Quality of Water in the Unsaturated Zone at Camp Shelby, Mississippi–2002-2004

Scientific Investigations Report 2004-5278

Prepared in cooperation with the
Mississippi Military Department and the
U.S. Army Engineer Research and Development Center

U.S. Department of the Interior
U.S. Geological Survey

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CONVERSION FACTORS, ABBREVIATIONS, AND ACRONYMS

Multiply	By	To obtain
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
square mile (mi^2)	2.590	square kilometer (km^2)
acre-foot (acre-ft)	0.001233	cubic hectometer (hm^3)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
gallon (gal)	3.785	liter (L)
gallon (gal)	3,785	milliliter (mL)
gallon per minute (gal/min)	0.06309	liter per second (L/s)
gallon per day (gal/d)	0.003785	cubic meter per day (m^3/d)
bar	100	kilopascal (kPa)
micron	0.000001	meter (m)
inch per second (in/s)	2.54	centimeter per second (cm/s)

Chemical concentrations and water temperature are given only in metric units. Chemical concentration in water is given in milligrams per liter (mg/L) or micrograms per liter (µg/L). Milligrams per liter is a unit expressing the solute mass (milligrams) per unit volume (liter) of water. One thousand micrograms per liter is equivalent to 1 milligram per liter. For concentrations less than 7,000 milligrams per liter, the numerical value is about the same as for concentrations in parts per million. Specific conductance is given in microsiemens per centimeter (µS/cm) at 25 degrees Celsius (° C).

CMLS	Camp McCain lysimeter site
CSLS	Camp Shelby lysimeter site
CSTS	Camp Shelby Training Site
DOD	Department of Defense
DP	Drive point (well)
FP	Firing point
LVUSWS	Large Volume Ultra Soil Water Sampler
MCAWW	Methods for Chemical Analysis of Water and Wastes
MCL	Maximum contaminant level
MDL	Method detection limit
MLRS	Multiple Launch Rocket System
MMD	Mississippi Military Department
MPF	Mortar firing point
MSARNG	Mississippi Army National Guard
NFM	National Field Manual
OP	Observation point
QALS	Quality assurance/quality control lysimeter site
RL	Reporting or quantification limit
STL	Severn Trent Laboratories, Inc.
STT	South tank trail
SVOC	Semi-volatile organic compound
USA-ERDC	U.S. Army Engineer Research and Development Center
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
VOC	Volatile organic compound

Quality of Water in the Unsaturated Zone at Camp Shelby, Mississippi—2002-2004

By Larry J. Slack[1], June E. Mirecki[2], and Robert A. Lemire[3]

ABSTRACT

During 2002-2004, the U.S. Geological Survey collected water samples from lysimeters to determine the quality of water in the unsaturated zone outside the central impact area at Camp Shelby, Mississippi. The quality of water from the unsaturated zone at Camp Shelby was generally good. The specific conductance of lab samples was low but varied greatly, ranging from 67 to 1,500 microsiemens per centimeter at 25 degrees Celsius. The pH was near neutral and typical of shallow ground water in the area, ranging from 5.4 to 7.0. Major ion concentrations were low. Median concentrations of calcium, chloride, fluoride, potassium, sodium, and sulfate [1.9, 5.1, 0.29, 0.9, 36, and 52 milligrams per liter (mg/L), respectively] were lower than background concentrations.

Nutrient concentrations were low. All orthophosphate concentrations were less than the method detection limit (MDL). Median concentrations of ammonia and nitrate plus nitrite (0.028 and 0.018 mg/L, respectively) were much lower than median concentrations in water from background lysimeters. Although low, median concentrations of total Kjeldahl nitrogen and total phosphorus (0.09 and 0.34 mg/L, respectively) were higher than background concentrations.

Most trace-element concentrations were low. Median concentrations of antimony, beryllium, cadmium, chromium, copper, lead, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc [0.21, <0.01, <0.01, 0.87, 0.68, <0.01, 1.2, 3.1, 0.61, 0.06, <0.01, 8.0, and 6.5 micrograms per liter (µg/L), respectively] were less than or equal to background concentrations. Median concentrations of arsenic, barium, cobalt, iron, manganese, and tin (0.95, 64, 1.10, 19, 100, and 0.19 µg/L, respectively) were higher than background concentrations.

Few of the volatile organic compounds were detected at or above the stated MDLs. Only two were detected above the reporting limits. Methyl tert-butyl ether and 2-butanone (methyl ethyl ketone) were detected in one sample each. Few of the semi-volatile organic compounds were detected at or above the stated MDLs. Except for caprolactum, all concentrations were less than the reporting limits. No explosives were detected at or above the MDLs. The perchlorate concentrations were very small, ranging from less than the detection limit to 0.47 µg/L, with a median of 0.067 µg/L.

INTRODUCTION

The Mississippi Military Department (MMD) continues to assume a strong leadership role in environmental and natural-resource stewardship in order to attain a balance between the environmental impacts, public and agency concerns, and the ability of the Mississippi Army National Guard (MSARNG) to meet their training mission readiness requirements (National Guard Mississippi, 2003; U.S. Army Center for Health Promotion and Preventive Medicine, 1999). Beginning with two major studies conducted in the early 1940's by Brown and Adams (1943) and Brown (1944), the MSARNG has funded and participated in numerous intensive hydrologic and environmental studies at Camp Shelby and Camp McCain, Mississippi (fig. 1).

Purpose and Scope

During 2002-2004, the U.S. Geological Survey (USGS), in partnership with the MSARNG, conducted an investigation to determine the quality of water in the unsaturated zone (soil zone above the water table) outside the central impact area (target area that receives most of the mortars, rockets, and other ordinance) at Camp Shelby and Camp McCain (fig. 1; Slack, Lemire, and Mirecki, 2004). This report presents the results of the Camp Shelby part of that study. The report briefly describes the site selection; lysimeter properties, installation, and operation; hydrogeology of the Camp Shelby study area; and sampling and water-quality analyses at the site.

This information is integrated with data from a collaborative study of energetics transport and fate through the vadose zone (aeration zone within the unsaturated zone) near the central impact area (Mirecki, 2004). Both studies will help the MSARNG develop a better understanding of the processes that affect transport, transformation, and fate of contaminants;

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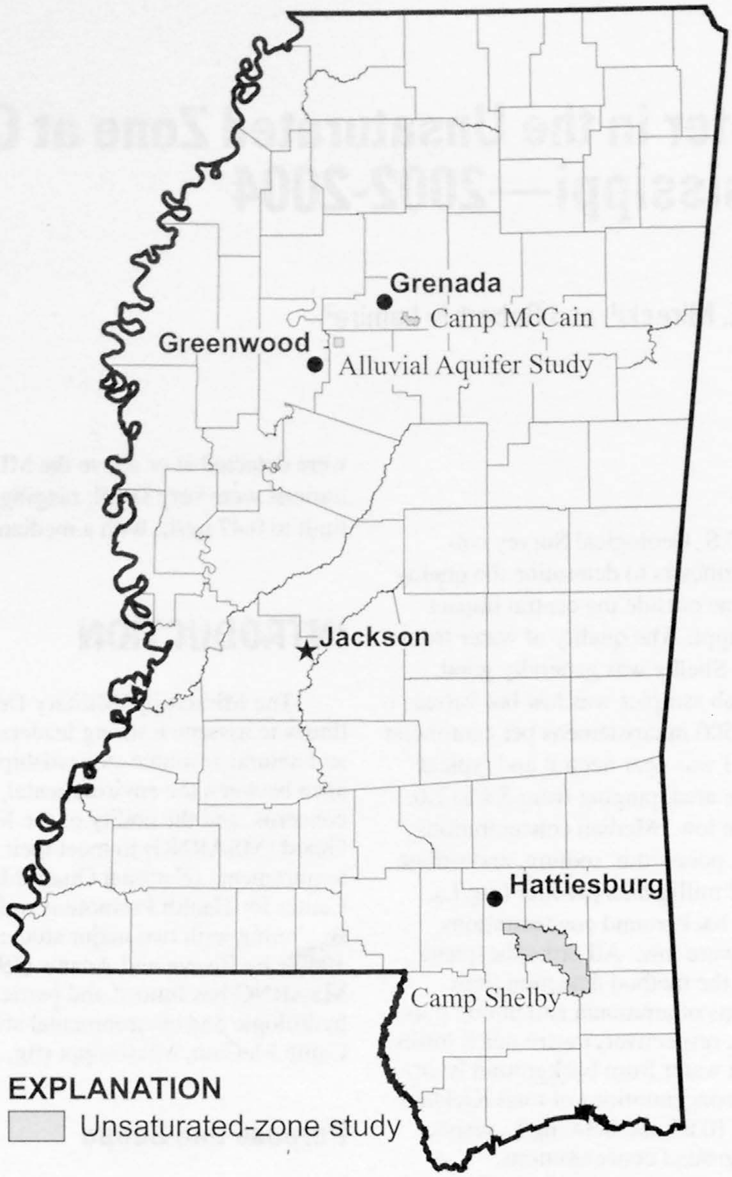


Figure 1. Location of unsaturated-zone studies in Mississippi.

estimate the potential for future contamination of ground water in adjacent areas; develop reasonable mitigation measures to reduce environmental impact; and help ensure the continued, uninterrupted training activities at Camp Shelby.

Previous Investigations

Notable studies conducted near Camp Shelby since the study by Brown (1944) are as follows: "Final Environmental Impact Statement for Proposed Facilities at Camp Shelby," published by the Mississippi Military Department, National Guard Bureau (1990); "Final Environmental Impact Statement for Military Training Use of National Forest Lands at Camp Shelby, Mississippi," by the U.S. Department of Agriculture (1994); "Wetland and Training Area Delineations, Camp Shelby Training Site, Mississippi," by Boyd, Patrick, and Hanley (1998); "Water Quality Investigations, Camp Shelby and Camp McCain, 1992 – 1998," by Pessoney and others (1998); "Training Range Site Characterization and Risk Screening, Camp Shelby, Mississippi, 7-23 September 1999," by the U.S. Army Center for Health Promotion and Preventive Medicine (1999); "Mississippi Military Department, Biological Inventory, Camp Shelby, 1994-1999," by Leonard, Moore, and Duran (1999); "Soil Mineral Analysis at Multiple Launch Rocket System (MLRS) Firing Points, Camp Shelby," by Savell and Patrick (2002); "The Hydrogeologic Model – A Natural Resource Management Tool, Camp Shelby Training Site, Mississippi, USA," by Patrick, Roth, and Lemire (2003); "Monitoring the Quality of Water in the Unsaturated Zone at Camp Shelby and Camp McCain, Mississippi," by Slack and Lemire (2003); and "Quality of Water in the Unsaturated Zone at Camp Shelby, Mississippi," by Slack, Neely, Murphy, and Lemire (2004).

The Department of Defense (DOD) has published detailed reports addressing sustainable range management and environmental restoration programs. The reader is referred to the DOD 2001 and 2002 annual reports (Department of Defense, 2001, 2003).

Site Selection

The principal criteria for site selection at Camp Shelby were that the proposed site be located outside the central impact area for safety of the personnel installing the lysimeters or wells and collecting water samples, but near enough to the impact area to detect any shallow near-surface contamination associated with training activities. Captain Robert A. Lemire, the Natural and Cultural Resources Manager for the MSARNG, selected the first set of lysimeter sites. In addition to using the general criteria listed above, Captain Lemire selected sites that were near deeper ground-water-quality monitoring wells and in areas with no known threatened or endangered species. Due to Captain Lemire being called to active service, the USGS selected tentative locations for the second set of lysimeter sites and submitted these locations to Mr. R. Brian Neely, Acting Natural and Cultural Resources Manager. These sites were selected to supplement the first set of sites and more fully bracket the impact area.

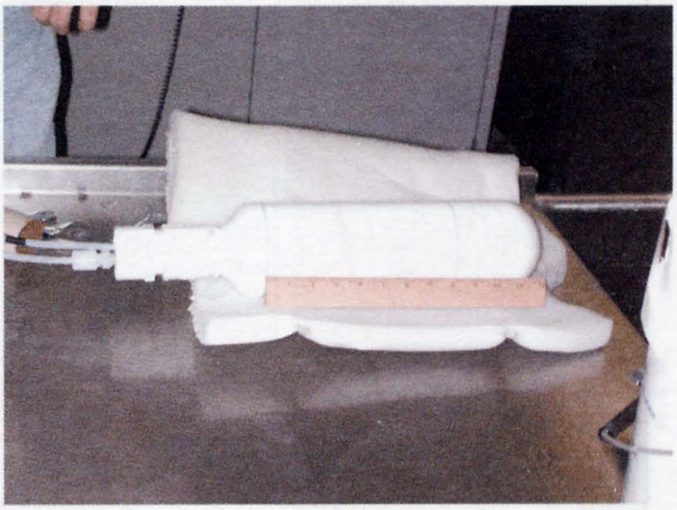
The USGS installed eight lysimeters (soil-water samplers) at shallow depths at selected locations at Camp Shelby near Hattiesburg, Miss. [table 1 (all tables are located at the back of report); fig. 2] during 2002. The naming convention used throughout this report for the Camp Shelby lysimeter sites is CSLS, which is followed by a sequential site number, which is followed by approximate depth (in whole feet). For example, CSLS 1-5 is a lysimeter installed at the first site to a depth of about 5 feet (ft). Two lysimeters installed for another study near Greenwood (fig. 1), in the Mississippi River Alluvial Plain near the eastern boundary of the Delta, were used for quality control/quality assurance purposes (to determine reference/background conditions). These two lysimeter sites are referred to as QALS 5 and QALS 11.

During 2003, seven additional lysimeters were installed at shallow depths at selected locations at Camp Shelby. Only lysimeters that produced sufficient water for water-quality analyses (and that have not been destroyed) are included in table 1 and figure 2. A surface-water (stream) site (table 2; fig. 3) was added for additional quality control/quality assurance and reference purposes. This site, Pearces Creek (also known as Pierce or Pierces Creek), drains the southeastern part of the central impact area at Camp Shelby, and ultimately discharges into Black Creek, south of the study area. Within the Pearces Creek Basin are firing points 66-69, 71, 93, 117, 118, 151, and 153 (north of the impact area); firing points 98, 99, and 134 (northeast of the impact area); and firing points 20-25 (east of the impact area).

During 2004, additional lysimeters, surface-water sites, and shallow monitoring wells (table 3; fig. 2) were installed at or near several of the lysimeter sites at Camp Shelby in order to better determine the depth of the water table and compare the quality of water in the unsaturated zone with that in the saturated zone. Some of these sites were installed as part of a related study with the U.S. Army Engineer Research and Development Center (USA-ERDC). The additional surface-water sites were on Middle Creek near Brooklyn and on Cypress Creek near Beaumont (table 2; fig. 3).

Lysimeter Properties, Installation, and Operation

The "Large Volume Ultra Soil Water Sampler" (LVUSWS; model 1923) porous cup suction lysimeter, manufactured by Soilmoisture Equipment Corp., was used at all lysimeter sites. The LVUSWS lysimeter was selected because its large-volume capacity allows for collection of sufficient volumes of soil water for analysis of contaminants at microgram-per-liter (µg/L, or part-per-billion) concentrations. The LVUSWS has a total sampler volume of 1,730 mL and a total volume of retained sample in the glazed reservoir of 560 mL (Soilmoisture Equipment Corp., 1997, 2003).



