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DEPARTMENT OF THE NAVY
CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA 47522-5000

IN REPLY REFER TO:
5090
095/H11.9
21 FEB 1992

2-12-1992

Director, Waste Management Division
RCRA Permitting Branch (5HR-13)
U.S. Environmental Protection Agency, Region V
Attn: Ms. Carol Witt-Smith (Indiana Section)
230 South Dearborn Street
Chicago, IL 60604

Dear Ms. Witt-Smith:

Crane Division, Naval Surface Warfare Center (NAVSURFWARCENDIV) submits three copies of the RFI Workplan for the Old Burn Pit and McComish Gorge as enclosure (1) for your review. Responses to each of the comments made by Region V on the draft work plan are included as enclosure (2).

This workplan will become final on March 23, 1992 unless Region V requests an extension. Page 35 of the Workplan illustrates the work durations and milestone dates for the RFI Phase III Groundwater Release Characterization study.

NAVSURFWARCENDIV point of contact is Mr. Thomas J. Brent, Code 09510, telephone 812-854-3233. Northern Division, Naval Facilities Engineering Command (NORTHNAVFACENGCOM) point of contact is Mr. Bill Schrock, Code 142, telephone 215-897-6280.

Sincerely,

J. D. FARIS
Assistant Public Works Officer
By direction of
the Commander

Encl:
(1) RFI Workplan for the Old Burn Pit and McComish Gorge
(2) Response to EPA Comments
(3) Certification Statement

Copy to: w/o encl
NORTHNAVFACENGCOM, BILL SCHROCK (Code 142)
NORTHNAVFACENGCOM, JEFF CIOCCO (Code 142)
COMNAVSEASYSCOM (SEA 654E)
USAE-WES, BILL MURPHY (GG-YH)
USAE-WILMINGTON, KAMALA POWELL (EN-GG)

Admin. Records 095 109

RFI Phase III Groundwater Work Plan for:
Naval Weapons Support Center, Crane, Indiana
Old Burn Pit and McComish Gorge

Prepared By:
U.S. Army Corps of Engineers
Waterways Experiment Station
Geotechnical Laboratory
3909 Halls Ferry Road
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Prepared For:
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1. INTRODUCTION

1.1.0 SITE DESCRIPTION

1.1.1 Background. Under the direction of Chief of Naval Operations (CNO), the Naval Energy and Environmental Support Activity (NEESA) conducted Initial Assessment Studies (IAS's) to collect and evaluate data concerning pollutants which may pose a health threat to people located on or off the Naval Weapons Support Center Crane, Indiana (NWSCC). These efforts represented the first phase of the Navy Assessment and Control of Installation Pollutants (NACIP) Program. The NACIP program was designed to:

- Identify any environmental contamination resulting from past hazardous material storage, handling, and waste disposal operations at shore installations;
- Assess the impact, or potential for impact, of the contamination on public health and the environment, both at the installation and in surrounding civilian communities; and
- Provide corrective measures, as needed, to prevent contamination from causing any adverse effects on public health or the environment.

During the first phase of the NACIP studies records search and on-site surveys nineteen suspected disposal sites were investigated. Of these 19 sites, McComish Gorge (MG) (Site 2) and the Old Burn Pit (OBP) (Site 3) were among 17 sites that were declared to have significant pollution problems. The remaining 15 sites were: Site 1, Battery Shop; Site 4, PCB Burial Area; Site 5, Pesticide Shop; Site 6, Roads and Grounds Area; Site 7, PCB Dip Tank; Site 8, Loading EAD Area; Site 9, Demolition Area; Site 10, Ordnance Burning Grounds; Site 11, Dye Burial Ground; Site 12, Chemical Burial Grounds; Site 13, Load and Fill Area; Site 14, Mine Fields A and B; Site 15, Rockeye Site; Site 16, Cast High Explosives Fill; and Site 17, Load and Fill Area, Building 106 pond.

The second phase of the NACIP Program was the Confirmation Study. The Confirmation Studies were conducted because the following circumstances exist:

1. Sufficient evidence exists to suspect that the installation has contaminated areas, and

2. The contamination may present a potential danger to:

   a. The health of civilians in nearby communities or personnel within the activity fenceline, or to

   b. The environment within or outside the activity.

The confirmatory studies were conducted by the Army Corps of Engineers Waterways Experiment Station (WES). McComish Gorge and the Old Burn Pit are identified presently as Solid Waste Management Units (SWMU) under the RCRA Facility Investigation (RFI) Corrective Action Requirements. These work plans are to guide Phase III groundwater assessments to satisfy requirements for a RCRA Hazardous Waste Storage Permit for NWSCC. The previous work performed by WES fulfilled the RFI Phase I and II groundwater assessment requirements.

1.1.2 Location. The NWSCC is a Naval Facility located in Martin County, Indiana. The NWSCC covers approximately 62,463 acres (Figure 1). The OBP occupies approximately 25 acres and is located near the center of the facility in the SW quarter of Section 5 and the NW quarter of Section 8, T5N, R4W. Geographically it is at 38 degrees, 53 minutes, 24 seconds North Lati-

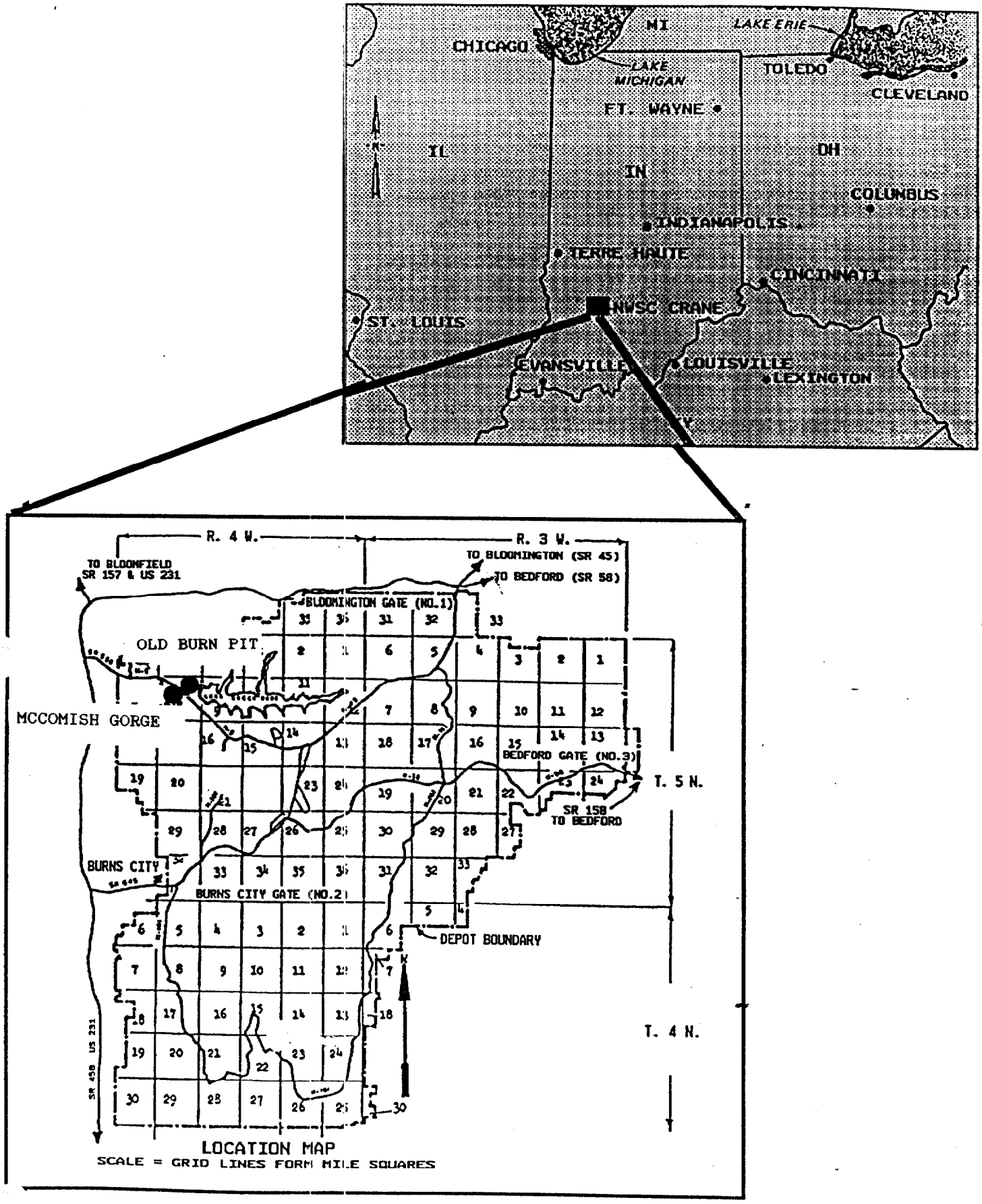


Figure 1. Location map for Old Burn Pit and McComish Gorge.

tude and 86 degrees, 52 minutes, 42 seconds West Longitude. The area is approximately 2000 ft. east of the Crane Gate No. 4 and is accessed using Crane Road H-331 off of Crane Road H-5 (Figure 2). The MG site occupies about 5 acres and is located in the NE quarter of Section 7, T5N, R4W. Geographically it is at 38 degrees, 53 minutes, 22 seconds North Latitude, 86 degrees, 53 minutes, 18 seconds West Longitude. MG is about 500' south of Crane Gate No. 4 and is accessed by Crane Road H-140 off of Crane Road H-5 (Figure 3). Both sites are located along Culpepper Branch, a tributary of First Creek. Both sites are within the Scotland, Ind., 7.5-minute quadrangle of the US Geological Survey. Their topographical setting is shown in Figure 4.

1.1.3 Site History. The Old Burn Pit site was used from 1942 to 1972. Garbage and trash were burned at the site. The rubbish included wood, paper, building material and industrial wastes. No explosive wastes were burned here. The material was burned in a depression or pit structure. Ash residue from the burning operation and metallic objects were buried in the gully to the north of the burn pit. Today the site is used as a parking area for delivery trailers. Since 1972 the site has revegetated. Contaminated leachate is migrating from the pit and ash fill. Contaminants have been found in groundwater samples (Dunbar, 1982). Amounts of trans-1,2 dichloroethylene, chloroform, and trichloroethylene exceeding 50 ppb have been detected in some of the groundwater samples drawn from monitoring wells at the OBP.

The McComish Gorge dump site was used for an unknown period of time between 1942 and 1972. Records of its use are indefinite. Undefined amounts and types of garbage and trash were buried at the site. This rubbish could include wood, paper, construction material, plaster-filled warheads, metal shavings, and industrial wastes. Reportedly small-arms ammunition was buried here. Today the site is not used and the site has revegetated. Metal contamination has been detected in groundwater samples from the site.

1.1.4 Site Hydrogeology. Work performed by WES (Dunbar, 1982, 1984) satisfied the requirements for the Phase I and Phase II groundwater studies at the sites. The recently completed RFI Phase II soils studies conducted at the Old Burn Pit and McComish Gorge refined the degree of hydrogeologic knowledge concerning these sites. The following discussion is taken from the Phase II draft soil reports.

Old Burn Pit. The Old Burn Pit (OBP) is located on the Crawford Upland, a rugged, dissected plateau formed by differential erosion of Pennsylvanian and Mississippian Age sedimentary rocks. The rock units underlying the OBP and forming the surrounding hills consist of Mansfield Formation shales and sandstones of the Pennsylvanian Age Raccoon Creek Group. There is no available data concerning the physical or hydraulic characteristics of the Mansfield Formation at the site. Most of the OBP is situated in the dissected alluvial valley of Culpepper Branch as seen in Figure 4. The unconsolidated sediments of the OBP site were formed by several processes. Residual soils formed by weathering of the underlying parent rock. During the Pleistocene Epoch the OBP was filled with lacustrine (lake) and alluvial (outwash) deposits which are facies included in the Atherton Formation (Grey, Wayne, and Wier, 1970). The facies relationships of the Atherton Formation are shown in Figure 5 (Wayne 1963). Colluvium derived from the hill slopes, and soil reworked by man associated with the burning activity, also underlie the site.

The soil samples from the auger borings were classified in the field according to the Unified Soil Classification System (USCS). Selected soil samples were analyzed later in the laboratory. The soil types which compose the OBP site are clay (CL and CH), silt (ML and MH) and sand (SC, SW, SM, and SP). The gravel portion of the clay (CL) is primarily sandstone fragments.

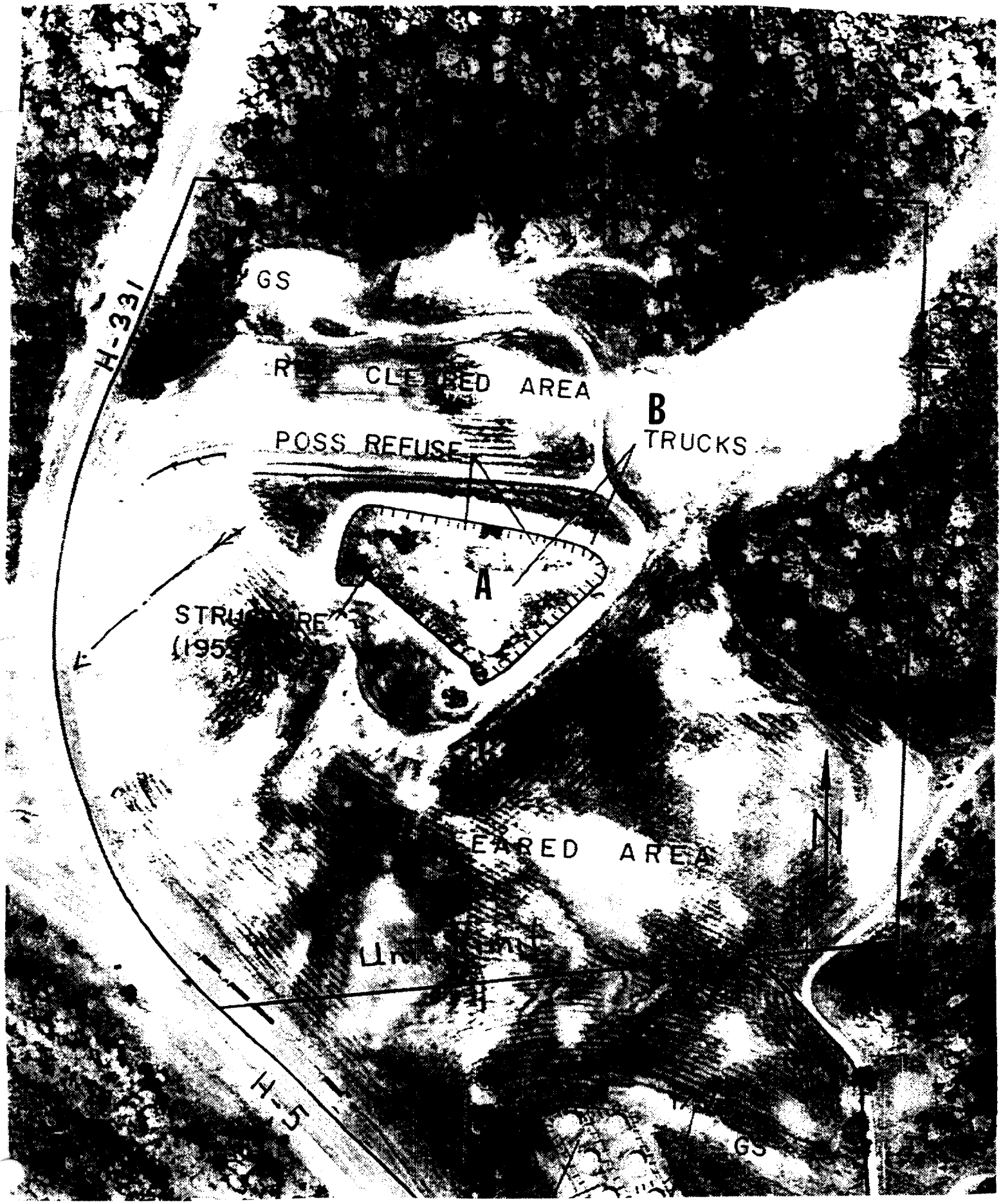


Figure 2. Aerial photograph showing the Old Burn Pit in operation. The burn pit is at A and the northern disposal area is at B.

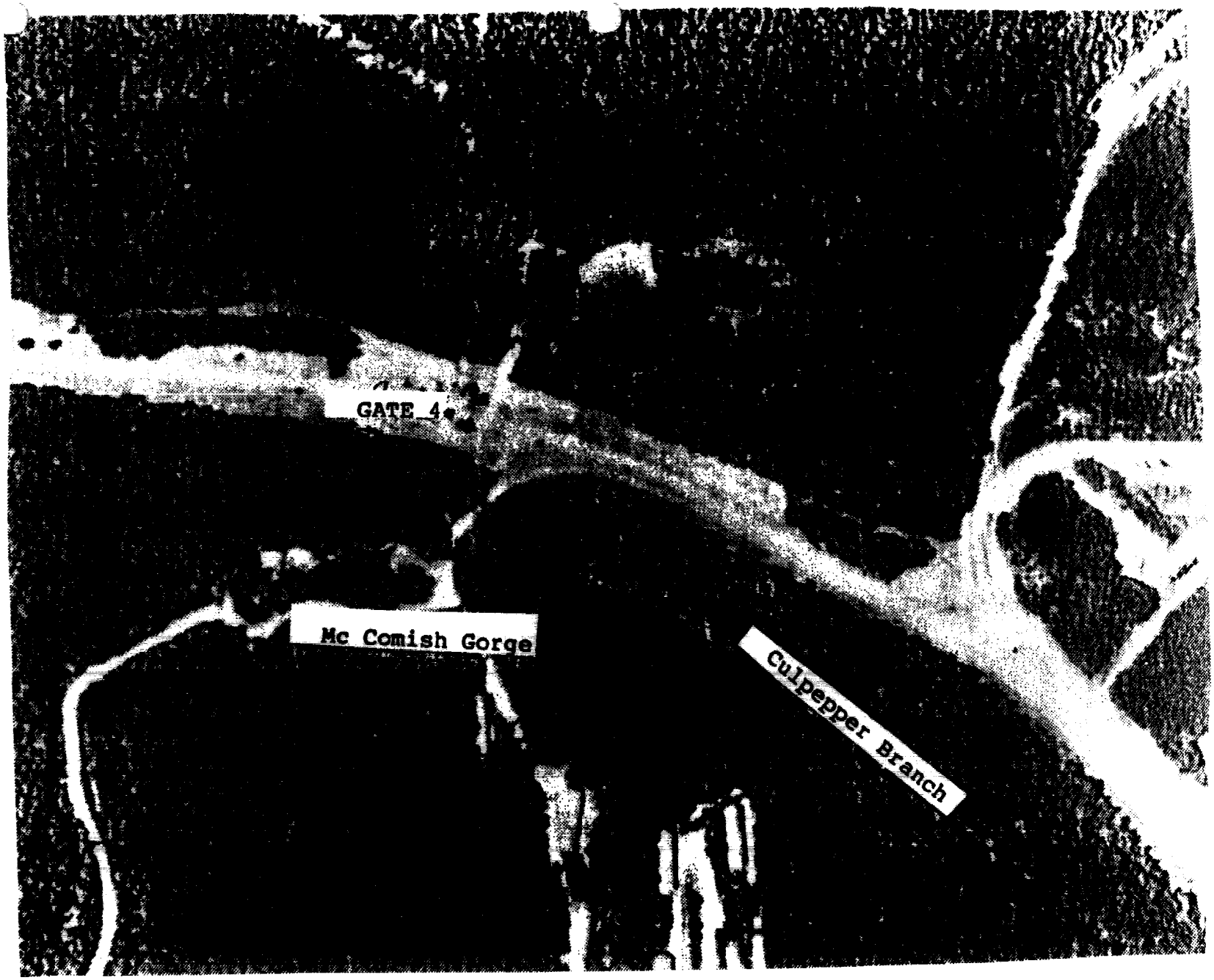


Figure 3. Aerial photograph showing revegetated conditions at McComish Gorge.

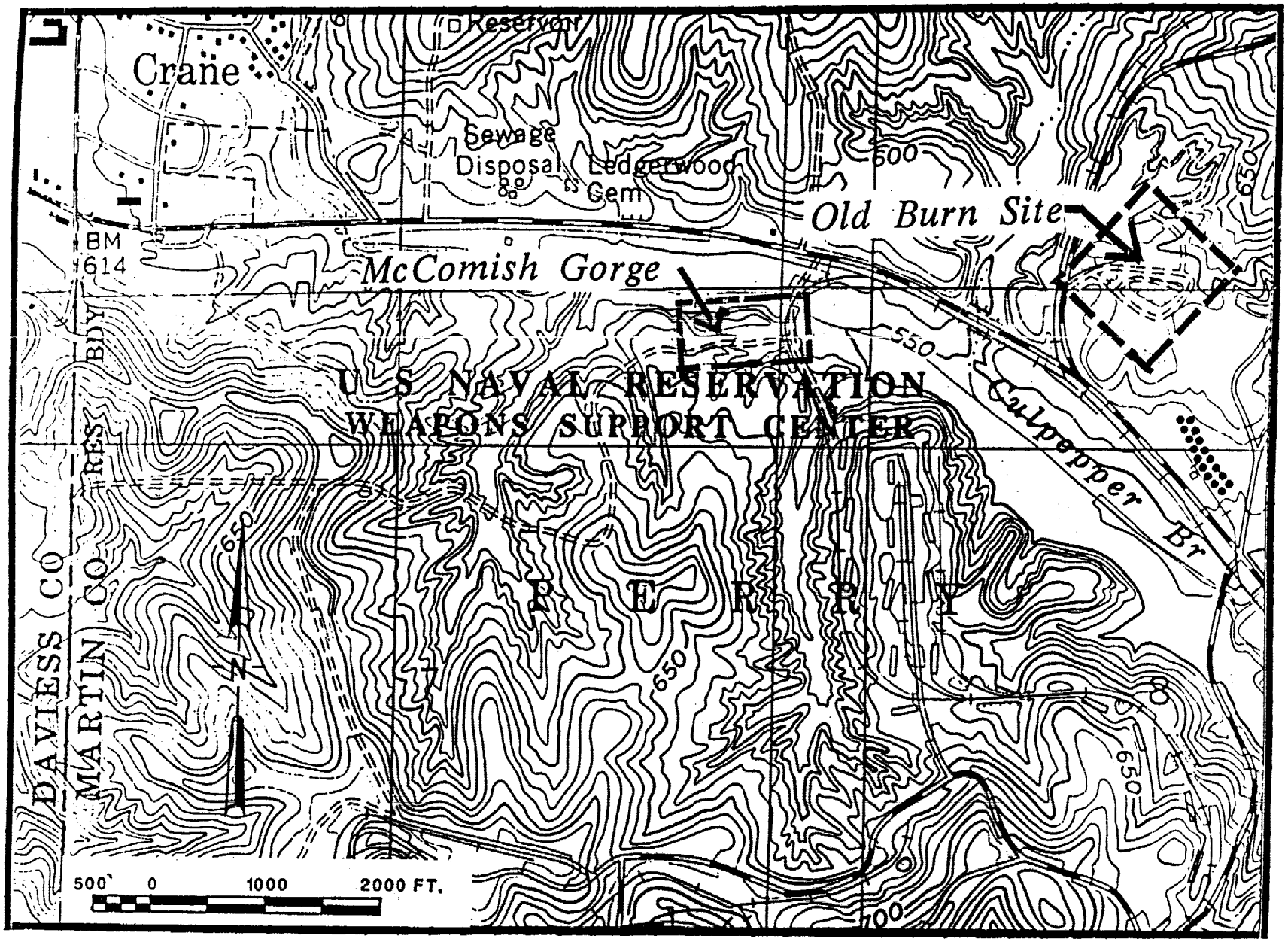


Figure 4. Topographic setting for the Old Burn Pit and McComish Gorge.

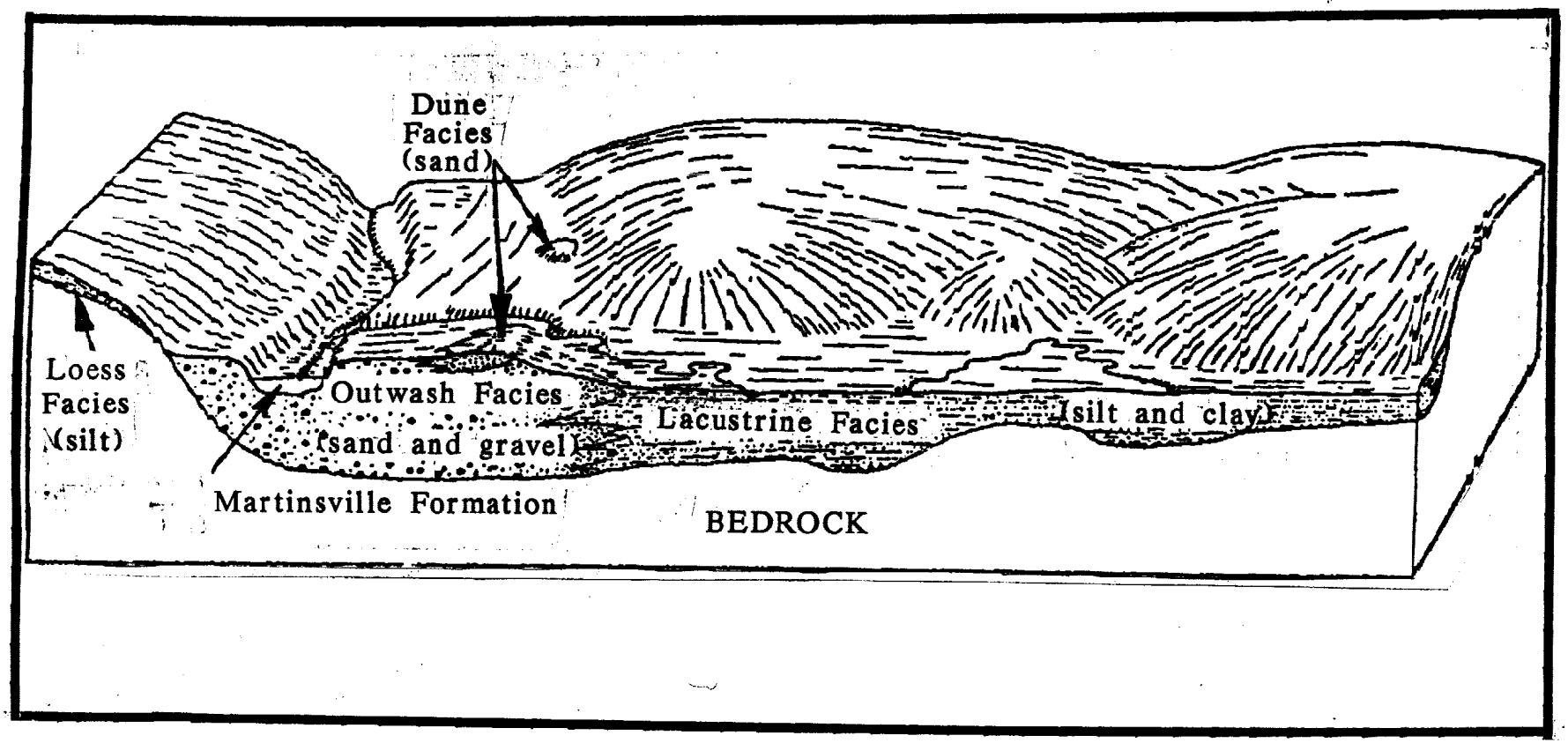


Figure 5. Geologic facies map of the area.

The soil thickness of the OBP site ranges from zero to almost 60 feet. The areal variability of soil thickness was not adequately characterized because only a few borings penetrated the total soil thickness. Therefore, a soil-thickness map was not constructed for this report. The soil data did lend itself to generating isochore (equal soil-type thickness penetrated by boring samples) maps. A surface clay and silt map (Figure 6) was prepared by contouring known clay and silt thickness determined by the borings. A net sand map (Figure 7) was prepared to display the total known sand encountered by the borings. Each isochore map is limited by incomplete soil data. Nevertheless the predominant soil type and depositional environment are suggested. For example, the thicker clay and silt (Figure 6) reflect areas where the lacustrine deposits were penetrated by the borings. The predominant portion of the clays and silts were formed as lacustrine deposits. Remnants of residual soil also add to the clay and silt thickness. The clay (CH) in boring 05/03-06-90 and the silt (ML and MH) at the base of borings WES-5-1-81 and 05/03-04-90 represent residual soil, formed from the weathering of shale parent material.

The thickest sand in Figure 7 is interpreted as an outwash channel. Figure 8 shows the location of the geologic cross sections as interpreted across the site. The sands (SM, SP, SP-SM, SC, and SW) are interpreted as alluvial (outwash) channel sands on geologic sections (Figures 9, 10, 11, and 12). Colluvial infilling of sediments derived from the surrounding slopes is shown in Figures 10 and 11.

An anthropedogenic soil unit is depicted on the geologic cross sections as "modified". Anthropedogenic refers to soils which have been modified by human activity associated with, in this case, burning operations. The modified soil consists of lacustrine deposits and alluvium containing cultural debris. Examination of boring logs 05/03-5, 6, 8, and 9 shows soil containing debris such as rusty nails, metal, glass and burnt wood. The above physical evidence should be correlated with the chemical analysis to describe the area of potential contamination. A preliminary examination shown in Figure 13 reveals a correlation of the modified soil with high concentrations of lead (Pb), cadmium (Cd), and chromium (Cr). Review of the site's history indicates that the modified soil is reworked to a depth of 2 to 3 feet. The modified soil is shown on the cross-sections as a continuous unit, with dashed lines denoting uncertain limits. The area and depth of actual contamination will require additional borings for accurate delineation.

