, 3 boxes.

2. Record Group 165, Records of War Department General and Special Staffs.

   Office of the Director of Intelligence (G-2), General Records, Security Classified Subject Index to Series 64-67. Examined approximately 19 boxes.

   Entry 58, Boxes 20 and 25.

   Military Intelligence Division, Boxes 2480, 2523, 2968, 3014, 3062, 3065, and 3862.

   Chemical Warfare Service, 1st Gas and Flame Regiment, Boxes 304, 305, 306, 307, 308, 309, 310.

   Entry 310, Army War College, Records of the Historical Section Relating to the War Department, Boxes 220, 301, 302, 303, 366.

3. Record Group 393, Records of USA Continental Commands, 1821-1920.

   Part V, Entry 1, Camp Leach, D.C., Correspondence, 1918, Boxes 1-4.

4. Record Group 407, Records of the Adjutant General's Office. Searched approximately 300 boxes.

   Central Decimal Files, 1917-1925, Project Files, Boxes 990, 1199.

   Bound Volume Construction Completion Reports, Camp Leach.

III. Architectural and Cartographic Branch, Alexandria, Virginia.

Reviewed maps and aerial photographs of Camp Leach, northwest Washington, and Washington metropolitan area, 24 maps and aerial photographs.

Appendix C
"World War II"

Methodology

The section on World War II, 1942–45, relies heavily on "History of U.S. Navy Bomb Disposal," issued in typescript form about 1945 and published by the Navy Explosive Ordnance Association in 1992. Copies of both the published and typescript versions are at the Naval Historical Center, Washington Navy Yard, Washington, D.C.

The World War II section also draws on interviews its author conducted with an instructor at the wartime Navy Bomb Disposal School and with the school's final commander.

Selected materials in the American University archives were also consulted in preparing this section.

Appendix D
Guide for Users
American University
Experiment Station Database

General Information

1. This database has been prepared using dBASE IV. The information contained herein is drawn from the available bound and loose American University Experiment Station historical files located at Fisher Library, U.S. Army Chemical School, Fort McClellan, Alabama.

2. The database is separated into two parts—Reports and Analysis. The two parts are linked through the volume/report number of the individual reports and are organized by alphabetical character identifiers for the originating office (see below).

3. The Reports database consists of the following:
   a. Volume number/report number
   b. Title
   c. Date of report
   d. Bound volume (a logical field which indicates the report exists in a bound volume)
   e. Cross-reference (used only for missing bound Bureau of Mines reports)
   f. Loose report (a logical field to indicate the existence of a loose report)
   g. Loose report location

4. The Analysis database contains:
   a. Volume number/report number
   b. Agent/subject
   c. Test location(s)
   d. Type of test (i.e., open air, bomb pit, laboratory, or human exposure)

5. Once the database is located, it can be accessed through normal dBASE commands.

6. The bound American University reports contain information compiled from the Bureau of Mines, the Chemical Warfare Service, the subordinate sections thereof, and foreign sources. The loose reports are, in the majority, the reports which appear in the bound volumes. The bound and loose reports are filed by the alphabetical identifiers which were established by the personnel at the American University Experiment Station.

7. An individual report may exist in different bound volumes as well as in the loose reports. An attempt has been made to identify which reports were duplicated in the Bureau of Mines reports. This cross-reference appears in the title field for all reports other than the Bureau of Mines reports. For example, Pyrotechnical Section report PS 27-835 shows "BM 30-59" in the title field. This indicates that the Pyrotechnic Section report is a duplicate of the Bureau of Mines report.

Unique Characteristics

1. A listing of the source document identifiers and the alphabetical designators used for them follows:

American?	AM (No other logical explanation for the alphabetical designator could be discovered)
Anti-Gas Department	AG (British)
Bureau of Mines	BM
Catalytic Section	CS
Chemical Committee Porton [Down]	CCP
Chemical Development	CD
Chemical Production	CP
Chemical Warfare Monographs	CWM
Defensive Research	DR
Dispersoid Section	DS
Explosive Section	ES
French Reports	F
Gas Mask Research	GMR
Mechanical Research and Development	MRD
Mechanical Research Section	MRS
Meetings of Coordinating Committee	MCC
Miscellaneous	MISC
Miscellaneous Loose Reports	MISCLR
Miscellaneous Physiological	M-Phy
Offensive Research	OR
Pharmacological Reports	PR
Pharmacological/Toxicological Section	PT
Physiological	Ph
Pyrotechnic Monographs	PM
Pyrotechnic Section	PS
Pyrotechnic Section Post War	PSPW
Zanetti Reports	Z

2. The locations for tests were derived from the information in the subject reports. Some locations are spelled out in the location field, but for those locations with numerous entries, an abbreviation was used. The following is a list of those locations for which abbreviations were used:

American Expeditionary Force	AEF
American University	AU
Aberdeen Proving Ground	APG
Bryn Mawr College	BMC
Columbia University	CU
Cornell University	CRU
Edgewood Arsenal	EAL
Harvard University	HU
Iowa State University	ISU
Johns Hopkins University	JHU
Massachusetts Institute of Technology	MIT
Mellon Institute	MI
Ohio State University	OSU
Princeton University	PU
University of California	UC
University of Illinois	UI
University of Michigan	UMCH
University of Minnesota	UM
University of Pittsburgh	UP
University of Rochester	UR
University of Vermont	UV
University of Wisconsin	UW
Wooster Polytech	WP
Yale University	YU

3. The accuracy of the database is limited by human error. Typographical errors may [have] occurred which can be corrected at any user site. It is requested that notification of these errors be furnished to the Fisher Library at the following address:

Commandant, U.S. Army Chemical School
ATTN: ATZN-CM-FI
Fort McClellan, AL 36205-5020

4. The term "multiple agents" is the agent field meaning that the number of agents in the report exceeded five. Usually this term only appears with laboratory tests. One must include the category of multiple agents when searching for any individual agent. The subject report must then be examined to determine if a particular agent was included in a report in which the term "multiple agents" is used.

5. The agent field entry of "mustard" describes any and all mustard agents. There are no categories for sulphur mustard, mustard selenide, or nitrogen mustard.

6. The laboratory test field is used to indicate a report on a particular chemical property of an agent. This field is also used as a general indicator for reports that discuss or describe various topics.

7. Smoke reports with a lab identifier refer to tests conducted in the 1,000 liter box.

8. The title of an irritant test report does not always accurately describe the subjects of the test. The human exposure identifier may appear with a test titled "dogs and mice," etc.

9. If the date of a report is unknown, the field is blank.

10. The term "summary" in the agent field indicates the report covers several subjects or is a discussion or description of various topics. Generally, these reports recap subsequent reports of a particular section or agency.

11. In addition to the bound Bureau of Mines (BM) and section reports, there are 33 record center boxes of loose reports. Most of the loose reports are extra copies of individual reports that are in the bound volumes. These reports are organized by section identifier and are in numerical order. An entry in the loose report field identifies the presence of a loose report.

12. To request an examination of a particular report, you must provide the volume/report number and title to Fisher Library at the following address:

Commandant, U.S. Army Chemical School
ATTN: ATZN-CM-FI
Fort McClellan, AL 36205-5020