Large Volume Ultra Soil Water Sampler. (photograph by Larry J. Slack)

The LVUSWS is composed entirely of 1 bar high-flow ceramic and uses a combination ceramic and glaze plug. The ceramic material has a high alumina content for very low adsorption characteristics, is lead-free, and has a moderate bubbling pressure (1 bar or 100 kPa). The lower one-third of the cup is glazed on the inside to retain the collected sample. The sampler has a 45 percent porosity, 2.5-micron maximum pore size, and 3.4 X 10^{-6} in/s maximum saturated hydraulic conductivity (Greg Hart, Soilmoisture Equipment Corp., oral commun., Jan. 7, 2004). The LVUSWS has a diameter of 4 inches and a length of about 14 inches to the top of the neck, and a total length of about 18 inches to the stainless steel or Teflon® compression fittings at the top of the stainless steel

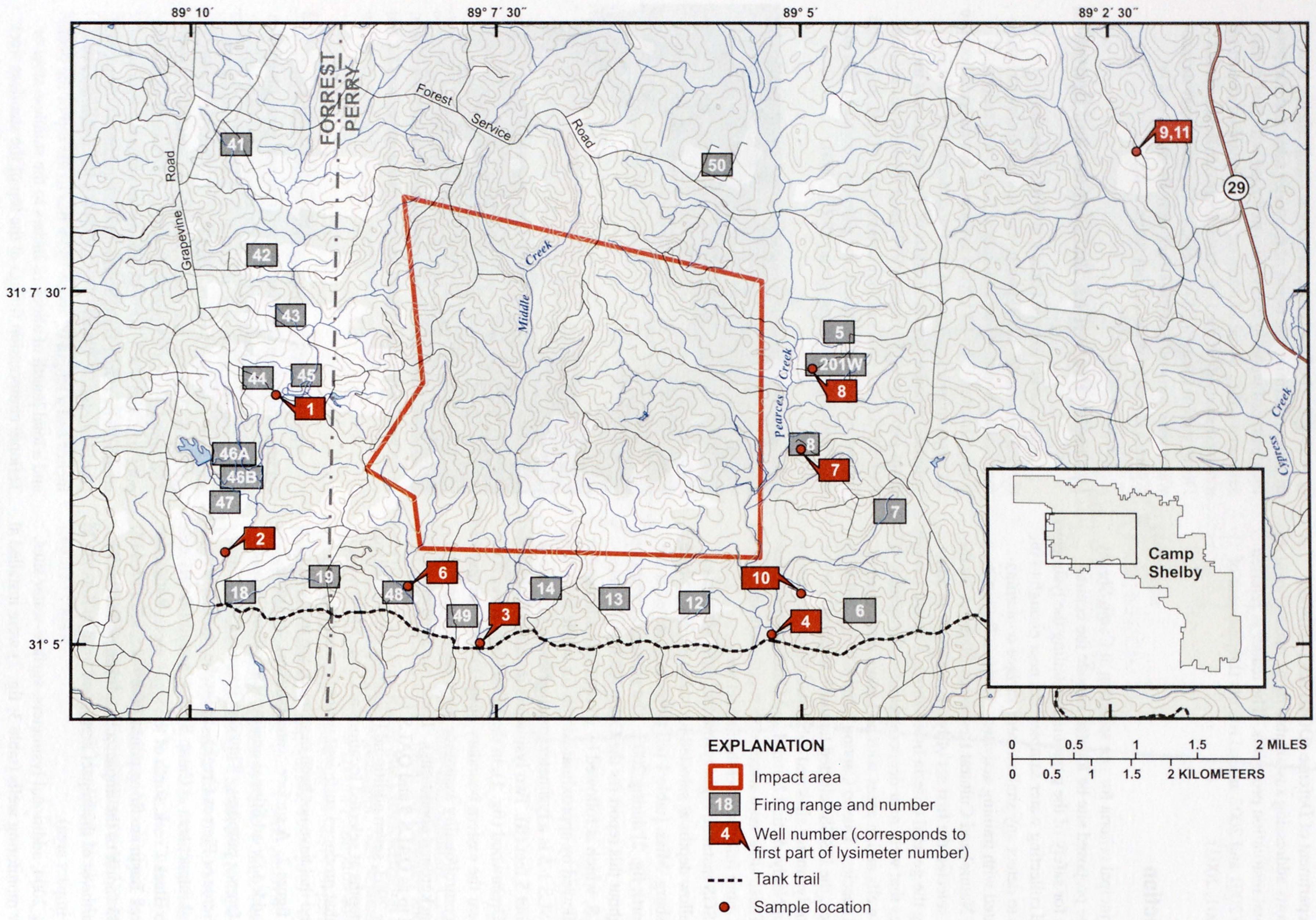


Figure 2. Location of selected unsaturated-zone and shallow monitoring well sampling sites, Camp Shelby, Mississippi.

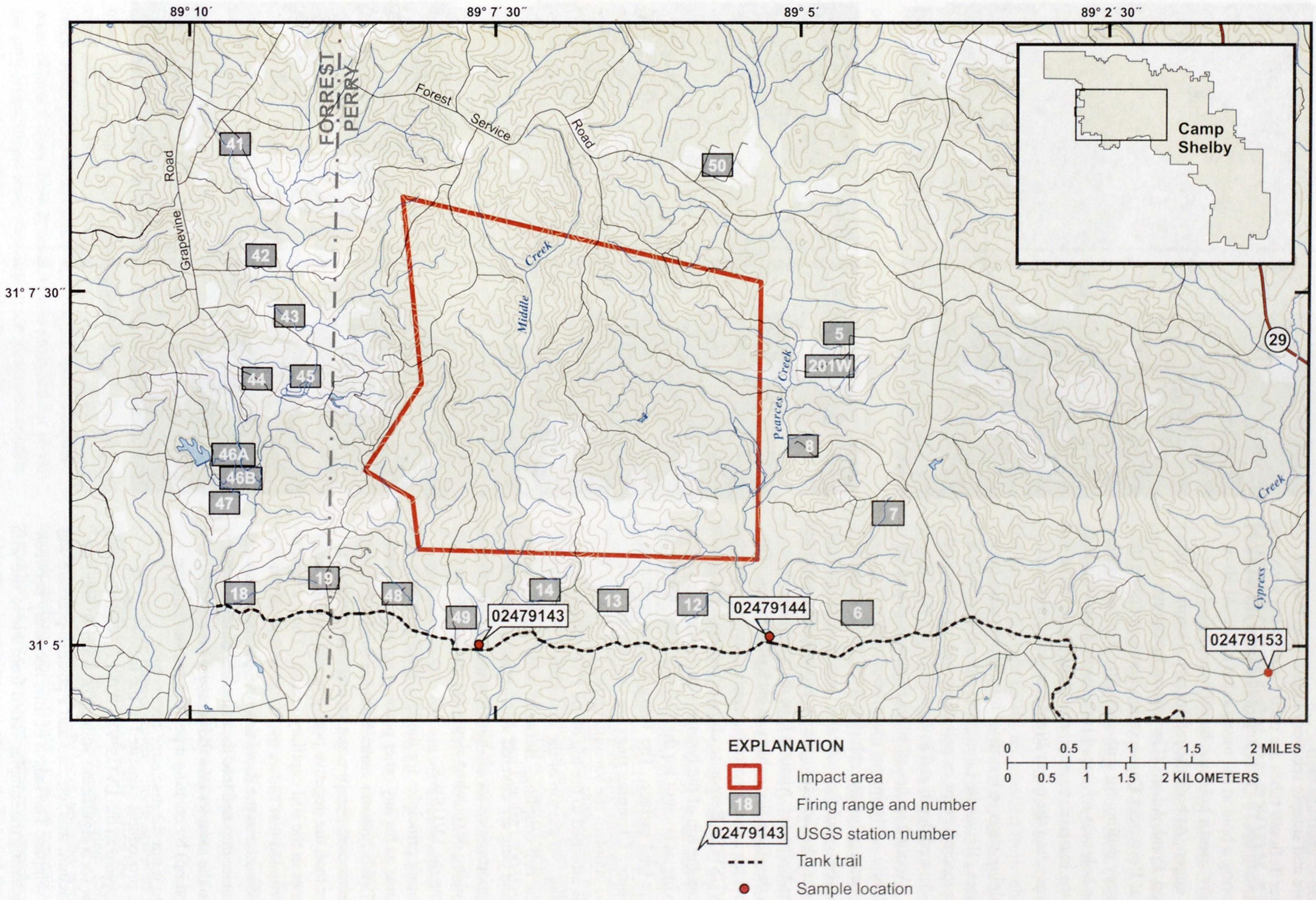


Figure 3. Location of selected surface-water sampling sites, Camp Shelby, Mississippi.

vacuum/pressure and sample recovery lines. Two 1/4-inch outside diameter Teflon® tubes are used for drawing a vacuum and recovering samples.The first step in lysimeter installation consisted of boring a hole in the unsaturated zone. At all of the Camp Shelby sites, a hole was bored by using a 4-inch-diameter hand auger. At both the reference/background sites near Greenwood, Frank Adams (Geological Investigations Section, Natural Resources Conservation Service) drilled the hole using a rotary drilling rig with a roughly 4 ½-inch-diameter auger. The hole was advanced incrementally by rotating the auger into the material; to minimize disturbance of the soil, the "plug" surrounding the auger flight was withdrawn and sampled.

The remaining steps in lysimeter installation were fairly similar at all sites. Bentonite (aluminum silicate clay with a high swelling capacity) chips or pellets were used to backfill the hole to the desired depth and isolate the LVUSWS from the soil below. About 2 inches of silica flour was placed on top of the bentonite. A lysimeter (suspended with a 1-1/2-inch-diameter polyvinyl chloride (PVC) pipe attached to an adapter at the top of the lysimeter) was inserted into the center of the hole. A silica-flour slurry was poured around and to the top of the lysimeter. About 2 L of distilled water was introduced via the silica-flour slurry at each of the sites. The silica flour provides a good hydraulic connection between the soil and the LVUSWS. Bentonite chips or pellets were used to fill the hole from the top of the lysimeter to the surface. The PVC pipe, serving as conduit for the Teflon® lines, terminates a few feet above land surface. The Teflon® tubes terminate in neoprene tubing. Clamping rings are used to pinch off the neoprene to maintain the vacuum on the LVUSWS. A bell coupling is attached to the top of the PVC pipe to hold the excess tubing. At the top of the assembly, a PVC plug is screwed into the bell coupling. Between sampling trips, the bell coupling and plug are covered with a plastic "freezer" bag to minimize opportunities for air-blown contaminants reaching the neoprene tubing or traveling down the inside of the assembly and reaching the LVUSWS.

The operating principles for the LVUSWS lysimeter basically are the same as for any other porous cup suction lysimeter. The LVUSWS removes water from the soil by creating (via a pressure/vacuum pump) negative pressure inside the sampler greater than the negative pore pressure (soil suction) holding the water in the soil capillary spaces. Thus, a hydraulic gradient is created that causes the water to flow (from the less negative potential to the more negative potential) through the porous ceramic cup and into the sampler. Sample water is recovered from the sampler (via the pressure port of a pressure/vacuum pump) by creating a positive pressure on the sample, forcing it out the discharge access tube.

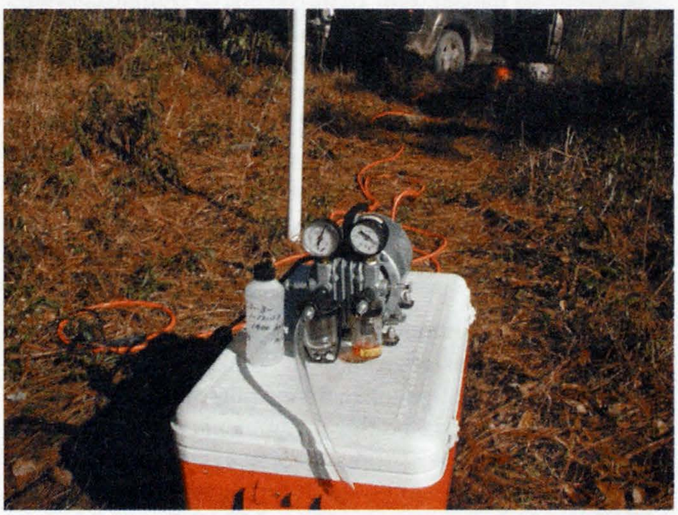
Sampling procedures consisted of the following: A vacuum was applied to the LVUSWS. After enough time had passed to allow for a significant volume of water to enter the sampler, the vacuum was released and a positive pressure was applied to the sampler. The length of time necessary between filling and evacuating the sampler varied from site to site with

Technician using a 4-inch-diameter sand-type auger. (photograph by June E. Mirecki)

Geologist using a rotary drilling rig. (photograph by Larry J. Slack)

Silica-flour slurry being poured around and to the top of a lysimeter. (photograph by Larry J. Slack)

PVC lysimeter-tubing conduit, bell for housing excess tubing above land surface, and Teflon® pressure and recovery lines terminated in neoprene tubing. (photograph by Larry J. Slack)



Vacuum pump. (photograph by Larry J. Slack)

antecedent conditions, and was determined on a trial-and-error basis. The volume of water forced from the sampler was measured and recorded. For detailed information on "Safety in Field Activities" and "Selection of Equipment for Water Sampling," the reader is referred to the articles by Lane and Fay (1997) and Lane, Flanagan, and Wilde (2003), respectively.

The lysimeters were purged periodically to remove all water introduced during the installation. Specific conductance and other water-quality parameters were measured to determine that the water sample was representative of the unsaturated zone and uninfluenced by the installation of the lysimeters. After construction water was purged, water samples were obtained from these lysimeters and analyzed for physical properties, major ions, nutrients, trace elements, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), explosives, and perchlorate.

HYDROGEOLOGY OF STUDY AREA

Delineation of the hydrogeology of the Camp Shelby Training Site (CSTS) has been a significant part of previous studies. This report presents the results of an ongoing investigation that has a limited scope and does not present a detailed description of the hydrogeology of the area. The information gleaned from this study is meant to complement the information from other studies. Thus, the following discussion of the hydrogeology of the study area is meant as an overview only, and largely is based on the information from other studies.

One of the earliest studies of the geology and groundwater resources of the Camp Shelby area was published by Brown (1944), who described Camp Shelby as being "situated in the Long Leaf Pine Hills of South Mississippi. Most of the hills are composed of clay overlain with a veneer of sand and gravel, but at depth sand aquifers are interbedded with the clays" (p. 10). Brown identified three freshwater formations of Miocene age (the Catahoula Sandstone, the Hattiesburg Formation, and the Pascagoula Formation) and concluded, "Disconformably overlying this conformable series of sediments are the Citronelle Formation of Pliocene age and younger terrace and alluvial deposits" (p. 10).

In a study of the Miocene and younger aquifers underlying Camp Shelby and nearby areas, Roth and Patrick (2002) determined, "There are approximately five principal aquifers combined in the Catahoula and Hattiesburg Formations. These aquifers exhibit approximate depths between 200 to nearly 1,100 feet, and well-defined confining layers were present" (p. 41). In a related study using drillers' logs and geophysical logs from more than 1,200 permitted wells in the Camp Shelby area, Patrick, Roth, and Lemire (2003) determined:

> (1) Most of the training site [is] underlain by a clay-rich [confining unit] having low hydraulic conductivity that would prevent significant aquifer contamination by surface activities.
>
> (2) Wetland water tables are controlled by this clay-rich [confining unit] and are not interconnected with water supply aquifers.
>
> (3) Most water wells are screened in confined aquifers at depths of 30 to 300 meters [100-1,000 ft] below ground surface. These laterally discontinuous aquifers are separated by clayey units and are not interconnected.

Soil-texture data obtained during installation of lysimeters and shallow monitoring wells during the current study are consistent with that previously reported. Soils typically are composed of sand, sandy loam, and clay with low total organic carbon content (table 4). Soils typically are light tan to reddish in color, although some soils contain small amounts of black or brown organic material. Most of the soils at the lysimeter and monitoring well sites are well drained.

CAMP SHELBY SAMPLING AND WATER-QUALITY RESULTS

During 2002-2004, water-quality samples were collected from 18 lysimeters and 9 shallow monitoring wells at Camp Shelby (tables 1, 3; fig. 2). Water-quality sampling and results are discussed in the following order: physical properties, major ions, nutrients, trace elements, VOCs, SVOCs, explosives, and perchlorate. All laboratory analyses were performed by Severn Trent Laboratories, Inc. (STL) in Arvada, Colo. Complete copies of the analytical reports furnished by STL are available at the USGS Mississippi District Office. The STL analytical reports present executive summaries—detection highlights, methods summaries, method/analyst summaries, lot sample summaries, analytical results, quality control data association summaries, quality control sample results, and chain-of-custody information.

Physical Properties

The principal physical properties of water measured during this study are specific conductance and pH. District personnel used standard USGS techniques in making field determinations ("National Field Manual for the Collection of Water-Quality Data" (NFM), USGS Techniques of Water-Resources Investigations Book 9, Wilde, Radtke, Gibs, and Iwatsubo, 1998; Wilde and Radtke, 2004). The analytical method used by STL was MCAWW ("Methods for Chemical Analysis of Water and Wastes," U.S. Environmental Protection Agency, 1979, EPA-600/4-79-020, March 1983 and subsequent revisions) 150.1 for pH and MCAWW 120.1 for specific conductance.

During 2002-2004, specific conductance and pH were measured in water samples from 18 lysimeters and 9 shallow monitoring wells at Camp Shelby. Although each lysimeter and shallow monitoring well was evacuated several times prior to collection of water-quality samples, specific conductance values varied extensively. The specific conductance of water samples collected from 13 lysimeters at Camp Shelby during 2002-2003 and analyzed by STL ranged from 67 to 1,500 microsiemens per centimeter (μS/cm) at 25° C, with a median of 220 μS/cm (table 5). In contrast, the specific conductance of water collected from the 18 lysimeters during June 2004 was much lower and ranged from 20 to 529 μS/cm, with a median of 113 μS/cm (table 6). The specific conductance of water collected from nine shallow monitoring wells during June 2004 ranged from 27 to 1,066 μS/cm, with a median of 90 μS/cm (table 7).

The variation in pH was much less than the variation in specific conductance. The pH of water samples collected from 13 lysimeters during 2002-2003 and analyzed by STL ranged from 5.4 to 7.0, with a median of 6.3 (table 5). In comparison, the pH of water collected from the 18 lysimeters during June 2004 ranged from 6.0 to 7.1, with a median of 6.3 (table 6). Similarly, the pH of water collected from nine shallow monitoring wells during June 2004 ranged from 5.9 to 7.3, with a median of 6.2 (table 7).

Major Ions

The major ions analyzed in water collected during this study are calcium, chloride, fluoride, potassium, sodium, and sulfate. The analytical method for calcium, potassium, and sodium was SW846 ("Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," Third Edition, U.S. Environmental Protection Agency, 1986, and its updates) 6010B. The analytical method for chloride, fluoride, and sulfate was MCAWW 300.0A.

During 2002-2004, major-ion concentrations were low in samples from 13 lysimeters at Camp Shelby (table 5). Calcium concentrations ranged from 0.6 to 71 mg/L. Chloride concentrations ranged from 2.3 to 12 mg/L. Fluoride concentrations ranged from 0.19 to 0.41 mg/L. Potassium concentrations ranged from less the detection limit to 5.3 mg/L. Sodium concentrations ranged from 11 to 160 mg/L. Sulfate concentrations ranged from 13 to 660 mg/L. Median concentrations of calcium, chloride, fluoride, potassium, sodium, and sulfate in water from the Camp Shelby lysimeters (1.9, 5.1, 0.29, 0.90, 36, and 52 mg/L, respectively) were less than median concentrations in water from background lysimeters (4.1, 23, 0.39, 1.3, 85, and 96 mg/L, respectively) (table 8).