The soil auger borings were left open prior to grouting to measure water levels. Groundwater was encountered at shallow depth (4 to 6 feet) in all but three borings during drilling. Boring 05/03-7-90, which was only 1.7 feet deep to top of rock, was a dry hole. Borings 05/03-5 and 9-90 were terminated due to high HNU readings at 3 feet deep and therefore did not encounter water. The groundwater during the drilling in October 1990 ranged from elevation 585 to 580 feet MSL. Previous investigations (Dunbar, 1982, 1984) found that groundwater elevations ranged from 591 to 561 feet MSL (Figure 14). Dunbar (1982) presents laboratory permeabilities of the order of 2×10^{-5} and 8×10^{-6} cm/sec for silt (ML) and clay (CL) samples from the OBP. These soils are, practically speaking, impermeable, with most rainwater exiting the site as surface runoff. During periods of infiltration the soil acts as a very slow conduit for groundwater and any contaminants. Figure 6 indicates the areas of thick clay and silts which would tend to prevent contamination seeping into the groundwater regime. The area of thickest sands would act as a conduit for groundwater flow. The sands which form the paleochannel (Figure 7) probably have permeabilities of the order of 2×10^{-2} to 5×10^{-3} cm/sec (Freeze and Cherry, 1979).

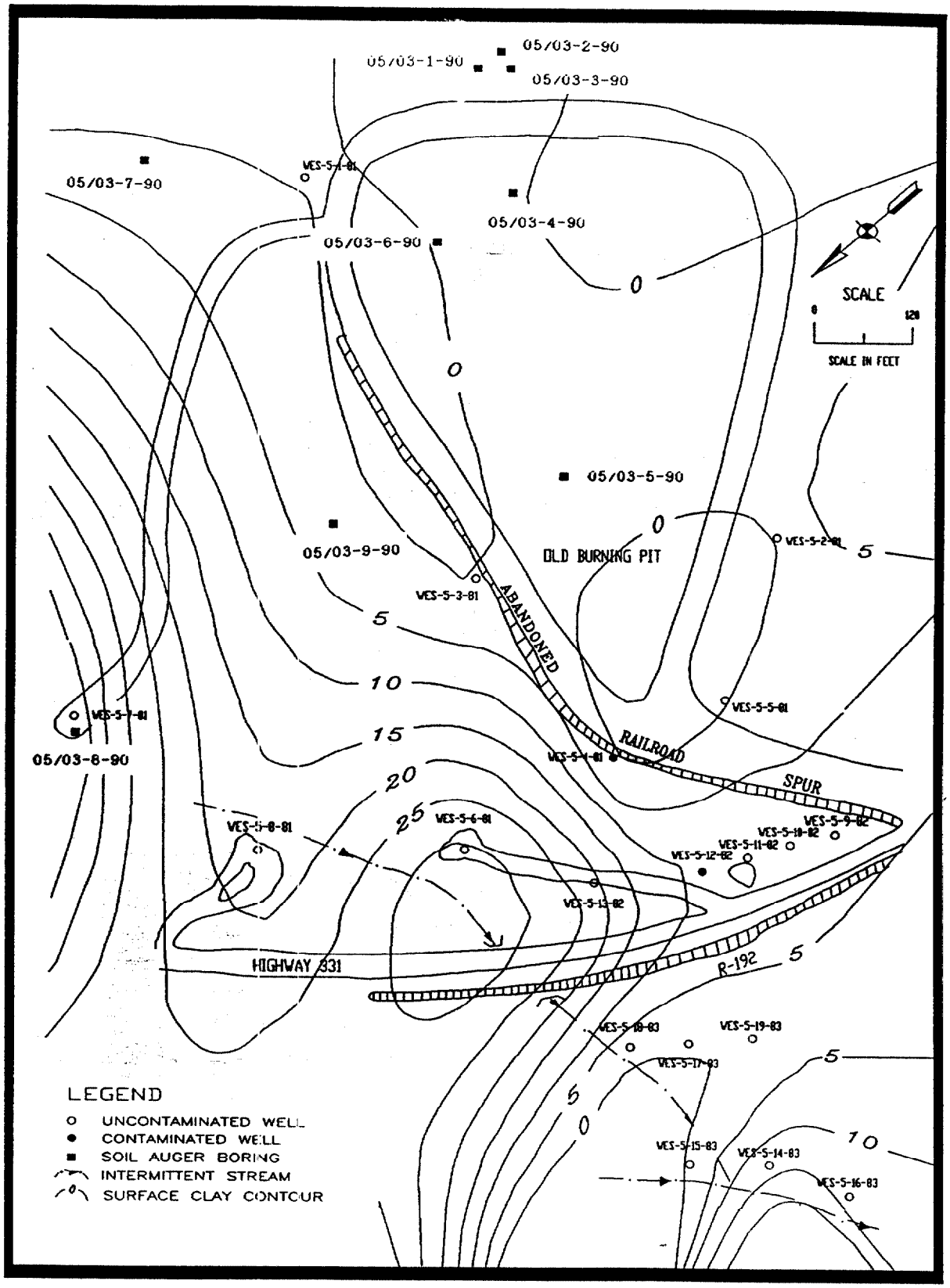


Figure 6. Surface clay thickness contour map at Old Burn Pit.

(After Robertson, 1991 Draft)

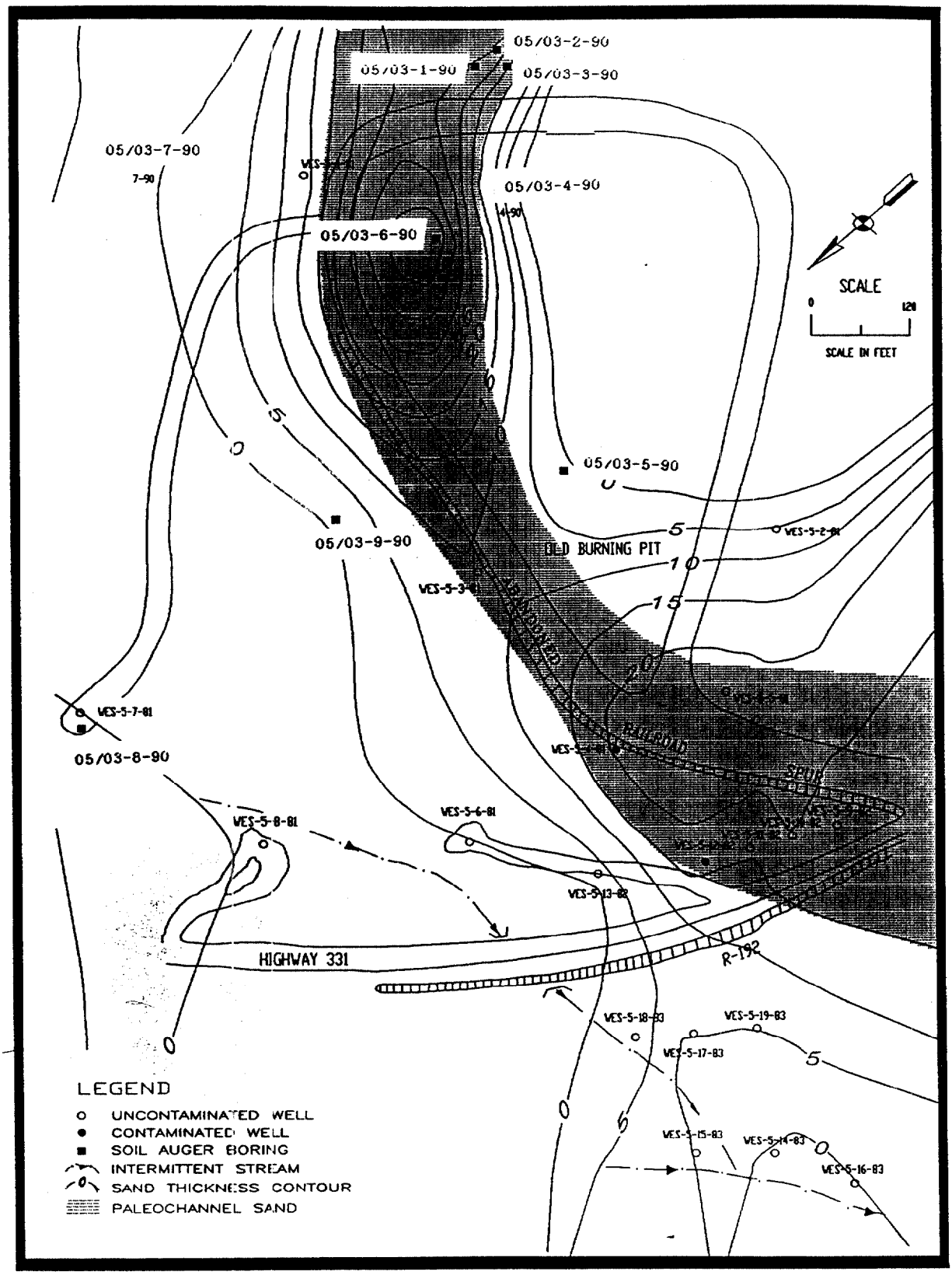


Figure 7. Sand thickness contour map at Old Burn Pit.

(After Anderson, [illegible])

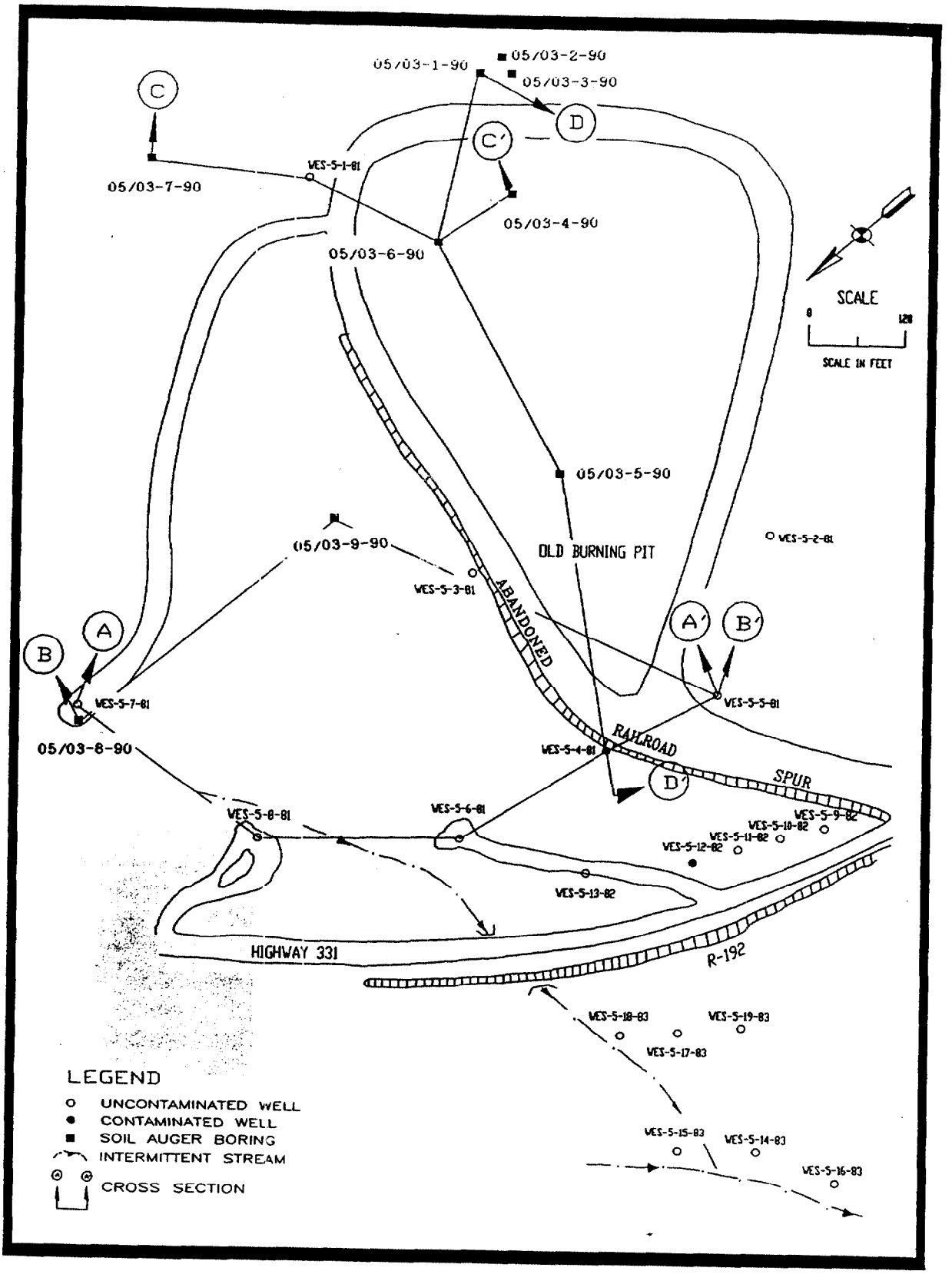


Figure 8. Location of geologic cross sections at Old Burn Pit.

(Afte Anderson [illegible])

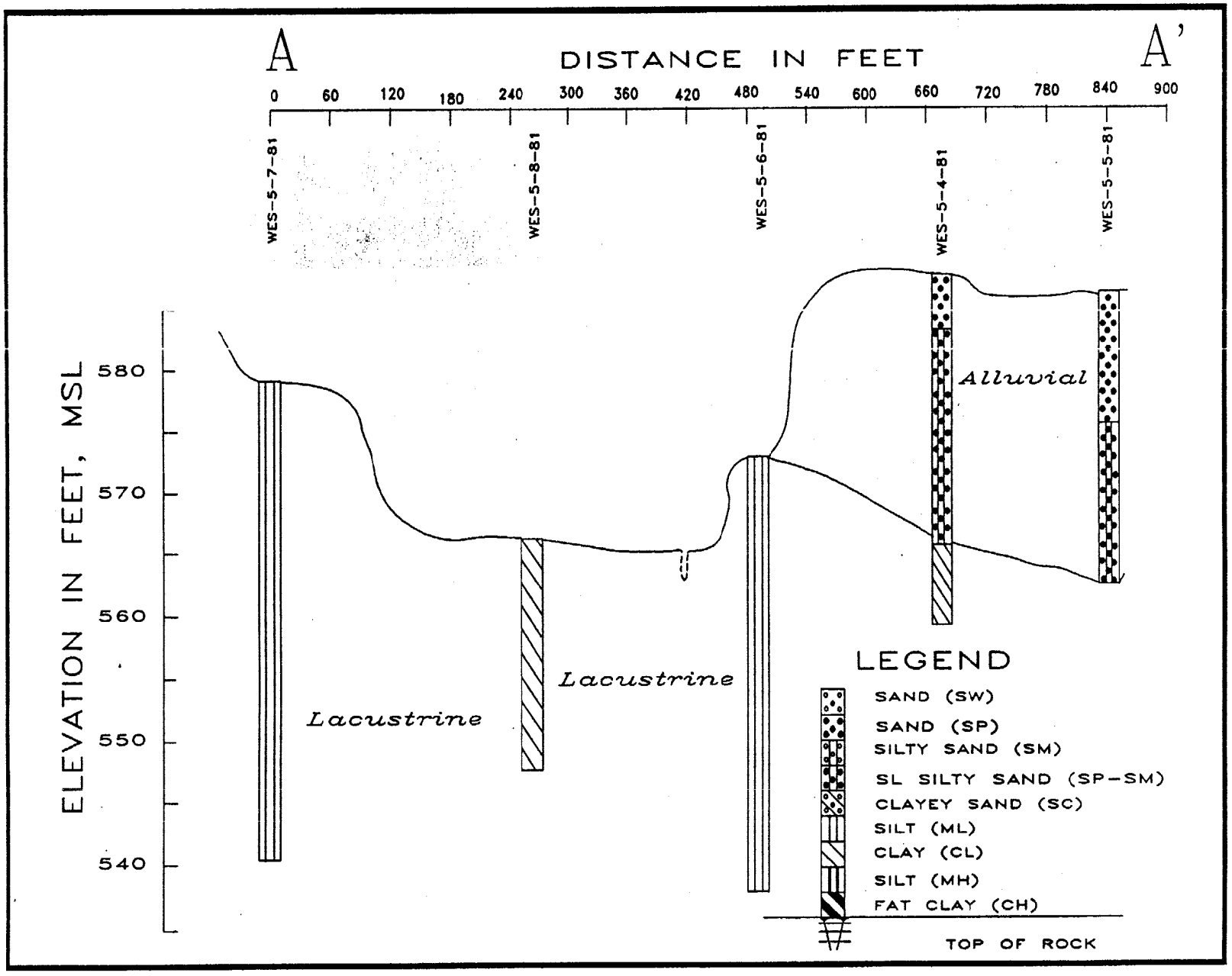


Figure 9. Cross section A-A',Old Burn Pit.

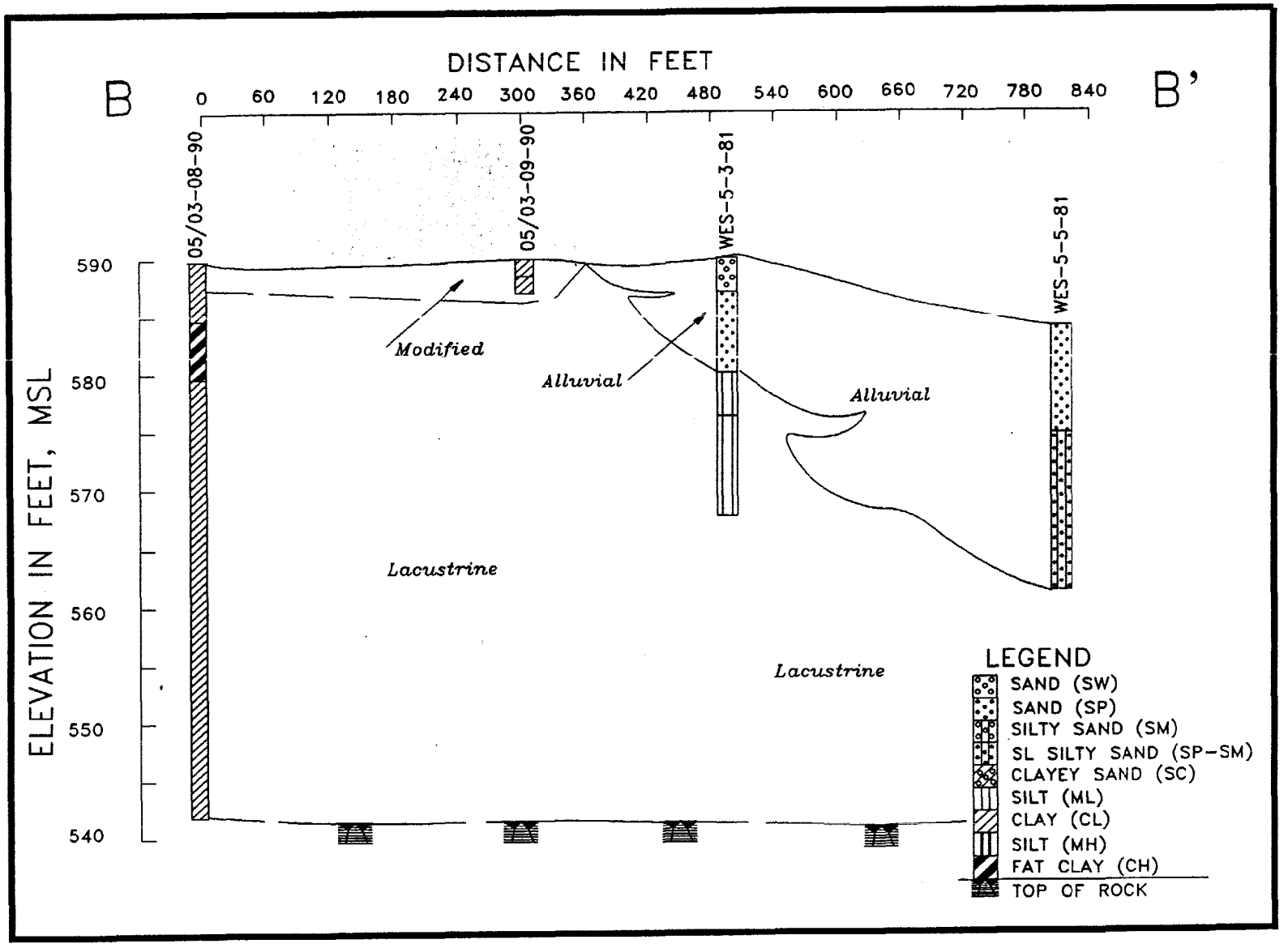


Figure 10. Cross section B-B',Old Burn Pit.

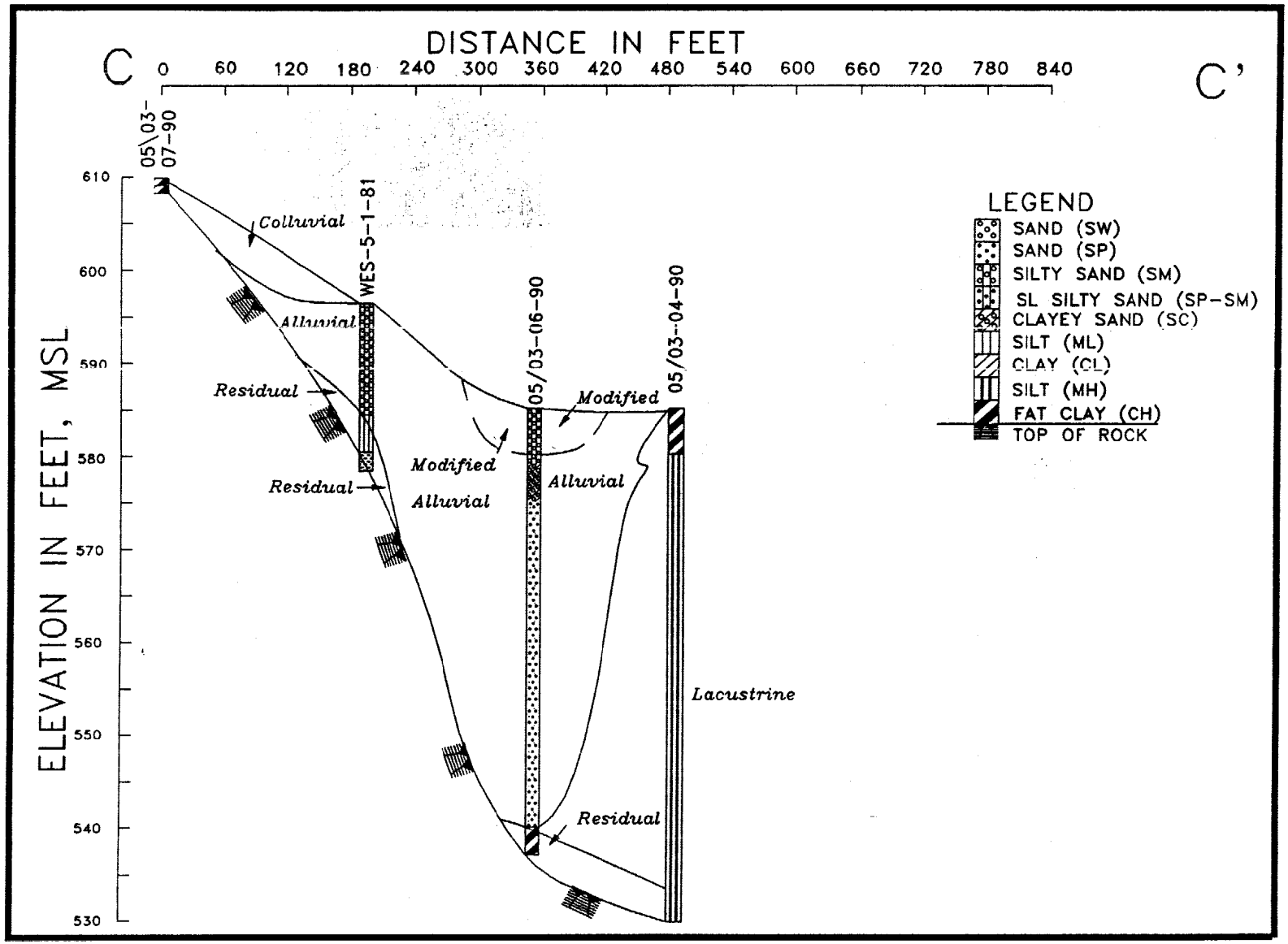


Figure 11. Cross section C-C',Old Burn Pit.

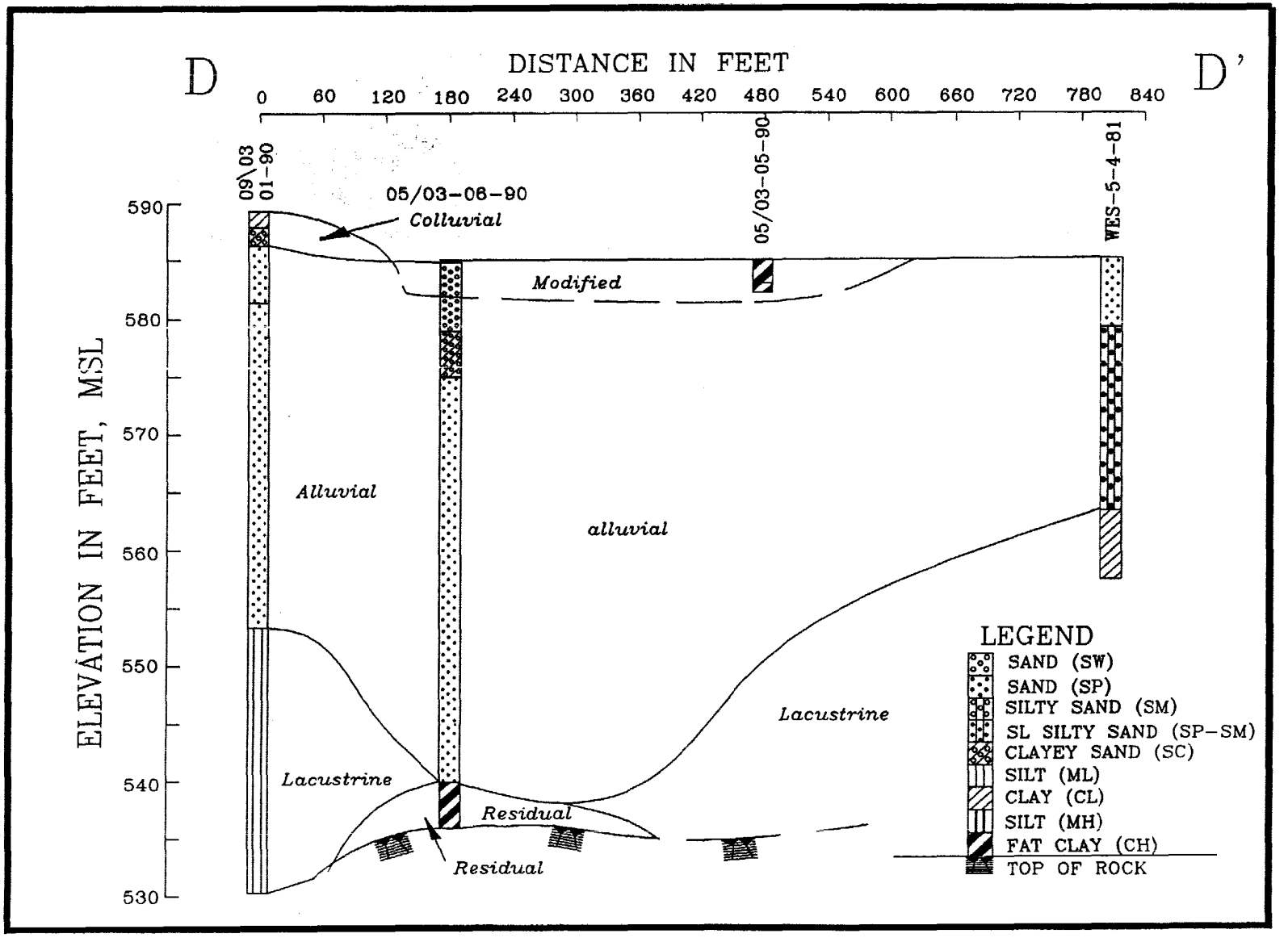


Figure 12. Cross section D-D', Old Burn Pit.