Nutrients

The principal nutrients (elements or compounds essential for animal and plant growth) analyzed in water collected during this study are ammonia, nitrate plus nitrite, orthophosphate, total Kjeldahl nitrogen (ammonia plus organic nitrogen), and total phosphorus. The analytical method for ammonia was MCAWW 350.1; for nitrate plus nitrite, MCAWW 353.2; for orthophosphate, MCAWW 300.0A; for total Kjeldahl nitrogen, MCAWW 351.2; and for total phosphorus, MCAWW 365.3.

During 2002-2004, nutrient concentrations were low in samples from 13 lysimeters at Camp Shelby (table 5). Ammonia concentrations ranged from less than the detection limit to 0.18 mg/L as N. Nitrate plus nitrite concentrations ranged from less than the detection limit to 4.0 mg/L as N. All orthophosphate concentrations were less than the detection limit. Total Kjeldahl nitrogen concentrations ranged from less the detection limit to 0.85 mg/L. Total phosphorus concentrations ranged from 0.025 to 0.95 mg/L. Median concentrations of ammonia and nitrate plus nitrite in water from the Camp Shelby lysimeters (0.028 and 0.018 mg/L, respectively) were less than median concentrations in water from background lysimeters (0.048 and 0.67 mg/L, respectively) (table 8). However, median concentrations of total Kjeldahl nitrogen and total phosphorus in water from the Camp Shelby lysimeters (0.087 and 0.34 mg/L, respectively), although low, were higher than median concentrations in water from background lysimeters (less than 0.01 and 0.19 mg/L, respectively) (table 8).

Trace Elements

Trace elements in water collected during this study were analyzed by two principal methods. Antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, thallium, tin, vanadium, and zinc were analyzed by method SW846 6020 (inductively coupled plasma-mass spectrometry). Aluminum and iron were analyzed by method SW846 6010B (inductively coupled plasma-atomic emission spectroscopy).

During 2002-2003, concentrations of most trace elements were low in samples from 13 lysimeters at Camp Shelby (table 5). Median concentrations of antimony, beryllium, cadmium, chromium, copper, lead, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc in water from the Camp Shelby lysimeters (0.21, <0.01, <0.01, 0.87, 0.68, <0.01, 1.2, 3.1, 0.61, 0.064, <0.01, 8.0, and 6.5 µg/L, respectively) were less than or equal to median concentrations in samples from the two background lysimeters (0.25, <0.01, 0.02, 1.2, 0.89, <0.01, 1.8, 19, 0.88, 0.070, <0.01, 12, and 7.8 µg/L, respectively) (table 8). Median concentrations of arsenic, barium, cobalt, iron, manganese, and tin in water from the Camp Shelby lysimeters (0.95, 64, 1.1, 19, 100, and 0.19 µg/L, respectively) were higher than median concentrations in samples from the two background lysimeters (0.51, 60, 0.87, <1, 42, and <0.01 µg/L, respectively) (table 8).

Volatile Organic Compounds

During July 2002, water samples for VOC analysis were collected from eight lysimeters (CSLS 1-5, CSLS 1-10, CSLS 2-5, CSLS 2-8, CSLS 3-3, CSLS 3-6, CSLS 4-5, and CSLS 4-10) at the CSTS. The analytical method was SW846 8260B (gas chromatography/mass spectroscopy). Analytes are listed in table 9. Few of the constituents were detected at or above the stated MDLs (table 10). The acetone concentration exceeded the MDL but was less than the RL (the reporting, or quantification, limit) in two samples; the acetone concentration was estimated to be 4.8 µg/L at CSLS 1-10 and 30 µg/L at CSLS 2-5. The chloromethane concentration exceeded the MDL but was less than the RL in one sample; the chloromethane concentration was estimated to be 0.34 µg/L at CSLS 1-10. The 2-butanone (methyl ethyl ketone, the only VOC to exceed the RL in 2002) concentration was 2,100 µg/L at CSLS 2-5. Tetrahydrofuran was reported as a tentatively identified compound in samples from all eight sites. It should be noted that tetrahydrofuran was not part of the target compound list and all concentrations were less than the RL. The trace amounts of tetrahydrofuran are believed to be contamination caused by the glue used in installing the lysimeters.

During August 2003, water samples for VOC analysis were collected from five lysimeters (CSLS 1-5, CSLS 6-1, CSLS 6-3, CSLS 7-3, and CSLS 8-5) and one stream at the CSTS. The analytes were the same as those selected during 2002. Few of the constituents were detected at or above the stated MDLs (table 10). The acetone concentration exceeded the MDL, but was less than the RL in four samples; the acetone concentration was estimated to be 2.8 µg/L at CSLS 1-5, 3.7 µg/L at CSLS 6-3, 2.5 µg/L at CSLS 7-3, and 3.6 µg/L in the stream sample (Pearces Creek). Methyl tert-butyl ether was detected in one sample, 5.4 µg/L (slightly above the RL of 5.0 µg/L) at CSLS 6-1. Toluene exceeded the MDL but was less than the RL in one sample; the toluene concentration was estimated to be 0.26 µg/L at CSLS 8-5. Tetrahydrofuran was detected in samples from all five lysimeter sites, but the concentration was less than the RL. It is noteworthy that tetrahydrofuran was not detected in the surface-water sample. Because tetrahydrofuran was detected in all the lysimeter samples, but not detected in the surface-water sample, further indicates that tetrahydrofuran was likely a contaminant associated with the glue used in installation of the lysimeters.

Semi-Volatile Organic Compounds

During July 2002, water samples for SVOC analysis were collected from eight lysimeters (CSLS 1-5, CSLS 1-10, CSLS 2-5, CSLS 2-8, CSLS 3-3, CSLS 3-6, CSLS 4-5, and CSLS 4-10) at the CSTS. The analytical method was SW846 8270C. Analytes are listed in table 11. Sixty-seven of the target SVOCs were not detected in any of the samples. Few of the constituents were detected with concentrations at or above the stated MDLs. All concentrations were less than the RL (table 12). Unknown SVOCs were reported as tentatively identified compounds in samples from all eight sites. The 3-pentene-2-one (e) concentration was estimated to be 6.5 µg/L at CSLS 2-8. The 2-(2-methoxethoxy)-ethanol concentrations were estimated to be 8.9, 9.3, and 9.3 µg/L at CSLS 3-3, CSLS 3-6, CSLS 4-10, respectively. The 1,1,2-trichloro-1-propene concentrations were estimated to be 57 and 29 µg/L at CSLS 2-8 and CSLS 4-5, respectively.

During August 2003, water samples for SVOC analysis were collected from five lysimeters (CSLS 1-5, CSLS 6-1, CSLS 6-3, CSLS 7-3, and CSLS 8-5) and one stream (Pearces Creek) at the CSTS. The analytes were the same as those selected during 2002 (table 11). The same 67 target SVOCs that were not detected in any of the samples during 2002 also were not detected during 2003. A few of the SVOCs were detected with concentrations at or above the stated MDLs. Except for caprolactum, all concentrations were less than the RL (table 12). Unknown SVOCs were reported as tentatively identified compounds in samples from all six sites. As noted by the U.S. Environmental Protection Agency (U.S. Environmental Protection Agency, 2004), "The presence of contaminants does not necessarily indicate that water poses a health risk." Caprolactum is not on the current (2004) list of

Drinking Water Contaminants, and no Maximum Contaminant Level (MCL) exists for caprolactum. [Note: On June 18, 1996 (61 Fed. Reg. 30816), the USEPA removed caprolactum from the Clean Air Act (CAA) list of hazardous air pollutants (HAPs). This action was taken in response to a petition filed by Allied Signal, Inc., BASF Corp., and DSM Chemical NA. The USEPA determined that caprolactum may not be reasonably expected to cause adverse environmental or human health effects (Environmental Register, 1996).]

Explosives

During July 2002, water samples for explosives analyses were collected from eight lysimeters (CSLS 1-5, CSLS 1-10, CSLS 2-5, CSLS 2-8, CSLS 3-3, CSLS 3-6, CSLS 4-5, and CSLS 4-10) at Camp Shelby. The analytical method was SW846 8330 (high performance liquid chromatography). The analytes included the following: 2-amino-4,6-dinitrotoluene, 4-amino-2,6-dinitrotoluene 1,3-dinitrotoluene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, HMX, nitrobenzene, nitroglycerin, 2-nitrotoluene, 3-nitrotoluene, 4-nitrotoluene, PETN, RDX, tetryl, 1,3,5-trinitrobenzene, and 2,4,6-trinitrotoluene. None of the constituents were detected at or above the stated MDLs.

During August 2003, water samples for explosives analyses were collected from five lysimeters (CSLS 1-5, CSLS 6-1, CSLS 6-3, CSLS 7-3, and CSLS 8-5) and one stream at the CSTS. The analytes were the same as those selected during 2002. None of the constituents in the soil-water samples were detected at or above the stated MDLs. Only one constituent in the streamwater sample (Pearces Creek) was detected at or above the stated MDLs; the 2,4,6-trinitrotoluene concentration was estimated to be 0.16 µg/L (data not shown; the result is less than the RL, the quantification limit, 0.25 µg/L). For a more detailed article on the "Environmental Fate and Transport Process Descriptors for Explosives," the reader is referred to the report by Brannon and Pennington (2002).

Perchlorate

Perchlorate contamination of ground water and surface water related to military activities is a topic of emerging concern nationally. Although perchlorate salts are used in pyrotechnics, highway safety flares, fireworks, matches, and electroplating, "over 90 percent of all the perchlorate salts manufactured in United States have been used in the manufacture of solid rocket fuel" (Office of Environmental Health Hazard Assessment, 2004). The perchlorate anion, ClO_4^-, is highly soluble and mobile. The primary health concern associated with perchlorate arises from the fact that perchlorate interferes with iodide uptake into the thyroid gland.

The United States General Accounting Office recommends "that Department of Defense (DOD), acting under its revised perchlorate sampling policy, provide specific funding for comprehensive sampling at sites where no prior sampling has been conducted, yet perchlorate contamination is likely and human exposure is possible based on the sites' prior or current use" (United States General Accounting Office, 2004, p. 32). Consequently, the MMD requested that the USGS obtain perchlorate analyses of water at Camp Shelby.

During June-July 2004, perchlorate samples were collected from 13 lysimeters, 8 shallow monitoring wells, and 3 surface-water sites at Camp Shelby (table 13). At sites with a nest of two or three lysimeters, samples were collected from the shallowest lysimeter (that would yield sufficient water) to maximize chances of detecting perchlorate. Replicate samples were collected from selected sites. The analytical method was modified SW846 8321A, which is an IC/MS/MS (ion chromatography/mass spectrometry/mass spectrometry) with a usual reporting limit of 0.010 µg/L and a method detection limit of 0.0012 µg/L. One sample had a RL of 0.020 µg/L and a MDL of 0.0024 µg/L.

The perchlorate concentrations in water samples collected at Camp Shelby during 2004 were very low (table 13)—much less than State action levels, which currently range from 1 to 18 µg/L (Penfold, 2004). At present (November 2004), there is no federal standard for perchlorate. The Massachusetts Department of Environmental Protection has recommended a limit of 1 µg/L for sensitive populations, and the agency requires additional tests when concentrations exceed that limit. By contrast, California allows ground-water concentrations as high as 4 µg/L. The Massachusetts Department of Environmental Protection states that perchlorate is unhealthy at or above a concentration of 18 µg/L.

Perchlorate concentrations for the entire set of ground-water and surface-water samples ranged from less than the detection limit to 0.50 µg/L, with a median of 0.036 µg/L (table 13). The perchlorate concentrations of water in samples collected from 13 lysimeters (plus replicates) ranged from less than the detection limit to 0.47 µg/L, with a median of 0.067 µg/L. Perchlorate concentrations of water samples collected from eight shallow monitoring wells were quite similar to concentrations in lysimeters and ranged from 0.008 µg/L (less than the RL) to 0.50 µg/L, with a median of 0.050 µg/L. The perchlorate concentration in samples from the three surface-water sites (Cypress Creek, Middle Creek and Pearces Creek; including replicates) ranged from 0.003 µg/L (less than the RL) to 0.036 µg/L, with a median of 0.0075 µg/L.

SUMMARY

During 2002-2004, the U.S. Geological Survey, in partnership with the Mississippi Military Department/Mississippi Army National Guard, conducted an investigation to determine the quality of water in the unsaturated zone outside the central impact area at Camp Shelby near Hattiesburg, Miss. Information from that study, integrated with data from a related study by the U.S. Army Engineer Research and Development Center, will help the MSARNG to develop a better understanding of the processes that affect transport, transformation, and fate of contaminants; to determine the potential for future contamination of ground water in adjacent areas; to develop reasonable mitigation measures to reduce environmental impact; and to help ensure the continued, uninterrupted training activities at Camp Shelby.

The USGS and USA-ERDC installed large volume, porous cup suction lysimeters (soil-water samplers) at shallow depths at selected locations at Camp Shelby. Lysimeters installed for another study near Greenwood and selected surface-water sites were used for quality control/quality assurance purposes (to determine reference/background conditions). Shallow monitoring wells were installed at several of the lysimeter sites to better determine the extent of the water table and to compare the quality of water in the unsaturated zone with that from the saturated zone. Sites were located outside the central impact area for safety, but near the impact area to increase the likelihood of detecting any shallow near-surface contamination associated with training activities.

Information obtained during installation of lysimeters and shallow monitoring wells is consistent with that previously reported. Soils typically are composed of sand, sandy loam, and clay, with low organic content. Most of the lysimeter and monitoring well sites are well drained. Water tables in the study area are controlled by a clay-rich confining unit that prevents significant aquifer contamination by surface activities.

Water-quality samples were collected from 18 lysimeters, 9 shallow monitoring wells, and 3 streams at Camp Shelby. All laboratory analyses were performed by Severn Trent Laboratories, Inc. in Arvada, Colo.

The quality of water from the unsaturated zone at Camp Shelby generally was good. The specific conductance of lab samples of water from the unsaturated zone was low but varied greatly, ranging from 67 to 1,500 μS/cm. The pH was near neutral and typical of shallow ground water in the area, ranging from 5.4 to 7.0. Major ion concentrations were low. Calcium ranged from 0.6 to 71 mg/L; chloride, 2.3 to 12 mg/L; fluoride, 0.19 to 0.41 mg/L; potassium, less than the detection limit to 5.3 mg/L; sodium, 11 to 160 mg/L; and sulfate, 13 to 660 mg/L. Median concentrations of calcium, chloride, fluoride, potassium, sodium, and sulfate in water from the Camp Shelby lysimeters (1.9, 5.1, 0.29, 0.90, 36, and 52 mg/L, respectively) were lower than median concentrations in background water from lysimeters.

Nutrient concentrations were small. Ammonia concentrations ranged from less than the detection limit to 0.18 mg/L as N; nitrate plus nitrite, less than the detection limit to 4.0 mg/L as N. All orthophosphate concentrations were less than the detection limit. Total Kjeldahl nitrogen concentrations ranged from less than the detection limit to 0.85 mg/L; and total phosphorus, 0.025 to 0.95 mg/L. Median concentrations of ammonia and nitrate plus nitrite in water from the Camp Shelby lysimeters (0.028 and 0.018 mg/L, respectively) were much lower than median concentrations in background water from lysimeters. However, median concentrations of total Kjeldahl nitrogen and total phosphorus in water from the Camp Shelby lysimeters (0.087 and 0.34 mg/L, respectively), although low, were higher than median concentrations in background water from lysimeters.

Most trace-element concentrations were low. Median concentrations of antimony, beryllium, cadmium, chromium, copper, lead, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc in water from the Camp Shelby lysimeters (0.21, <0.01, <0.01, 0.87, 0.68, <0.01, 1.2, 3.1, 0.61, 0.064, <0.01, 8.0, and 6.5 μg/L, respectively) were less than or equal to median concentrations in samples from background lysimeters. Median concentrations of arsenic, barium, cobalt, iron, manganese, and tin in water from the Camp Shelby lysimeters (0.95, 64, 1.1, 19, 100, and 0.19 μg/L, respectively) were higher than median concentrations in background samples from lysimeters.

Few of the VOCs were detected at or above the stated MDLs. Only two VOCs were detected above the RLs. Methyl tert-butyl ether and 2-butanone (methyl ethyl ketone) were detected in one sample each, at a concentration of 5.4 and 2,100 μg/L, respectively.

Few of the SVOCs were detected with concentrations at or above the stated MDLs. With the exception of caprolactum, which is not on the current list of Drinking Water Contaminants, all concentrations were less than the RL. Unknown SVOCs were reported as tentatively identified compounds in samples from all sites.

No explosives were detected at or above the stated MDLs. The perchlorate concentrations were very low, ranging from less than the detection limit to 0.47 μg/L, with a median of 0.067 μg/L—quite similar to concentrations in shallow monitoring wells, ranging from less than the detection limit to 0.50 μg/L, with a median of 0.050 μg/L.

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REFERENCES

Boyd, S.A., Patrick, D.M., and Hanley, R.M., 1998, Wetland and training area delineations, Camp Shelby Training Site, Mississippi: University of Southern Mississippi, Department of Geology, Hattiesburg, Mississippi: prepared for the Mississippi Military Department, NGMS-FMO-E, Jackson, Miss.

Brannon, J.M. and Pennington, J.C., 2002, Environmental fate and transport process descriptors for explosives: U.S. Army Engineer Research and Development Center, Vicksburg, Miss., ERDC-TR-02-10, 62 p.

Brown, G.F., 1944, Geology and ground-water resources of the Camp Shelby area: Mississippi State Geological Survey Bulletin 58, 72 p.

Brown, G.F., and Adams, R.W., 1943, Geology and ground-water supply at Camp McCain: Mississippi State Geological Survey Bulletin 55, 116 p.

Department of Defense, 2001, Annual Report to Congress, 2001, Environmental Quality Program: Sustainable Range Management. Accessed on 12 June 2003 at *https://www.denix.osd.mil/denix/Public/News/OSD/EQ01/eqarc01_Sus-Range.pdf*

Department of Defense, 2003, Annual Report to Congress, 2002, Defense Environmental Restoration Program: Army Restoration Status and Progress. Accessed on 12 June 2003 at *http://63.88.245.60/derparc_fy02/derp/FY02_Army.pdf*

Environmental Register, 1996, Caprolactum removed from CAA HAP List: Issue No. 506, p. 12. Accessed on 2 February 2003 at *http://www.ipcb.state.il.us/Archive/dscgi/ds.py/Get/File-11783/9607-506.pdf*

Lane, S.L., and Fay, R.G., October 1997, Safety in field activities: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A9, accessed July 1, 2004, at *http://pubs.water.usgs.gov/twri9A9/*

Lane, S.L., Flanagan, Sarah, and Wilde, F.D., 2003, Selection of equipment for water sampling (v. 2.0): U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A2. Accessed July 1, 2004, at *http://pubs.water.usgs.gov/twri9A2/*

Leonard, S.W., Moore, J.H., and Duran, C.M., 1999, Mississippi Military Department, Biological Inventory, Camp Shelby, 1994-1999: Final report submitted to the Mississippi Army National Guard: variously paginated.

Mirecki, J.E., 2004, Toward a sustainable range: Assessment of source, transport, and fate of munitions constituents on active army training ranges: Presentation at USGS Department of Defense Environmental Program Conference, May 3-7, 2004, Biloxi, Miss., accessed July 1, 2004 at *http://dodesp.er.usgs.gov/events_conferences/presentations_biloxi2004.html*

Mississippi Military Department, National Guard Bureau, 1990, Final Environmental Impact Statement for Proposed Facilities at Camp Shelby: prepared by Weatherford and McDade, Ltd.

National Guard Mississippi, 2003, Camp Shelby, Mississippi: The Nation's most versatile training site. Accessed 12 June 2003 at *http://www.ngms.state.ms.us/campshelby/CSTS/DPTM/dptm.htm*

Office of Environmental Health Hazard Assessment, 2004, Frequently asked questions about the public health goal for perchlorate. Accessed July 1, 2004, at *http://www.oehha.ca.gov/public_info/facts/faqperchlorate.html*

Patrick, David, Roth, Kai, and Lemire, Robert, 2003, The hydrogeologic model – A natural resource management tool, Camp Shelby Training Site, Mississippi, USA: International Conference on Military Geology and Geography Proceedings, June 15-18, 2003. Accessed July 1, 2003, at *http://www.x-cd.com/usma/prof28.html*

Penfold, L., 2004, Critical issues for definitive analysis of low concentrations of perchlorate in the environment: accessed July 1, 2004, at *http://www.stl-inc.com/analyticalservices/specialty%20services/Perchlorate/Critical%20Issues%20for%20Perchlorate%20%201-13-04.ppt*

Pessoney, G.F., and others, 1998, Water quality investigations, Camp Shelby and Camp McCain, 1992 – 1998: University of Southern Mississippi, Department of Biological Sciences, Hattiesburg, Miss.

Roth, Kai, and Patrick, David, 2002, Declines in potentiometric surfaces of Neogene aquifers, Perry County, Mississippi: Journal of the Mississippi Academy of Science, v. 47, no. 1, p. 38-39.

Savell, M.D., and Patrick, D.M., 2002, Soil mineral analysis at multiple launch rocket system (MLRS) firing points, Camp Shelby: Journal of the Mississippi Academy of Science, v. 47, no. 1, p. 39.

Slack, L.J., and Lemire, R.A., 2003, Monitoring the quality of water in the unsaturated zone at Camp Shelby and Camp McCain, Mississippi [abs.], *in* Wilson, P.A., Abstracts with Programs, Thirty-third Annual Mississippi Water Resources Conference, Raymond, MS, April 23-24, 2003: Mississippi State, Miss., Mississippi Water Resources Research Institute.

Slack, L.J., Lemire, R.A., and Mirecki, J.E., 2004, Quality of water in the unsaturated zone at Camp McCain, Mississippi—2002-2004: U.S. Geological Survey Scientific Investigations Report 2004-5279.

Slack, L.J., Neely, R.B., Murphy, L.O., and Lemire, R.A., 2004, Quality of water in the unsaturated zone at Camp Shelby, Mississippi: Presentation at USGS Department of Defense Environmental Program Conference, May 3-7, 2004, Biloxi, Miss. Accessed July 1, 2004 at *http://dodesp.er.usgs.gov/events_conferences/presentations_biloxi2004.html.*

Soilmoisture Equipment Corp., 1997, Operating instructions, 1920F1/1920F1K1 Pressure-Vacuum Soil Water Samplers: Soilmoisture Equipment Corp., Santa Barbara, CA.

Soilmoisture Equipment Corp., 2003, Ultra samplers. Accessed January 7, 2004, at *http://www.soilmoisture.com/PDF%20Files/ultrasamplers.pdf*

U.S. Army Center for Health Promotion and Preventive Medicine, 1999, Training range site characterization and risk screening, Camp Shelby, Mississippi, 7-23 September 1999: Geohydrologic Study No. 38-EH-8879-99, 301 p.

U.S. Department of Agriculture, 1994, Final environmental impact statement for military training use of National Forest lands at Camp Shelby, Mississippi: Forest Service, Southern Region, Mississippi.

U.S. Environmental Protection Agency, 1979, Methods for chemical analysis of water and wastes: EPA-600/4-79-020, March 1983 and subsequent revisions.

U.S. Environmental Protection Agency, 1986, Test methods for evaluating solid waste, physical/chemical methods: Third Edition, November 1986 and its updates.

U.S. Environmental Protection Agency, 2004, Ground water and drinking water: Drinking water contaminants: Accessed Aug. 4, 2004, at *http://www.epa.gov/safewater/hfacts.html*

United States General Accounting Office, 2004, DOD Operational ranges—More reliable cleanup cost estimates and a proactive approach to identifying contamination are needed: Report to Congressional Requesters, GAO-04-601, 48 p.

Wilde, F.D., Radtke, D.B., eds., 2004 [chapter sections variously dated], Field measurements: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A6, Accessed July 1, 2004, at *http://pubs.water.usgs.gov/twri9A6/*

Wilde, F.D., Radtke, D.B., Gibs, Jacob, and Iwatsubo, R.T., 1998, Preparations for water sampling: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A1, Accessed July 1, 2004, at *http://pubs.water.usgs.gov/twri9A1/*

TABLES

Table 1. Site information for selected lysimeters, Camp Shelby, Mississippi

[CSLS, Camp Shelby lysimeter site; QALS, quality-assurance/quality-control lysimeter site used to establish reference/background conditions; --, out of area shown in figure 2. Note: sites destroyed or which produced insufficient water for water-quality analyses are omitted]

Site name	Site number	Date constructed	County	Latitude	Longitude	Lysimeter depth, in feet
CSLS 1-5	1	05/24/02	Forrest	N 31° 06' 49.9"	W 89° 09' 12.4"	4.7
CSLS 1-10	1	05/24/02	Forrest	N 31° 06' 47.8"	W 89° 09' 12.4"	9.8
CSLS 2-5	2	05/20/02	Forrest	N 31° 05' 41.3"	W 89° 09' 35.7"	5.0
CSLS 2-8	2	05/20/02	Forrest	N 31° 05' 41.3"	W 89° 09' 35.6"	8.0
CSLS 3-3	3	05/20/02	Perry	N 31° 05' 04.5"	W 89° 07' 30.6"	3.0
CSLS 3-6	3	05/20/02	Perry	N 31° 05' 04.7"	W 89° 07' 30.5"	6.0
CSLS 4-5	4	05/21/02	Perry	N 31° 05' 11.0"	W 89° 05' 08.8"	5.0
CSLS 4-10	4	05/21/02	Perry	N 31° 05' 11.2"	W 89° 05' 08.8"	10.0
CSLS 6-1	6	06/10/03	Perry	N 31° 05' 28.0"	W 89° 08' 08.0"	1.2
CSLS 6-3	6	06/10/03	Perry	N 31° 05' 28.0"	W 89° 08' 08.0"	3.0
CSLS 7-3	7	06/10/03	Perry	N 31° 06' 29.0"	W 89° 04' 56.0"	3.0
CSLS 8-5	8	06/10/03	Perry	N 31° 07' 03.0"	W 89° 04' 51.0"	5.0
CSLS 9-3	9	03/16/04	Perry	N 31° 08' 36.6"	W 89° 02' 14.4"	3.5
CSLS 9-5	9	03/16/04	Perry	N 31° 08' 36.7"	W 89° 02' 14.4"	5.5
CSLS 9-10	9	03/16/04	Perry	N 31° 08' 36.8"	W 89° 02' 14.3"	10.6
CSLS 10-3	10	05/25/04	Perry	N 31° 05' 28.4"	W 89° 04' 56.9"	3.0
CSLS 10-5	10	05/25/04	Perry	N 31° 05' 28.2"	W 89° 04' 56.4"	5.0
CSLS 10-8	10	05/25/04	Perry	N 31° 05' 28.4"	W 89° 04' 54.8"	8.0
CSLS 11-3	11	07/26/04	Perry	N 31° 08' 28.6"	W 89° 02' 13.8"	3.0
CSLS 11-5	11	07/26/04	Perry	N 31° 08' 28.6"	W 89° 02' 13.8"	5.0
CSLS 11-10	11	07/26/04	Perry	N 31° 08' 28.7"	W 89° 02' 13.6"	10.0
QALS 5	--	04/25/02	Carroll	N 33° 32' 28.0"	W 90° 05' 02.0"	5.0
QALS 11	--	04/25/02	Carroll	N 33° 32' 28.0"	W 90° 05' 02.0"	11.5

Table 2. Site information for selected surface-water sampling sites, Camp Shelby, Mississippi

[USGS, U.S. Geological Survey; CSLS, Camp Shelby lysimeter site]

Site name	USGS station number (fig. 3)	Site number	Latitude	Longitude	Remarks
Middle Creek near Brooklyn	02479143	SW 1	N 31° 05' 03.5"	W 89° 07' 31.1"	Gaging station; near CSLS 3-3, 3-6; well 3
Pearces Creek near Janice	02479144	SW 2	N 31° 05' 08.7"	W 89° 05' 07.7"	On South Tank Trail, near south-eastern corner of central impact area
Cypress Creek near Beaumont	02479153	SW 3	N 31° 05' 00.0"	W 89° 01' 04.8"	Upstream of long-term (Oct. 1966–present; 37 years) gaging station Cypress Creek near Janice (02479155)

Table 3. Site information for selected shallow monitoring wells, Camp Shelby, Mississippi

[USGS, U.S. Geological Survey; MPF, mortar firing point; OP, observation point; FP, firing point. Wells terminate with a 3-foot drive point]

Well number (fig. 2)	Associated Camp Shelby lysimeter site	Date constructed	Well depth (bottom of screen), in feet below land surface	Remarks
1	1-5, 1-10	03/10/04	6.0	Range 45
2	2-5, 2-8	04/06/04	4.5	Range 47C
3	3-3, 3-6	03/11/04	9.8	East bank of Middle Creek; upstream of USGS gage
4	4-5, 4-10	03/11/04	9.6	Close to MFP 27 and OP 12
6	6-1, 6-3	03/10/04	16.5	Range 48
7	7-3	03/11/04	9.0	OP 8, MFP 22
8	8-5	04/07/04	9.7	OP 5
9	9-3, 9-5, 9-10	04/07/04	12.4	FP 125A
10	10-3, 10-5, 10-8	04/07/04	11.0	OP 6
11	11-3, 11-5, 11-10	07/26/04	13.0	FP 125B

Table 4. Drillers' logs of selected lysimeter sites and shallow monitoring wells, Camp Shelby, Mississippi

[CSLS, Camp Shelby lysimeter site; ft, feet]

Site name	Depth, in feet	Description
CSLS 2-5	0.0-3.0	Sand
	3.0-3.5	Clay, red, moist
	3.5-5.5	Clay, gray, moist
CSLS 2-8	0.0-0.5	Sand, dark brown
	0.5-2.5	Coarse sand and gravel
	2.5-3.5	Sand with orange-red clay, plastic, wet
	3.5-8.0	Clay, gray, moist
		[water level=7.7 feet below land surface]
CSLS 3-3	0.0-0.5	Top soil, black, rich
	0.5-2.0	Sandy clay, brown
	2.0-3.0	Sandy clay, light tan
CSLS 3-6	0.0-0.5	Top soil, black
	0.5-3.0	Sandy clay, brown
	3.0-5.0	Sandy clay, light tan
	5.0-6.0	Sandy clay, gray, moist
		[water level=5.7 feet below land surface]
CSLS 4-5	0.0-0.5	Top soil
	0.5-1.0	Fine sandy silt, light brown
	1.0-2.5	Sandy silt, darker brown
	2.5-5.0	Sandy silt, with a little sub-pea gravel
	5.0-5.5	Medium sand, very dark brown, very moist
CSLS 4-10	0.0-3.0	Silty sand, light tan with streaks of brown
	3.0-4.0	Silty sand, darker brown
	4.0-5.0	Sand, light tan, moist
	5.0-6.5	Sand, medium to coarse, with fine, black organic material
	6.5-6.8	Sandy clay, gray
	6.8-8.2	Medium sand, gray, with silt
	8.2-10.3	Turquoise clay with sand and brown organic material
CSLS 6-1	0.0-0.2	Light brown sand with roots
	0.2-1.1	Light brown sand with loam
	1.1-1.6	Light brown sand with loam and rounded pebbles
	1.6-2.1	Dark gray-green silty clay
	2.1-2.7	Light tan silty clay, increasing saturation
	2.7-3.7	Dark tan clay, increasing saturation
	3.7-4.3	Dark tan clay, increasing saturation
		[next day, water level=2.5 feet below land surface]

Table 4. Drillers' logs of selected lysimeter sites and shallow monitoring wells, Camp Shelby, Mississippi--Continued

Site name (fig. 2; tables 1, 3)	Depth, in feet	Description
CSLS 6-3	0.0-0.2	Root zone (A horizon)
	0.2-0.7	Red clay
	0.7-1.1	Red clay; carbon flecks
	1.1-1.8	Dark brown loam/soil; carbon flecks
	1.8-2.5	Mottled dark brown and light tan clay (loam soil); abundant carbon
	2.5-5.5	Light tan clay with orange/red iron-oxides abundant; sparingly moist
	5.5-6.0	Same as above, but saturated
		[water level=4.2 feet below land surface]
CSLS 7-3	0.0-0.3	Sandy loam
	0.3-1.9	Light ochre yellow sandy clay
	1.9-2.3	Light tan sandy clay with iron oxide
	2.3-2.7	Light tan sandy clay with increasing saturation
	2.7-3.2	Light tan sand with increasing saturation
	3.2-3.5	Same as above
		[water level=3.5 feet below land surface]
CSLS 8-5	0.0-0.5	Roots, organics, iron oxides
	0.5-0.9	Orange, ochre clayey sand
	0.9-1.3	Same as above, moist
	1.3-2.8	Silty sand, moist
	2.8-3.4	Silty sand, light tan to ochre, iron oxides
	3.4-4.6	Silty sand with increasing clay
	4.6-5.5	Silty sand with increasing clay and increasing saturation
Well 1	0.0-0.5	Fill material
	0.5-2.0	Sandy clay, gray
	2.0-3.0	Sandy clay, mixed with tan clay
		[water level=1.23 feet below land surface]
Well 2	0.0-0.5	Sandy loam
	0.5-1.3	Tan sandy loam
	1.3-2.2	Sand, white, with gravel
	2.2-2.6	Sand, white, with gravel, light tan
	2.6-2.9	White sand, very moist
	2.9-3.0	White sand with a lot of gravel
	3.0-3.6	Orange clay (sloughing)
		[water level=3.05 feet below land surface]

Table 4. Drillers' logs of selected lysimeter sites and shallow monitoring wells, Camp Shelby, Mississippi--Continued