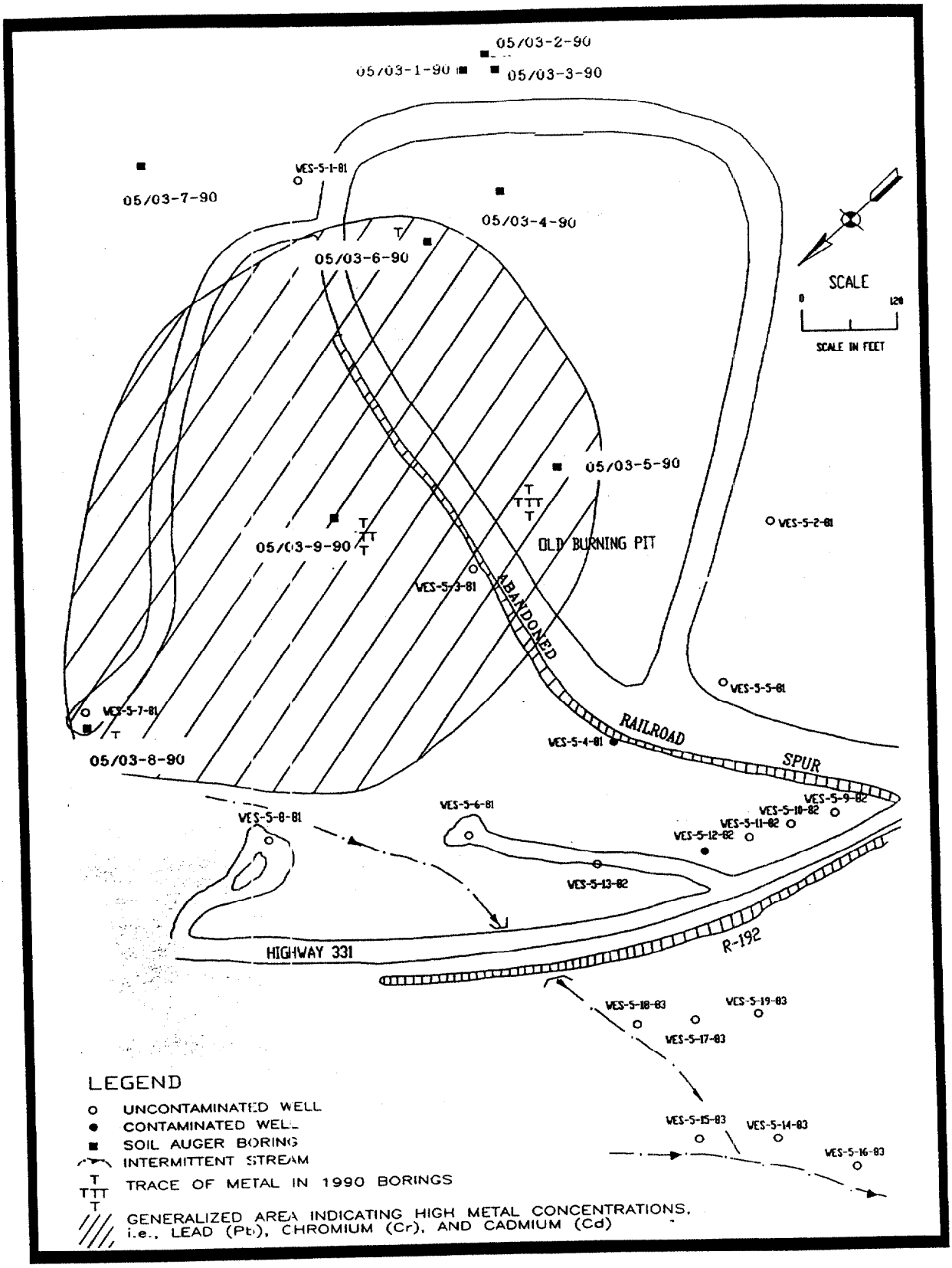


Figure 13. Generalized area of high metal concentrations. Based on preliminary soil tests.

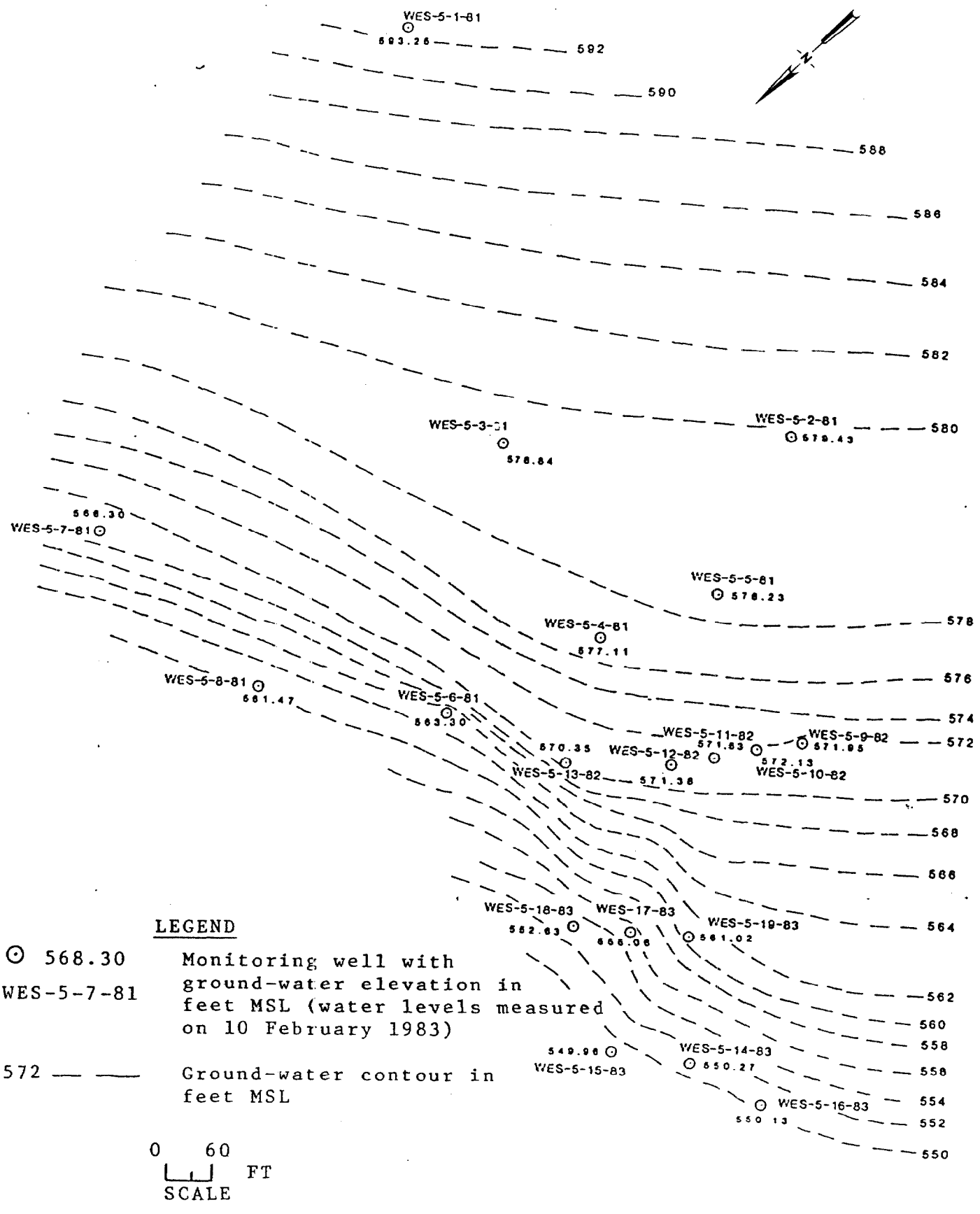


Figure 14. Groundwater contour map for the Old Burn Pit.

Therefore, based on the available evidence, groundwater moves through the clays and silts very slowly by downward vertical infiltration, then laterally along the soil/rock interface until it reaches fractured rock and enters the rock aquifer system. However, in the paleochannel sand area groundwater moves laterally through the sand body. This helps explain why the contaminated wells found in 1984 indicate a westerly direction of flow, while the groundwater elevations would suggest a southwesterly direction of flow (Figure 14). Understanding the presence and orientation of this sand body is important in monitoring the OBP site.

McComish Gorge. The McComish Gorge is also located on the Crawford Upland, a rugged dissected plateau formed by differential erosion of Pennsylvanian and Mississippian Age sedimentary rocks. The rock units underlying the MG and forming the surrounding hills consist of Mansfield Formation shales and sandstones of the Pennsylvanian Age Raccoon Creek Group. There is no available data concerning the physical or hydraulic characteristics of the Mansfield Formation at the site. Most of the MG is situated in the dissected alluvial valley of Culpepper Branch as seen in Figure 4. The unconsolidated sediments of the MG site were formed by several processes. During the Pleistocene Epoch the MG was filled with lacustrine (lake) and alluvial (outwash) deposits, which are facies included in the Atherton Formation (Grey, Wayne, and Wier, 1970). The facies relationships of the Atherton Formation are shown in Figure 5 (Wayne, 1963). Colluvium derived from the slopes and soil reworked by man associated with the burning also underlie the site.

The soil samples from the auger borings were classified in the field according to the Unified Soil Classification System (USCS). Selected soil samples were analyzed later in the laboratory. The soil types which compose the MG site are clay (CL), silt (ML and MH) and sand (SC, SM, and SP).

The soil thickness at the MG site ranges from zero to over 65 feet. The areal variability of soil thickness was not characterized because none of the borings penetrated the total soil thickness. Therefore, a soil-thickness map was not constructed for this report. The soil data did lend itself to generating isochore (equal soil-type thickness penetrated by boring samples) maps. The contouring method utilized a minimum-curvature algorithm, which tends to produce linear trends. A surface clay and silt map was prepared by contouring known clay and silt thickness determined by the borings. The clay and silt map was used for preliminary comparison and is not presented in this report. A net sand map (Figure 15) was prepared to display the total known sand encountered by the borings. Each isochore map is limited by incomplete soil data. Nevertheless the predominant soil type and depositional environment are suggested. For example, the thinner sands (thicker clay and silt) reflect areas where the lacustrine deposits were penetrated by the borings. The predominant portion of the clays and silts were formed as lacustrine deposits. Figure 16 shows the locations of geologic cross sections across the site. The sands (SM and SC) are interpreted as alluvial (outwash) channel sands on geologic sections (Figures 17 thru 23).

An anthropedogenic soil unit is depicted on the geologic cross sections as "modified". Anthropedogenic refers to soils which have been modified by human activity associated with, in this case, disposal operations. The modified soil consists of lacustrine deposits and alluvium containing cultural debris. Examination of boring logs 04/02-1, 2, 5, 6, 7, 8, 9, and 10 shows soil containing debris such as plastic, rubber, metal, and wood. In addition, the above-mentioned boring logs make note of black seams, white seams, and rust stains. A preliminary examination indicates a modified soil containing debris and/or stains. The above physical evidence should be correlated with the chemical analysis to describe the area of potential contamination. An initial review of the chemical data reveals high concentrations of barium in samples from borings 04/02-1A and 02-90. Boring 04/02-1A-90 also contained

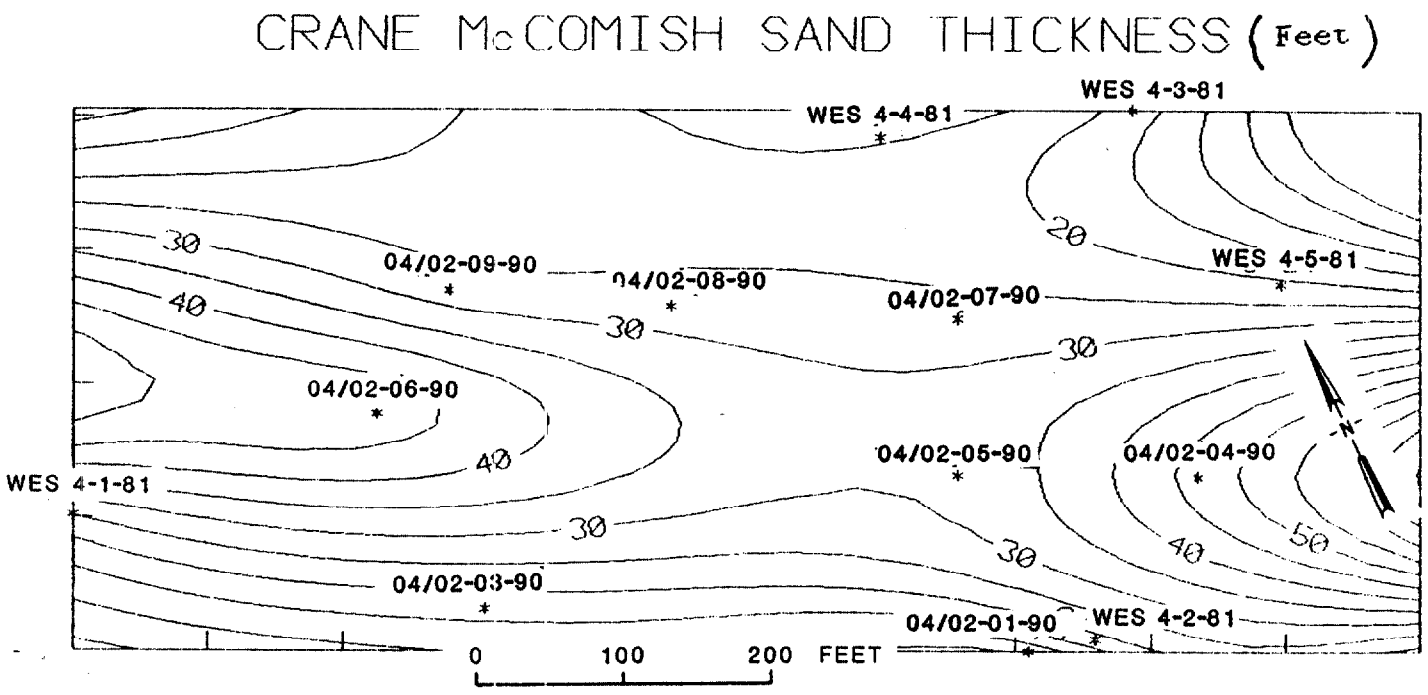


Figure 15. Sand thickness map at McComish Gorge.

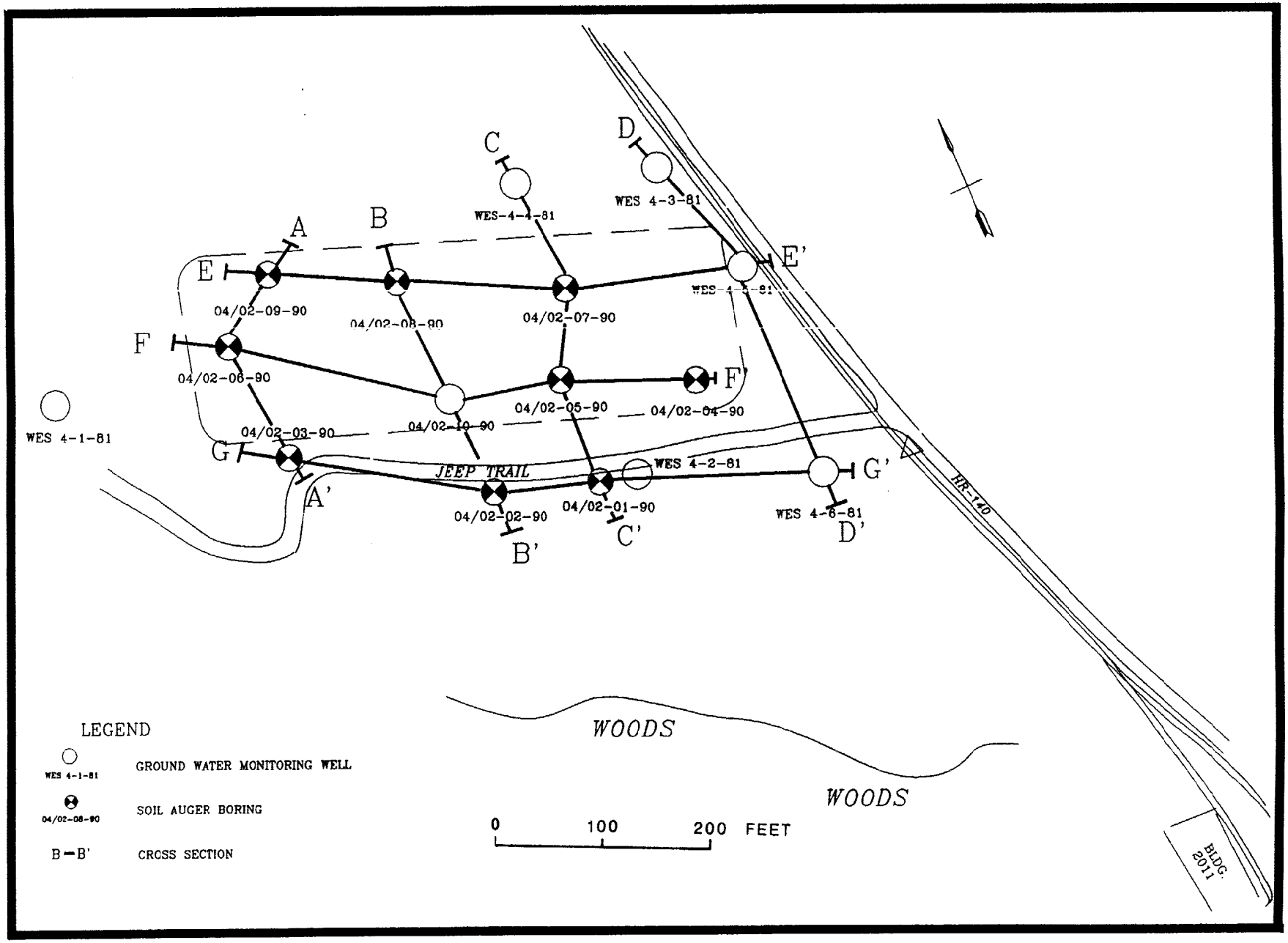


Figure 16. Location of geologic cross sections at McComish Gorge.

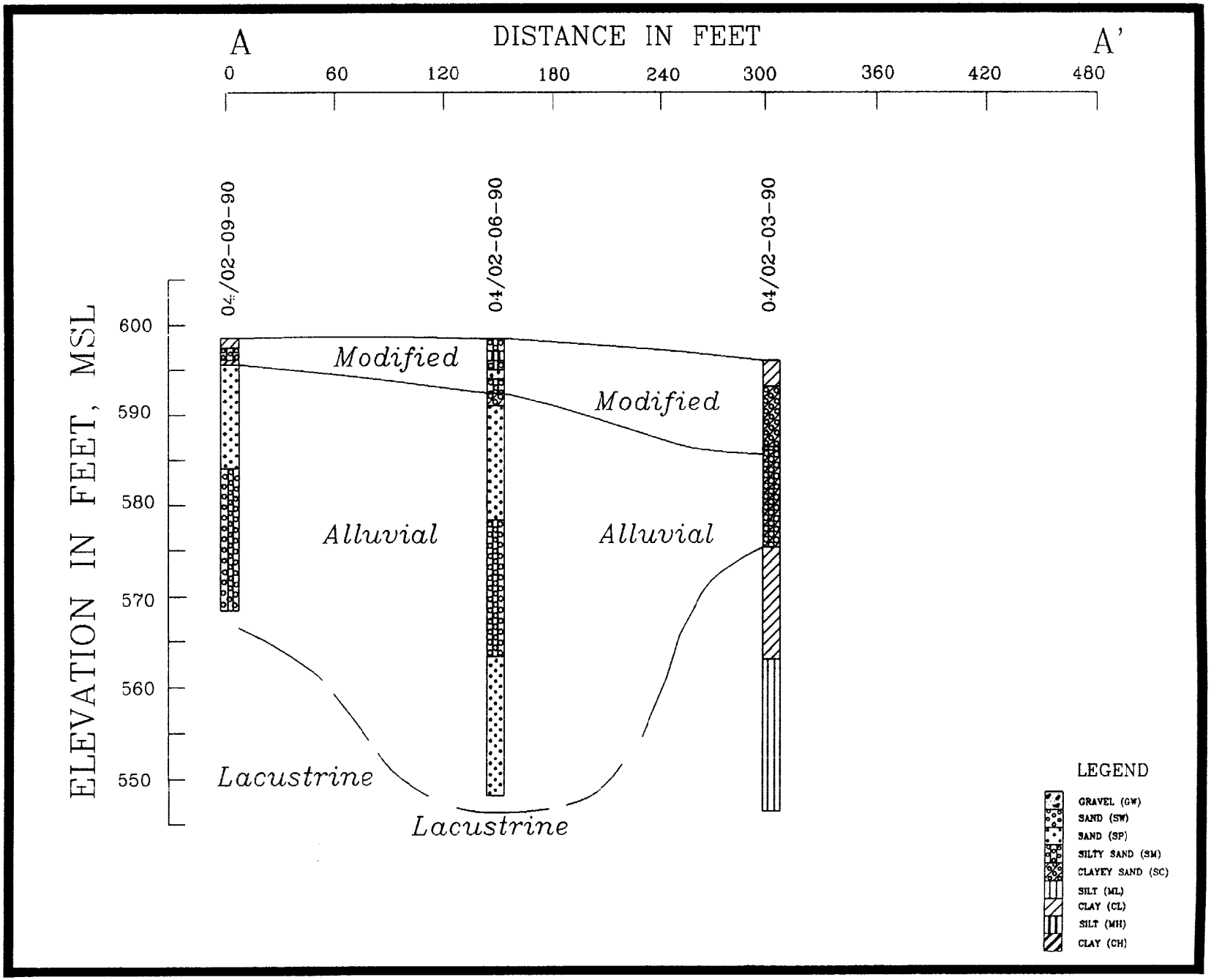


Figure 17. Cross section A-A', McComish Gorge.

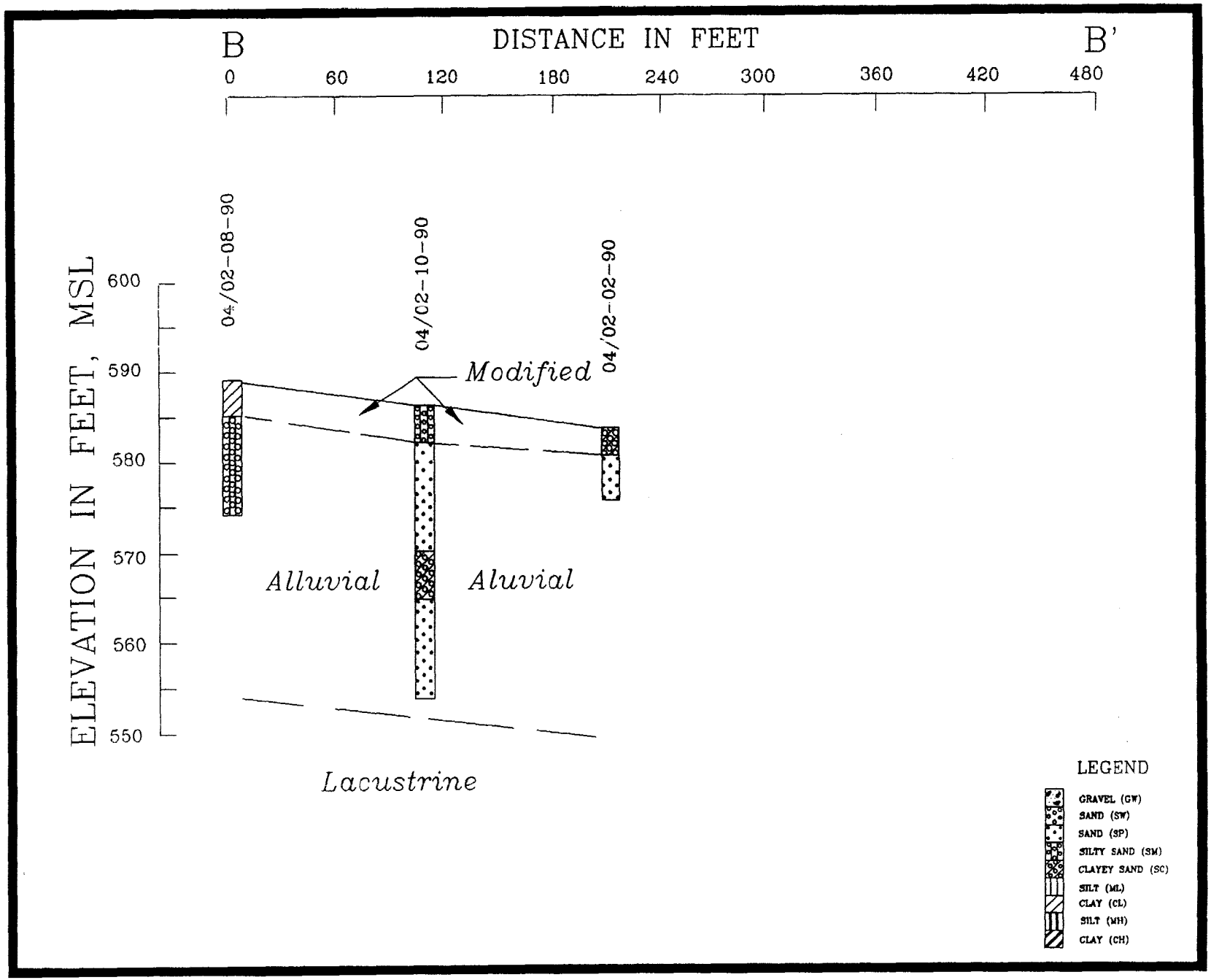


Figure 18. Cross section B-B', McComish Gorge.

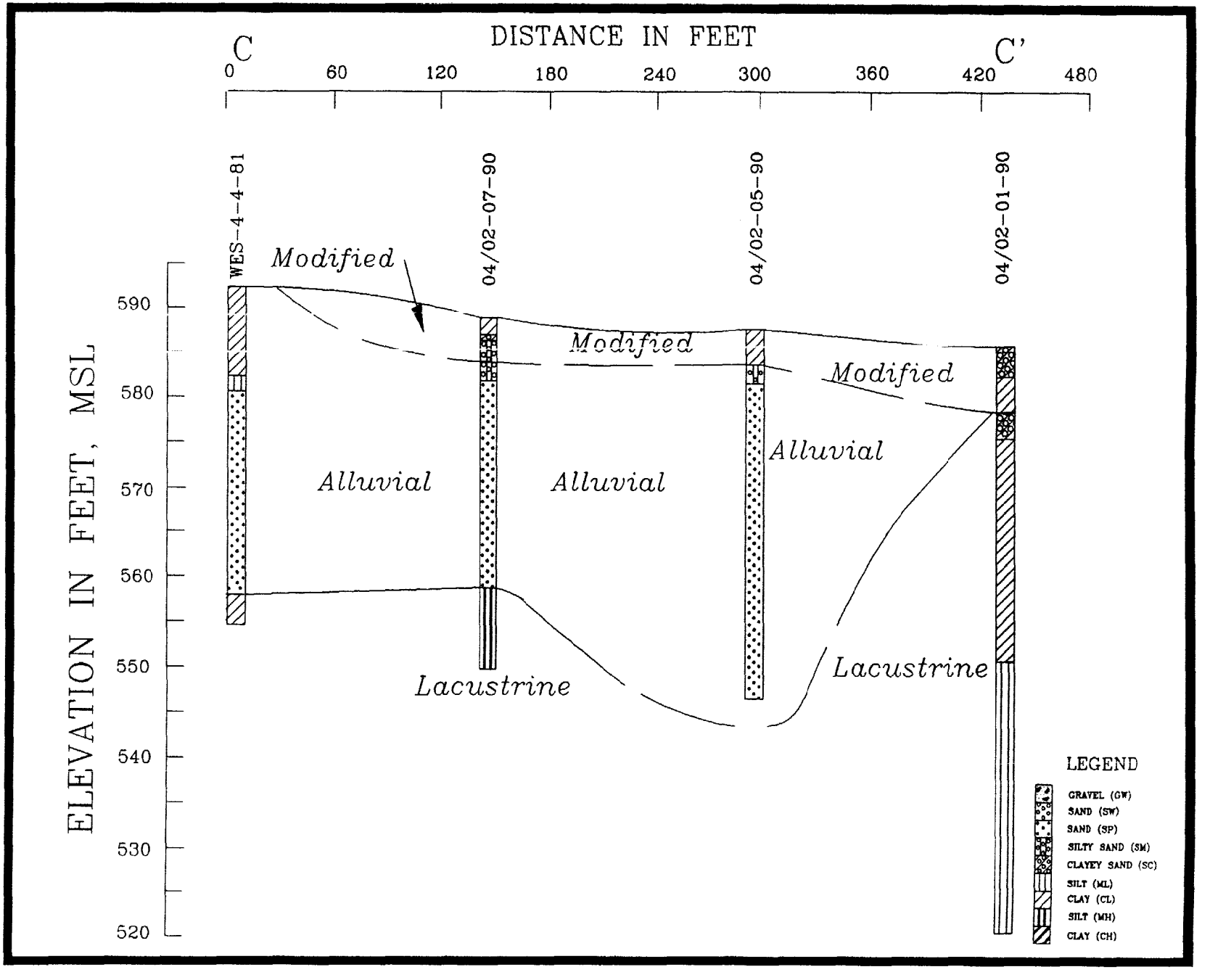


Figure 19. Cross section C-C', McComish Gorge.

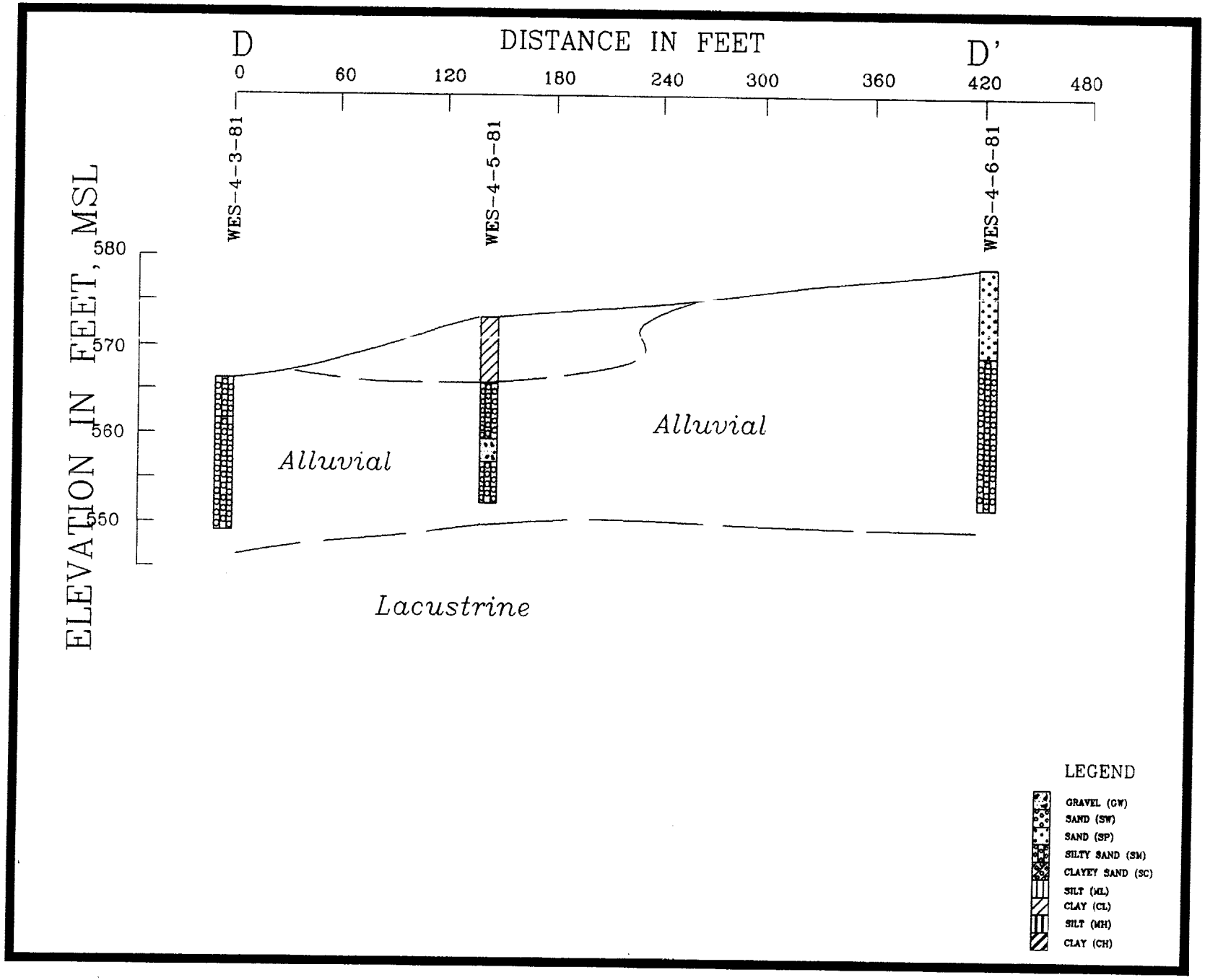


Figure 20. Cross section D-D', McComish Gorge.