Site name (fig. 2; tables 1, 3)	Depth, in feet	Description
Well 3	0.0-1.0	Dark sandy loam
	1.0-1.5	Light tan sandy loam
	1.5-2.6	Light tan sandy loam with increasing tan, moist
	2.6-3.0	Yellow sand, slightly orange
		[water level=3.02 feet below land surface]
Well 4	0.0-2.6	Light brown sandy loam
	2.6-4.7	Light brown sandy loam, some gray
	4.7-4.9	Dark gray sand, wet
		[water level=3.70 feet below land surface]
Well 6	0.0-0.4	Brown sand
	0.4-1.0	Yellow-brown sandy clay
	1.0-1.5	Orange-brown clay
	1.5-2.5	Orange-brown clay with reddish streaks
	2.5-3.5	Orange-brown clay with a lot of red clay
	3.5-4.0	Orange-brown clay with tan sand streaks
	4.0-8.0	Brown, red (rust) and tan clay
	8.0-8.5	Brown, red clay with more tan clay
	8.0-8.8	Tan clay with a lot of gray sand, very friable
	8.8-16.5	Gray sand with gray clay
Well 7	0.0-1.0	Yellow-orange-tan sandy loam, with organic material
	1.0-3.9	Sandy clay, yellow-orange, picking up some pink streaks-oxidation
	3.9-4.9	Gray clay and sand mixed with yellow-orange clay, moist
	4.9-6.0	Same as above, but with more gray clay streaks
	6.0-9.0	White sand, wet
		[waterlevel=5.60 feet below land surface]
Well 8	0.0-2.0	Tan sandy loam
	2.0-2.8	Tan sandy loam with light to darker tan sand
	2.8-3.7	Light tan sand, turning gray, moist
	3.7-5.5	Gray sand, almost white, moist
	5.5-8.0	White sandy clay, saturated
		[water level=4.30 feet below land surface]
Well 9	0.0-0.9	Light brown sandy loam
	0.9-2.2	Orange-brown clayey loam
	2.2-2.9	Loamy clay, lighter, orange-brown
	2.9-3.6	Same, with specks of red oxidation
	3.6-4.1	Loamy orange-brown clay, with streaks of red clay
	4.1-6.4	Tan mixed with orange-brown clay
	6.4-7.0	Red, ratty clay with tan streaks of fine sand

Table 4. Drillers' logs of selected lysimeter sites and shallow monitoring wells, Camp Shelby, Mississippi--Continued

Composite Lithologic Log: Firing Point 125 (FP125A), Camp Shelby	
Depth, in feet	**Description**
0.0-0.1	Sandy loam. Soil samples FP125-1 (0.0-0.2 ft. Lab no. 08356); FP125-2 (0.0 – 0.2 ft. Lab no. 08354); and FP125-3 (0.0-0.3 ft. Lab no. 08352). Grassy surface removed for lysimeter installation
2.5-2.9	Sandy clay loam. Soil samples FP125-1 (2.5-2.9 ft. Lab no. 08357)
4.0-4.3	Sandy loam. Soil samples FP125-2 (4.0-4.3 ft. Lab no. 08355)
4.6-5.0	Lysimeter FP125-2 installed at this depth
9.8-10.0	Sandy clay loam. FP125-1 (9.8-10.0 ft. Lab no. 08353). Lysimeter FP125-1 installed at 9.7 to 10.1 ft.
10.6	Bottom of hole
12.0	Maximum depth of drive point well

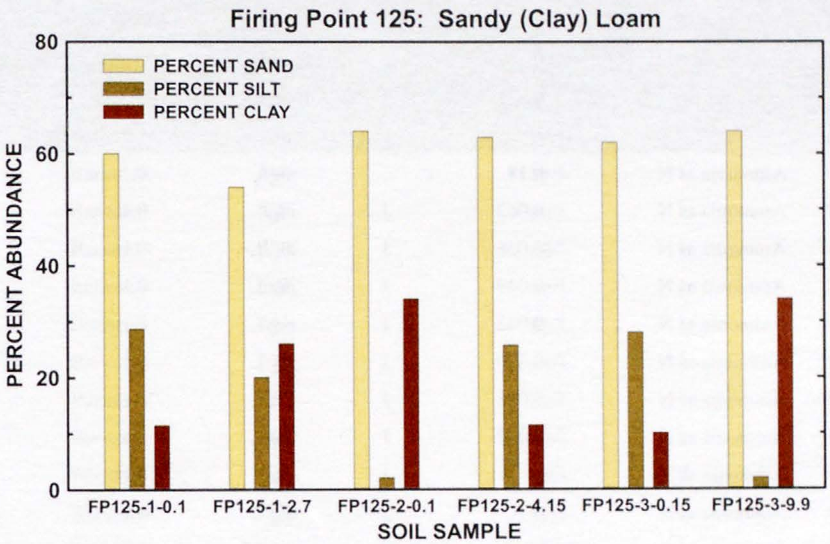

Table 5. Inorganic water-quality data (physical properties, major ions, nutrients, and trace elements) for selected lysimeters, Camp Shelby, Mississippi

[CSLS, Camp Shelby lysimeter site; µg/L, micrograms per liter; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter; 0, less than method detection limit; B, method blank contamination; J, estimated result (less than the reporting limit); L, interferences present; Q, elevated reporting limit; **bold**, median value]

Site name	Date	Parameter	Results	Remarks	Units	Reporting limit	Method detection limit
CSLS 1-5	07/30/02	Aluminum	380		µg/L	100	20
CSLS 7-3	08/26/03	Aluminum	250		µg/L	100	20
CSLS 4-5	07/29/02	Aluminum	220		µg/L	100	20
CSLS 1-5	08/26/03	Aluminum	150		µg/L	100	20
CSLS 6-3	08/26/03	Aluminum	110		µg/L	100	20
CSLS 6-1	08/26/03	Aluminum	79	J	µg/L	100	20
CSLS 8-5	08/26/03	Aluminum	76	J	µg/L	100	20
CSLS 3-3	07/29/02	Aluminum	57	J	µg/L	100	20
CSLS 2-8	07/29/02	Aluminum	26	J	µg/L	100	20
CSLS 3-6	07/29/02	Aluminum	25	J	µg/L	100	20
CSLS 1-10	07/30/02	Aluminum	0	J	µg/L	100	20
CSLS 2-5	07/29/02	Aluminum	0	J	µg/L	100	20
CSLS 4-10	07/29/02	Aluminum	0	J	µg/L	100	20
			76				
CSLS 8-5	08/18/03	Ammonia as N	0.18		mg/L	0.1	0.038
CSLS 4-10	08/28/02	Ammonia as N	0.062	J	mg/L	0.1	0.015
CSLS 7-3	08/19/03	Ammonia as N	0.056	J	mg/L	0.1	0.038
CSLS 3-3	08/28/02	Ammonia as N	0.049	J	mg/L	0.1	0.015
CSLS 1-10	08/28/02	Ammonia as N	0.038	J	mg/L	0.1	0.015
CSLS 1-5	08/28/02	Ammonia as N	0.030	J	mg/L	0.1	0.015
CSLS 2-8	08/28/02	Ammonia as N	0.028	J	mg/L	0.1	0.015
CSLS 2-5	08/28/02	Ammonia as N	0.022	J	mg/L	0.1	0.015
CSLS 1-5	08/18/03	Ammonia as N	0	J	mg/L	0.1	0.038
CSLS 3-6	08/28/02	Ammonia as N	0	J	mg/L	0.1	0.015
CSLS 4-5	08/28/02	Ammonia as N	0	J	mg/L	0.1	0.015
CSLS 6-1	08/18/03	Ammonia as N	0	J	mg/L	0.1	0.038
CSLS 6-3	08/18/03	Ammonia as N	0	J	mg/L	0.1	0.038
			0.028				
CSLS 4-5	07/29/02	Antimony	1.3	J	µg/L	2	0.040
CSLS 6-3	08/26/03	Antimony	1.0	B J	µg/L	2	0.024
CSLS 7-3	08/26/03	Antimony	1.0	B J	µg/L	2	0.024
CSLS 6-1	08/26/03	Antimony	0.50	B J	µg/L	2	0.024
CSLS 3-3	07/29/02	Antimony	0.28	J	µg/L	2	0.040
CSLS 1-10	07/30/02	Antimony	0.24	J	µg/L	2	0.040
CSLS 8-5	08/26/03	Antimony	0.21	B J	µg/L	2	0.024
CSLS 2-8	07/29/02	Antimony	0.14	J	µg/L	2	0.040
CSLS 4-10	07/29/02	Antimony	0.13	J	µg/L	2	0.040
CSLS 3-6	07/29/02	Antimony	0.12	J	µg/L	2	0.040
CSLS 1-5	07/30/02	Antimony	0.084	J	µg/L	2	0.040
CSLS 2-5	07/29/02	Antimony	0.079	J	µg/L	2	0.040
CSLS 1-5	08/26/03	Antimony	0	J	µg/L	2	0.024
			0.21				

Table 5. Inorganic water-quality data (physical properties, major ions, nutrients, and trace elements) for selected lysimeters, Camp Shelby, Mississippi--Continued

Site name	Date	Parameter	Results	Remarks	Units	Reporting limit	Method detection limit
CSLS 2-8	07/29/02	Arsenic	5.5		µg/L	5	0.061
CSLS 7-3	08/26/03	Arsenic	5.5		µg/L	5	0.120
CSLS 4-5	07/29/02	Arsenic	2.1	J	µg/L	5	0.061
CSLS 2-5	07/29/02	Arsenic	1.3	J	µg/L	5	0.061
CSLS 1-10	07/30/02	Arsenic	1.2	J	µg/L	5	0.061
CSLS 3-3	07/29/02	Arsenic	1.2	J	µg/L	5	0.061
CSLS 4-10	07/29/02	Arsenic	0.95	J	µg/L	5	0.061
CSLS 6-3	08/26/03	Arsenic	0.80	J	µg/L	5	0.120
CSLS 8-5	08/26/03	Arsenic	0.62	J	µg/L	5	0.120
CSLS 1-5	08/26/03	Arsenic	0.51	J	µg/L	5	0.120
CSLS 6-1	08/26/03	Arsenic	0.43	J	µg/L	5	0.120
CSLS 1-5	07/30/02	Arsenic	0.38	J	µg/L	5	0.061
CSLS 3-6	07/29/02	Arsenic	0.19	J	µg/L	5	0.061
			0.95				
CSLS 2-5	07/29/02	Barium	180		µg/L	1	0.057
CSLS 4-10	07/29/02	Barium	140		µg/L	1	0.057
CSLS 1-5	07/30/02	Barium	130		µg/L	1	0.057
CSLS 3-6	07/29/02	Barium	120		µg/L	1	0.057
CSLS 6-1	08/26/03	Barium	102		µg/L	1	0.081
CSLS 6-1	08/26/03	Barium	101		µg/L	1	0.081
CSLS 2-8	07/29/02	Barium	79		µg/L	1	0.057
CSLS 1-10	07/30/02	Barium	64		µg/L	1	0.057
CSLS 6-1	08/26/03	Barium	61		µg/L	1	0.081
CSLS 6-3	08/26/03	Barium	39		µg/L	1	0.081
CSLS 1-5	08/26/03	Barium	37		µg/L	1	0.081
CSLS 7-3	08/26/03	Barium	16		µg/L	1	0.081
CSLS 4-5	07/29/02	Barium	3.7		µg/L	1	0.057
CSLS 8-5	08/26/03	Barium	3.4		µg/L	1	0.081
CSLS 3-3	07/29/02	Barium	3.3		µg/L	1	0.057
			64.0				
CSLS 1-5	07/30/02	Beryllium	0.220	J	µg/L	1	0.028
CSLS 1-5	08/26/03	Beryllium	0.044	J	µg/L	1	0.032
CSLS 1-10	07/30/02	Beryllium	0	J	µg/L	1	0.028
CSLS 2-5	07/29/02	Beryllium	0	J	µg/L	1	0.028
CSLS 2-8	07/29/02	Beryllium	0	J	µg/L	1	0.028
CSLS 3-3	07/29/02	Beryllium	0	J	µg/L	1	0.028
CSLS 3-6	07/29/02	Beryllium	0	J	µg/L	1	0.028
CSLS 4-10	07/29/02	Beryllium	0	J	µg/L	1	0.028
CSLS 4-5	07/29/02	Beryllium	0	J	µg/L	1	0.028
CSLS 6-1	08/26/03	Beryllium	0	J	µg/L	1	0.032
CSLS 6-3	08/26/03	Beryllium	0	J	µg/L	1	0.032
CSLS 7-3	08/26/03	Beryllium	0	J	µg/L	1	0.032
CSLS 8-5	08/26/03	Beryllium	0	J	µg/L	1	0.032
			0				

Table 5. Inorganic water-quality data (physical properties, major ions, nutrients, and trace elements) for selected lysimeters, Camp Shelby, Mississippi--Continued

Site name	Date	Parameter	Results	Remarks	Units	Reporting limit	Method detection limit
CSLS 1-10	07/30/02	Cadmium	0.25	J	µg/L	1	0.022
CSLS 1-5	07/30/02	Cadmium	0.17	J	µg/L	1	0.022
CSLS 6-1	08/26/03	Cadmium	0.071	J	µg/L	1	0.051
CSLS 2-5	07/29/02	Cadmium	0.042	J	µg/L	1	0.022
CSLS 3-6	07/29/02	Cadmium	0.038	J	µg/L	1	0.022
CSLS 1-5	08/26/03	Cadmium	0	J	µg/L	1	0.051
CSLS 2-8	07/29/02	Cadmium	0	J	µg/L	1	0.022
CSLS 3-3	07/29/02	Cadmium	0	J	µg/L	1	0.022
CSLS 4-10	07/29/02	Cadmium	0	J	µg/L	1	0.022
CSLS 4-5	07/29/02	Cadmium	0	J	µg/L	1	0.022
CSLS 6-3	08/26/03	Cadmium	0	J	µg/L	1	0.051
CSLS 7-3	08/26/03	Cadmium	0	J	µg/L	1	0.051
CSLS 8-5	08/26/03	Cadmium	0	J	µg/L	1	0.051
			0				
CSLS 1-10	07/30/02	Calcium	71		mg/L	0.2	0.031
CSLS 2-5	07/29/02	Calcium	24		mg/L	0.2	0.031
CSLS 4-10	07/29/02	Calcium	19		mg/L	0.2	0.031
CSLS 1-5	07/30/02	Calcium	13		mg/L	0.2	0.031
CSLS 2-8	07/29/02	Calcium	12		mg/L	0.2	0.031
CSLS 3-6	07/29/02	Calcium	3.2		mg/L	0.2	0.031
CSLS 6-3	08/26/03	Calcium	1.9	B	mg/L	0.2	0.076
CSLS 6-1	08/26/03	Calcium	1.6	B	mg/L	0.2	0.076
CSLS 3-3	07/29/02	Calcium	1.5		mg/L	0.2	0.031
CSLS 4-5	07/29/02	Calcium	1.5		mg/L	0.2	0.031
CSLS 1-5	08/26/03	Calcium	1.2	B	mg/L	0.2	0.076
CSLS 7-3	08/26/03	Calcium	1.0	B	mg/L	0.2	0.076
CSLS 8-5	08/26/03	Calcium	0.6	B	mg/L	0.2	0.076
			1.9				
CSLS 4-5	08/28/02	Chloride	12		mg/L	3	0.10
CSLS 3-6	08/28/02	Chloride	9.0		mg/L	3	0.10
CSLS 6-3	08/26/03	Chloride	8.2		mg/L	3	0.22
CSLS 3-3	08/28/02	Chloride	6.2		mg/L	3	0.10
CSLS 1-5	08/26/03	Chloride	5.3		mg/L	3	0.22
CSLS 1-5	08/28/02	Chloride	5.2		mg/L	3	0.10
CSLS 1-10	08/28/02	Chloride	5.1		mg/L	3	0.10
CSLS 8-5	08/26/03	Chloride	4.2		mg/L	3	0.22
CSLS 4-10	08/28/02	Chloride	3.6		mg/L	3	0.10
CSLS 2-5	08/28/02	Chloride	3.5		mg/L	3	0.10
CSLS 6-1	08/26/03	Chloride	3.1		mg/L	3	0.22
CSLS 2-8	08/28/02	Chloride	2.7	J	mg/L	3	0.10
CSLS 7-3	08/26/03	Chloride	2.3	J	mg/L	3	0.22
			5.1				

Table 5. Inorganic water-quality data (physical properties, major ions, nutrients, and trace elements) for selected lysimeters, Camp Shelby, Mississippi--Continued