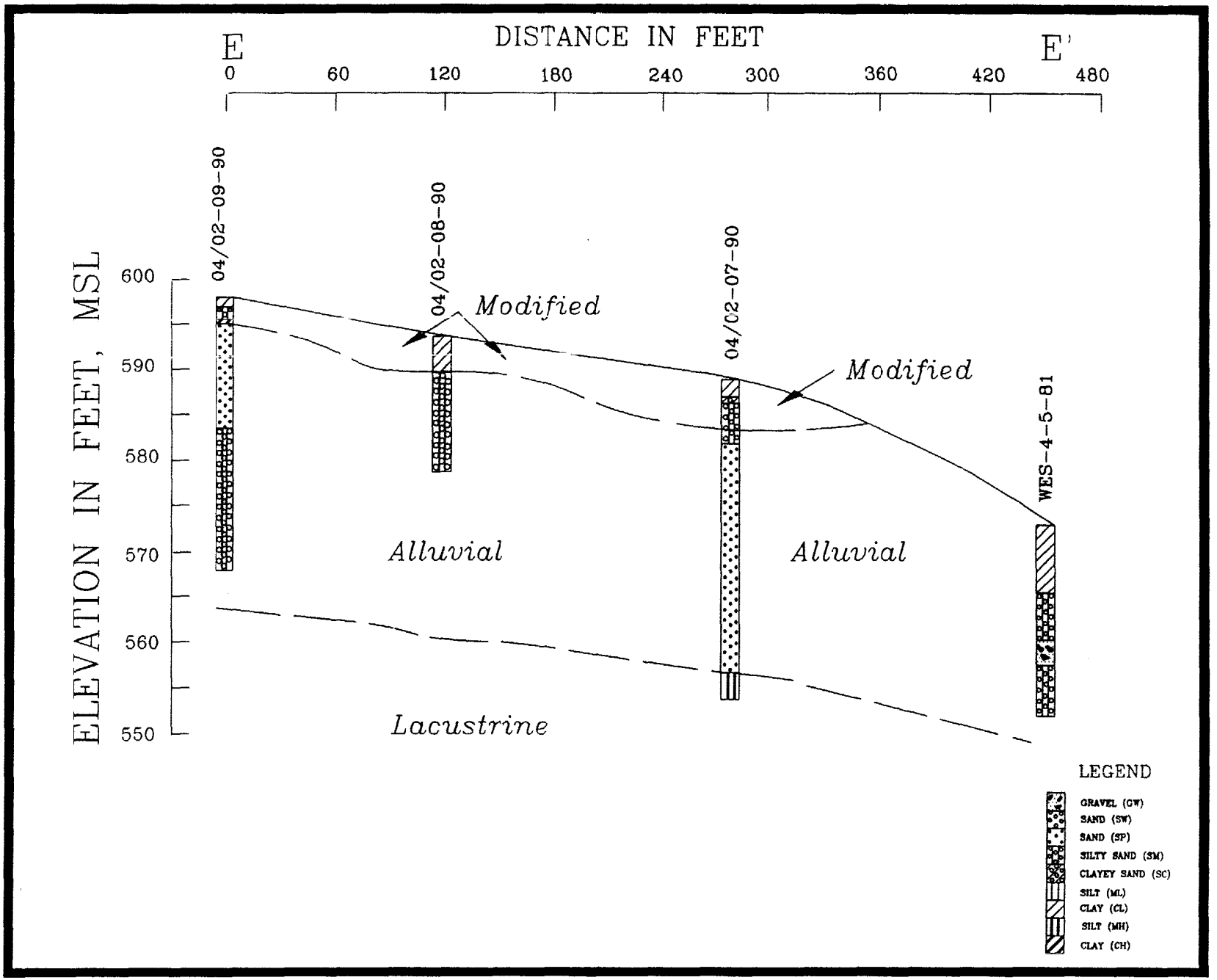


Figure 21. Cross section E-E', McComish Gorge.

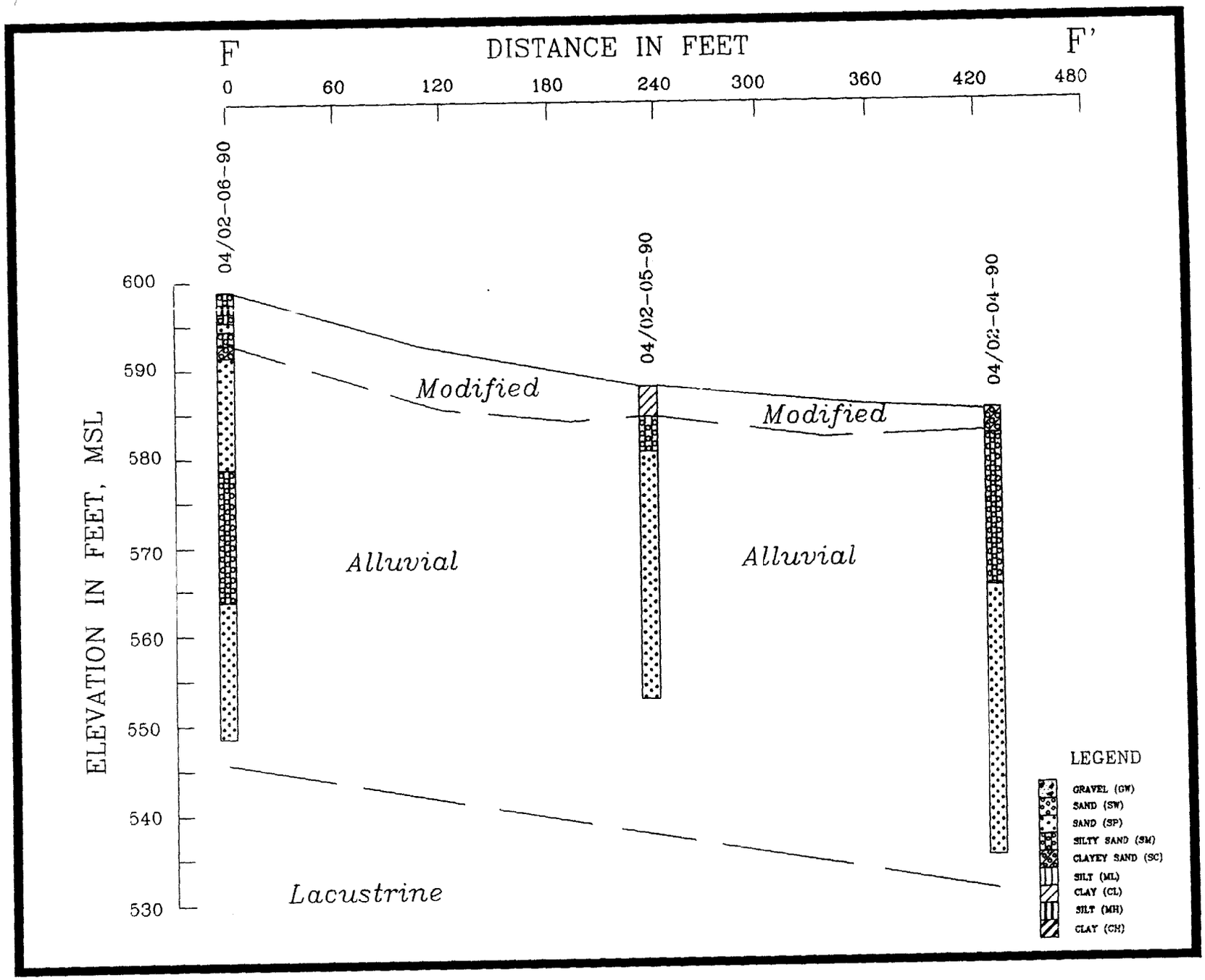


Figure 22. Cross section F-F', McComish Gorge.

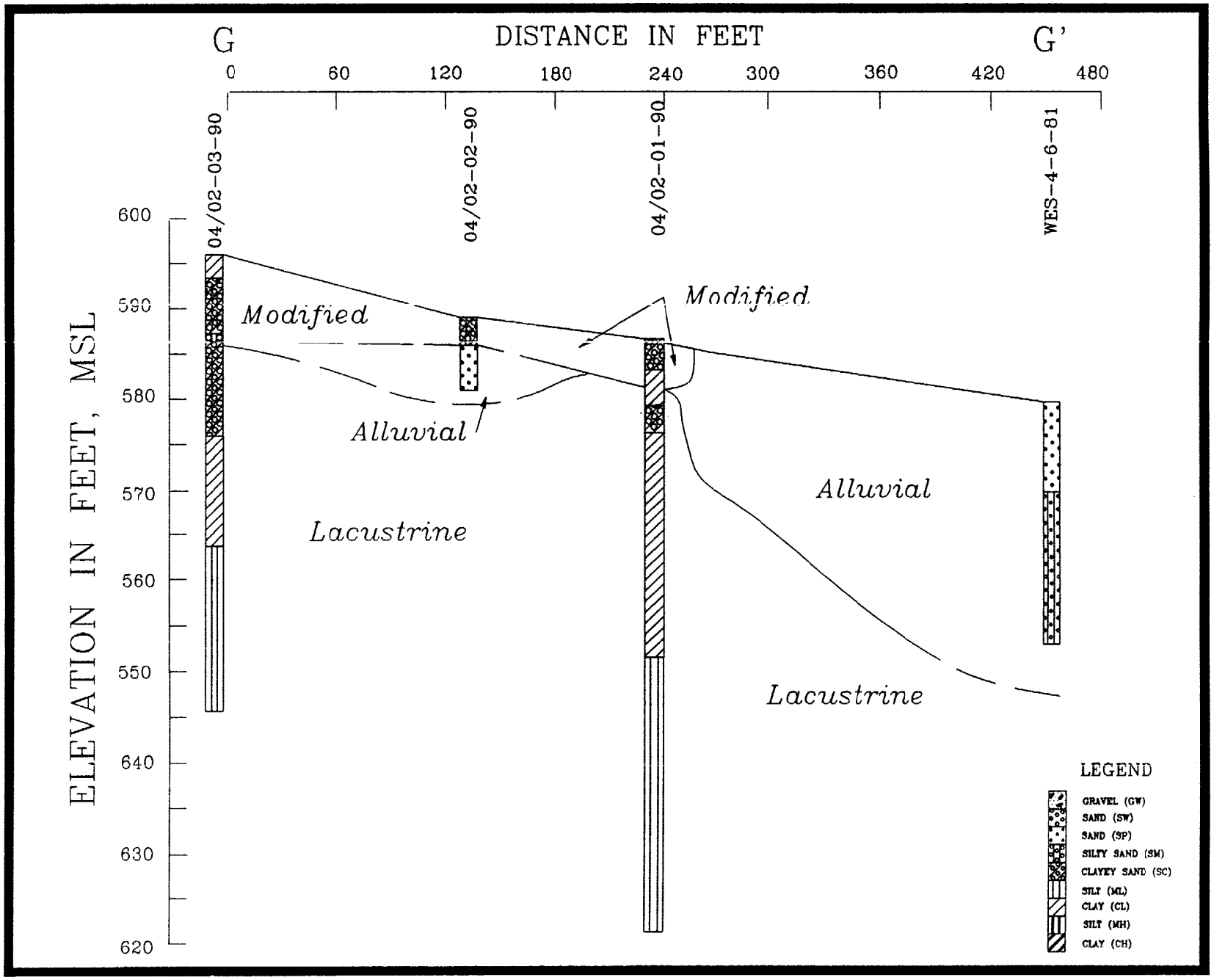


Figure 23. Cross section G-G', McComish Gorge.

133 ppm lead and 71 ppm 2,4-dinitrotoluene (2,4-DNT). Correlation of the modified soil with high concentrations of barium (Ba), lead (Pb), and 2,4-DNT is restricted to only one pocket of thick (4 feet) modified soil. The physical and chemical data enlarge the limits of debris disposal presented by Dunbar (1982).

Review of the site's history indicates that the modified soil is reworked to a depth of 3 to 4 feet. The modified soil is shown on the cross-sections as a continuous unit, with dashed lines denoting uncertain limits. The area and depth of actual contamination will require additional borings for accurate delineation.

The soil auger borings were left open prior to grouting to measure water levels. Groundwater was encountered at shallow depth (3 to 10 feet) during drilling. The groundwater level during drilling in October 1990 ranged from elevation 592 to 577 feet MSL. Previous investigations (Dunbar, 1982) found that groundwater elevations ranged from 573 to 563 feet MSL. Dunbar (1982) presents laboratory permeabilities of the order of 4×10^{-5} cm/sec for a silty sand (SM) sample. During periods of infiltration the soil acts as a slow conduit for groundwater and any contaminants. Figure 15 indicates the areas of thin sand (thick clay and silts), which would tend to prevent contamination seeping into the groundwater regime. Inversely, the area of thickest sands shown on Figure 15 would act as a conduit for groundwater flow. The SP sands which form the paleochannel (Figure 15) probably have permeabilities on the order 5×10^{-3} cm/sec (Freeze and Cherry, 1979).

Therefore, based on the available evidence, groundwater moves through the clays and silts very slowly by downward vertical infiltration, then laterally along the soil/rock interface until it reaches fractured rock and enters the rock aquifer system. However in the paleochannel sand area, groundwater moves laterally through the sand body. Understanding the presence and orientation of this sand body is important in monitoring the MG site.

The near-surface aquifer in the area is made up of Pleistocene deposits. It is unconfined and discharges into the Culpepper Branch. Surface water will be addressed in future Surface Water work plans. The groundwater studies indicate that the water table is at a shallow depth, 10 to 20 feet. Its gradient is to the east and northeast (Figure 24). Surface drainage is to Culpepper Branch and then into First (Furst) Creek.

1.2.0 STUDY HISTORY

1.2.1 Previous Investigations (Old Burn Pit) In 1981 a team from the USACEWES completed a groundwater and soils investigation at the OBP. Between 1981 and 1983 a total of nineteen monitoring wells were installed at this site. Groundwater quality testing resulted in the detection of organic contaminants. The contaminants are TCE, chloroform, and dicloroethylene.

(McComish Gorge) In 1981 a team from the USACEWES completed a groundwater and soils investigation at the MG. In 1981 six monitoring wells were installed at this site. A replacement well (4A) was installed in 1986. Groundwater quality testing resulted in the detection of metal contamination. Primary drinking water standards were used to flag elevated conditions. The elevated parameters were cadmium, chromium, fluoride, iron, manganese, mercury, sodium, and sulfate.

Construction details of the monitoring wells installed by the USACEWES are given in Table 1.2.1.

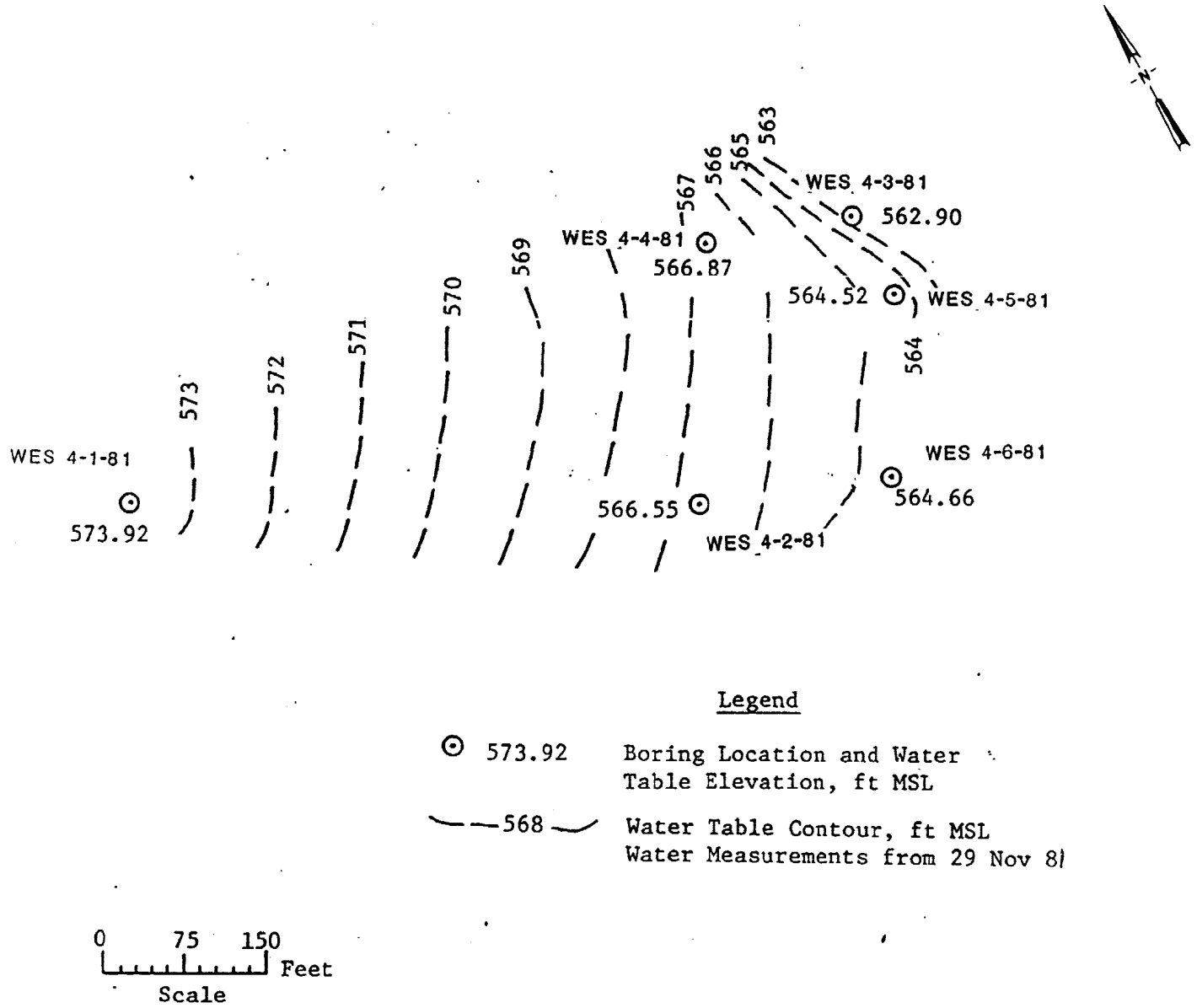


Figure 24. Ground water contour map for McComish Gorge.

TABLE 1.2.1
WELL CONSTRUCTION DETAILS
(dimensions in feet)

well number	ground elevation MSL	total depth	screen top	screen bottom	base grout	base bentonite	base sand	water level during drilling	remarks
McCOMISH GORGE									
WES-4-1-81	603.49	40.0	25.31	34.52	21.3	23.3	40.0	30.0	
WES-4-2-81	585.69	30.0	15.48	24.64	11.5	13.5	30.0	19.9	
WES-4-3-81	566.22	15.0	3.10	10.12	1.2	2.7	-->	5.5	Natural Sand, 12.3', below bentonite
WES-4-4-81	593.14	36.9	22.90	31.87	18.9	20.9	36.9	26.9	
WES-4-5-81	573.39	19.8	5.22	14.40	1.2	3.2	13.0	9.5	
WES-4-6-81	579.54	25.4	10.62	19.83	6.0	8.0	17.0	15.4	Natural Sand, 8.35' below sand
OLD BURN PIT									
WES-5-1-81	596.52	17.0	3.98	11.86	2.0	4.0	11.9	10.5	
WES-5-2-81	583.43	17.0	4.10	11.86	2.0	4.0	18.2	7.1	
WES-5-3-81	589.78	21.4	6.89	16.02	2.0	4.0	21.4	11.4	
WES-5-4-81	585.33	25.0	10.74	19.95	2.9	4.9	25.0	15.0	
WES-5-5-81	583.78	20.0	5.98	14.99	2.0	4.0	8.0	10.1	Natural Material, 12.0', below sand
WES-5-6-81	570.27	30.0	15.52	24.71	11.5	13.5	30.0	19.5	
WES-5-7-81	576.70	35.0	20.30	29.62	16.0	18.0	35.0	25.0	
WES-5-8-81	563.78	17.5	2.70	12.18	0.5	2.0	17.5	7.0	
WES-5-9-82	581.94	25.0	10.27	19.62	6.0	8.0	25.0	15.0	
WES-5-10-82	583.86	25.5	9.77	19.12	8.0	10.0	25.5	15.5	
WES-5-11-82	584.95	26.7	12.03	21.35	7.0	9.5	26.7	16.2	
WES-5-12-82	586.18	28.0	13.09	22.47	8.0	11.0	28.0	---	Water level not recorded
WES-5-13-82	581.56	25.0	10.12	19.56	6.0	8.0	25.0	14.5	
WES-5-14-83	550.92	15.0	5.16	12.82	2.0	4.0	15.0	1.7	
WES-5-15-83	---	14.8	4.98	12.45	2.0	4.0	14.8	3.5	Ground elevation not recorded
WES-5-16-83	550.59	15.0	5.06	12.75	2.0	4.0	15.0	3.5	
WES-5-17-83	557.72	15.0	5.00	12.78	2.0	4.0	15.0	2.0	
WES-5-18-83	552.99	15.0	5.00	12.57	2.0	4.0	15.0	0.0	
WES-5-19-83	562.36	15.0	4.80	12.75	2.0	4.0	15.0	2.0	

Source: Well-Completion diagrams in App. C, Dunbar (1982), and App. C, Dunbar (1983)

1.2.2 Regulatory Status (Old Burn Pit) RCRA as amended by HSWA states that a hazardous waste treatment, storage, and disposal facility must be permitted by the EPA. In 1989 NWSC Crane was issued a Storage Operating Permit. The facility was required to complete a RCRA Facility Investigation (RFI). The OBP was named as a Solid Waste Management Unit (SWMU). Corrective Action Requirements were negotiated between NWSC CRANE and the USEPA Region V. As part of the Corrective Action Requirements, NWSC CRANE is to conduct a RFI at its SWMUs. A RFI is a three-part study, consisting of a Phase I or Environmental Monitoring Report, a Phase II or Release Assessment, and a Phase III or Release Characterization Study. A RFI Phase III Groundwater study for the Old Burn Pit site, SWMU 05/03, is to be discussed in this work plan.

(McComish Gorge) McComish Gorge has the same regulatory-status history as the Old Burn Pit. A RFI Phase III Groundwater study for the McComish Gorge site, SWMU 04/02, is to be discussed in this work plan.

1.3.0 OLD BURN PIT / MCCOMISH GORGE WORK PLAN

1.3.1 Work Plan Objectives. This work plan is intended to adequately describe the site to be investigated, the rationale underlying procedural decisions implemented by the plan, and the quality control methods needed to assure defensible conclusions. Included in this plan are detailed directions which are to be used by the field personnel, laboratory chemist, and report writers. This work plan is intended to be reviewed and used by people familiar with commonly used drilling, sampling, and RCRA terms.

1.3.2 Work Plan Structure. A RFI Phase III Release Characterization is to cover four main tasks. They are the development of a Work Plan, a Facility Investigation, an Investigation Analysis, and a Report. The enclosure is the work plan, which is made up of five components. Those components are a project management plan, a sampling and analysis plan, a Quality Assurance/Quality Control plan, a health and safety plan, and a data management plan. Those individual plans will be treated as major headings and elements.

2.0 ELEMENT A: MANAGEMENT PLAN

2.1.0 PROJECT OBJECTIVES

2.1.1 Study Intent. The intent of the Phase III groundwater investigation is to determine the rate and extent (vertical and horizontal) of migration of hazardous waste or hazardous constituents in the groundwater. The Phase III work will also further define groundwater flow patterns, characterize affected aquifers at the site, and describe the hydrogeology at the site. Groundwater samples will be taken for quantitative chemical analysis of specific compounds.

2.1.2 Project Description. The project objectives will be met by the following efforts. (1) The existing wells at OBP and MG will be sampled and analyzed. The last available data was taken in 1986. (2) To fully describe the groundwater system of the areas, additional rock borings will be drilled and monitoring wells will be installed. The goals of this part of the work are to determine the vertical extent of the surface aquifer, to gather information about additional aquifers, and to place additional monitoring wells as needed. One well is intended to be placed to detail the character of the contamination in the deeper portions of the surface aquifer system. Samples will be taken and analyzed for the presence or absence of chemical contamination. (3) Slug tests will be performed to derive the groundwater parameters of the aquifers. The information will be needed to design a remedial effort, if needed, and to predict the spreading rate of the contaminant(s). It will also indicate if more aquifer testing is needed.

2.2.0 TECHNICAL APPROACH

2.2.1 Physical and Chemical Screening. An effort is planned to quickly check the site for chemical hot spots. Radioactive material is not expected at these sites. For the detection of chemical parameters a Foxboro OVA or a HNU, will be used. These are direct reading devices which are designed to detect the presence of volatile organic compounds. Their readings are of concentrations in the parts per million range. The device will be used to detect the presence of organic volatiles in the breathing zone. The breathing zone readings are taken at the mid chest level.

2.2.2 Geophysical Investigations. Geophysical surveys will be conducted at the OBP and MG. The goal of this effort is to locate and define anomalous areas that may indicate contamination. Buried alluvial channels which were defined in the Phase II soils work can be more clearly defined using geophysics. A number of methods and devices are available to conduct the geophysical surveys. Electromagnetic (EM) conductance and ground-penetrating radar are to be used. Electromagnetic conductance surveys will be the first surveys done, and they will be followed by ground-penetration radar surveys. These are rapid turnaround efforts. Their results can be reduced in the field and quickly used to guide the remaining work.

2.2.3 Sample Locations. Existing groundwater monitoring wells will be used initially to sample the groundwater. Their locations will be surveyed and their condition determined. Where needed the wells will be redeveloped. Drilling will be needed to install new groundwater wells to gather additional hydrogeologic data.

The site will be sectioned using a location grid which will be related to established bench marks. All surface and subsurface investigations will be located using that grid.

2.2.4 Sample Collection. Groundwater monitoring wells will be used to gather groundwater samples. Relative contamination levels will be based on analyses of prior well samples. The newly installed wells will be tested using the same sampling procedure. Disturbed soil samples will be collected for physical testing. Split-spoon sampling methods will be used to obtain samples down to the water table. Samples for physical testing will be taken every 5 feet and at major material-type breaks. Continuous core will be taken in well borings below the top of rock.

2.2.5 Sample Testing. Groundwater analysis for the presence of inorganics, explosives, pesticides/PCBs, herbicides, and 8240 and 8270 organics will be conducted (Table 3.1.3). The information developed will be used to characterize the groundwater and to guide remedial technique selection. Samples collected for chemical analysis will be sent to USACEWES Analytical Laboratory Group (ALG) in Vicksburg, Mississippi. The ALG's address (POC Ms. Ann Strong) is: 3909 Halls Ferry Road, Vicksburg, MS 39180. Samples collected for physical characterization will be sent to USACEWES Geotechnical Soils Investigation Laboratory, also in Vicksburg. The address for this laboratory (POC Mr. Jesse Oldham) is: 3909 Halls Ferry Road, Vicksburg, MS 39180.

2.2.6 Slug Testing. The results from slug tests will be used to derive aquifer characteristics. Slug tests are preferable to pumping tests for this investigation because they can be conducted without bringing contaminated water to the surface. A solid weight, of known volume, can be used to increase the head in the well, and the decline in head can be measured over time. The aquifer parameters of hydraulic conductivity and storativity can be computed for the area close to the well bore.

Each well test must be approached on an individual basis. Adjustments must be made for changes in well design or aquifer conditions. Hvorslev-method analysis will be used for most tests at Crane. The Hvorslev-method analysis can be used for a variety of well shapes, confined or unconfined aquifers, and partial or fully penetrating screens. Changes in the well design or in aquifer conditions will necessitate changes in the equations needed to calculate hydraulic conductivity and storativity.

A minimum of two tests will be performed on each well. The changes in water levels will be measured with a pressure transducer and recorded with a data logger (Hermit).

2.2.7 Survey Plan. An accurate survey will be made of all existing and future wells and tied to NWSCC control. All surveys will be performed by certified professional surveyors. Accuracy of ground surface elevations shall be to +/- 0.01 foot.