Site name	Date	Parameter	Results	Remarks	Units	Reporting limit	Method detection limit
CSLS 4-5	07/29/02	Chromium	2.3	B	µg/L	2	0.24
CSLS 1-10	07/30/02	Chromium	1.1	B J	µg/L	2	0.24
CSLS 1-5	07/30/02	Chromium	1.1	B J	µg/L	2	0.24
CSLS 3-3	07/29/02	Chromium	1.0	B J	µg/L	2	0.24
CSLS 3-6	07/29/02	Chromium	1.0	B J	µg/L	2	0.24
CSLS 2-8	07/29/02	Chromium	0.96	B J	µg/L	2	0.24
CSLS 2-5	07/29/02	Chromium	0.87	B J	µg/L	2	0.24
CSLS 4-10	07/29/02	Chromium	0.79	B J	µg/L	2	0.24
CSLS 6-1	08/26/03	Chromium	0.68	B J	µg/L	2	0.13
CSLS 8-5	08/26/03	Chromium	0.68	B J	µg/L	2	0.13
CSLS 7-3	08/26/03	Chromium	0.64	B J	µg/L	2	0.13
CSLS 1-5	08/26/03	Chromium	0.58	B J	µg/L	2	0.13
CSLS 6-3	08/26/03	Chromium	0.55	B J	µg/L	2	0.13
			0.87				
CSLS 2-5	07/29/02	Cobalt	9.5		µg/L	1	0.015
CSLS 1-5	07/30/02	Cobalt	5.0		µg/L	1	0.015
CSLS 3-6	07/29/02	Cobalt	3.4		µg/L	1	0.015
CSLS 6-3	08/26/03	Cobalt	1.6		µg/L	1	0.017
CSLS 1-10	07/30/02	Cobalt	1.5		µg/L	1	0.015
CSLS 4-10	07/29/02	Cobalt	1.1		µg/L	1	0.015
CSLS 6-1	08/26/03	Cobalt	1.1		µg/L	1	0.017
CSLS 7-3	08/26/03	Cobalt	1.0		µg/L	1	0.017
CSLS 1-5	08/26/03	Cobalt	0.66	J	µg/L	1	0.017
CSLS 2-8	07/29/02	Cobalt	0.39	J	µg/L	1	0.015
CSLS 4-5	07/29/02	Cobalt	0.39	J	µg/L	1	0.015
CSLS 3-3	07/29/02	Cobalt	0.35	J	µg/L	1	0.015
CSLS 8-5	08/26/03	Cobalt	0.15	J	µg/L	1	0.017
			1.1				
CSLS 6-1	08/26/03	Copper	2.1		µg/L	2	0.17
CSLS 2-5	07/29/02	Copper	2.0		µg/L	2	0.63
CSLS 1-5	07/30/02	Copper	1.8	J	µg/L	2	0.63
CSLS 1-10	07/30/02	Copper	1.6	J	µg/L	2	0.63
CSLS 4-5	07/29/02	Copper	1.6	J	µg/L	2	0.63
CSLS 6-3	08/26/03	Copper	0.86	J	µg/L	2	0.17
CSLS 7-3	08/26/03	Copper	0.68	J	µg/L	2	0.17
CSLS 1-5	08/26/03	Copper	0.65	J	µg/L	2	0.17
CSLS 8-5	08/26/03	Copper	0.34	J	µg/L	2	0.17
CSLS 2-8	07/29/02	Copper	0	J	µg/L	2	0.63
CSLS 3-3	07/29/02	Copper	0	J	µg/L	2	0.63
CSLS 3-6	07/29/02	Copper	0	J	µg/L	2	0.63
CSLS 4-10	07/29/02	Copper	0	J	µg/L	2	0.63
			0.68				

Table 5. Inorganic water-quality data (physical properties, major ions, nutrients, and trace elements) for selected lysimeters, Camp Shelby, Mississippi--Continued

Site name	Date	Parameter	Results	Remarks	Units	Reporting limit	Method detection limit
CSLS 1-5	08/28/02	Fluoride	0.41	J	mg/L	1	0.03
CSLS 4-10	08/28/02	Fluoride	0.36	J	mg/L	1	0.03
CSLS 8-5	08/26/03	Fluoride	0.35	J	mg/L	1	0.11
CSLS 1-10	08/28/02	Fluoride	0.31	J	mg/L	1	0.03
CSLS 3-3	08/28/02	Fluoride	0.31	J	mg/L	1	0.03
CSLS 3-6	08/28/02	Fluoride	0.30	J	mg/L	1	0.03
CSLS 4-5	08/28/02	Fluoride	0.29	J	mg/L	1	0.03
CSLS 2-8	08/28/02	Fluoride	0.26	J	mg/L	1	0.03
CSLS 2-5	08/28/02	Fluoride	0.24	J	mg/L	1	0.03
CSLS 6-3	08/26/03	Fluoride	0.23	J	mg/L	1	0.11
CSLS 7-3	08/26/03	Fluoride	0.23	J	mg/L	1	0.11
CSLS 1-5	08/26/03	Fluoride	0.19	J	mg/L	1	0.11
CSLS 6-1	08/26/03	Fluoride	0.19	J	mg/L	1	0.11
			0.29				
CSLS 2-5	07/29/02	Iron	390		µg/L	100	13
CSLS 4-5	07/29/02	Iron	150		µg/L	100	13
CSLS 3-3	07/29/02	Iron	44	J	µg/L	100	13
CSLS 7-3	08/26/03	Iron	44	J	µg/L	100	19
CSLS 1-5	08/26/03	Iron	39	J	µg/L	100	19
CSLS 6-1	08/26/03	Iron	20	J	µg/L	100	19
CSLS 8-5	08/26/03	Iron	19	J	µg/L	100	19
CSLS 2-8	07/29/02	Iron	14	J	µg/L	100	13
CSLS 1-10	07/30/02	Iron	0	J	µg/L	100	13
CSLS 1-5	07/30/02	Iron	0	J	µg/L	100	13
CSLS 3-6	07/29/02	Iron	0	J	µg/L	100	13
CSLS 4-10	07/29/02	Iron	0	J	µg/L	100	13
CSLS 6-3	08/26/03	Iron	0	J	µg/L	100	19
			19				
CSLS 4-10	07/29/02	Lead	0.22	J	µg/L	1	0.15
CSLS 4-5	07/29/02	Lead	0.19	J	µg/L	1	0.15
CSLS 1-10	07/30/02	Lead	0	J	µg/L	1	0.15
CSLS 1-5	07/30/02	Lead	0	J	µg/L	1	0.15
CSLS 1-5	08/26/03	Lead	0	J	µg/L	1	0.19
CSLS 2-5	07/29/02	Lead	0	J	µg/L	1	0.15
CSLS 2-8	07/29/02	Lead	0	J	µg/L	1	0.15
CSLS 3-3	07/29/02	Lead	0	J	µg/L	1	0.15
CSLS 3-6	07/29/02	Lead	0	J	µg/L	1	0.15
CSLS 6-1	08/26/03	Lead	0	J	µg/L	1	0.19
CSLS 6-3	08/26/03	Lead	0	J	µg/L	1	0.19
CSLS 7-3	08/26/03	Lead	0	J	µg/L	1	0.19
CSLS 8-5	08/26/03	Lead	0	J	µg/L	1	0.19
			0				

Table 5. Inorganic water-quality data (physical properties, major ions, nutrients, and trace elements) for selected lysimeters, Camp Shelby, Mississippi--Continued

Site name	Date	Parameter	Results	Remarks	Units	Reporting limit	Method detection limit
CSLS 2-5	07/29/02	Manganese	1,700	B	µg/L	1	0.061
CSLS 1-10	07/30/02	Manganese	700	B	µg/L	1	0.061
CSLS 2-8	07/29/02	Manganese	290	B	µg/L	1	0.061
CSLS 4-10	07/29/02	Manganese	220	B	µg/L	1	0.061
CSLS 1-5	07/30/02	Manganese	180	B	µg/L	1	0.061
CSLS 6-1	08/26/03	Manganese	120	L	µg/L	1	0.100
CSLS 3-6	07/29/02	Manganese	100	B	µg/L	1	0.061
CSLS 1-5	08/26/03	Manganese	40	L	µg/L	1	0.100
CSLS 6-3	08/26/03	Manganese	25	L	µg/L	1	0.100
CSLS 3-3	07/29/02	Manganese	10	B	µg/L	1	0.061
CSLS 4-5	07/29/02	Manganese	8.1	B	µg/L	1	0.061
CSLS 7-3	08/26/03	Manganese	7.6	L	µg/L	1	0.100
CSLS 8-5	08/26/03	Manganese	4.7	L	µg/L	1	0.100
			100				
CSLS 6-3	08/26/03	Molybdenum	16		µg/L	2	0.040
CSLS 7-3	08/26/03	Molybdenum	8.7		µg/L	2	0.040
CSLS 4-5	07/29/02	Molybdenum	7.8		µg/L	2	0.023
CSLS 2-8	07/29/02	Molybdenum	4.9		µg/L	2	0.023
CSLS 4-10	07/29/02	Molybdenum	2.2		µg/L	2	0.023
CSLS 1-10	07/30/02	Molybdenum	1.2	J	µg/L	2	0.023
CSLS 2-5	07/29/02	Molybdenum	1.2	J	µg/L	2	0.023
CSLS 3-3	07/29/02	Molybdenum	1.1	J	µg/L	2	0.023
CSLS 3-6	07/29/02	Molybdenum	0.27	J	µg/L	2	0.023
CSLS 8-5	08/26/03	Molybdenum	0.22	J	µg/L	2	0.040
CSLS 6-1	08/26/03	Molybdenum	0.15	J	µg/L	2	0.040
CSLS 1-5	07/30/02	Molybdenum	0.11	J	µg/L	2	0.023
CSLS 1-5	08/26/03	Molybdenum	0	J	µg/L	2	0.040
			1.2				
CSLS 1-10	07/30/02	Nickel	43		µg/L	2	0.25
CSLS 4-10	07/29/02	Nickel	39		µg/L	2	0.25
CSLS 1-5	07/30/02	Nickel	16		µg/L	2	0.25
CSLS 2-5	07/29/02	Nickel	9.5		µg/L	2	0.25
CSLS 3-6	07/29/02	Nickel	6.8		µg/L	2	0.25
CSLS 4-5	07/29/02	Nickel	5.1		µg/L	2	0.25
CSLS 2-8	07/29/02	Nickel	3.1		µg/L	2	0.25
CSLS 3-3	07/29/02	Nickel	2.7		µg/L	2	0.25
CSLS 7-3	08/26/03	Nickel	2.7		µg/L	2	0.15
CSLS 6-1	08/26/03	Nickel	2.5		µg/L	2	0.15
CSLS 6-3	08/26/03	Nickel	2.3		µg/L	2	0.15
CSLS 1-5	08/26/03	Nickel	1.4	J	µg/L	2	0.15
CSLS 8-5	08/26/03	Nickel	1.1	J	µg/L	2	0.15
			3.1				

Table 5. Inorganic water-quality data (physical properties, major ions, nutrients, and trace elements) for selected lysimeters, Camp Shelby, Mississippi--Continued

Site name	Date	Parameter	Results	Remarks	Units	Reporting limit	Method detection limit
CSLS 4-5	08/28/02	Nitrate plus nitrite as N	4.0		mg/L	0.1	0.012
CSLS 1-10	08/28/02	Nitrate plus nitrite as N	2.5		mg/L	0.1	0.012
CSLS 1-5	08/28/02	Nitrate plus nitrite as N	0.58		mg/L	0.1	0.012
CSLS 2-8	08/28/02	Nitrate plus nitrite as N	0.10		mg/L	0.1	0.012
CSLS 6-3	08/18/03	Nitrate plus nitrite as N	0.082	J	mg/L	0.1	0.012
CSLS 8-5	08/18/03	Nitrate plus nitrite as N	0.019	J	mg/L	0.1	0.012
CSLS 4-10	08/28/02	Nitrate plus nitrite as N	0.018	J	mg/L	0.1	0.012
CSLS 7-3	08/19/03	Nitrate plus nitrite as N	0.018	J	mg/L	0.1	0.012
CSLS 1-5	08/18/03	Nitrate plus nitrite as N	0.014	J	mg/L	0.1	0.012
CSLS 2-5	08/28/02	Nitrate plus nitrite as N	0	J	mg/L	0.1	0.012
CSLS 3-3	08/28/02	Nitrate plus nitrite as N	0	J	mg/L	0.1	0.012
CSLS 3-6	08/28/02	Nitrate plus nitrite as N	0	J	mg/L	0.1	0.012
CSLS 6-1	08/18/03	Nitrate plus nitrite as N	0	J	mg/L	0.1	0.012
			0.018				
CSLS 2-8	08/28/02	pH	7.0		pH units	0.1	
CSLS 3-3	08/28/02	pH	7.0		pH units	0.1	
CSLS 8-5	08/26/03	pH	7.0		pH units	0.1	
CSLS 7-3	08/26/03	pH	6.7		pH units	0.1	
CSLS 4-5	08/28/02	pH	6.6		pH units	0.1	
CSLS 4-10	08/28/02	pH	6.5		pH units	0.1	
CSLS 2-5	08/28/02	pH	6.3		pH units	0.1	
CSLS 1-10	08/28/02	pH	6.2		pH units	0.1	
CSLS 6-3	08/26/03	pH	6.2		pH units	0.1	
CSLS 6-1	08/26/03	pH	6.0		pH units	0.1	
CSLS 3-6	08/28/02	pH	5.6		pH units	0.1	
CSLS 1-5	08/26/03	pH	5.5		pH units	0.1	
CSLS 1-5	08/28/02	pH	5.4		pH units	0.1	
			6.3				
CSLS 1-10	08/28/02	Phosphate as P, ortho	0	J	mg/L	0.5	0.04
CSLS 1-5	08/28/02	Phosphate as P, ortho	0	J	mg/L	0.5	0.04
CSLS 1-5	08/26/03	Phosphate as P, ortho	0	J	mg/L	0.5	0.11
CSLS 2-5	08/28/02	Phosphate as P, ortho	0	J	mg/L	0.5	0.04
CSLS 2-8	08/28/02	Phosphate as P, ortho	0	J	mg/L	0.5	0.04
CSLS 3-3	08/28/02	Phosphate as P, ortho	0	J	mg/L	0.5	0.04
CSLS 3-6	08/28/02	Phosphate as P, ortho	0	J	mg/L	0.5	0.04
CSLS 4-10	08/28/02	Phosphate as P, ortho	0	J	mg/L	0.5	0.04
CSLS 4-5	08/28/02	Phosphate as P, ortho	0	J	mg/L	0.5	0.04
CSLS 6-1	08/26/03	Phosphate as P, ortho	0	J	mg/L	0.5	0.11
CSLS 6-3	08/26/03	Phosphate as P, ortho	0	J	mg/L	0.5	0.11
CSLS 7-3	08/26/03	Phosphate as P, ortho	0	J	mg/L	0.5	0.11
CSLS 8-5	08/26/03	Phosphate as P, ortho	0	J	mg/L	0.5	0.11
			0				

Table 5. Inorganic water-quality data (physical properties, major ions, nutrients, and trace elements) for selected lysimeters, Camp Shelby, Mississippi--Continued

Site name	Date	Parameter	Results	Remarks	Units	Reporting limit	Method detection limit
CSLS 1-10	07/30/02	Potassium	5.3		mg/L	3	0.49
CSLS 2-5	07/29/02	Potassium	3.0		mg/L	3	0.49
CSLS 1-5	07/30/02	Potassium	2.0	J	mg/L	3	0.49
CSLS 2-8	07/29/02	Potassium	1.3	J	mg/L	3	0.49
CSLS 6-1	08/26/03	Potassium	1.2	J	mg/L	3	0.49
CSLS 4-10	07/29/02	Potassium	0.99	J	mg/L	3	0.49
CSLS 6-3	08/26/03	Potassium	0.90	J	mg/L	3	0.49
CSLS 3-6	07/29/02	Potassium	0.81	J	mg/L	3	0.49
CSLS 4-5	07/29/02	Potassium	0.67	J	mg/L	3	0.49
CSLS 7-3	08/26/03	Potassium	0.60	J	mg/L	3	0.49
CSLS 1-5	08/26/03	Potassium	0.53	J	mg/L	3	0.49
CSLS 3-3	07/29/02	Potassium	0.53	J	mg/L	3	0.49
CSLS 8-5	08/26/03	Potassium	0	J	mg/L	3	0.49
			0.90				
CSLS 1-10	07/30/02	Selenium	8.3		µg/L	5	0.19
CSLS 1-5	07/30/02	Selenium	6.7		µg/L	5	0.19
CSLS 4-5	07/29/02	Selenium	2.3	J	µg/L	5	0.19
CSLS 2-5	07/29/02	Selenium	1.9	J	µg/L	5	0.19
CSLS 8-5	08/26/03	Selenium	0.71	J	µg/L	5	0.24
CSLS 7-3	08/26/03	Selenium	0.66	J	µg/L	5	0.24
CSLS 3-3	07/29/02	Selenium	0.61	J	µg/L	5	0.19
CSLS 3-6	07/29/02	Selenium	0.55	J	µg/L	5	0.19
CSLS 4-10	07/29/02	Selenium	0.45	J	µg/L	5	0.19
CSLS 6-3	08/26/03	Selenium	0.45	J	µg/L	5	0.24
CSLS 6-1	08/26/03	Selenium	0.42	J	µg/L	5	0.24
CSLS 1-5	08/26/03	Selenium	0.31	J	µg/L	5	0.24
CSLS 2-8	07/29/02	Selenium	0.24	J	µg/L	5	0.19
			0.61				
CSLS 2-5	07/29/02	Silver	0.45	B J	µg/L	5	0.012
CSLS 1-5	07/30/02	Silver	0.21	B J	µg/L	5	0.012
CSLS 1-10	07/30/02	Silver	0.14	B J	µg/L	5	0.012
CSLS 4-5	07/29/02	Silver	0.079	B J	µg/L	5	0.012
CSLS 3-6	07/29/02	Silver	0.067	B J	µg/L	5	0.012
CSLS 3-3	07/29/02	Silver	0.065	B J	µg/L	5	0.012
CSLS 2-8	07/29/02	Silver	0.064	B J	µg/L	5	0.012
CSLS 4-10	07/29/02	Silver	0.048	B J	µg/L	5	0.012
CSLS 1-5	08/26/03	Silver	0	J	µg/L	5	0.058
CSLS 6-1	08/26/03	Silver	0	J	µg/L	5	0.058
CSLS 6-3	08/26/03	Silver	0	J	µg/L	5	0.058
CSLS 7-3	08/26/03	Silver	0	J	µg/L	5	0.058
CSLS 8-5	08/26/03	Silver	0	J	µg/L	5	0.058
			0.064				