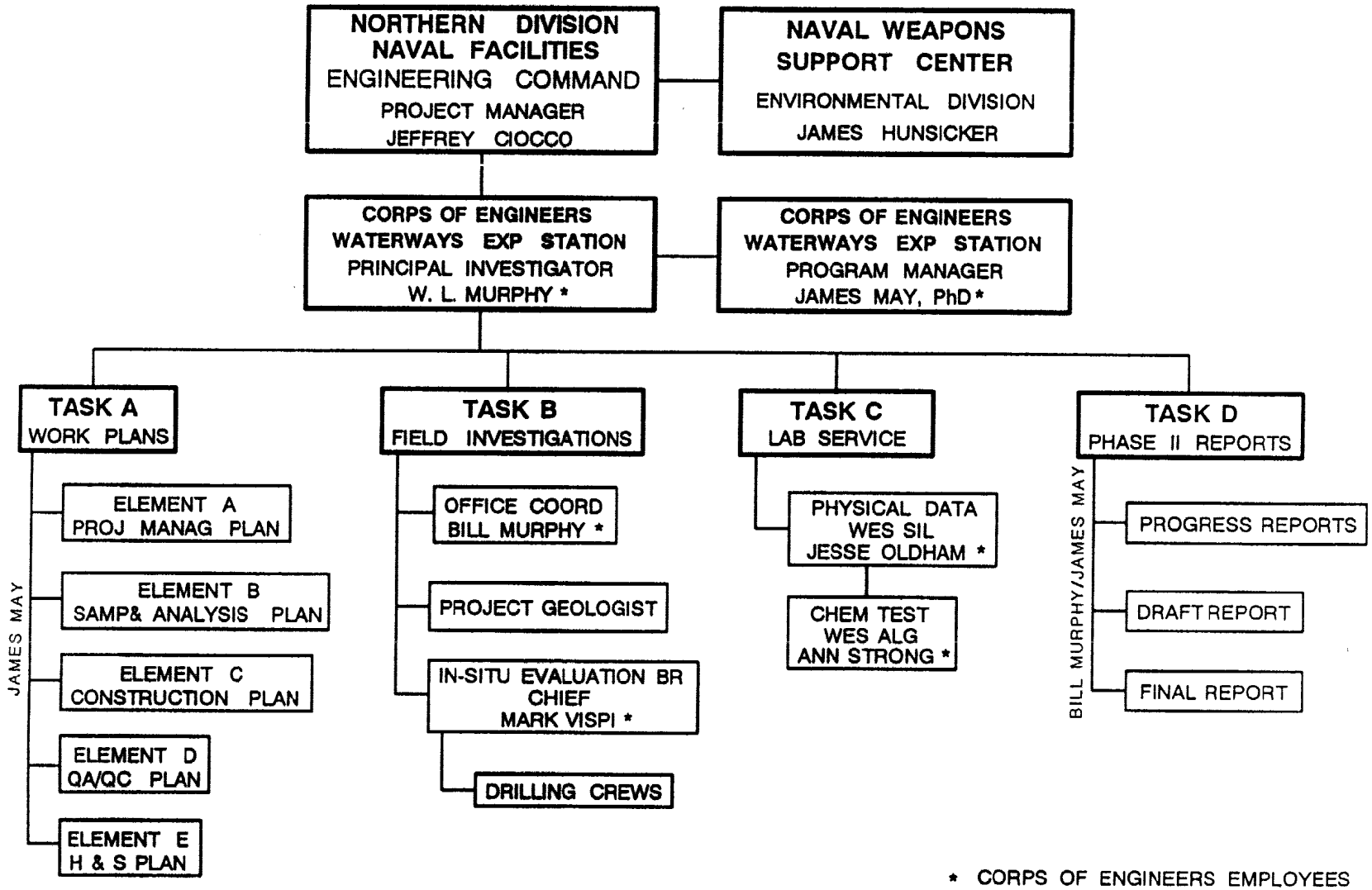
2.3.0 STUDY MANAGEMENT

2.3.1 Management Responsibilities. The Navy's prime contractor for this RCRA investigation is USACEWES. A project team, which is made up of United States Army Corps of Engineers (USACE) personnel, was assembled (Diagram 2.3.1). Oversight and management responsibility will be handled by Dr. James May and Mr. William Murphy of USACEWES' Geotechnical Laboratory. General program management and oversight will be the responsibility of Dr. James H. May of USACEWES. The planning, scope writing, and report preparation is also the responsibility of Dr. May and Mr. Murphy. Field work supervision will be the responsibility of a USACEWES geologist. Drilling will be done by personnel from the In Situ Evaluation Branch, Geotechnical Laboratory, USACEWES. Mr. Mark Vispi is the Branch Chief. The chemical analysis is to be processed through the USACEWES' Analytical Laboratory Group (ALG) under the supervision of Ms. Ann Strong. All chemical-data validation will be done by Blaze Willis of USACE Engineering District, Savannah, Georgia. Soils classification and physical testing will be done at the USACEWES Soils Investigation Laboratory under the supervision of Mr. Jesse Oldham. Report preparation will be done by USACEWES personnel.

2.3.2 Program Schedule. Diagram 2.3.2 is a work schedule which illustrates expected work durations, phase structure, phase completion dates, and milestone dates. Note that a major decision point is scheduled after the geophysical work is completed and the sampling and analyses of existing wells are completed. At this time it will be decided if the additional monitoring wells are justified. Field work-weeks are to be 6-day weeks. The Internal Draft is followed by a Draft Report which is reviewed by the EPA. Forty-five days are allotted for EPA review and comment. Twenty days for incorporation of comments are scheduled to prepare the final report. Bimonthly progress reports will be issued. These reports will include overall project progress, individual study progress, impending schedule targets, and expected or existent schedule adjustments. Because the bimonthly progress reports are independent of the individual study work plans, they are not shown on the work schedule (Diagram 2.3.2).

RCRA FACILITY INVESTIGATION, PHASE II SOILS
OLD BURN PIT 05/03

PROJECT ORGANIZATION CHART



* CORPS OF ENGINEERS EMPLOYEES

DIAGRAM 2.3.1

SCHEDULE FOR RFI PHASE III GROUND WATER RELEASE CHARACTERIZATION FOR OBP AND MG

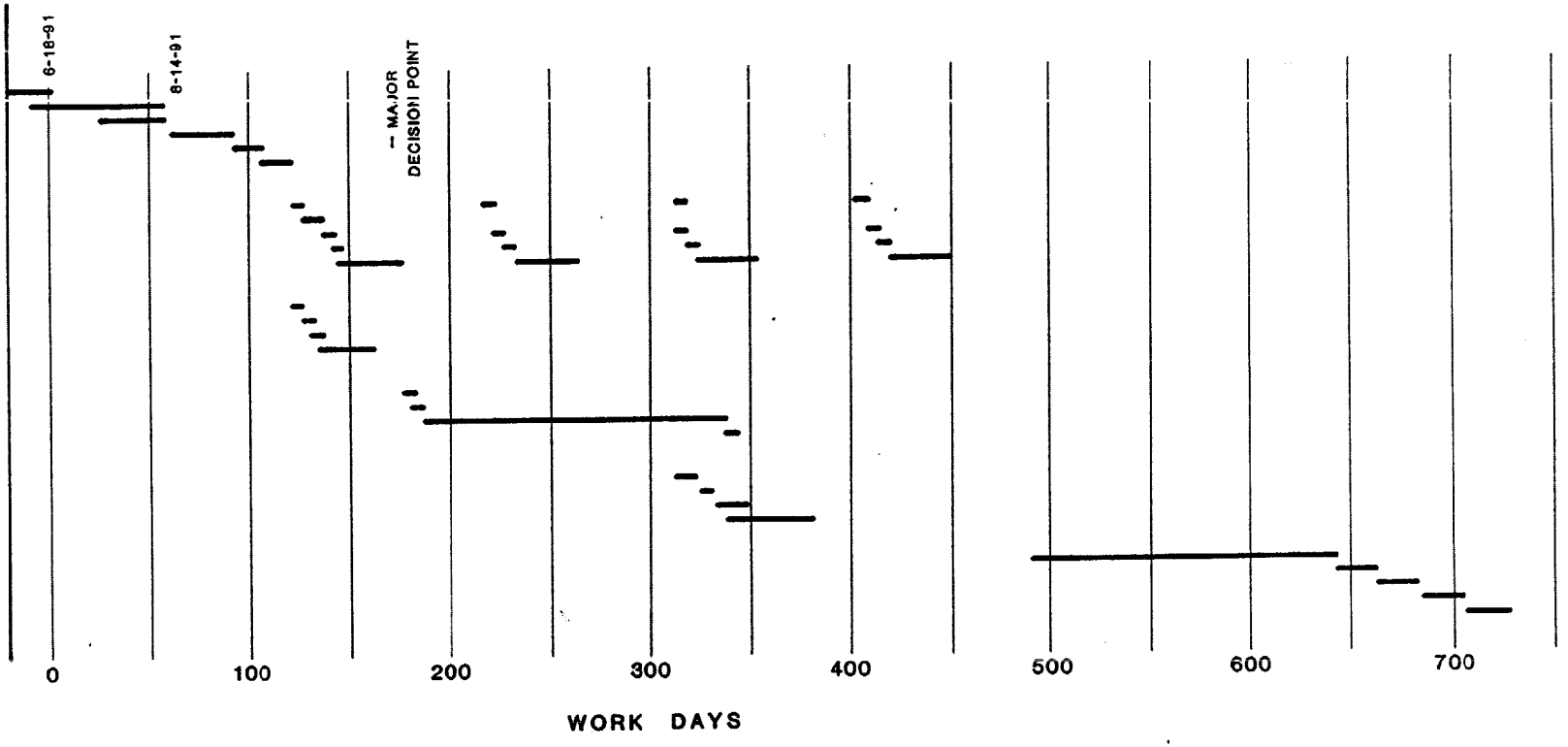


DIAGRAM 2.3.2.SCHEDULE

3.0 ELEMENT B: SAMPLE AND ANALYSIS PLAN

3.1.0 SELECTION PROCEDURES

3.1.1 Selection Rationale. At McComish Gorge (MG) and the Old Burn Pit (OBP) a wide variety of wastes were buried and burned. A Phase III Release Characterization for groundwater must be performed at both sites since they have been identified as Solid Waste Management Units (SWMU's). The intent of the Phase III work is to determine the rate and extent of migration of hazardous constituents in the groundwater. The soils will be screened using a Foxboro OVA. Geophysical investigation devices to be used are an electromagnetic device and a ground-penetrating radar unit. The resultant data will be used to select locations for monitoring wells. The groundwater will be tested for chemical contamination using SW-846 analytical methods, or other accepted methods when no SW-846 method is available. The use of these methods is described in the Corrective Actions portion of the permit. The particular procedures selected were determined by the site-specific descriptions of the wastes. Waste descriptions were obtained from review of groundwater data and historical disposal documentation. US Army Corps of Engineers geotechnical procedures will be used to physically characterize the soil. These methods are found in US Army Corps of Engineers publication EM 1110-2-1906.

3.1.2 Sample Location. The existing groundwater monitoring wells will be used initially to sample the groundwater. The exact location of the additional monitoring wells will be dependent on the geophysical results and initial groundwater sampling data. Based on the results of the Phase II soils work, both OBP and MG sites are larger than previously thought. Also the presence of buried alluvial channels may cause contaminants to be moving in selected pathways. Cluster wells (if need is established) will be placed in these potential pathways to determine vertical and lateral extent of contamination. A deep boring will be placed at each site to establish stratigraphic control. The installation of the additional monitoring wells will be coordinated with planned slug tests at each site. The cluster wells will be used to define any aquifers in addition to the surficial aquifer. It is also possible that pollution has become stratified, with heavier chemical compounds vertically separated from lighter compounds. The cluster wells will help define this potential chemical stratification. Tentatively 10 additional monitoring-well clusters are planned at the MG and 15 monitoring wells at the OBP (Figures 25 and 26). Figure 27 shows how well clusters will be used to isolate aquifers at different depths. It should be noted that Figure 27 illustrates how wells will be placed, and also that the geology is for the area of the Dye Burial Ground.

3.1.3 Chemical Analyte Selection (Old Burn Pit) Analyte selection is based on the probability of a contaminant occurring at the site. The OBP area was used to burn rubbish, solid wastes, and liquid wastes. No explosive wastes were burned here. The principal contaminants could be organics and metal wastes. Groundwater monitoring has been performed at the site and the detected contaminants were organics. The analytical test parameters listed in Table 3.1.3 were selected on the basis of their probability of occurring at the site. The 8240 and 8270 organics were selected because of their common industrial use, their reported disposal and their detected presence in the groundwater and soils. Pesticides, PCBs, and herbicides are used at NWSC Crane and may have been burned at the site. Metals are always a possible contaminant at a landfill site.

(McComish Gorge) Rubbish, solid wastes, liquid wastes, and explosive wastes were reportedly buried at MG. The principal contaminants are organics and metal wastes. Groundwater monitoring has been performed at the site and the detected contaminants were metals. No pesticides or organics were detected in the groundwater samples. The analytical test parameters listed in Ta-

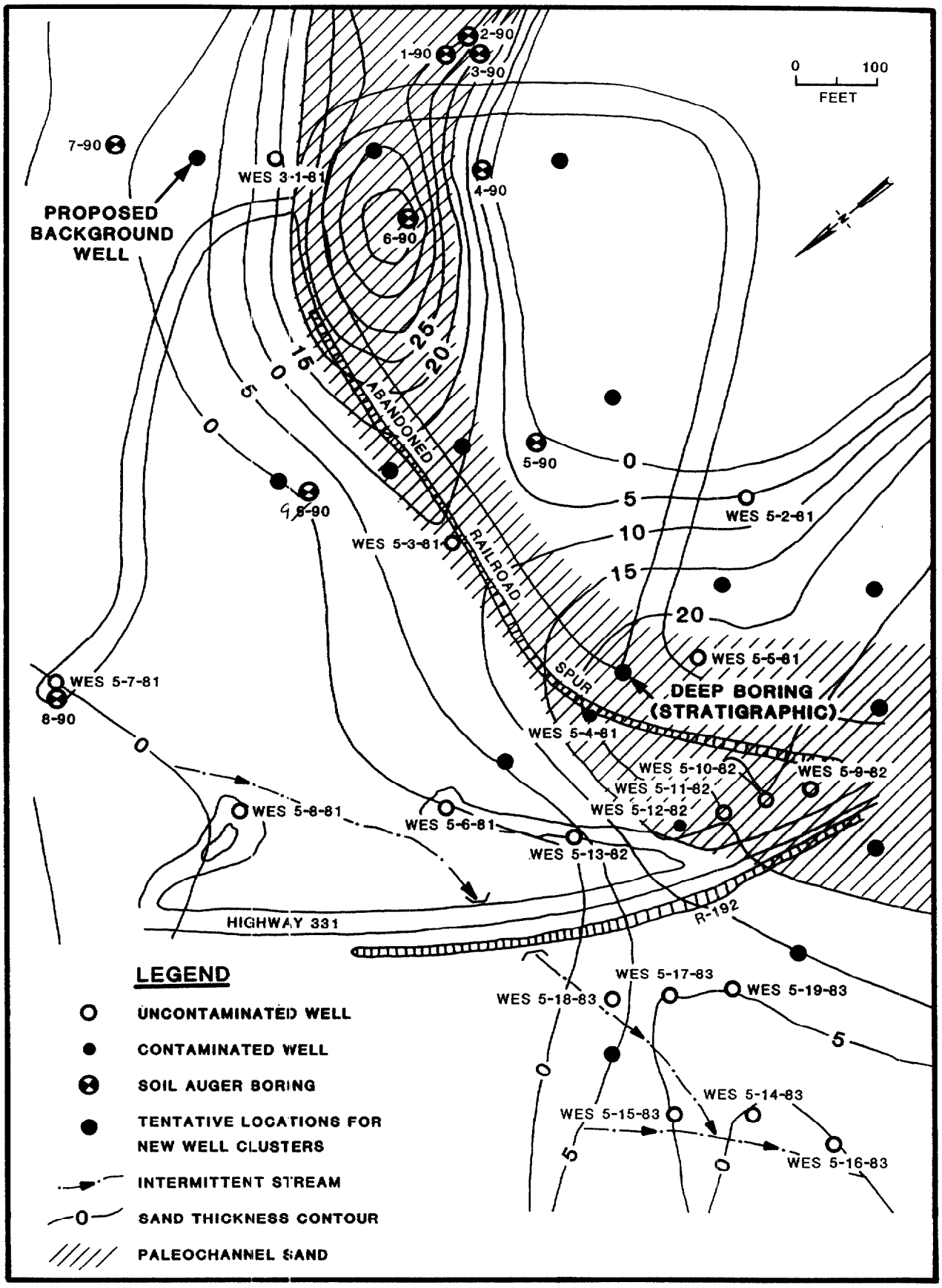


Figure 25. Tentative locations for new well clusters at Old Burn Pit.

(After Alberson 1991, draft)

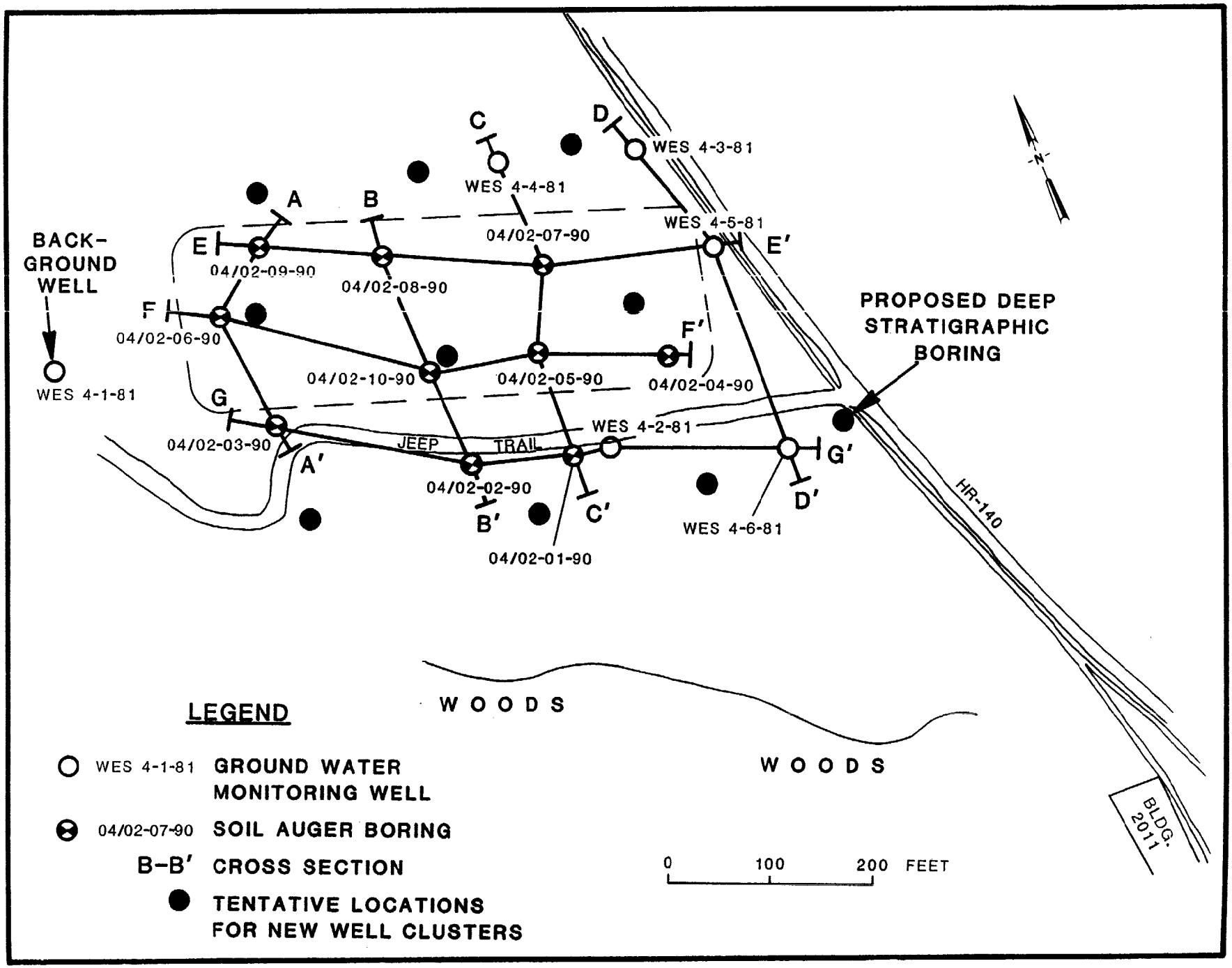


Figure 26. Tentative locations for new well clusters at McComish Gorge.

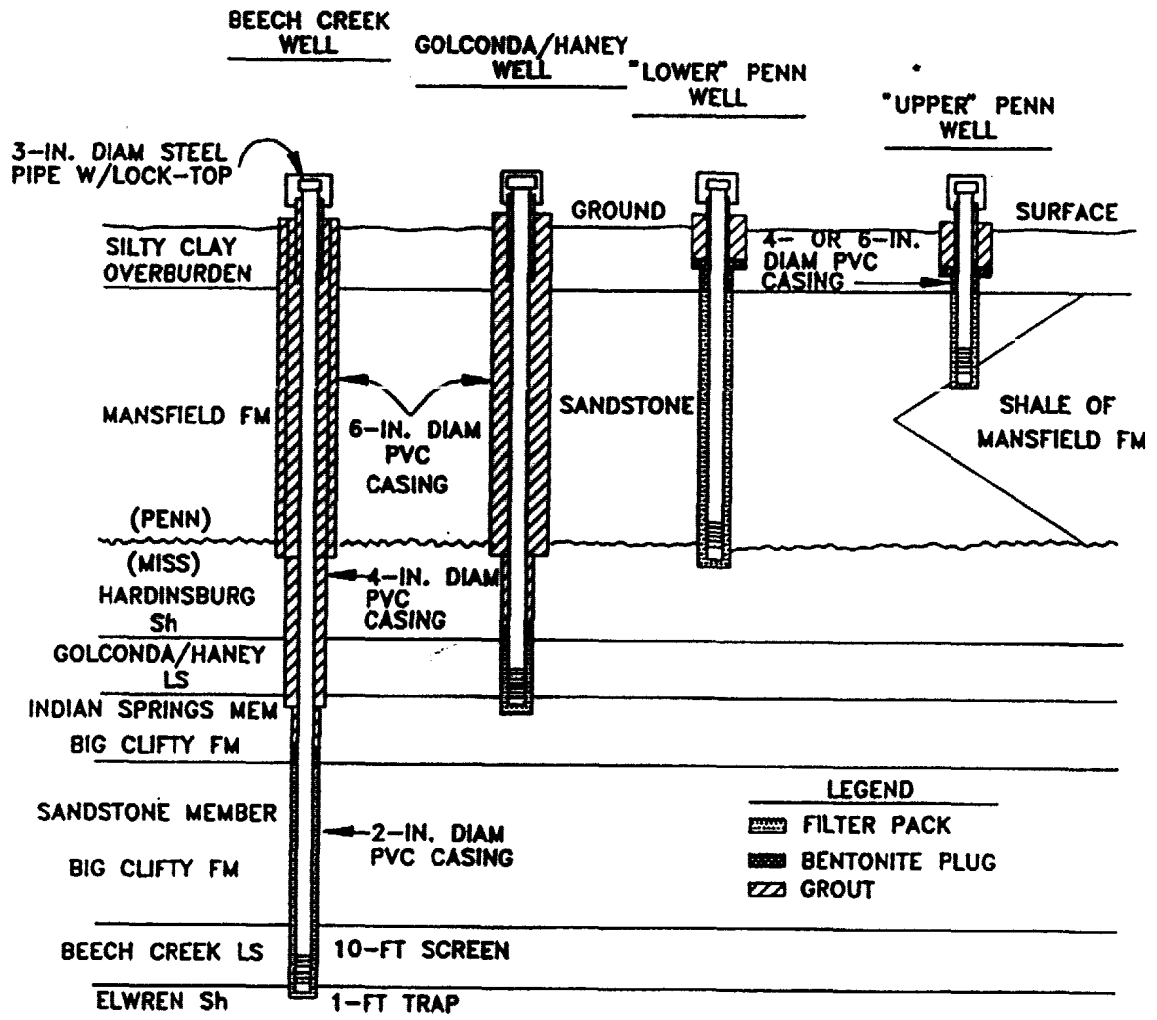


Figure 27. Schematic of typical well cluster installation.

ble 3.1.3 were selected on the basis of their probability of occurring at the site. The 8240 and 8270 organics were selected because of their common industrial use. Explosives were selected because they may have been placed here. Pesticides, PCBs, and herbicides are used at NWSC Crane and may have been buried at the MG site. Metal contamination was detected during the sampling program.

TABLE 3.1.3
LIST OF PARAMETERS

EXPLOSIVES	INORGANICS		ORGANICS
HMX	Aluminum	Lead	Volatiles
TNT	Antimony	Magnesium	8270 Semivol.
RDX	Arsenic	Manganese	Organochloride pesticides and PCB
135 TNB	Barium	Mercury	
13 DNB	Beryllium	Nickel	Organophosphorus pesticides
246 TNT	Cadmium	Phosphorus	Chlorinated herbicides
24 DNT	Calcium	Selenium	
26 DNT	Chromium	Silver	
NB	Cobalt	Sodium	
2 NT	Copper	Thallium	
3 NT	Cyanide	Tin	
4 NT	Iron	Zinc	

3.1.4 Analytical Method Selection. Analytical method selection for chemical analytes is a matter determined by environmental regulation. US EPA mandates that RCRA studies adhere to procedures and methods set out in "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods" SW-846, Third Edition. Organic and inorganic test methods are given in Tables 3.1.4a and 3.1.4b.

3.1.5 Physical Parameter Selection. Soil samples will be characterized using standard USACE geotechnical methods. The soil samples will be described and classified in the field by the field crew. USCS classification will be done at the laboratory and will consist of visual classification, sieve and hydrometer analysis to determine grain size distribution, and determinations of natural water content, Atterberg Limits, and organic content. The sieve analysis determines the gradation of grain sizes ranging from the number 4 sieve to the number 200 sieve. The hydrometer analysis determines the percentage of silt- and clay-sized particles in the sample (finer than the number 200 sieve).

3.2.0 SAMPLING PROCEDURES

3.2.1 General Principles. Direct body contact with the samples must be avoided. To minimize the spreading of contamination between samples, samplers will wear disposable latex gloves. The outer pair of latex gloves are to be changed between each sampling event. All sampling equipment and drilling equipment will be decontaminated between usage.

Monitoring wells will be installed in and around the OBP and MG to provide for measuring groundwater levels (for unconfined aquifers) and piezometric surfaces (for confined aquifers), determining subsurface geology, and collecting groundwater samples to detect chemical contamination. The water samples will be collected using a Teflon bailer or stainless steel pump. An attempt

TABLE 3.1.4a
SUMMARY OF METHODS FOR DETERMINATION
OF INORGANIC METALLIC ANALYSIS

METAL ANALYSIS	TECHNIQUE*	METHODS FROM SW-846 ANALYSIS
Aluminum	ICP	6010
Antimony	ICP	6010
Arsenic	GF	7060
Barium	ICP	6010
Beryllium	ICP	6010
Cadmium	ICP	6010
Calcium	ICP	6010
Chromium	ICP	6010
Copper	ICP	6010
Iron	ICP	6010
Lead	ICP	6010
Manganese	ICP	6010
Mercury	CV	7471
Nickel	ICP	6010
Selenium	GF	7740
Silver	ICP	6010
Sodium	ICP	6010
Thallium	ICP	6010
Zinc	ICP	6010

* Abbreviations: GF = Graphite Furnace, CV = Cold Vapor,
ICP = Inductively Coupled Plasma

TABLE 3.1.4b
SUMMARY OF METHODS FOR DETERMINATION
OF ORGANIC COMPOUND ANALYSIS

ORGANIC ANALYSIS	TECHNIQUE	ANALYSIS METHODS
Volatiles	GC/MS	8240
Semivolatiles	GC/MS	8270
Organochloride Pesticides & PCBs	GC/MS	8080
Organophosphorus Pesticides	GC/MS	8140
Chlorinated Herbicides	GC/MS	8150

will be made to move from the least contaminated wells to the most contaminated wells. To insure that the samples represent the conditions existent in the aquifer, three casing volumes of water will be drawn prior to sampling.

3.2.2. Soil and Rock Sampling. Soil borings will be placed using a truck-mounted drilling rig. Samples will be taken at specified depths above the water table and at the point of refusal for physical testing and chemical analysis. A Shelby Tube or split-spoon sampler will be used to collect soil samples. The sampler will be advanced through a hollow-stem auger. The hollow-stem auger will be used because it will minimize cross contamination of samples. As the auger advances into the soil, protective casing is advanced. This casing will prevent the hole from caving. At the ground surface, the sampler will be opened and the sample extracted. All samples will be placed in wide-mouth glass jars or other containers, with minimal disturbance of the sample. Sample-jar types and sizes are given on Table 3.2.7.

Continuous core will be taken with a diamond core barrel once the bedrock is encountered. The core boxes will be permanently labeled and transferred to the core storage area. Core boxes will be tranferred to the storage area at the completion of each well or cluster or at the completion of site drilling. The core storage area is in magazine 1970 on Highway 333 west of the Demo ridge, down from the sedimentation pond.

3.2.3 Drilling Techniques. Three drilling methods, as described in US Army Corps of Engineers publication EM 1110-1-1804, are to be used. The method to be used at any particular boring or depth will depend on the particular medium to be sampled. Soil borings will be drilled using hollow-stem augering methods. Rock drilling will be accomplished using rock-bit and wireline-coring methods. Only the first and deepest well boring of a cluster of wells is to be cored and logged, since the geology penetrated by other borings in the cluster will be closely the same as in the first boring, and the time and expense of coring and logging the other cluster borings are unwarranted.