Table 5. Inorganic water-quality data (physical properties, major ions, nutrients, and trace elements) for selected lysimeters, Camp Shelby, Mississippi--Continued

Site name	Date	Parameter	Results	Remarks	Units	Reporting limit	Method detection limit
CSLS 1-10	07/30/02	Sodium	160		mg/L	5	1.5
CSLS 1-5	07/30/02	Sodium	130		mg/L	5	1.5
CSLS 4-5	07/29/02	Sodium	99		mg/L	5	1.5
CSLS 6-3	08/26/03	Sodium	57		mg/L	5	1.1
CSLS 3-6	07/29/02	Sodium	43		mg/L	5	1.5
CSLS 2-8	07/29/02	Sodium	40		mg/L	5	1.5
CSLS 2-5	07/29/02	Sodium	36		mg/L	5	1.5
CSLS 3-3	07/29/02	Sodium	36		mg/L	5	1.5
CSLS 4-10	07/29/02	Sodium	30		mg/L	5	1.5
CSLS 6-1	08/26/03	Sodium	26		mg/L	5	1.1
CSLS 8-5	08/26/03	Sodium	26		mg/L	5	1.1
CSLS 7-3	08/26/03	Sodium	22		mg/L	5	1.1
CSLS 1-5	08/26/03	Sodium	11		mg/L	5	1.1
			36				
CSLS 4-5	08/28/02	Specific conductance	1,500		µS/cm	2	
CSLS 1-10	08/28/02	Specific conductance	880		µS/cm	2	
CSLS 1-5	08/28/02	Specific conductance	560		µS/cm	2	
CSLS 3-3	08/28/02	Specific conductance	420		µS/cm	2	
CSLS 6-3	08/26/03	Specific conductance	280		µS/cm	2	
CSLS 2-8	08/28/02	Specific conductance	230		µS/cm	2	
CSLS 4-10	08/28/02	Specific conductance	220		µS/cm	2	
CSLS 3-6	08/28/02	Specific conductance	190		µS/cm	2	
CSLS 8-5	08/26/03	Specific conductance	180		µS/cm	2	
CSLS 2-5	08/28/02	Specific conductance	170		µS/cm	2	
CSLS 6-1	08/26/03	Specific conductance	150		µS/cm	2	
CSLS 7-3	08/26/03	Specific conductance	110		µS/cm	2	
CSLS 1-5	08/26/03	Specific conductance	67		µS/cm	2	
			220				
CSLS 4-5	08/28/02	Sulfate	660	Q	mg/L	100	4.00
CSLS 1-10	08/28/02	Sulfate	430	Q	mg/L	100	4.00
CSLS 1-5	08/28/02	Sulfate	250	Q	mg/L	100	4.00
CSLS 3-3	08/28/02	Sulfate	150	Q	mg/L	25	1.00
CSLS 6-3	08/26/03	Sulfate	74	Q	mg/L	25	1.10
CSLS 3-6	08/28/02	Sulfate	56	Q	mg/L	25	1.00
CSLS 4-10	08/28/02	Sulfate	52	Q	mg/L	25	1.00
CSLS 2-5	08/28/02	Sulfate	49	Q	mg/L	25	1.00
CSLS 8-5	08/26/03	Sulfate	49		mg/L	5	0.22
CSLS 6-1	08/26/03	Sulfate	46		mg/L	5	0.22
CSLS 2-8	08/28/02	Sulfate	26		mg/L	5	0.20
CSLS 7-3	08/26/03	Sulfate	25		mg/L	5	0.22
CSLS 1-5	08/26/03	Sulfate	13		mg/L	5	0.22
			52				

Table 5. Inorganic water-quality data (physical properties, major ions, nutrients, and trace elements) for selected lysimeters, Camp Shelby, Mississippi--Continued

Site name	Date	Parameter	Results	Remarks	Units	Reporting limit	Method detection limit
CSLS 1-5	07/30/02	Thallium	0.034	J	µg/L	1	0.015
CSLS 1-10	07/30/02	Thallium	0.031	J	µg/L	1	0.015
CSLS 2-5	07/29/02	Thallium	0.026	J	µg/L	1	0.015
CSLS 1-5	08/26/03	Thallium	0	J	µg/L	1	0.012
CSLS 2-8	07/29/02	Thallium	0	J	µg/L	1	0.015
CSLS 3-3	07/29/02	Thallium	0	J	µg/L	1	0.015
CSLS 3-6	07/29/02	Thallium	0	J	µg/L	1	0.015
CSLS 4-10	07/29/02	Thallium	0	J	µg/L	1	0.015
CSLS 4-5	07/29/02	Thallium	0	J	µg/L	1	0.015
CSLS 6-1	08/26/03	Thallium	0	J	µg/L	1	0.012
CSLS 6-3	08/26/03	Thallium	0	J	µg/L	1	0.012
CSLS 7-3	08/26/03	Thallium	0	J	µg/L	1	0.012
CSLS 8-5	08/26/03	Thallium	0	J	µg/L	1	0.012
			0				
CSLS 6-3	08/26/03	Tin	2.4	J	µg/L	10	0.24
CSLS 2-5	07/29/02	Tin	0.56	B J	µg/L	10	0.05
CSLS 1-10	07/30/02	Tin	0.49	B J	µg/L	10	0.05
CSLS 7-3	08/26/03	Tin	0.31	J	µg/L	10	0.24
CSLS 1-5	07/30/02	Tin	0.26	B J	µg/L	10	0.05
CSLS 3-6	07/29/02	Tin	0.22	B J	µg/L	10	0.05
CSLS 4-5	07/29/02	Tin	0.19	B J	µg/L	10	0.05
CSLS 4-10	07/29/02	Tin	0.08	B J	µg/L	10	0.05
CSLS 1-5	08/26/03	Tin	0	J	µg/L	10	0.24
CSLS 2-8	07/29/02	Tin	0	J	µg/L	10	0.05
CSLS 3-3	07/29/02	Tin	0	J	µg/L	10	0.05
CSLS 6-1	08/26/03	Tin	0	J	µg/L	10	0.24
CSLS 8-5	08/26/03	Tin	0	J	µg/L	10	0.24
			0.19				
CSLS 1-5	08/18/03	Total Kjeldahl nitrogen	0.85	B	mg/L	0.5	0.083
CSLS 7-3	08/19/03	Total Kjeldahl nitrogen	0.40	B J	mg/L	0.5	0.083
CSLS 8-5	08/18/03	Total Kjeldahl nitrogen	0.29	B J	mg/L	0.5	0.083
CSLS 6-1	08/18/03	Total Kjeldahl nitrogen	0.27	B J	mg/L	0.5	0.083
CSLS 4-5	08/28/02	Total Kjeldahl nitrogen	0.19	J	mg/L	0.5	0.140
CSLS 4-10	08/28/02	Total Kjeldahl nitrogen	0.18	J	mg/L	0.5	0.140
CSLS 6-3	08/18/03	Total Kjeldahl nitrogen	0.087	B J	mg/L	0.5	0.083
CSLS 1-10	08/28/02	Total Kjeldahl nitrogen	0	J	mg/L	0.5	0.140
CSLS 1-5	08/28/02	Total Kjeldahl nitrogen	0	J	mg/L	0.5	0.140
CSLS 2-5	08/28/02	Total Kjeldahl nitrogen	0	J	mg/L	0.5	0.140
CSLS 2-8	08/28/02	Total Kjeldahl nitrogen	0	J	mg/L	0.5	0.140
CSLS 3-3	08/28/02	Total Kjeldahl nitrogen	0	J	mg/L	0.5	0.140
CSLS 3-6	08/28/02	Total Kjeldahl nitrogen	0	J	mg/L	0.5	0.140
			0.087				

Table 5. Inorganic water-quality data (physical properties, major ions, nutrients, and trace elements) for selected lysimeters, Camp Shelby, Mississippi--Continued

Site name	Date	Parameter	Results	Remarks	Units	Reporting limit	Method detection limit
CSLS 3-3	08/28/02	Total phosphorus	0.95	Q	mg/L	0.10	0.026
CSLS 2-8	08/28/02	Total phosphorus	0.63		mg/L	0.05	0.013
CSLS 4-10	08/28/02	Total phosphorus	0.61		mg/L	0.05	0.013
CSLS 1-10	08/28/02	Total phosphorus	0.52		mg/L	0.05	0.013
CSLS 4-5	08/28/02	Total phosphorus	0.51		mg/L	0.05	0.013
CSLS 3-6	08/28/02	Total phosphorus	0.43		mg/L	0.05	0.013
CSLS 2-5	08/28/02	Total phosphorus	0.34		mg/L	0.05	0.013
CSLS 1-5	08/28/02	Total phosphorus	0.15		mg/L	0.05	0.013
CSLS 7-3	08/19/03	Total phosphorus	0.046	B J	mg/L	0.05	0.019
CSLS 6-1	08/18/03	Total phosphorus	0.040	B J	mg/L	0.05	0.019
CSLS 8-5	08/18/03	Total phosphorus	0.038	B J	mg/L	0.05	0.019
CSLS 1-5	08/18/03	Total phosphorus	0.031	B J	mg/L	0.05	0.019
CSLS 6-3	08/18/03	Total phosphorus	0.025	B J	mg/L	0.05	0.019
			0.34				
CSLS 4-5	07/29/02	Vanadium	35		μg/L	5	0.07
CSLS 6-3	08/26/03	Vanadium	16		μg/L	5	0.07
CSLS 3-3	07/29/02	Vanadium	15		μg/L	5	0.07
CSLS 7-3	08/26/03	Vanadium	12		μg/L	5	0.07
CSLS 2-8	07/29/02	Vanadium	9.7		μg/L	5	0.07
CSLS 2-5	07/29/02	Vanadium	8.2		μg/L	5	0.07
CSLS 4-10	07/29/02	Vanadium	8.0		μg/L	5	0.07
CSLS 1-10	07/30/02	Vanadium	7.0		μg/L	5	0.07
CSLS 3-6	07/29/02	Vanadium	6.1		μg/L	5	0.07
CSLS 8-5	08/26/03	Vanadium	5.4		μg/L	5	0.07
CSLS 1-5	07/30/02	Vanadium	3.5	J	μg/L	5	0.07
CSLS 6-1	08/26/03	Vanadium	1.8	J	μg/L	5	0.07
CSLS 1-5	08/26/03	Vanadium	0.26	J	μg/L	5	0.07
			8.0				
CSLS 1-5	07/30/02	Zinc	28		μg/L	10	2.3
CSLS 6-1	08/26/03	Zinc	17		μg/L	10	1.2
CSLS 3-6	07/29/02	Zinc	10		μg/L	10	2.3
CSLS 2-5	07/29/02	Zinc	9.7	J	μg/L	10	2.3
CSLS 1-10	07/30/02	Zinc	9.3	J	μg/L	10	2.3
CSLS 4-10	07/29/02	Zinc	7.6	J	μg/L	10	2.3
CSLS 2-8	07/29/02	Zinc	6.5	J	μg/L	10	2.3
CSLS 1-5	08/26/03	Zinc	5.4	J	μg/L	10	1.2
CSLS 6-3	08/26/03	Zinc	3.6	J	μg/L	10	1.2
CSLS 7-3	08/26/03	Zinc	3.6	J	μg/L	10	1.2
CSLS 4-5	07/29/02	Zinc	2.6	J	μg/L	10	2.3
CSLS 8-5	08/26/03	Zinc	2.6	J	μg/L	10	1.2
CSLS 3-3	07/29/02	Zinc	0	J	μg/L	10	2.3
			6.5				

Table 6. Specific conductance and pH of water collected from lysimeters during June 2004, Camp Shelby, Mississippi

[µS/cm, microsiemens per centimeter at 25 degrees Celsius; CSLS, Camp Shelby lysimeter site; **bold**, median value]

Site name	Date	Specific conductance (µS/cm)
CSLS 9-10	06/15/04	529
CSLS 10-3	06/15/04	522
CSLS 9-5	06/15/04	497
CSLS 10-8	06/15/04	401
CSLS 9-3	06/15/04	358
CSLS 6-3	06/14/04	226
CSLS 1-10	06/14/04	212
CSLS 2-8	06/14/04	148
CSLS 3-6	06/14/04	113
CSLS 10-5	06/15/04	112
CSLS 6-1	06/14/04	73
CSLS 1-5	06/14/04	67
CSLS 4-10	06/14/04	60
CSLS 2-5	06/14/04	58
CSLS 3-3	06/14/04	53
CSLS 7-3	06/15/04	50
CSLS 8-5	06/15/04	39
CSLS 4-5	06/14/04	20
		113

Site name	Date	pH
CSLS 10-8	06/15/04	7.1
CSLS 9-10	06/15/04	6.9
CSLS 9-5	06/15/04	6.8
CSLS 10-5	06/15/04	6.5
CSLS 2-5	06/14/04	6.5
CSLS 8-5	06/15/04	6.5
CSLS 9-3	06/15/04	6.4
CSLS 1-10	06/14/04	6.3
CSLS 2-8	06/14/04	6.3
CSLS 10-3	06/15/04	6.2
CSLS 3-3	06/14/04	6.2
CSLS 4-5	06/14/04	6.2
CSLS 6-1	06/14/04	6.2
CSLS 7-3	06/15/04	6.2
CSLS 1-5	06/14/04	6.1
CSLS 3-6	06/14/04	6.1
CSLS 6-3	06/14/04	6.1
CSLS 4-10	06/14/04	6.0
		6.3

Table 7. Specific conductance and pH of water collected from shallow monitoring wells during June 2004, Camp Shelby, Mississippi

[µS/cm, microsiemens per centimeter; DP convention for well numbers used because each well terminates with a 3-foot drive point; **bold**, median value]

Well number	Date	Specific conductance (µS/cm)	Well number	Date	pH
6	06/14/04	1,066	10	06/15/04	7.3
3	06/14/04	171	8	06/15/04	6.4
9	06/15/04	136	7	06/15/04	6.3
1	06/14/04	126	6	06/14/04	6.2
7	06/15/04	90	2	06/14/04	6.2
4	06/14/04	71	9	06/15/04	6.2
2	06/14/04	46	3	06/14/04	6.1
10	06/15/04	33	1	06/14/04	6.0
8	06/15/04	27	4	06/14/04	5.9
		90			**6.2**

Table 8. Median values for inorganic water-quality data for selected lysimeters, Camp Shelby, Camp McCain, and Greenwood, Mississippi–2002-2004

[CSLS, Camp Shelby lysimeter site; CMLS, Camp McCain lysimeter site; QALS, quality-assurance/quality-control lysimeter site near Greenwood. µS/cm, microsiemens per centimeter at 25 degrees Celsius; mg/L, milligrams per liter; µg/L, micrograms per liter; 0, less than the reporting limit]

Parameter	Median value CSLS	Median value CMLS	Median value QALS	Units
Physical property				
pH	6.3	7.0	6.2	pH units
Specific conductance	220	975	390	µS/cm
Major ion				
Calcium	1.9	4.1	4.1	mg/L
Chloride	5.1	4.8	23	mg/L
Fluoride	0.29	0.45	0.39	mg/L
Potassium	0.9	1.5	1.3	mg/L
Sodium	36	245	85	mg/L
Sulfate	52	185	96	mg/L
Nutrient				
Ammonia as N	0.028	0.064	0.048	mg/L
Nitrate plus nitrite as N	0.018	0.14	0.67	mg/L
Phosphate as P, ortho	0	0	0	mg/L
Total Kjeldahl nitrogen	0.087	0.24	0	mg/L
Total phosphorus	0.34	0.078	0.19	mg/L
Trace element				
Aluminum	76	54	34	µg/L
Antimony	0.21	1.0	0.25	µg/L
Arsenic	0.95	1.3	0.51	µg/L
Barium	64	24	60	µg/L
Beryllium	0	0	0	µg/L
Cadmium	0	0	0.02	µg/L
Chromium	0.87	2.1	1.2	µg/L
Cobalt	1.1	0.29	0.87	µg/L
Copper	0.68	1.9	0.89	µg/L
Iron	19	0	0	µg/L
Lead	0	0	0	µg/L
Manganese	100	19	42	µg/L
Molybdenum	1.2	6.5	1.8	µg/L
Nickel	3.1	5.0	19	µg/L
Selenium	0.61	2.7	0.88	µg/L
Silver	0.064	0	0.07	µg/L
Thallium	0	0.016	0	µg/L
Tin	0.19	0.13	0	µg/L
Vanadium	8	14	12	µg/L
Zinc	6.5	5.4	7.8	µg/L

Table 9. Volatile organic compounds included in analytical method SW846 8260B

[µg/L, micrograms per liter; NA, not applicable or not reported]