At sites needing rock coring, the following procedures are to be used. The soil zone will be drilled using a hollow-stem auger down to refusal. Where the soil thickness is greater than 11 feet, core samples will be taken with a HQ wireline system. If the depth to refusal is less than approximately 11 feet (the depth needed to start coring with the HQ wireline core barrel), then a 2-foot-long NX coring barrel will be used to sample to 11 feet. The core samples will be placed, in order of removal, into plywood boxes for future reference, and detailed geologic logs will be prepared. This work requires the services of a professional geologist. Care will be taken to collect all drill cuttings and to place those cuttings in drums. Marking of the drums and disposal of the cuttings are discussed in Section 3.4.5.

3.2.4 Well Construction. A system of 2-inch-IDflush-threaded schedule 40 PVC pipe and screen will be used toinstall the monitoring wells. The screen length is dependent onthe aquifer thickness but will not exceed 10 feet without Navy approval. The well materials will be steam-cleaned prior to installation. Well screens will consist of 2-inch-diameter slotted PVC. Well riser pipes will consist of PVC and will extend upward to a point approximately 2.5 feet above the ground surface. The bottom of the well screen will have a non-slotted PVC trap extending one foot below the screen.

In wells to be screened in bedrock, screens with a slot width of 0.020 inch, which has worked well previously at NWSCC in bedrock wells, will be used. In wells to be screened in soil, specific attention to the gradation of the soil is necessary so as to avoid gross mismatches in grain size between native soil, filter pack, and screen slots that would allow fines to migrate from the soil and clog the filter pack and screen. Such wells will be designed in accordance with procedures outlined in Section 5, "Design Components

of Monitoring Wells," subsection "Monitoring Well Intakes," pp. 173-192, in Aller et al. (1989).

Once the pipe system is installed in the boring, the annulus of the screened section and the total aquifer zone will be packed with a coarse silica sand filter material. The filter material will be poured in from the top of the well slowly by hand and periodically checked for depth with a tape measure. The filter pack will be brought up to the next higher aquiclude. The size of the filter sand will be determined based on the size of the sand in the aquifer being screened. Rock wells do not have to be packed. The silica filter sand must be certified clean and shipped to the site in sealed bags. The screened groundwater zone must be isolated from the remaining well annulus above the well screen. It is to be capped with a 3-to-5-foot thickness of bentonite pellets which will act as a sealing medium. The bentonite is allowed to set 30 minutes to 1 hour for swelling time, and the well is then to be grouted to the surface. The grout will be a cement-bentonite mixture. It is to be pumped into the well from the bottom through a 3/4-inch-diameter pipe. The top of each well has a vented PVC cap. A typical well installation is shown in Figure 27.

This general installation procedure will be used for all the new wells. It will be modified for the wells which are to test the base of the surface aquifer and possibly the deeper aquifers. The slotted screen for the base of the surface aquifer test will be 5 feet in length and will cover only the basal 5 feet of the aquifer.

3.2.5 Well Development. A bailing and surging procedure will be used to develop the new wells and to redevelop the old wells needing rehabilitation. The surge tool is a length of stainless steel rod with rubber washers attached at each end. The washers are to be slightly smaller than the inside diameter of the well pipe. The bailer is a 5-foot-long stainless steel or Teflon bucket with a diameter that is slightly less than the casing inside diameter. The tools are alternately lowered into the well on a stainless steel cable and pulled briskly up and down within the screened zone. This bailing/surging procedure creates a surging action within the screened zone. This action is to flush the finer particles out of the screen and packing material, allowing better flow of groundwater into the well from the aquifer. These processes are repeated for several hours in each well or until the water forced out at the top becomes relatively clear. The developing tools will be flushed with clean water before each well-development setup.

Well development by compressed air will not be used because oil could be introduced into the aquifer from the compressed air used in the development process. It has been found that even with inline oil filters, oil can still escape into the formation.

All water generated by the development process and by the decontamination process will be collected and placed in drums. These drums will be marked and left at the drill site. The marking and disposal of the drummed material is discussed in Section 3.4.5.

3.2.6 Well Protection. The riser pipe will be protected at the surface by 3-inch-diameter steel pipe with locking cap. The WES will provide keyed-alike locks for all wells. A minimum 3-feet-square, 4-inch-thick concrete pad, sloping away from the well, will be installed at each site. Three 4-inch-diameter steel posts will be equally spaced around the well. The posts will be embedded in concrete, but separated from the protective concrete pad. A permanent tag that clearly identifies the well number, date constructed, screen interval, well depth, and top of inside well casing elevation will be placed on each well.

3.2.7 Groundwater Sampling. Samples will be taken using a Teflon bailer lowered into the well with a stainless steel leader. Newly installed wells must be fully developed in accordance with the installation plan prior to sampling. The depth to the water table will be determined using a steel tape. Prior to sampling, the wells must be purged. This involves removing three well volumes of water from the well. Before purging a well, groundwater parameters (water-table depth, pH, temperature, and water conductivity) will be determined and recorded. Groundwater parameters must have stabilized before a well is sampled. The water sample will be poured from the bailer into proper sampling containers. Sample jar types and sizes are given in Table 3.2.7. For volatile organic analysis, two 40-mL VOA vials are filled first. They should be completely filled with no headspace or bubbles. Samples for the other parameters will then be collected. Nitric acid (HNO_3) will be added to water collected for metal analysis. The pH of the sample should be lowered to <2 for proper preservation.

TABLE 3.2.7
CHEMICAL ANALYSIS
SUMMARIZATION OF SAMPLE CONTAINERS

MATRIX CONTAINERS	PARAMETERS
Water Volatiles	Two 40 mL glass vials
Water Semivolatiles	One 1000 mL amber glass jars
Water Metals	One 1000 mL plastic jar
Water Chloride and Conductance	One 8 oz glass jar

3.3.0 DECONTAMINATION PROCEDURES

3.3.1 General Procedures. To prevent the spreading of contaminants from one location to another and from one level to another, the sampling and drilling equipment will be cleaned between uses. The sample containers will be pre-cleaned before being delivered to the site. All personnel involved in the equipment decontamination will wear protective clothing.

3.3.2 Sampling Devices. All sampling devices will be cleaned using the following steps.

1. If mustard gas is detected, decontaminate the equipment with a HTH wash.
2. Scrub equipment with a non-phosphoric detergent and potable water.
3. Rinse with potable water.
4. Rinse with 0.1-N HNO_3 (nitric acid).
5. Rinse with deionized water.
6. Rinse with methanol (pesticide grade).
7. Air dry.
8. Rinse with deionized water. Collect rinsate blanks now.
9. Air dry.
10. Wrap or cover sampling equipment with aluminum foil (shining side out) when not in use.

3.3.3 Sample Containers. The sample containers will be obtained from a supplier (ICHEM Research Inc.). The containers will be pre-cleaned. The containers will be shipped to the location in sealed packages. A verifi-

cation of the decontamination procedure will accompany every container shipment.

3.3.4 Drilling Equipment. Drilling equipment will be decontaminated before moving to the location. A Decon pad will be constructed on the site. The complete rig and all drilling tools will be cleaned before moving to a new SWMU. Only the drilling equipment, drill pipe, coring device, and auger tools will be cleaned between boring/drilling sites or aquifers. The equipment will be steam cleaned and scrubbed with detergent water.

3.3.5 Rinsate Disposal. Wastewater generated during the cleaning and decontaminating of the sampling equipment will be collected if it is contaminated. Decontamination will be done on site.

3.4.0 SAMPLE DOCUMENTATION PROCEDURES

3.4.1 General Procedure. Field parameters will be recorded in a field logbook. These parameters will be transferred to Data Sheets, Chain of Custody Forms, Drilling Logs, and Sample Tags. Final documentation will be made from a consolidation of those notes, data sheets, and laboratory data.

3.4.2 Chain of Custody. A Chain-of-Custody program will be initiated in the field upon collection of the sample. A Chain-of-Custody record will acompany each shipment of samples at all times. An example of a Chain-of-Custody record is shown in Figure 28. A Chain-of-Custody Sample Tag and an example of a Tamper-Proof Shield are shown in Figure 29.

3.4.3 Sample Labeling. At the time of sample collection the sample will be placed in a pre-labeled, pre-cleaned sample container. The sample label is to contain the following information:

1. Site name.
2. Field station number.
3. Date and time of sample collection.
4. Sample type (grab or composite).
5. Sample location description.
6. Signature.
7. Sample preservative used.
8. Analyses type.

3.4.4 Field Logbook. The inspector will keep a logbook. It will contain a detailed record of particulars about each sample and sampling condition. This logbook will contain certain operational information: environmental conditions, equipment conditions, soil conditions, boring locations, equipment calibrations, personnel changes, etc.

Sampling information will also be kept in the logbook. This information is to include: sampling dates, sample numbers, sample descriptions, sample depths, groundwater conditions, and other pertinent sampling information. When sampling groundwater pertinent information should include: identification of well, well depth, static water level depth and measurement technique, presence of immiscible layers and detection method, well yield-high or low, time well purged, collection method for immiscible layers and sample identification numbers, well evacuation procedure/equipment, sample-withdrawal procedure/equipment, data and time of collection, well sampling sequence, types of sample containers used and sample identification numbers, preservatives used, parameters requested for analysis, field analysis data and methods, sample distribution and transporter, field observations on sampling event, name of collector, climatic conditions including air temperature, and internal temperature of field and shipping (refrigerated) containers.

Proj. :	Project Name					Number of Containers								
Sampler : *(Signature)*														
Date	Time	Pres.	Grab	Comp	Site Code/Sample Number									Remarks:

Sampler Relinquished by:	Date/Time	Received by: (Sig.)	Date/Time	Hazards Associated with Samples
Relinquished by: (Sig.)	Date/Time	Received by: (Sig.)	Date/Time	
Relinquished by: (Sig)	Date/Time	Received for Laboratory by: (Sig.)	Date/Time	Remarks at time of receipt:
Custody Seal No.		Lab case No.:		

ENG Form 5021-R, Oct 90

Proponent: CEMP-RT

Figure 28. Chain of Custody Form.

CHAIN OF CUSTODY

U. S. ARMY CORPS OF ENGINEERS
WATERWAYS EXPERIMENT STATION
P.O. DRAWER 631
VICKSBURG, MS 39180

United States Army
Corps of Engineers
...Serving the Army
...Serving the Nation

U.S. ARMY CORPS OF ENGINEERS

Station No.	Date	Time	Sequence No.

Station Location

_____ Grab
_____

_____ BOD
_____ Solids
_____ COD
_____ Nutrients
_____ Metals
_____ Oil & Grease
_____ D.O.
_____ Bact.
_____ Other

Remarks/Preservative:

Samplers:

Serial Tag No. _____

U.S. ARMY CORPS OF ENGINEERS
OFFICIAL SAMPLE SEAL

Sample No. Date

Signature

Print Name and Title (Inspector, Analyst, Tech

Figure 29. Example of Chain of Custody Sample Tag and Tamper-proof Seal.

Other information to be recorded in the logbook includes Chain-of-Custody data, sample shipment information, decontamination documentation, and personnel changes. The logbook will contain a detailed inventory of all waste drums generated by the operation. This inventory will describe the drum contents, and the boring number from which it was derived. The wastes generated during the decontamination of the sampling equipment will be marked by boring number. Decontamination-pad wastes will be identified as such. The logbook will remain at the site and will become a part of the project record at the end of the project.

3.4.5 Drum Inventory. Should material be encountered which has to be drummed, an inventory of all waste material drums will be kept by the site manager. This inventory list will contain a description of the drum, its location, its content, and the date filled. The inventory will be used later to determine the drum content for disposal. This list will be kept as a part of the operation records.

4.0 ELEMENT C: QUALITY ASSURANCE/QUALITY CONTROL PLAN

SEE QUALITY ASSURANCE PROJECT PLAN IN APPENDIX A

5.0 ELEMENT D: HEALTH AND SAFETY PLAN

SEE APPENDIX B

6.0 DATA MANAGEMENT PLAN

6.1.0 General. A RFI Work Plan is made up of five elements. The purpose of the Work Plan is to guide the investigative work through those separate elements. The Data Management Plan is the final element of the Work Plan. It is the part of the Work Plan that explains the movement of the data to final report form. Chemical and Physical Data is reduced from its raw form into final form by the laboratory personnel. The final data is then put into a report format. The data will be presented in various text, tabular, and graphic formats.

6.2.0 Data Record. Recorded data will consist of site (SWMU) locations, sampling station (boring) numbers and location, sample number and depth sampled, date sampled, names of sampling personnel, sample descriptions and other boring-log data, Chain-of-Custody information, parameters measured, laboratory results, and analysis of results. Locations will be recorded on base maps.

Chemical results will be presented in laboratory report format and NEESA required EPA Contract Laboratory Program forms. Physical laboratory results will be presented as computer printouts generated by the analyzing laboratory and will include parameters such as the sample number, parameter measured, amount detected, date analyzed, units used, and a lab ID number for each sample. The data will be presented in Appendices to all the drafts and the Final Report.

6.3.0 Tabular Displays. Summary tables of data will include field data (sample station number, number of samples per station, depths sampled, date sampled, etc.) and laboratory data for chemical and physical testing results.

6.4.0 Graphical Displays. Data will be presented in various graphical formats. Sample boring locations will be presented on base maps. Contaminant plume maps will be made to display the contaminant spread. Cross sections will be made to display the vertical distribution of soil type. Bar and line graphs will be used to show contamination levels. Pertinent photographs will

be included in the report to refine a point or add emphasis to a finding. Other displays are possible.

6.5.0 Report Format. An internal draft, a draft, and a final report will be submitted. A period of time for commenting will occur between the internal draft report, the draft report, and the final report. This comment period will allow for important perspectives to be considered. The contents of the reports shall be arranged in accordance with the suggested RFI format as presented in RFI Guidance Manual (USEPA, OSWER Directive 9502.00-6c, May 1989). The report shall consist of 8-1/2" × 11" pages with drawings to be folded, if necessary, to this size. There will be an Executive Summary and Conclusions section in the report. In the initial draft and the draft report, there shall be a statement listing the persons who had significant and specific input into the report's preparation. This statement will include the individual's name, job title, and telephone number. A decimal paragraphing system shall be used, with each section and paragraph of the reports having a unique decimal designation. Large displays will be presented as Plates found at the end of the report but referred to within the text. To reduce the number of drawings, data and ideas should be combined on drawings. But drawing details will not be cluttered or poorly organized. The data must not reduce the drawings effectiveness. All drawings shall be of engineering quality in drafted form with sufficient detail to show interrelations of major features and/or thoughts on the installation site map. A decimal paragraphing system shall be used, with each section and paragraph of the reports having a unique decimal designation. The report covers shall consist of durable 3-ring binders and shall hold pages firmly while allowing the easy removal, addition, or replacement of pages. Only in the appendix of the draft report should there be a statement listing the persons who had significant and specific input into the report's preparation. This statement will include the individual's name, job title, and telephone number.

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APPENDIX A

QUALITY ASSURANCE PROJECT PLAN FOR OBP AND MG

IN5 170 023 498
12 FEBRUARY 1992

ELEMENT 1

QUALITY ASSURANCE PROJECT PLANS FOR RCRA FACILITY INVESTIGATION (RFI) AT THE OLD BURN PIT AND MCCOMISH GORGE SOLID WASTE MANAGEMENT UNITS NAVAL WEAPONS SUPPORT CENTER, CRANE, INDIANA

ELEMENT 2

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ELEMENT 3

PROJECT DESCRIPTION

Introduction. At the OBP and MG a wide variety of wastes were buried or burned. Some of these materials present special hazards. The OBP and MG were identified as a Solid Waste Management Units (SWMUs). Phase III release assessments must be performed at these sites.

Background. To fulfill the Corrective Action Requirements of the Federal Portion of the Final RCRA/HSWA Part B Permit, Naval Weapons Support Center (NWSC), Crane, Indiana will be conducting a RCRA Facility Investigation (RFI) at the OBP and MG. The US Army Corps of Engineers' (USACE), Waterways Experiment Station (USACEWES) will be conducting the study.

The Old Burn Pit site was used from 1942 to 1972. Garbage and trash was burned at the site. This rubbish included wood, paper, building material and industrial wastes. No explosive wastes were burned here. The material was burned in a depression or pit structure. Ash residue from this burning operation along with metallic objects were buried in the gully to the north of the burn pit. Today the site is used as a parking area for delivery trailers. Since 1972 the site has revegetated. Contaminated leachate is migrating from the pit and ash fill. Contaminants have been found in groundwater samples. Amounts of Trans-1,2 dichloroethylene, chloroform, and trichloroethylene exceeding 50 ppb have been detected in some of the groundwater samples drawn from monitoring wells at the OBP.

The McComish Gorge dump site was used for an unknown period of time between 1942 to 1972. Records of its use are indefinite. Undetermined amounts and types of garbage and trash were buried at the site. This rubbish could include wood, paper, construction material, plaster filled warheads, metal shaving, and industrial wastes. Reportedly small arms ammunition were buried here. Today the site is not used and the site has revegetated .

In 1981 a team from the USACEWES completed a groundwater and soils investigation at the OBP. Between 1981 and 1983 a total of nineteen monitoring wells were installed at this site. Groundwater quality testing resulted in the detection of organic contaminants. The contaminants are TCE, chloroform, and dicloroethylene.

In 1981 a team from the USACEWES completed a groundwater and soils investigation at the MG. In 1981 six monitoring wells were installed at this site. A replacement well (4A) was installed in 1986. Groundwater quality testing resulted in the detection of metal contamination. Primary drinking water standards were used to flag elevated conditions. The elevated parameters were cadmium, chromium, fluoride, iron, manganese, mercury, sodium, barium, and sulfate.

Site Setting. The NWSC is a Naval Facility located in Martin County, Indiana. The NWSC covers approximately 62,463 acres. The OBP occupies approximately 25 acres and is located near the center of the facility in the NE one fourth of Section 8, T5N, R4W, 38°53' 24" north latitude and 86°52' 42" longitude. The area is approximately 2000' east of the Crane Gate No. 4. It is accessed using Crane Road H-331 off of Crane Road H-5. The McComish Gorge site occupies about 5 acres and is located in the NE one fourth of Section 7, T5N, R4W, 38°53' 22" latitude and 86°53' 18" longitude. MG is about 500' south of Crane Gate No. 4. It is accessed by Crane Road H-140 off of Crane Road H-5. Both sites are located along Culpepper Branch, a tributary of First Creek. The topographical setting of the sites is shown in Figure 4(work plan).

The Old Burn Pit. The Old Burn Pit (OBP) is located on the Crawford Upland, a rugged, dissected plateau formed by differential erosion of Pennsyl-

vanian and Mississippian Age sedimentary rocks. The rock units underlying the OBP and forming the surrounding hills consist of Mansfield Formation shales and sandstones of the Pennsylvanian Age Raccoon Creek Group. Most of the OBP is situated in the dissected alluvial valley of Culpepper Branch. The unconsolidated sediments of the OBP site were formed by several processes. Residual soils formed by weathering of the underlying parent rock. During the Pleistocene the OBP was filled with lacustrine (lake deposits) and alluvial (outwash) deposits which are facies included in the Atherton Formation (Grey, Wayne, and Weir 1970). The facies relationships of the Atherton Formation are shown on Figure 4.2 (Wayne 1963). Colluvium derived from the hillslopes, and soil reworked by man associated with the burning activity also compose the site.

The soil samples from the auger borings were classified in the field according to the Unified Soil Classification System (USCS). Selected soil samples were analyzed later in the laboratory. The soil types which compose the OBP site are clay (CL and CH), silt (ML and MH) and sand (SC, SW, SM, and SP). The gravel portion of the clay (CL) is primarily sandstone fragments.

The soil thickness of the OBP site ranges from zero to almost 60 feet. The areal variability of soil thickness was not adequately characterized because only a few borings penetrated the total soil thickness. Therefore, a soil thickness map was not constructed for this report. The soil data did lend itself to generating isochore (equal soil-type thickness penetrated by boring samples) maps. A surface clay and silt map was prepared by contouring known clay and silt thickness determined by the borings.

McComish Gorge. The McComish Gorge (MG) is also located on the Crawford Upland, a rugged, dissected plateau formed by differential erosion of Pennsylvanian and Mississippian Age sedimentary rocks. The rock units underlying the McComish Gorge and forming the surrounding hills consist of Mansfield Formation shales and sandstones of the Pennsylvanian Age Raccoon Creek Group. Most of the McComish Gorge is situated in the dissected alluvial valley of Culpepper Branch. The unconsolidated sediments of the McComish Gorge site were formed by several processes. During the Pleistocene the McComish Gorge was filled with lacustrine (lake deposits) and alluvial (outwash) deposits which are facies included in the Atherton Formation (Grey, Wayne, and Weir 1970). The facies relationships of the Atherton Formation are shown in Figure 5 (work plan). Colluvium derived from the hillslopes, and soil reworked by man associated with the activity also compose the site.

The soil samples from the auger borings were classified in the field according to the Unified Soil Classification System (USCS). Selected soil samples were analyzed later in the laboratory. The soil types which compose the McComish Gorge site are clay (CL), silt (ML and MH) and sand (SC, SM, and SP).

The soil thickness of the McComish Gorge site ranges from zero to over 65 feet. The areal variability of soil thickness was not characterized because none of the borings penetrated the total soil thickness. Therefore, a soil thickness map was not constructed for this report. The soil data did lend itself to generating isochore (equal soil-type thickness penetrated by boring samples) maps. The contouring utilized a minimum curvature algorithm which tends to produce linear trends. A surface clay and silt map was prepared by contouring known clay and silt thickness determined by the borings. The soil is thin (2' to 12') and is classed as mostly clays or sandy clays. The underlying rocks are sedimentary sandstones and shales of Pennsylvanian Age. The superficial and upper bedrock aquifer form one groundwater system.

Target Compounds. The groundwater samples will be analyzed for the presence of organic and inorganic compounds. Chemical analysis will be done using SW-846 analytical methods, or other accepted methods when no SW-846 method is available. The contamination detected in the groundwater is principally organic contaminants (TCE, chloroform and dicloroethylene and metals

(cadmium, chromium, iron, manganese, mercury, and sodium. EPA methods 8240 and 8270 analysis will be run to detect the organic contamination. Analytical routines for metals will be run to detect the presence of metal contaminants. In an attempt to establish monitoring parameters tests for Total Halogenated Organics, Total Chloride, and Conductance will be run on the groundwater samples.

Project Objectives. This is a Phase III groundwater study. The intent of the project is to provide data of sufficient quality to support Corrective Action decisions. The chemical analytical data must meet NEESA Level C (EPA Level 4 equivalent) specifications. This will be accomplished by judiciously selecting sample locations, selecting the appropriate analytes, and using proper analytical methods. The QAPP was prepared in accordance with the USEPA Region 5 Guidance on preparing 16 Element OAPP's.

Sample Network and Rationale. Refer to Part 3.0, Sample Plan, of the Work Plan for further discussion and rationale.

Project Schedule. See Table 2.3.2 (work plan).

ELEMENT 4

PROJECT ORGANIZATION

Management Responsibilities. US Army Corps of Engineers Waterways Experiment Station (USCEWES) is the Navy's prime contractor for this RCRA investigation. The project team is made up of United States Army Corps of Engineers (USACE) personnel. Management and oversight of the WES study is the responsibility of Dr. James H. May and Mr. William Murphy of the Geotechnical Laboratory. The planning, scope writing, and report preparation is also the responsibility of Dr. May and Mr. Murphy. Field work supervision will be the responsibility of a WES geologist. Drilling will be done by personnel from the In situ Section, Geotechnical Branch of USACEWES. Mr. Mark Vispi is the Section Chief. The chemical analysis is to be processed through the USACEWES' Analytical Laboratory Group (ALG) under the supervision of Ann Strong. All chemical data validation will be done by Blaze Willis of USACE Engineering District, Savannah, Ga. Soils classification and physical testing will be done at USACEWES' Soils Investigation Laboratory under the supervision of Mr. Jesse Oldham.

ELEMENT 5

QUALITY ASSESSMENT OBJECTIVES

QC Level Selection. The field QC NEESA Level is a Level B. The QC level for the chemical detection is a NEESA Level C. EPA Level 4 equivalent. The objective of such a plan is to insure that the data collected is comparable with known conditions, that sources of extraneous contamination can be determined, and that decisions made are meaningful and supported.

A site requiring Level C QC would be a site near a populated area, not on the NPL, and not likely to be undergoing litigation. The Level C QC includes review and approval of laboratory QA and the site work plan. The laboratory must successfully analyze a performance sample, undergo an audit, correct deficiencies found during the audit, and provide monthly progress reports on QA.

Level C allows the use of non-CLP methods. All methods used must be EPA methods or be equivalent to EPA methods. When EPA methods are not available other documented methods may be used.

Level C provides for the minimum detection limits, a wide range of calibrated analytes, matrix recovery information, laboratory process control

information, and known precision and accuracy. Level C data may be used for risk assessment, site characterization, evaluation of alternatives, engineering design, and monitoring during implementation.

Chemical Data Quality Objectives. The Navy's Level C requires that certain procedures be followed. They are:

1. EPA approved methods (SW-846 Third Edition), when available, be used.
2. Trip blanks must accompany every volatile organic analysis shipment.
3. Rinsate blanks be collected each day.
4. Field blanks be collected from each source of water.
5. A 10% duplication of samples be taken.

TABLE 1
CHEMICAL ANALYSIS
PRESERVATION AND HOLDING TIMES

MATRIX	PARAMETERS	PRESERVATION	MAX. HOLDING TIMES EXTRACTION	MAX. HOLDING TIMES ANALYSIS
Water	Volatiles	Ice to 4 Deg.		14 d.
Water	Semivolatiles	Ice to 4 Deg.	7 d.	40 d.
Water	Metals except Mercury	HNO_3 to pH <2.		180 d.
Water	Mercury	HNO_3 to pH <2.		28 d.
Water	Total Chloride	None Required		28 d.
Water	Total Organic Halogens	Ice to 4 Deg., H_2SO_4 to pH <2.		14 d.
Water	Specific Conductance	Ice to 4 Deg.		28 d.

When only analysis holding time is given, this implies total holding time from sampling until analysis.

The validity of the data depend on the following of specific procedural constraints. Holding times are dictated by SW-846 procedures. Those holding times are parameter specific (Table 1). They are to be adhered to specifically to assure the quality of the analytical data.

ELEMENT 6

SAMPLE PROCEDURE

(REFER TO WORK PLAN SAMPLING PROCEDURE (SECTION NO.3.2.0)

ELEMENT 7

SAMPLE CUSTODY PROCEDURES

Field Procedures. The field sampler is personally responsible for the care and custody of the samples until they are transferred or properly dispatched. All bottles must be labeled with management stickers and seals. Sample labels are to be completed using waterproof ink. The project manager will review all field activity to determine whether proper custody procedures are being followed. Sample information is to be recorded in the Field Logbook. This information should include measurements made, sample numbers, numbers of samples, sampled depths, boring and well numbers sampled, analysis requested, packing procedures, and date shipped.

Transfer of Custody. Samples are to be accompanied by a properly completed chain of custody form identifying the contents (Figure 28, work plan). One copy of the chain of custody is kept at the site, one copy of the chain of custody is sent to the project manager, and the original copy will travel with the samples. The sample numbers and locations will be listed on the chain of custody form. Each cooler of samples will be accompanied by a signed chain of custody. A commercial carrier is not required to sign off on the custody form as long as the custody forms are sealed inside the sample cooler and the custody seals remain intact. The sample custody is transferred from the sampler to the laboratory at the time when the ice chest containing the chain of custody is sealed. The laboratory assumes custody of the samples when the cooler is received in the laboratory and the seals are broken. Samples will not be accepted by the laboratory if the seals are not intact when received.

Receipt of chain-of-custody samples is recorded in a permanent receipt book. Upon receipt at the laboratory, the sample management officer fills out a cooler receipt form . The sample collector or project manager is notified of any discrepancies noted on the cooler receipt form (Figure 1).

If samples are received from a commercial carrier, Form 2097 is filled out by the sample management officer. The ALG uses preprinted consecutively numbered duplicate gummed labels to identify samples. One label is placed on the sample bottle and the other label is placed on Form 2097 under the heading Lab I.D. No. next to the corresponding Project I.D. No. This information is also entered into a permanent log book, WES Form 2108. The estimated cost is calculated, entered onto the Sample Receipt Form 2118, and the original copy returned to the Project manager.

All samples except volatiles are stored in a locked walk-in cooler which is maintained at 4 degrees Celsius and equipped with an alarm system that goes off when the temperature deviates by more than 2 degrees. A separate refrigerator is maintained for volatile analysis and temperatures are recorded in a refrigerator log. Two ALG employees have keys to the cooler and a permanent log is maintained to check chain-of-custody samples in and out of the cooler for analysis. The analyst is required to keep chain-of-custody samples behind locked doors if he is away from the area where analyses are in progress.

The sample management officer then enters the information into the ALG computer data management system. Job files are created for use by the analysts in recording their data.

FINAL EVIDENCE FILES: All data generated (raw and final) are kept at the laboratory on permanent file. This data is kept in digital format. It can be retrieved and duplicated upon request.

ELEMENT 8

CALIBRATION PROCEDURES

Field. Several field methods are to be used in the field as scanning and detection tools. The scanning field instruments are the HNU and the OVA. All of these instruments will be calibrated by a qualified repair representative prior to being used. The instruments calibration will be checked daily using instrument specific procedures prior to the start of the work effort for that day. The daily instrument checks will be recorded by the site manager in site logbook.

The presence of volatile organic compounds in the headspace of the monitoring well will be monitored upon removal of the protective cap using a photoionization organic vapor detector (HNu Systems Model 101 Hazardous Waste Detector). The photoionization unit is a nonspecific detector that can semi-quantitatively determine the concentration of a broad range of potentially

hazardous organic compounds in the air. The unit will be calibrated relative to benzene concentration or to standards traceable to benzene. The unit will be set to provide an audible alarm at 75 percent of the threshold limit value (TLV) for benzene. The photoionization unit will be calibrated in accordance with manufacturer's recommendation and checked periodically for proper operation.

For the geophysical devices there are no specific calibration methods needed. These devices record relative data and are not calibration specific. The devices either work or they do not work.

Figure 1

COOLER RECEIPT FORM
PROJECT:
Cooler received on and opened on by
Signature

1. Were custody seals on outside of cooler----------YES NO
   If yes, how many and where?
   Were signature and date correct?----------YES NO

2. Were custody papers taped to lid inside cooler----------YES NO

3. Were custody papers properly filled out(ink, signed)----YES NO

4. Did you sign custody papers in the appropriate place? --YES NO

5. What kind of packing material was used?

6. Was sufficient ice used(if appropriate)----------YES NO

7. Were all bottles sealed in separate plastic bags?-------YES NO

8. Did all bottles arrive in good condition(unbroken)?-----YES NO

9. Were all bottle labels complete (date, signed, anal., preserv., etc.)?----------YES NO

10. Did bottle labels and tags agree with custody papers?-- YES NO

11. Were correct bottles used for tests indicated?----------YES NO

12. Were VOA vials checked for absence of bubbles?----------YES NO

13. Did each bottle contain sufficient sample?----------YES NO

14. Were acid/base preserved samples checked with pH paper? YES NO

Explain any discrepancies--------->

Laboratory. All analytical methods require calibration. In keeping with method calibration requirements, the following requirements are presented. For all semivolatile and volatile analysis by GC/MS, the current CLP calibration method shall be used. The calibration procedures are discussed in the WES Quality Assurance Plan (QAP) on page 41. The current CLP criteria shall be used for frequency of calibration, for the system performance check compounds (SPCCs), and for the calibration check compounds (CCCs).

For other methods, a minimum of three different concentration standards for each analyte shall be analyzed for initial calibration. Calibration shall be checked every 12 hours of operation and prior to sample analysis. The laboratory shall use the calibration check acceptance criteria specified by the methods (WES QAP, 1991). The initial calibration curve shall be plotted and the correlation coefficient and response factors evaluated. The calibration shall include one standard at a concentration at the method detection limits. The calibration curve shall bracket all samples in the concentration range. If the samples are not within the 3 calibration ranges, appropriate dilution shall be performed to bring the samples into the calibration range. The details of the calibration are given in WES QAP, 1991.

ELEMENT 9

ANALYTICAL PROCEDURES

RCRA studies adhere to procedures and methods set out in "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods" SW-846, Third Edition when available. Organic and inorganic test methods are given in Table 2. For explosives, the method is number 8330, revision 0 (zero), November 1990, which is included in proposed update 2 (two) to SW-846. It is an HPLC (high-performance liquid chromatograph) procedure.

TABLE 2
LIST OF PARAMETERS
AND SUMMARY OF METHODS
from SW-846

METAL ANALYSIS	TECHNIQUE*	EXTRACTION**	ANALYSIS	
Aluminum	ICP	3050 S	3005 W	6010
Antimony	ICP	3050 S	3005 W	6010
Arsenic	GF	3050 S	3005 W	7060
Barium	ICP	3050 S	3005 W	6010
Beryllium	ICP	3050 S	3005 W	6010
Cadmium	ICP	3050 S	3005 W	6010
Calcium	ICP	3050 S	3005 W	6010
Chromium	ICP	3050 S	3005 W	6010
Copper	ICP	3050 S	3005 W	6010
Iron	ICP	3050 S	3005 W	6010
Lead	ICP	3050 S	3005 W	6010
Magnesium	ICP	3050 S	3005 W	6010
Manganese	ICP	3050 S	3005 W	6010
Mercury	CV			7471
Nickel	ICP	3050 S	3005 W	6010
Potassium	ICP	3050 S	3005 W	6010
Selenium	GF	3050 S	3005 W	7740
Silver	ICP	3050 S	3005 W	6010
Sodium	ICP	3050 S	3005 W	6010
Thallium	ICP	3050 S	3005 W	6010
Zinc	ICP	3050 S	3005 W	6010

TABLE 2 (CONT'D)

METAL ANALYSIS	TECHNIQUE*	EXTRACTION**	ANALYSIS
ORGANIC ANALYSIS			
Volatiles	GC/MS	INC.***	8240
Semivolatiles	GC/MS	3540/3550	8270

* Abbreviations: GF = Graphite Furnace, CV = Cold Vapor, and ICP= Inductively Coupled Plasma.
**Extraction process, when not noted, is included in the analytical method.
S = Soil and sediment
W = Water
***INC.= Extraction procedure included in method procedure.

ELEMENT 10

INTERNAL QUALITY CONTROL CHECKS

Laboratory Analysis. For Level C a blank/spike control shall be analyzed with each batch and shall be plotted on control charts. For metals, and other wet chemical analysis, a method blank shall also be processed with each batch and shall contain less than the method detection limit for compounds of interest. In any method using surrogates spiked into the blank, the blank shall serve as both the method blank and blank/spike control. In methods not using surrogates such as metals, and wet chemical analysis, a blank and a blank/spike (laboratory control sample) shall be analyzed.

A matrix spike and matrix spike duplicate are required for volatiles, semivolatiles, and all GC analysis for every 20 samples of similar matrix. For metals analysis, a duplicate and a matrix spike are required for every 20 samples of similar matrix.

For all GC methods used in Level C QC, second column confirmation shall be used for all positive responses for the analytes of interest.

Field Activities.

Radiometer - Daily calibration checks will be done and their results will be recorded to assure any drift if instrument reading can be found.

HNU - Daily calibration checks will be done and their results will be recorded to assure any drift if instrument reading can be found.

OVA - Daily calibration checks will be done and their results will be recorded to assure any drift if instrument reading can be found.

M18S2 Test Kits - Test Kits have an expiration date. Their results are only qualitative. The test only records the presence or absence to a determined detection level.

Slug tests - The instrumentation which records the hydraulic head declines record only relative data. Pressure is recorded over a time period. These instruments will be checked prior to mobilization. Pressure transducers are checked manually and electrically against induced water levels readings.

Ground penetration radar - The results from this device are relative results and can be checked against "ground truth" drilling data. The instruments produce soil cross-sections which will be compared to known subsurface data points.

Electromagnetic Conductivity - This data is also relative. The generated interpretations will be refined using "ground truth" drilling data and GPR information.

Control Samples

Field QC Samples. The number of QC samples is determined by the level of QC implemented (see Table 4). The types of QC samples are:

(1) Duplicates are identical splits of individual samples which are analyzed by the laboratory to test for method reproducibility. These samples are to be split in the laboratory.

(2) Equipment Rinsates are the final analyte-free water rinse from equipment cleaning collected daily during a sampling event. Initially, samples from every other day should be analyzed. If analytes pertinent to the project are found in the rinsate, the remaining samples must be analyzed. The results from the blanks will be used to flag or assess the levels of analytes in the samples. This comparison is made during data validation. The rinsates are analyzed for the same parameters as the related samples.

(3) Field Blanks consist of the source water used in decontamination and steam cleaning. These blanks are collected and analyzed to determine the level of contamination introduced into the sample due to sampling techniques. At a minimum, one field blank from each event and each source of water must be collected and analyzed for the same parameters as the related samples.

(4) Field duplicates of water are aliquots of water collected from the same sampler at the same time. Field duplicates should be collected at a frequency of 10% per matrix for Level C. All the duplicates should be sent to the laboratory responsible for analysis. The same samples used for field duplicates shall be split by the laboratory and be used as the laboratory duplicate or matrix spike. Spikes are known amounts of specific chemical constituents added by the laboratory to select samples to test the appropriateness and recover efficiencies of specific analytical methods. This means that for the duplicate sample, there will be analysis of the normal sample, the field duplicate, and the laboratory matrix spike/duplicate.

(5) Matrix Spike is an aliquot of matrix (water or soil) spiked with known quantities of compounds and subjected to the entire analytical procedure in order to indicate the appropriateness of the method for the matrix by measuring recovery.

(6) Matrix spike Duplicate is a second aliquot of the same matrix as the matrix spike that is spiked in order to determine the precision of the method.

(7) Method Blank is a blank sample run to ensure reported analytical results are not the results of laboratory contamination.

(8) Method Blank/Spike is the distilled and/or deionized water for soil or sand spiked with known compounds or elements. The method blank as defined by the CLP for organics and the laboratory control sample as defined by the CLP may be used as the method blank/spike.

(9) Preparation Blank is an analytical control containing distilled, deionized water and reagents, which is carried through the entire analytical procedure (digested and analyzed).

(10) Trip Blanks are defined as samples which originate from analyte-free water taken from the laboratory to the sampling site and returned to the laboratory with the volatile organic (VOA) samples. One trip blank should accompany each cooler containing VOAs, should be stored at the laboratory with the samples, and analyzed by the laboratory. Trip blanks are only analyzed for VOAs.

ELEMENT 11

DATA REDUCTION VALIDATION AND REPORTING

Data Reduction. Data generated by this project will be in two forms, direct read and calculated. The following is a description of data reduction and reporting. The data-reduction procedures are given in the method (WES QAP, 1991).

(1) The chemical detection data is reduced using EPA specified Contract Laboratory Program procedures.

(2) The physical data are determined by direct measurement.

(3) The OVA, HNU, GPR, and EM are direct-reading instruments.

(4) The slug test data are recorded by the instruments and dumped into a computer data base from which decline charts are produced. The parameters transmissivity, storativity, and permeability are derived. Those parameters are calculated from generated curves and from calculations involving generalized formulas as those presented below.

Transmissivity

$$T = \frac{1.0\ r}{t}$$

where
T = Transmissivity
t = time 1
r = radius of the casing

Storativity

$$S = \frac{(r\ u)}{r}$$

where
S = Storativity
r = radius of the casing
r = radius of the well screen
u = equilibrium constant

Hydraulic Conductivity

$$K = \frac{T}{b}$$

where
T = Transmissivity
b = thickness of the formation

Deliverables. For these studies the method blanks, blank/spike, surrogates, matrix spikes, matrix spike duplicates, duplicates, and initial and continuing calibration data shall be reported. Table 4 is a list of the needed documentary forms. The forms referred to are the current CLP forms for organics and metals/cyanide (WES QAP, 1991).

Level C Data Validation. Listed below are the validation criteria which will be utilized in evaluating the analytical data for a Level C QC site:

1. Volatile Organic Analysis

Holding Times - Samples must be analyzed within the holding times specified in Section 3 or the data should be marked as estimated (J).

GC/MS Tuning - Check that bromofluorobenzene tune is completed each 12-h shift of operation. Check that it meets the CLP criteria. Assure that each sample is associated with a tune.

Initial Calibration - The maximum relative standard deviation [(RSD) percent RSD] shall not be .30% for indicted CLP CCC. The maximum mean relative response factor (RRF) for SPCC shall be .0.300 (0.250 for bromoform). The SPCCs are chloromethane, 1,1-dichloroethane, bromoform, 1,1,2,2-tetrachloroethane, and chlorobenzene. The CCC compounds are vinyl chloride, 1,1-dichloroethene, chloroform, 1,2-dichloropropane, toluene, and ethylbenzene.

Continuing Calibration - The minimum response factor for the SPCC components for VOA analyses shall not be <0.300 (0.250 for bromoform). The maximum response factor percent deviation for indicated CLP CCC components from the mean initial calibration response factor shall not exceed 25%. If these criteria are exceeded, a new calibration for the compound shall be employed.

Blank/Spike Control Samples - Any control sample which exceeds the internal QC limits set by the laboratory (Table 3) for a given sample matrix shall require all data from the associated batch of samples to be closely inspected. If no analytical problems are found, the data analyzed with the

TABLE 4
DATA SET DELIVERABLES FOR LEVEL C QA

METHOD REQUIREMENTS	DELIVERABLES
Organics - Method blank spikes with results and Control Chart.	Control charts. Run with each batch of samples processed.
Results to be reported on CLP Form 1 or spreadsheet. Sample results using CLP data flags.	Form 1 or Section 9 1/sample chromatograms and mass spectra.
Surrogate recovery from samples reported on CLP Form 2. Surrogates to be used in volatiles, semivolatiles, pesticides/PCB. For volatiles by GC, the names of surrogates should be changed to reflect the surrogate used.	Form 2
Matrix spike/spike duplicate 1 spike and spike duplicate per 20 samples of similar matrix reported on Form 3.	Form 3
Method blank reported on CLP Form 4.	Form 4
For volatiles by GC, a similar format will be used as CLP Form 4 for blanks.	
GC/MS tuning for volatiles/ semivolatiles. Report results on Form 5.	Form 5
Initial calibration data reported on Form 6.	Form 6
For volatiles by GC, the initial calibration data with response factors must be reported.	No Form
For pesticide/PCB data Form 9 must be used for calibration data.	Form 9

TABLE 4 (CONT'D)

	METHOD REQUIREMENTS	DELIVERABLES
	Continuing calibration GC/MS data reported on Form 7.	Form 7
	For volatiles GC data, the response factors and their percent differences from the initial must be reported.	No Form
	Internal Standard Area for volatiles and semivolatiles.	Form 8
Metals -	Level C, requirements	Deliverables
	Sample results with CLP flagging system	CLP Form 1 or Equiv.
	Initial and continuing calibration	CLP Form 2, Part 1 only
	Blanks 10% frequency	Form 3
	Method blank taken through digestion (1/20 samples of same matrix)	Form 3
	ICP interference check sample	Form 4
	Matrix spike recovery (1 per 20 samples of similar matrix)	Form 5, Part 1
	Postdigestion spike sample recovery for ICP metals. Only done if predigest spike recovery exceed CLP limits.	Form 5, Part 2,1 (never used for GFAA work)
	Postdigest spike for GFAA.	Recovery will be noted on raw data
	Duplicates (1 per 20 samples will be samples split and digested as separated method blank spike information will be plotted on control chart, one per batch of samples processed.	Form 6
	Standard addition. The decision process outlined in CLP page E-3 will be used to determine when standard additions are required.	Form 8
	Holding times	Form 10

out-of-control point shall be discussed in the QC section of the MPR and final report. If problems are found in the analytical data, the samples associated with the batch shall be reanalyzed and the data from reanalysis reported. If holding times are exceeded in the reanalysis, both sets of data shall be presented.

If the blank/spike results are outside the internal laboratory limits and if the matrix spike results are outside the CLP limits, the laboratory will either reanalyze the samples within the holding times or the data will be flagged with an "R," and the data are not usable.

Surrogates - If surrogates exceed the CLP limits (Table 3), the data shall be flagged that the surrogates exceeded limits.

Method Blanks - A method blank should be run each day following the Continuing Calibration Standard. Common laboratory solvents should not be found in the blank at levels over five times the detection limits. Other compounds should not be found in the blank at levels exceeding the detection limits. If common contaminant compounds are detected in samples at a concentration of <10 times the concentration found in the blank, or other compounds at <5 times the concentration in the blank, report those compounds as not detected. Adjust the sample quantitation limit to the value reported in the samples and flag the limit as estimated (UJ) (Table 3).

Matrix Spike/Spike Duplicate - Ensure that 1 out of 20 samples has been spiked in duplicate. The recoveries shall meet the CLP criteria. If the recoveries do not meet the criteria, examine the blank spike data. If the blank spike data exceed the limits and the matrix spikes exceed limits, the data shall be flagged as unusable (R). If the blank spike data from the batch are satisfactory, the data is usable, and the low recovery is discussed in the final report QA/QC and in the QC report sent to the NCR.

Field Trip and Equipment Blanks - If contaminant analytes are detected in samples at concentrations of <5 times the concentration found in the highest associated blank, the results are considered suspect and are reported as estimated.

2. Semivolatile Organics Analysis

Holding Times - Samples must be extracted within 7 days of collection and analyzed within 40 days of extraction. Any samples which do not meet these requirements must be flagged as estimated.

GC/MS Tune - Make certain that a decafluorotriphenylphosphine tune is completed every 12 h of sample analysis, that each sample is associated with a tune, and that each tune meets CLP requirements. Data are not reported if the instrument does not meet tune.

Initial Calibration - Ensure that a 5-point curve has been completed. The RRF of the BNA compounds shall be a minimum of 0.050 for the SPCC listed in the current revision of the CLP. The maximum RSD for the CCC listed in the CLP procedure is 30.0%. The minimum RRF for the SPCC is 0.050, and the maximum percent difference for the CCC is 25%. If these limits are exceeded, a new calibration curve shall be generated.

Continuing Calibration - The continuing calibration check will be performed once every 12 h during operation. The minimum RRF for the SPCC is 0.05, and the maximum percent difference from the initial calibration shall not exceed 25% for the CCC. If these limits are exceeded, a new calibration curve shall be generated.

Blank/Spike Control Samples - Any control sample which exceeds the internal QC limits set by the laboratory for a given sample matrix shall require all data from the associated batch of samples to be closely inspected. If no analytical problems are found, the data and the out-of-control point shall be discussed in the QC section of the report. If problems are found in the analytical data, the samples associated with the batch shall be reanalyzed and the data from reanalysis reported. If holding times are exceeded in the reanalysis, both sets of data shall be presented.

If the blank/spike results are outside the internal laboratory limits and if the matrix spike results are outside the CLP limits, the laboratory will either reanalyze the samples or the data will be flagged with an "R," and the data is not usable.

Surrogates - If surrogates exceed the CLP limits, the data shall be flagged that the surrogates exceeded limits (Table 3).

Blanks - A method blank should be run each day following the Continuing Calibration Standard. Phthalate should not be found in the blank at levels over five times the detection limits. Other compounds should not be found in the blank at levels exceeding the detection limits. If common contaminant compounds are detected in samples at a concentration of <10 times the concentration found in the blank, or other compounds at <5 times the concentration in the blank, report those compounds as not detected. Adjust the sample quantitation limit to the value reported in the samples and flag the limit as estimated (UJ).

Matrix Spike/Spike Duplicate - Ensure that 1 out of 20 samples has been spiked in duplicate. The recoveries should meet the CLP criteria (Table 3). If the recoveries do not meet the criteria, examine the blank spike data. If the blank spike data exceed the limits and the matrix spikes exceed limits, the data shall be flagged as unusable (R).

3. Metals

Holding Times - Samples must be analyzed within six months, except mercury shall be analyzed in 28 days from sample collection.

ICP Initial Calibration - A calibration blank and at least one standard must be analyzed daily. An initial calibration verification standard must be within 90 to 110% recovery or the samples should be reanalyzed. If it is not possible to perform reanalysis, the data are rejected and flagged with an "R."

AA Calibration - Calibration blank and at least three standards shall be used in establishing the curve prior to sample analysis. A curve shall be analyzed each day prior to sample analysis.

Calibration Verification - Verification using a standard obtained from a source other than that of the initial calibration shall be used and the result shall be within 90 to 110% of the true value for both ICP and AA work. Calibration verification shall be done at a minimum frequency of 10% or every 2 h, whichever is more frequent, and shall be done at the end of the analytical run.

Method Blanks - At least one preparation blank shall be prepared with each batch of samples. The blanks shall contain less than the detection limit for all analytes. If the concentration of the associated blanks is above the detection limit and if the lowest analyte concentration is 10 times the blank, reanalysis of the sample must occur. If reanalysis is not done, the data shall be reported and flagged as estimated. The blank shall never be subtracted from the sample.

Field and Equipment Blanks - If contaminant analytes are detected in samples at concentrations of <5 times the concentration found in the highest associated blank, the results are considered suspect and are reported as estimated.

Blank/Spike Laboratory Control Samples - Any laboratory control sample which exceeds the internal QC limits set by the laboratory (Table 3) for a given sample matrix shall require all data from the associated batch of samples to be closely inspected. If no analytical problems are found, the data and out-of-control point shall be discussed in the QC section of the report. If problems are found in the analytical data, the samples associated with the

batch shall be reanalyzed and the data from reanalysis reported. If holding times are exceeded in the reanalysis, both sets of data shall be presented. A discussion of data reported when the blank/spike laboratory control sample is out of control shall be presented in the QC section of both the final report and the MPR.

If the blank/spike results are outside the internal laboratory limits and if the matrix spike results are outside the CLP limits, the laboratory will either reanalyze the samples or the data will be flagged with an "R," and the data are not usable.

ELEMENT 12

PERFORMANCE AND SYSTEM AUDITS

Field Audits. The project manager is responsible for monitoring the quality of the field activities. This will be accomplished by monitoring daily, weekly, and monthly goals given to the field team. Site inspections will be performed. Chain of custody forms will be audited. Coordination with the laboratory will be maintained on at least a weekly basis.

Laboratory Approval. All chemical analytical laboratories working on Navy Installation Restoration Program (IRP) projects must pass the Navy's laboratory screening program. NEESA has been assigned the task of managing that program. The program is instituted by a Navy contractor.

Once a laboratory has received Navy approval to begin analysis of samples, maintaining that approval requires adherence to the QA plan and reporting of QA-related information. The performance and reporting requirements outlined below are essential to ensuring that data of known and defensible quality are being generated throughout the course of a site investigation. Topics covered include control samples, control charts, out-of-control events, corrective action reports, significant changes in the QA plan, and other reporting requirements.

Performance Audits. Several methods of internal audits are used including worksheet review, on-site analyst review, intra- and interlaboratory sample examination. Presently the ALG participates in the Corps of Engineers Interlaboratory Testing Program and subscribes bi-monthly to the Environmental Research Associates Quality Control Sample program. In addition the QA officer submits EPA, NRC, or NIST quality-assurance samples to the laboratory for internal review of the measurement process. System audits are conducted semi-annually to evaluate sample handling, sample analysis, record control, proficiency testing, personal practices, training, workload, and manpower needs.

Control Charts. All inorganic parameters routinely analyzed are charted. A minimum of 20 points is required for limit calculations. Precision control charts are prepared from the duplicate analysis data and accuracy charts are prepared from matrix spikes. Charts are also prepared utilizing blank spike data and using SRMs and external QA samples. Control charts for organics are limited to the CLP spiked compounds and surrogates. PCB-1248 is usually the spiking compound for PCB analysis. Procedures for preparing control charts are described in WES QAP, 1991.

Monthly Progress Report. The primary means of communication from the laboratories to the NCR will be the monthly progress report (MPR) to be submitted by the laboratories to the NCR on the 15th of each month in which work for the Navy is performed. The following information is to be included in the MPR:

1. Site name and contract number.

2. Numbers, types and locations of samples collected and analyzed for Navy project only.

3. Data for blanks, spikes, laboratory duplicates and controls related to Navy samples.

4. New methods used for analysis and changes in old methods.

5. Copies of all control charts pertinent to Navy samples and to which results have been added over the reporting period.

6. Summaries of out-of-control incidents during the reporting period, including references to documentation and corrective action reports.

7. Descriptions of and justifications for significant changes in the QA.

8. Changes in LQAC personnel and other key technical personnel; resumes of new personnel must be submitted.

9. Completed sample data.

Much of the information presented in an MPR is incremental in nature and relates to changes and findings since the previous MPR:

1. Control charts from the minimizing control charts program and any additional control charts from monitoring matrix spikes, duplicates, or other QC parameters.

2. Personnel changes relating to QA responsibilities.

3. Method changes (e.g., a minor modification with an attached EPA variance).

4. Procedural changes in establishing control limits and/or the preparation and use of control charts.

Since the first such report for each laboratory has no precedent, more explanation and detail may be necessary; subsequent MPRs will likely not require as much detail in some areas.

ELEMENT 13

PREVENTIVE MAINTENANCE

All Perkin-Elmer instruments (atomic absorption units) at WES are maintained by service contract that provides for twice yearly preventive maintenance and emergency repair. Permanent records are maintained of service visits.

The Plasma Emission Spectrometer (Spectrametrix) is maintained by service contract that provides for twice yearly preventive maintenance and emergency service. Permanent records are maintained of service visits.

All Hewlett-Packard Instruments (GC and GC/MS systems) are maintained by service contract that provides for twice yearly preventive maintenance and emergency repair. In addition, the GC/MS systems are tied via modem to the Analytical Response Center Support which can duplicate software problems at HP's service center. Records of all service calls are maintained in permanent files.

All analytical balances are serviced annually by a certified balance technician.

All other instrumentation is serviced on an as needed basis and records are maintained of any repair calls.

Daily or routine maintenance of instruments is performed by the individual analysts and recorded in the instrument logs.

ELEMENT 14

DATA ASSESSMENT

All data is checked by the analyst, the inorganic team leader or the organic team leader, and the Chief, ALG before it is submitted to the customer. The following items are checked:

1. Completeness
2. Duplicate values for precision
3. Recovery of Spikes for accuracy
4. Method blanks for contamination
5. Surrogate recoveries for organic analysis
6. Data for QA check samples
7. Reasonableness and trends

If data falls outside acceptable limits as described in the procedures, sample is rerun if sample is available. If data falls outside acceptable limits on the reruns and QA check sample data is good, then data may be reported with qualifying explanations. Acceptable data is usually defined by the specific procedural method (i.e. SW-846).

ELEMENT 15

CORRECTIVE ACTION

The laboratory uses EPA Contract Laboratory Program procedures for determining Out of Control events, reporting those events, and corrective actions responses to those events.

ELEMENT 16

QUALITY ASSURANCE REPORT

The laboratory has a built in quality check procedure within its structure. The Laboratory Chief will prepare a summary report to describe all discrepancies, out of control events, and corrective actions taken.

APPENDIX B

SITE SPECIFIC SAFETY AND HEALTH PLAN
RFI PHASE III GROUNDWATER STUDY
FOR OBP/MG, NWSCC

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1.0 PURPOSE

The Site-Specific Safety and Health Plan (SSHP) establishes procedures that are to be followed in order to protect Corps of Engineers' employees from potential safety and health hazards arising from the collection of ground water samples at the Old Burn Pit (OBP) and McComish Gorge (MG) areas of the Naval Weapons Support Center Crane (NWSCC), Indiana.

2.0 LOCATION AND SITE DESCRIPTION/HISTORY

The NWSC is located in the northern half of Martin County, in southwestern Indiana, approximately 75 miles southwest of Indianapolis and 71 miles northwest of Louisville, Kentucky. The nearest major metropolitan area is Bloomington, Indiana approximately 40 miles northeast on State Highway 45. NWSC occupies approximately 100 sq. miles zone (62,463.46 acres) which includes 1,006 acres of improved grounds, 49,611 acres of unimproved grounds, and 800 acres of water. The area is divided into facility operations, safety buffer and security zones and surrounding farmland. The area is extremely isolated (High Security) and is not accessible to the public.

The OBP occupies approximately 25 acres and is located near the center of the facility in the northeast quarter of Section 8, T5N, R4W, 38 degrees, 53 minutes, 24 seconds north latitude and 86 degrees, 52 minutes, 42 seconds longitude. The area is approximately 2000 feet east of the Crane Gate No. 4. It is accessed using Crane Road H-331 off of Crane Road H-5. The McComish Gorge site occupies about 5 acres and is located in the northeast quarter of Section 7 T5N, R4W, 38 degrees, 53 minutes, 22 seconds north latitude and 86 degrees, 53 minutes, 18 seconds longitude. MG is about 500 feet south of Crane Gate No. 4. It is accessed by Crane Road H-140 off of Crane Road H-5. Both sites are located along Culpepper Branch, a tributary of First Creek. The topographical setting of the sites is shown in Figure 4 of the Work Plan.

Both the OBP and MG are located on the Crawford Upland, a rugged dissected plateau formed by differential erosion of Pennsylvanian and Mississippian Age sedimentary rocks. The rock units underlying the sites and forming the surrounding hills consist of Mansfield Formation shales and sandstones of the Pennsylvanian Age Raccoon Creek Group. The unconsolidated sediments at the sites were formed by several processes. Residual soils formed by weathering of the underlying parent rock. During the Pleistocene the area was filled by lacustrine (lake deposits) and alluvial (outwash) deposits which are facies of the Atherton Formation. Colluvium derived from the hillslopes and soil reworked by man during the burning activities are also present.

The Old Burn Pit site was used from 1942 to 1972. Garbage and trash was burned at the site. This rubbish included wood, paper, building material and industrial wastes. No explosive wastes were burned here. The material was burned in a depression or pit. Ash residue from this burning operation was buried along with metallic objects in the gully to the north of the burn pit. Today the site is used as a parking area for delivery trailers. Since 1972 the site was revegetated. Contaminated leachate is migrating from the pit and ash fill. Contaminants have been found in groundwater samples. Amounts of trans-1,2-dichloroethylene, chloroform, and trichloroethylene exceeding 50 ppb have been detected in some of the groundwater samples drawn from monitoring wells at the OBP.

The McComish Gorge dump site was used for an unknown period of time between 1942 to 1972. Record of its use are not available. Undetermined amounts and types of garbage and trash were buried at the site. This rubbish could include wood, paper, construction material, plaster filled warheads, metal shavings, and industrial wastes. Reportedly small arms ammunition were also buried here.

Between 1981 and 1983 a total of nineteen monitoring wells were installed at the OBP. Groundwater testing showed the presence of the organic contaminants listed above. In 1981 six monitoring wells were installed at the MG. A replacement well was installed in 1986. The groundwater tests showed metal contamination. The elevated parameters were cadmium, chromium, fluoride, iron, manganese, mercury, sodium, and sulfate.

3.0 WEATHER EXTREMES

The climate in the region on NWSC is a temperate climate with broad seasonal variations characterized by a mean January temperature of 26 degrees F and a mean July temperature of 89 degrees F. Precipitation averages approximately 44 inches annually, with 42 inches of rainfall and 15 inches of snowfall. Both heat stress and cold stress are significant potential hazards and sever weather with thunderstorms are also a possible feature of the area (Appendix A).