Parameter	Units	Reporting limit	Method detection limit
1,1,1,2-Tetrachloroethane	µg/L	1	0.28
1,1,1-Trichloroethane	µg/L	1	0.32
1,1,2,2-Tetrachloroethane	µg/L	1	0.50
1,1,2-Trichloroethane	µg/L	1	0.41
1,1-Dichloroethane	µg/L	1	0.29
1,1-Dichloroethene	µg/L	1	0.31
1,1-Dichloropropene	µg/L	1	0.29
1,2,3-Trichlorobenzene	µg/L	1	0.62
1,2,3-Trichloropropane	µg/L	1	0.76
1,2,4-Trichlorobenzene	µg/L	1	0.63
1,2,4-Trimethylbenzene	µg/L	1	0.30
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	2	0.49
1,2-Dibromoethane (EDB)	µg/L	1	0.46
1,2-Dichlorobenzene	µg/L	1	0.30
1,2-Dichloroethane	µg/L	1	0.43
1,2-Dichloroethene (total)	µg/L	1	0.54
1,2-Dichloropropane	µg/L	1	0.38
1,3,5-Trimethylbenzene	µg/L	1	0.31
1,3-Dichlorobenzene	µg/L	1	0.30
1,3-Dichloropropane	µg/L	1	0.37
1,4-Dichlorobenzene	µg/L	1	0.31
1-Chlorohexane	µg/L	1	0.38
2,2-Dichloropropane	µg/L	5	0.37
2-Butanone (MEK)	µg/L	5	2.40
2-Chlorotoluene	µg/L	1	0.23
2-Hexanone	µg/L	5	1.80
4-Chlorotoluene	µg/L	1	0.26
4-Isopropyltoluene	µg/L	1	0.32
4-Methyl-2-pentanone	µg/L	5	1.80
Acetone	µg/L	10	2.90
Benzene	µg/L	1	0.27
Bromobenzene	µg/L	1	0.32
Bromochloromethane	µg/L	1	0.39
Bromodichloromethane	µg/L	1	0.35
Bromoform	µg/L	1	0.46
Bromomethane	µg/L	2	0.28
Carbon tetrachloride	µg/L	1	0.35
Chlorobenzene	µg/L	1	0.24
Chloroethane	µg/L	2	0.26
Chloroform	µg/L	1	0.29

Table 9. Volatile organic compounds included in analytical method SW846 8260B--Continued

Parameter	Units	Reporting limit	Method detection limit
Chloromethane	µg/L	2	0.26
cis-1,2-Dichloroethene	µg/L	1	0.33
cis-1,3-Dichloropropene	µg/L	1	0.31
Dibromochloromethane	µg/L	1	0.37
Dibromomethane	µg/L	1	0.40
Dichlorodifluoromethane	µg/L	2	0.44
Ethylbenzene	µg/L	1	0.51
Hexachlorobutadiene	µg/L	1	0.37
Isopropylbenzene	µg/L	1	0.30
Methyl tert-butyl ether	µg/L	5	0.88
Methylene chloride	µg/L	5	0.86
m-Xylene & p-Xylene	µg/L	2	0.52
Naphthalene	µg/L	1	0.78
n-Butylbenzene	µg/L	1	0.41
n-Propylbenzene	µg/L	1	0.33
o-Xylene	µg/L	1	0.24
sec-Butylbenzene	µg/L	1	0.34
Styrene	µg/L	1	0.28
tert-Butylbenzene	µg/L	1	0.29
Tetrachloroethene	µg/L	1	0.27
Tetrahydrofuran	µg/L	NA	NA
Toluene	µg/L	1	0.26
trans-1,2-Dichloroethene	µg/L	0.5	0.25
trans-1,3-Dichloropropene	µg/L	1	0.36
Trichloroethene	µg/L	1	0.24
Trichlorofluoromethane	µg/L	2	0.43
Vinyl acetate	µg/L	2	0.91
Vinyl chloride	µg/L	1	0.26

Table 10. Volatile organic compounds detected at Camp Shelby, Mississippi

[CSLS, Camp Shelby lysimeter site; MEK, methyl ethyl ketone; µg/L, micrograms per liter; J, estimated result (less than the reporting limit)]

Site name	Date	Parameter	Results	Remarks	Units	Reporting limit	Method detection limit
CSLS 2-5	07/22/02	2-Butanone (MEK)	2,100		µg/L	50	24
CSLS 1-10	07/22/02	Acetone	4.8	J	µg/L	10	2.9
CSLS 2-5	07/22/02	Acetone	30	J	µg/L	100	29
CSLS 1-5	08/18/03	Acetone	2.8	J	µg/L	10	2.5
CSLS 6-3	08/18/03	Acetone	3.7	J	µg/L	10	2.5
CSLS 7-3	08/19/03	Acetone	2.5	J	µg/L	10	2.5
Pearces Creek	08/18/03	Acetone	3.6	J	µg/L	10	2.5
CSLS 1-10	07/22/02	Chloromethane	0.34	J	µg/L	2	0.26
CSLS 6-1	08/18/03	Methyl tert-butyl ether	5.4		µg/L	5	0.38
CSLS 8-5	08/18/03	Toluene	0.26	J	µg/L	1	0.15

Note: Tetrahydrofuran was a tentatively detected compound in all lysimeter samples, but was not detected in any of the shallow ground-water samples or in any surface-water samples; hence, it was considered likely to be a contaminant associated with the glue used in installation of the lysimeters--and is excluded from this table.

Table 11. Semi-volatile organic compounds included in analytical method SW846 8270C

[µg/L, micrograms per liter; NA, not applicable or not reported]

Parameter	Units	Reporting limit	Method detection limit
1,2,4-Trichlorobenzene	µg/L	10	1.5
1,2-Dichlorobenzene	µg/L	10	1.6
1,3-Dichlorobenzene	µg/L	10	1.7
1,4-Dichlorobenzene	µg/L	10	1.8
1-Propene, 1,1,2-trichloro-	µg/L	NA	NA
1-Propene, 1,2,3-trichloro-	µg/L	NA	NA
2,4,5-Trichlorophenol	µg/L	10	1.3
2,4,6-Trichlorophenol	µg/L	10	1.3
2,4-Dichlorophenol	µg/L	10	1.7
2,4-Dimethylphenol	µg/L	10	2.9
2,4-Dinitrophenol	µg/L	50	18
2,4-Dinitrotoluene	µg/L	10	2.6
2,6-Dinitrotoluene	µg/L	10	1.6
2-Chloronaphthalene	µg/L	10	1.1
2-Chlorophenol	µg/L	10	1.8
2-Methylnaphthalene	µg/L	10	1.5
2-Methylphenol	µg/L	10	2.1
2-Nitroaniline	µg/L	50	1.8
2-Nitrophenol	µg/L	10	1.8
3,3'-Dichlorobenzidine	µg/L	50	8.4
3-Methylphenol & 4-Methylphenol	µg/L	10	2.1
3-Nitroaniline	µg/L	50	7.6
3-Penten-2-one, (e)-	µg/L	NA	NA
4,6-Dinitro-2-methylphenol	µg/L	50	18
4-Bromophenyl phenyl ether	µg/L	10	1.5
4-Chloro-3-methylphenol	µg/L	10	2.0

Table 11. Semi-volatile organic compounds included in analytical method SW846 8270C--Continued

Parameter	Units	Reporting limit	Method detection limit
4-Chloroaniline	µg/L	10	2.5
4-Chlorophenyl phenyl ether	µg/L	10	1.2
4-Nitroaniline	µg/L	50	2.1
4-Nitrophenol	µg/L	50	18
Acenaphthene	µg/L	10	1.0
Acenaphthylene	µg/L	10	1.0
Anthracene	µg/L	10	1.6
Benzo(a)anthracene	µg/L	10	1.2
Benzo(a)pyrene	µg/L	10	1.4
Benzo(b)fluoranthene	µg/L	10	2.2
Benzo(ghi)perylene	µg/L	10	1.7
Benzo(k)fluoranthene	µg/L	10	2.0
Benzoic acid	µg/L	50	12
Benzyl alcohol	µg/L	10	2.7
bis(2-Chloroethoxy)methane	µg/L	10	1.3
bis(2-Chloroethyl) ether	µg/L	10	1.8
bis(2-Chloroisopropyl) ether	µg/L	10	1.5
bis(2-Ethylhexyl) phthalate	µg/L	10	3.1
Butyl benzyl phthalate	µg/L	10	1.6
Caprolactum	µg/L	NA	NA
Carbazole	µg/L	10	1.2
Chrysene	µg/L	10	1.7
Dibenz(a,h)anthracene	µg/L	10	1.3
Dibenzofuran	µg/L	10	5.0
Diethyl phthalate	µg/L	10	1.1
Dimethyl phthalate	µg/L	10	5.0
Di-n-butyl phthalate	µg/L	10	1.1
Di-n-octyl phthalate	µg/L	10	1.5
Ethanol, 2-(2-methoxyethoxy)-	µg/L	NA	NA
Fluoranthene	µg/L	10	1.5
Fluorene	µg/L	10	1.3
Hexachlorobenzene	µg/L	10	1.7
Hexachlorobutadiene	µg/L	10	1.7
Hexachlorocyclopentadiene	µg/L	50	5.0
Hexachloroethane	µg/L	10	2.2
Indeno(1,2,3-cd)pyrene	µg/L	10	1.2
Isophorone	µg/L	10	2.3
Methylene chloride	µg/L	NA	NA
Naphthalene	µg/L	10	1.2
Nitrobenzene	µg/L	10	2.5
N-Nitrosodimethylamine	µg/L	10	2.1
N-Nitrosodi-n-propylamine	µg/L	10	1.6
N-Nitrosodiphenylamine	µg/L	10	1.5
Pentachlorophenol	µg/L	50	11
Phenanthrene	µg/L	10	1.3
Phenol	µg/L	10	1.4
Pyrene	µg/L	10	2.0

Table 12. Semi-volatile organic compounds detected at Camp Shelby, Mississippi

[CSLS, Camp Shelby lysimeter site; J, estimated result (less than the reporting limit); µg/L, micrograms per liter]

Site name	Date	Parameter	Results	Remarks	Units
CSLS 4-5	07/22/02	1-Propene, 1,1,2-trichloro-	29	J	µg/L
CSLS 2-8	07/29/02	1-Propene, 1,1,2-trichloro-	57	J	µg/L
CSLS 6-3	08/11/03	1-Propene, 1,2,3-trichloro-	23	J	µg/L
CSLS 2-8	07/29/02	3-Penten-2-one, (e)-	6.5	J	µg/L
CSLS 6-3	08/11/03	Caprolactum	44		µg/L
CSLS 7-3	08/12/03	Caprolactum	85		µg/L
CSLS 3-3	07/22/02	Ethanol, 2-(2-methoxyethoxy)-	8.9	J	µg/L
CSLS 3-6	07/22/02	Ethanol, 2-(2-methoxyethoxy)-	9.3	J	µg/L
CSLS 4-10	07/22/02	Ethanol, 2-(2-methoxyethoxy)-	9.3	J	µg/L
CSLS 1-5	08/11/03	Methylene chloride	11	J	µg/L
CSLS 6-1	08/11/03	Methylene chloride	13	J	µg/L
CSLS 6-3	08/11/03	Methylene chloride	13	J	µg/L
CSLS 8-5	08/11/03	Methylene chloride	10	J	µg/L
CSLS 7-3	08/12/03	Methylene chloride	15	J	µg/L
CSLS 1-10	07/22/02	Unknown	4.6	J	µg/L
CSLS 1-10	07/22/02	Unknown	7.5	J	µg/L
CSLS 1-10	07/22/02	Unknown	28	J	µg/L
CSLS 1-10	07/22/02	Unknown	29	J	µg/L
CSLS 1-5	07/22/02	Unknown	5.9	J	µg/L
CSLS 1-5	07/22/02	Unknown	8.6	J	µg/L
CSLS 1-5	07/22/02	Unknown	25	J	µg/L
CSLS 1-5	07/22/02	Unknown	35	J	µg/L
CSLS 2-5	07/22/02	Unknown	4.2	J	µg/L
CSLS 2-5	07/22/02	Unknown	6.8	J	µg/L
CSLS 2-5	07/22/02	Unknown	24	J	µg/L
CSLS 3-3	07/22/02	Unknown	4.8	J	µg/L
CSLS 3-3	07/22/02	Unknown	8.9	J	µg/L
CSLS 3-3	07/22/02	Unknown	24	J	µg/L
CSLS 3-3	07/22/02	Unknown	32	J	µg/L
CSLS 3-6	07/22/02	Unknown	5.0	J	µg/L
CSLS 3-6	07/22/02	Unknown	7.7	J	µg/L
CSLS 3-6	07/22/02	Unknown	26	J	µg/L
CSLS 3-6	07/22/02	Unknown	30	J	µg/L
CSLS 4-10	07/22/02	Unknown	4.5	J	µg/L
CSLS 4-10	07/22/02	Unknown	6.0	J	µg/L
CSLS 4-10	07/22/02	Unknown	6.2	J	µg/L
CSLS 4-10	07/22/02	Unknown	17	J	µg/L
CSLS 4-10	07/22/02	Unknown	23	J	µg/L
CSLS 4-5	07/22/02	Unknown	8.3	J	µg/L
CSLS 4-5	07/22/02	Unknown	8.4	J	µg/L
CSLS 4-5	07/22/02	Unknown	24	J	µg/L

Table 12. Semi-volatile organic compounds detected at Camp Shelby, Mississippi--Continued

Site name	Date	Parameter	Results	Remarks	Units
CSLS 2-8	07/29/02	Unknown	4.8	J	µg/L
CSLS 2-8	07/29/02	Unknown	6.2	J	µg/L
CSLS 2-8	07/29/02	Unknown	10	J	µg/L
CSLS 2-8	07/29/02	Unknown	10	J	µg/L
CSLS 2-8	07/29/02	Unknown	23	J	µg/L
CSLS 2-8	07/29/02	Unknown	110	J	µg/L
CSLS 2-8	07/29/02	Unknown	270	J	µg/L
CSLS 2-8	07/29/02	Unknown	280	J	µg/L
CSLS 1-5	08/11/03	Unknown	4.8	J	µg/L
CSLS 1-5	08/11/03	Unknown	4.9	J	µg/L
CSLS 1-5	08/11/03	Unknown	14	J	µg/L
CSLS 1-5	08/11/03	Unknown	18	J	µg/L
CSLS 1-5	08/11/03	Unknown	19	J	µg/L
CSLS 6-1	08/11/03	Unknown	10	J	µg/L
CSLS 6-1	08/11/03	Unknown	16	J	µg/L
CSLS 6-1	08/11/03	Unknown	24	J	µg/L
CSLS 6-1	08/11/03	Unknown	38	J	µg/L
CSLS 6-1	08/11/03	Unknown	72	J	µg/L
CSLS 6-3	08/11/03	Unknown	4.2	J	µg/L
CSLS 6-3	08/11/03	Unknown	4.5	J	µg/L
CSLS 6-3	08/11/03	Unknown	5.8	J	µg/L
CSLS 6-3	08/11/03	Unknown	14	J	µg/L
CSLS 6-3	08/11/03	Unknown	20	J	µg/L
CSLS 8-5	08/11/03	Unknown	3.8	J	µg/L
CSLS 8-5	08/11/03	Unknown	6.0	J	µg/L
CSLS 8-5	08/11/03	Unknown	16	J	µg/L
CSLS 8-5	08/11/03	Unknown	55	J	µg/L
CSLS 7-3	08/12/03	Unknown	12	J	µg/L
CSLS 7-3	08/12/03	Unknown	18	J	µg/L
CSLS 7-3	08/12/03	Unknown	20	J	µg/L
Pearces Creek	08/11/03	Methylene chloride	12	J	µg/L
Pearces Creek	08/11/03	Unknown	5.8	J	µg/L
Pearces Creek	08/11/03	Unknown	8.2	J	µg/L
Pearces Creek	08/11/03	Unknown	12	J	µg/L
Pearces Creek	08/11/03	Unknown	15	J	µg/L
Pearces Creek	08/11/03	Unknown	21	J	µg/L

Table 13. Perchlorate analyses of water from lysimeters, shallow monitoring wells, and surface-water sites at Camp Shelby, Mississippi

[CSLS, Camp Shelby lysimeter site; ND, not detected; µg/L, micrograms per liter; B, method blank contamination; J, estimated result (less than the reporting limit); **bold**, median value]

Site name	Depth (feet below land surface) or station number	Perchlorate (µg/L)	Date
CSLS 1-5	5	ND	06/21/04
Well 1	6	0.036	06/21/04
CSLS 2-5	5	ND	06/21/04
Well 2	4.5	0.028	06/21/04
CSLS 3-3	3	0.06	06/21/04
Well 3	9.8	0.0075 (J)	06/21/04
CSLS 4-5	5	0.47	06/21/04
Well 4	9.6	0.02	06/21/04
CSLS 6-1	1	0.025	06/21/04
Well 6	16.5	0.067	06/21/04
CSLS 7-3	3	0.031	06/22/04
Well 7	9	0.014	06/22/04
CSLS 8-5	5	0.075	06/22/04
Well 8	9.7	0.065	06/22/04
CSLS 9-3	3	0.09	06/22/04
CSLS 9-3	3	0.067	07/27/04
CSLS 9-5	5	0.043	07/27/04
CSLS 9-10	10	0.10	07/27/04
CSLS 10-3	3	0.11	06/22/04
CSLS 10-3	3	0.0069 (J)	07/27/04
CSLS 10-5	5	0.13	07/27/04
CSLS 10-10	10	0.38	07/27/04
Well 10	11	0.50	06/22/04
Well 10	11	0.15	07/27/04
Well 10	11	0.16	07/27/04
Cypress Creek	02479153	0.0081 (J)	07/27/04
Middle Creek	02479143	0.003 (J)	06/21/04
		0.0069 (J)	07/27/04
		0.0067 (J)	07/27/04
Pearces Creek	02479144	0.036	06/21/04
		0.011	07/27/04
Lysimeter samples		**0.067**	
Well samples		**0.050**	
Surface-water samples		**0.0075**	
All samples		**0.036**	

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