4.0 INVESTIGATION ACTIVITIES AND ASSOCIATED HAZARDS

4.1 Drilling. Drilling will be performed at the site for the collection of soil and groundwater samples for chemical analysis. Some of the boreholes will penetrate material known or suspected to contain hazardous material. The sampling and drilling have limited potential for exposing employees to parts per million (ppm, mg/m^3) levels of organic vapors, chemical agent or low levels of radioactivity. Primary exposure routes during drilling operations will be skin absorption, ingestion and inhalation due to vapors and contaminant volatilization from the drill cuttings. Drilling will take place in and adjacent to the possible source of contamination. Health hazards risks due to drilling and sample handling are considered low.

All work shall comply with all Federal, State and Local Health and Safety requirements, including the Occupational Safety and Health Administration's (OSHA) requirements (29 CFR 1910 and 1926), the U.S. Environmental Protection Agency's (EPA) hazardous waste requirements (40 CFR 260-270), the U.S. Army Corps of Engineers Safety and Health Manual (EM 385-1-1, April 1981, Revised October 1987) and all NWSC Crane and U.S. Army Corps of Engineers safety directives and policies and Safety and Health requirements as prescribed by Technical Escort (TEC) Guidelines for well drilling in Potentially Contaminated Areas.

All drill sites will be cleared with local utilities to ensure that there are no underground utilities present. All known underground utilities will be located and marked.

4.2 Soil and Water Sampling. Soil and water sampling operations may expose workers to chemical and physical hazards. Exposure to identified

chemicals from previous sampling at OBP and MG may occur during sampling. EPA Level C or Modified D shall be used during sampling.

5.0 HAZARD ASSESSMENT AND CONTAMINANT CHARACTERIZATION

5.1 Physical.

5.1.1 Health and Cold Stress. Appendix A.

5.1.2 Heavy Equipment. A truck-mounted drilling operation presents inherent noise and equipment hazards, a Job Hazard Analysis is attached (Appendix A).

5.1.3 Chemical. A description of contaminants found in monitoring wells and listing of possible contaminants (TLV's, STEL's, PEL's) is provided in Table 1. Pertinent information of contaminants is found in Appendix C.

5.1.4 Radiological. Contact with radiological contaminants is not anticipated. Based on the results of previous WES testing. Note, radiological contamination procedures are included.

5.1.5 Biological. Biological Hazards include insects (ticks, mosquitoes) and two species of poisonous snakes (Appendix A).

6.0 SITE INVESTIGATION PERSONNEL

The following U.S. Army Corps of Engineer personnel sampling (drill crew) under the direction of a Corps of Engineers supervisor will perform the investigation activities.

PROJECT MANAGER _____
ON-SITE TEAM LEADER _____
ALTERNATE _____
SITE SAFETY COORDINATOR (SSC) _____
PUBLIC INFORMATION OFFICER _____
SECURITY OFFICER _____
RECORD KEEPER _____
FIELD TEAM LEADERS (DRILLERS) _____
FIELD TEAM HELPERS _____
OTHER AGENCY REPRESENTATIVES (TEC) _____
_____
CONTRACTOR(S) _____

7.0 RESPONSIBILITY

7.1 Project Manager. The PM has the overall responsibility for the project and to assure that the goals of the project are attained in a manner consistent with the contract. The PM will coordinate with the SS and the SSC to assure that the drilling operation and sampling goals are completed in a manner consistent with the project.

7.2 On Site Team Leader. Responsible for managing field operations coordinating permission for site access, briefing site workers on specific

Table 1

Exposure Limits for Suspected Contaminants

Contaminant	TLV-TWA	STEL	IDLH
Trichloroethylene NIOSH-Reduce to lowest possible	50 ppm 269 mg/m^3	200 ppm for 30 min	1000 ppm Ca
1,2-Dichloroethylene synonym (Acetylene dichloride)	200 ppm 793 mg/m^3	No data	4000 ppm
Dichlorodiethyl sulfide synonym (Mustard Gas)	HAZARD: Vesicant war gas, causes conjunctivitis and blindness. Note, can be decontaminated by chloramines or bleaching powders. Vapor is extremely poisonous and is absorbed via SKIN.		
Chloroform	10 ppm 50 mg/m^3 NIOSH 2 ppm 60 min ceiling		1000 ppm
Barium	.5 mg/m^3 NIOSH reduce to lowest feasible limit		250 mg/m^3
Cadmium	.25 mg/m^3 NIOSH reduce to lowest feasible limit		40 mg/m^3
Chromium	1 mg/m^3		500 mg/m^3
Fluoride	2.5 mg/m^3		500 mg/m^3
Manganese	5 mg/m^3		10000 mg/m^3
Mercury	.01 mg/m^3 .04 ceiling		10 mg/m^3
Sodium	2 mg/m^3		200 mg/m^3
Sulfate	(Compound specific)		

ACGIH-TLV/TWA Threshold Limit Value-Time Weighted Average, An airborne concentration of substance under which it is believed that nearly all workers may be repeatedly exposed day after day (8 hr, 40 hr workweek) without adverse effects.

"Skin" Notation. Listed substances followed by skin, refer to the potential contribution to the overall exposure by the cutaneous route including mucous membranes and eye, either by airborne or more particularly, by direct contact with the substance.

Ca Confirmed or Suspect Carcinogen. Note, if high values occur, no cartridge filter respirators are approved protection.

STEL Defined as a 15 min TWA exposure which should not be exceeded at anytime during a work day even if the 8 hr TWA is within the TLV-TWA.

IDLH Immediately Dangerous to Life and Health. No exposure at all, allowed at this level.

NIOSH-Lowest Possible Exposure Recommended exposure below ACGIH TWA.

assignments, arranging safe secure storage of drill cuttings and water brought to the surface and enforcing site control.

7.3 Site Safety and Health Officer. The Site Safety and Health Officer (SSHO) or Site Safety Coordinator (SSC), has the responsibility and qualifications to implement the site specific safety and health plan on this project. This is to include the authority to cease the operation if he/she determines any unsafe conditions exist or if the Site Safety and Health Plan is not being implemented correctly. The SSC will monitor or inspect site conditions, equipment, protective clothing and other safety plan requirements. The SSC is responsible for safety meetings and the monitoring of personnel for signs of environmental stress (i.e. heat/cold).

The SSC will modify the SSHP as required due to additional information discovered during on-site work.

7.4 Public Information Officer. Responsible for releasing any information news media and the public concerning site activities.

7.5 Security Officer. In conjunction with a high level of security at the Crane to restrict public access, the security officer will help establish safe working zones (Exclusion Zone) and restrict access to unauthorized personnel.

7.6 Recordkeeper. Records all field activities, including monitoring results, and visiting personnel.

7.7 Field Team Leader (Driller). Responsible for Drill Crew operation and safety. Following the job hazard analysis attached and managing the drilling, sampling and well installations. All drilling sites will be inspected for health and safety hazards by the Site Safety Coordinator or Driller, prior to entering the site with drilling equipment. The SSC will then take all corrective measures necessary to safely work at the site. This inspection and all corrective measures will be documented and communicated to all site workers.

7.8 Field Team Members (Helpers). Responsibility to comply with all aspects of the Site-Specific Safety and Health Plan, and to notify the SSC or supervisor of any unsafe conditions.

8.0 WORKER PROTECTION REQUIREMENTS

8.1 Training Requirements. All personnel who will be engaged in hazardous waste operations must first present to the SSC certification of completion of a 40 hr hazardous waste site investigation course and 8 hrs of annual update training as required. This training must comply with OSHA regulations found in 29 CFR 1910.120(e). At least two members of each crew will have a valid certification in First Aid and CPR. Personnel not safety trained will not be allowed within the control zone (a 30 foot radius) of any field investigations being conducted at the site. Besides initial training, all personnel involved in field investigations will be required to have site-specific training. Topics to include, in site training sessions for on-site personnel include:

1. Biological, Chemical, and Physical Hazards. The biological, chemical and physical hazards at the site and their respective properties will be discussed. Including possible mustard gas (agent) exposure and contamination.

2. Toxicology. The potential routes of exposure to chemicals, the possible toxic effects, the IDLH (Immediately Dangerous to Life and Health) and TLV (Threshold Limit Value) values of chemical hazards at the site, and the level of personal exposure which can be anticipated will be discussed.

3. Personal Hygiene. Personal cleanliness and the prohibiting on the eating, drinking, and smoking on the site will be discussed. Note, all eating, drinking, smoking is prohibited in the exclusion zone.

4. Rights and Responsibilities of Workers under OSHA. Applicable provisions of the Occupational Safety and Health Act (29 CFR 1910, 1926 the U.S. Environmental Protection Agency's Hazardous waste requirements (40 CFR 260-270) and the Corps of Engineers Safety and Health Program (EM 385-1-1) will be discussed.

5. Monitoring Equipment. The functions, capabilities, limitations use and maintenance of monitoring equipment will be discussed. A hands-on review will be held with persons assigned to use the equipment.

6. Site-Specific Safety and Health Plan. The full SSHP will be reviewed, and a field SSHP will be available to each on-site worker.

7. Standard Operating Procedures. SOP's for this work will be reviewed. These SOP's are included in the appendices.

8. Personal Protective Equipment. The use, care, and disposition of the specific PPE selected for this work will be discussed. The PPE will be available for hands-on familiarity and practice donning, as needed. Individual respirator fit testing will be conducted at this time, if needed.

9. Medical Program. Handling of medical emergencies will be discussed. The names, locations and telephone numbers of an available physician, ambulance, and hospital will be posted and available.

10. Decontamination. The decontamination procedures established for this work will be discussed.

11. Emergencies. The Emergency Contingency Plan contained in the SSHP will be reviewed.

8.2 List of Trained Personnel. The following is a list of all trained personnel, training content (initial, supervisory, refresher, etc., date received, trainer and location, for the specific HTW operation).

Personnel	Training	Date	Trainer/Location
_____	40 hr	_____	_____
	8 hr Ref.	_____	_____
	8 hr Sup.	_____	_____
	First Aid	_____	_____
	CPR	_____	_____
_____	40 hr	_____	_____
	8 hr Ref.	_____	_____
	8 hr Sup.	_____	_____
	First Aid	_____	_____
	CPR	_____	_____
_____	40 hr	_____	_____
	8 hr Ref.	_____	_____
	8 hr Sup.	_____	_____
	First Aid	_____	_____
	CPR	_____	_____
_____	40 hr	_____	_____
	8 hr Ref.	_____	_____
	8 hr Sup.	_____	_____
	First Aid	_____	_____
	CPR	_____	_____
_____	40 hr	_____	_____
	8 hr Ref.	_____	_____
	8 hr Sup.	_____	_____
	First Aid	_____	_____
	CPR	_____	_____
_____	40 hr	_____	_____
	8 hr Ref.	_____	_____
	8 hr Sup.	_____	_____
	First Aid	_____	_____
	CPR	_____	_____

9.0 MEDICAL MONITORING REQUIREMENTS

All site personnel participate in a medical monitoring program. This program is initiated when the employee starts work with a complete physical and medical history and is continued on a regular basis. The annual physical will serve as an exit examination for full-time USACE personnel. A post-construction exit examination will be required for any temporary or terminated employees. The medical monitoring program complies with OSHA regulations found at 29 CFR 1910.120(f) and Corps of Engineers requirements. A listing of USACE's medical profile is shown below.

WORKER MEDICAL PROFILE

Item	Initial	Annual
Medical	X	X
Work History	X	X
Visual Acuity and Tonometry	X	X
Pulmonary Function Test	X	X
Physical Examination	X	X
Audiometry Tests	X	X
Chest X-Ray	X	X
Complete Blood Counts	X	X
Blood Chem (SSAC-23 or equivalent)	X	X
Urinalysis	X	X
Dermatology Examination	X	X
Electrocardiogram/Stress Test	X	X

Specific Tests (as required): (PCB blood or fat, urine mercury, urine arsenic, urine phenol, urine halomethanes, blood cyanide, cholinesterase-pseudo-cholesterase, nerve conduction velocity tests, blood lead, urine lead.)

9.1 Unscheduled Medical Examinations. Unscheduled medical examinations are conducted:

- At employee request after known or suspected exposure to toxic or hazardous materials
- At the discretion of the USACE occupational physician

The following signatures from each individual on the site verifies completion of requirements and Date of latest medical examination received:

Personnel	Date

The medical monitoring program is outlined in Table 2.

10.0 EMPLOYEE SAFETY

To ensure that the SSHP is followed, the SSC shall conduct safety meetings before and after each day's work. All individuals will attend these meetings. The purpose of these meetings is to:

Table 2

Medical Monitoring Program

1. Pre-employment Screening
   a. Medical history.
   b. Occupational history.
   c. Physical examination.
   d. Determination of fitness to work wearing protective equipment.
   e. Baseline monitoring for specific exposures.

2. Periodic Medical Examinations
   a. Yearly update of medical and occupational history; yearly physical examination; testing based upon (1) examination results, (2) exposures, and (3) job class and task.
   b. More frequent testing based on specific exposures.

3. Record-keeping and Review
   a. Maintain and provide access to medical records in accordance with OSHA and state regulations.
   b. Report and record occupational injuries and illnesses.
   c. Review health and safety plan periodically to determine if additional testing is needed.
   d. Review medical monitoring program periodically in light of current site hazards, exposures, and industrial hygiene standards.

- Coordinate site work activities.
- Describe any changes in the SSHP.
- Obtain worker feedback on conditions affecting health and safety.
- Obtain feedback on how well the HSP is working, and discuss needed changes.
- Reinforce proper work habits (i.e. use of "Buddy System").

10.1 Site Inspections. The SSC will inspect daily site conditions, facilities, equipment, and activities to determine whether the SSHP is adequate and being followed. In order to make inspections effective, the SSC shall:

- Have a checklist applicable for each site and activity, listing the items to be inspected.
- Review results of these inspections with supervisors and workers in the safety meetings.
- Inspect again any identified problems to ensure that they have been corrected.
- Document all inspection and subsequent follow-up actions. Retain these records until site activities are completed and turn them in to the Geotechnical Branch at the conclusion of the work.

The frequency of inspections shall be made more or less commensurate with the characteristics of the site the equipment used on the site, and the progress of the work on the site.

10.2 Personnel Protection.

10.2.1 Division of Work Area. Considering the isolated area and the low levels of contaminants revealed in earlier sampling at the OBP and MG, no formal division of the work area will be made at the start of sampling. However, if air monitoring indicates the need to minimize the transfer of hazardous substances from the work site and to ensure proper protection of personnel, three zones will be established. The three contiguous work zones are (1) Zone 1: Exclusion Zone, (2) Zone 2: Contamination Reduction Zone, and (3) Zone 3: Support Zone (Figure 4).

10.2.1.1 Exclusion Zone. Contamination does or could not occur in this zone. All people entering the Exclusion Zone must wear Modified Level D protection as a minimum. An entry and exit point for personnel and equipment will be established at the periphery of the Exclusion Zone to regulate the flow of personnel and equipment by the Site Safety Coordinator. The outer boundary of Zone 1, the Hotline, will initially be established as a 30-ft radius circle surrounding the drill rig or completed hole when bore samples are gathered. This Hotline will be defined in the field by a printed hazard ribbon or equal. Factors that will be considered in extending this boundary will be air monitoring data, the physical area necessary to conduct site operations, and the potential for contaminants to be blown from the area, but in no case will the circular boundary have a radius of less than 30-ft.

10.2.1.2 Contamination Reduction Zone. Between the Exclusion Zone and the Support Zone will be the Contamination Reduction Zone which will provide a transition between the potentially contaminated zone and the clean zone. Zone 2 will serve as a buffer to further reduce the probability of the clean zone becoming contaminated. It will provide additional assurances that the physical transfer of contaminating substances on people equipment, or in the air will be limited through a combination of decontamination, zone restrictions, and work functions. Exit from the Exclusion Zone will be through this Contamination Reduction Zone (Figure __).

10.2.1.3 Support Zone/Command Post. The Support Zone will be considered a non-contaminated area. The location of support facilities in the Support Zone and readily accessible to the nearest road. Support facilities (i.e. command post, equipment trailer, first aid station) will be located in this zone. Since normal work clothes are appropriate within this zone, potentially contaminated personal clothing, equipment, and samples are not permitted in this zone. The on-site support zone/command post have been established at TBP. The prevailing wind conditions are TBP. This location is upwind from the Exclusion Zone.

10.2.1.4 Work Zone Integrity. The integrity of the division of the work zone during duty hours shall be maintained by control of access and egress. Before crossing into another zone, a person will be admitted by the Site Safety Coordinator or Security Officer only after having given proper identification, authorization and certification of required training and medical examinations. The Site Safety Coordinator will record each person's:

- Name.
- Status (in our out).

Figure 5. Site Work Zones

Figure 6. Contamination Reduction Zone Layout

- Time of entry.
- Anticipated exit time.
- Areas to be entered.
- Task to be performed.
- PPE worn if applicable.

Access to any divisions of the work zone during off-duty hours shall be controlled by security at NWSC. They will be appraised of the work at the site and its hazards and will be instructed in contacting emergency services.

10.2.2 Personal Protective Equipment. This section addresses the various levels of personal protective equipment which are or may be required at NWSCC, OBP and MG. USACE employees are trained in use of all PPE utilized.

Personal protective equipment will be worn or used as required by this HASP. No downward changes to the level of protection is allowed without the approval of the SSC.

Based on the evaluation of potential hazards at OBP and MG, the Modified Level D or Level C is prescribed for all activities on this activity, except for the Support Zone, where Level D of protection beyond general safety PPE (i.e. hardhat/boots) will be required.

10.2.2.1 Anticipated Protection Levels.

Task	Protection Level	Comments/Mods
Soil Excavation/Drilling	Level C/Mod D	
Soil/Water Sampling	Level C/Mod D	

10.2.2.2 Level D. Level D consists of the following:

- Safety glasses with side shields
- Hard Hat
- Steel-toed work boots
- Work clothing as prescribed by the weather

10.2.2.3 Modified Level D.

- Safety glasses with side shields
- Hard Hat
- Steel-toed shoes
- Nitrile, neoprene, or PVC overboots or vinyl booties
- Outer nitrile, neoprene, or PVC gloves over latex sample gloves
- Face shield (when projectiles or splashes pose a hazard)
- Tyvek coverall (Saranex Tyveks (Sarans) and PVC acid gear will be required when workers have a potential to be exposed to contaminated liquids or sludge)
- Hearing protection (ear plugs, ear canal caps or muffs)

10.2.2.4 Level C.

- Full-face, air purifying respirator with North N7500-3, HEPA, Wilson T01 and Pre-filter T10 cartridges

- Hooded Tyvek coveralls and Saranex Tyveks (Sarans) (PVC acid gear will be required when workers have a potential to be exposed to contaminated liquids or sludge)
- Steel toes boots, boot covers
- Hearing protection
- Nitrile, neoprene, or PVC overboots
- Nitrile, neoprene, or PVC gloves over latex sample gloves
- Face shield (when projectiles or splashes pose a hazard)
- Disposable coveralls
- Hard Hat

10.2.2.5 Level B. Level B protection consists of the items required for level C protection with the exception that an air-supplied respirator is used in place of the air-purifying respirators.

10.2.2.6 Level A. Level A protection consists of the items required for Level B protection with the addition of a fully-encapsulated, vapor-proof suit capable of maintaining positive pressure.

10.2.2.7 Breathing-Air Quality. Code of Federal Regulations 29 1910.134 states breathing air will meet the requirement of the specifications for Grade D breathing air as described in the compressed Gas Association Specification G 7.-1966.

10.2.2.8 Air Purifying Respirators. North and Wilson full-face air-purifying respirators will be used at OBP and MG.

10.2.2.9 Respirator Cartridges. The crew members working in Level C will wear respirators equipped with North and Wilson air-purifying cartridges, unless otherwise noted. These cartridges are approved for:

- Organic vapors <1,000 ppm.
- Chlorine gas <10 ppm.
- Hydrogen chloride <50 ppm.
- Sulfur dioxide <50 ppm.
- Dust, fumes and mists with a TWA <0.05 mg/m3.
- Asbestos-containing dusts and mists.
- Radon daughters.
- Radionuclides.
- Pesticides.

10.2.2.10 Cartridge Changes. All cartridges will be changed a minimum of once daily. However, water saturation of the HEPA filter or dusty condition may necessitate more frequent changes. Changes will occur when personnel begin to experience increased inhalation resistance or breakthrough of a chemical warning property.

10.2.2.11 Inspection and Cleaning. Respirators are checked periodically by a qualified IH or HSO and inspected before each use by the wearer. All respirators and associated equipment will be decontaminated and hygienically cleaned after use.

10.2.2.12 Fit Testing. Annual respirator fit tests are required of all our personnel wearing negative-pressure respirators.

10.2.2.13 Corrective/Contact Lenses. Normal eyeglasses cannot be worn under full-face respirators. For workers requiring corrective lenses, special designed adapters for use with respirators will be provided.

Contact lenses will not be worn with any type of respirator.

10.2.2.14 Medical Certification. Only those workers who have been certified by a physician as being physically capable of respirator usage will be issued a respirator. Personnel unable to pass a respiratory fit test or without medical clearance for respirator use will not be permitted to enter or work in areas on site that require respiratory protection. Employees receive a written physicians opinion that they are fit for general hazardous waste operations as per 29 CFR 1910.120(f)(7).

10.2.2.15 Site-Specific Respiratory Protection Program. The USACE Respiratory Protection Program complies with 29 CFR 1910.134. The criteria for determining respirator need are contained in the SSHP's Air Monitoring Section. All respirator users are trained in proper respirator use and maintenance. The SS and SSC will observe workers during this project when using respirators and look for signs of stress and will monitor air levels of contaminants to ensure that respiratory protection is sufficient. The SSC/IH will also evaluate the HASP weekly to determine its continued effectiveness.

10.2.2.16 PPE Inspection. All PPE will be inspected by the SSC prior to being issued to workers on the job. The Site Safety Coordinator will:

- Inspect and operational testing of newly received equipment
- Inspection of equipment prior to issue to workers
- Inspect multiple-use equipment after use or training and prior to maintenance
- Periodically inspect stored safety equipment
- Insure all site workers have been trained in the use of PPE

Equipment inspection will follow procedures specified by PPE manufactures. The SSC will maintain records of all inspection procedures. Individual identification numbers shall be assigned to all multiple-use pieces of equipment, and records will be maintained by that number. Inspections, will record the ID number, date, inspector's name and findings. Damaged or otherwise objectionable equipment shall be repaired or removed from the job.

10.2.2.17 Work Mission Duration. Before the workers actually begin work in their PPE ensembles, the anticipated duration of their work mission will be established. Several factors will be considered in determining mission length. These will include:

- Suit/ensemble permeation and penetration by chemical contaminants.
- Ambient temperatures

10.2.2.18 In-use Monitoring. During equipment use, workers will be encouraged to report any perceived difficulties to the SSC or SS. These difficulties include, but are not limited to:

- Degradation or permeation of PPE

- Perception of odors
- Skin irritation
- Unusual residues on PPE
- Discomfort
- Resistance to breathing (if respirators are worn)
- Fatigue due to respirator use
- Interference with vision or communication
- Restriction of movement
- Personal response such as rapid pulse, nausea, and chest pain

10.2.2.19 Storage. PPE will be stored properly to prevent damage or malfunction from exposure to dust, moisture, sunlight, damaging chemicals, or extreme temperature.

11.0 DECONTAMINATION PROCEDURES

All personnel, clothing and equipment leaving the EZ (if applicable) must be decontaminated to remove any contaminants. Decontamination activities will be conducted in the CRZ. This sequence describes the general decontamination sequence to be followed for the OBP and MG sites.

For personnel, the following steps will be taken for decontamination:

Station 1. Deposit equipment (tools, sampling devices and containers, monitoring instruments, clipboard etc.) on plastic drop cloths.
Station 2. Scrub outer boots, outer gloves, and splash suit with decon solution or detergent water. Rinse thoroughly with water.
Station 3. Remove outer boots and gloves. Deposit in a container with a plastic liner.
Station 4. If a worker leaves the Exclusion Zone to change a canister or mask, this is the last step in the decontamination procedure. Obtain a new canister, don new outer gloves and boot covers, tape joints, and return to work.
Station 5. Remove boots, chemical-resistant splash suit, and inner gloves and deposit in separate containers lined with plastic.
Station 6. Remove facepiece/shield, or respirator and deposit.
Station 7. Wash hands and face thoroughly. Shower as soon as possible.

11.1 Suspected Contamination. Any employee suspected of sustaining skin contact with chemical materials will first use the emergency shower. Following a drenching, the worker will proceed to the decontamination facility. Here the worker will remove clothing, shower, don clean clothing, and immediately be taken to the first-aid station.

11.2 Personal Hygiene. Before any eating, smoking, or drinking, personnel will wash hands, arms, neck, and face.

11.3 Equipment Decontamination. A separate area will be designated in the CRZ for equipment decontamination. The USACE will provide in this area steam cleaning equipment at a capacity capable of adequately cleaning site equipment. Wastestreams will drain in the waste-water-collection area and be collected from a sump area.

The personnel performing equipment decontamination will be provided with splash aprons or chemically impervious/water resistance gear, chemical resistance boots and gloves.

For equipment, the following steps will be taken for decontamination:

1. Remove any solid particles from the equipment by brushing and then rinsing with tap water. For drilling equipment, steam cleaning is necessary.
2. Wash equipment with a detergent solution.
3. Rinse with tap water by submerging or spraying.
4. For organic contaminants, an optional rinse with a solvent (methanol or acetone) may be used to dissolve and remove contaminants.
5. Rinse thoroughly with distilled water.
6. Air dry equipment or rinse with methanol.

To protect delicate instruments prior to use in the EZ and CRZs, instruments shall be placed in a clear plastic bag, and the bag shall be taped and secured around the instrument. Openings are made in the bag for sample intake. The plastic bag shall be discarded appropriately in lieu of decontamination.

All liquids and disposable clothing will be treated as contaminated waste and disposed of properly.

12.0 AIR MONITORING

This program will be implemented for the periodic surveillance of the investigation sites so as to continually ensure the accuracy of the division of the work area and the adequacy of worker protection. During investigation activities, the SSC will monitor the work site for, combustible gas/02 and for organic vapors. Additional air monitoring may be conducted at the discretion of the SSC or IH.

The following chart describes the air monitoring which will be required at OBP and MG, and appropriate action levels. The select Engineering controls will be the PPE referenced and prescribed work practices. Initial entry will be Modified Level D at PCA/R-150 Tank Site. No IDLH conditions are expected on entry or during the operation but IDLH Hazards are listed in Table 1.

The SSC and IH will ensure that all PPE will protect below the designated PEL's for suspected substances listed in this HASP. The initial Entry for OBP and MG Sites will follow the proposed plan as stated below. Using the LEL meter, OVA/HNU and the Rad Survey meter.

Monitoring Device	Action Level	Action
LEL/02 Exotox 40	>10% LEL Explosion Hazard	Continue Monitoring, but if increase continues, evacuate.
Exotox 40	<20.8% 02 Depleted 02	Evacuate, upgrade to Level B if necessary and continue to monitor

Monitoring Device	Action Level	Action
PID/HNU 101 OVA/128	1-5 ppm unknowns above background Organic Vapors/Gas	Level C/Mod Level D
	5-100 ppm unknowns	Level B
	100 ppm unknowns	Level A
Ludlum Model 3	<1mr/hr	Continue Monitoring, Consult Health Physicist
	>1 mr/hr Gamma Radiation	Continue Monitoring upon advice from Health Physicist
Draeger Tubes Benzene	1-5 ppm	Stop work, consult for upgrade

12.1 Lower Explosive Limit/Oxygen (LEL/02) Meter. During drilling, the SSC will monitor the work area to detect, measure, and document any explosive concentrations of contaminants. Explosion potential measurements will be made using a combination combustible gas/oxygen (LEL) (Neotronics Meter, Exotox Model 40-OFH) and hydrogen sulfide meter. Drill crews shall use the LEL meter while drilling to determine if any explosive potential exists within the working area. Readings taken at the barrel or opening of the boring are indicative of vapor-gas escape, but may be inaccurate or inconclusive. Readings taken approximately one foot above the source indicate a greater potential for a hazardous condition developing. Readings one foot above a source showing >10% of LEL or greater requires an immediate shut down of operation and area evacuation of the Exclusion Zone until bore readings return to background levels. The Safety Office shall be notified to determine further action. All readings shall be recorded on direct reading forms. Potential for oxygen deficient atmosphere is unlikely for the work being conducted. Hydrogen sulfide will generally not be a problem in this project, but any readings greater than 10 ppm of Hydrogen Sulfide above a source require an immediate shut down.

12.2 Confined Space. No confined space work is planned for the OBP or MG sites. Prior to entering a confined-space area or hot work area, LEL/02 will be constantly monitored. In addition, the SSC will follow a Confined space entry procedure that is in EM 385-1-1, or the local District Policy, Appendix C.

The policy will include:

- The use of a designated competent person to enforce correct procedure.
- Obtain confined space entry procedure/permit from Health and Safety Department (ATTACHED).
- Monitor atmosphere with combustible gas meter, oxygen meter and any toxic gas meter, available (Exotox 40, OVA or PID).

12.3 Organic Vapors OVA 128/Photoionization Indicating Device (PID). The SSC shall use a photoionization detector (HNU Systems Model 101, Hazardous Waste Detector or Foxboro OVA Model 128) to monitor the levels of ionizable vapors at the investigation site. Measurements will be made in the bore hole,

at ground level, and at the worker's breathing zone. The PID/OVA will be calibrated relative to benzene and methane concentrations or to standards traceable to benzene. In the event that the PID/OVA detects a contaminant(s), a 0.5a Draeger tube for benzene will be used to confirm the presence of benzene and its concentration. Benzene will be specifically monitored for each drilling. If benzene is detected, but its concentration is below 5ppm in the breathing zone, work will stop, and the IH or Safety Office will be notified to inquire about donning respirators. If the benzene level exceeds 5ppm in the breathing zone, all personnel will evacuate the Exclusion Zone until bore hole readings return to background values, and the SSC will call the designated Safety Office or IH for further instruction.

If benzene is not detected, the protection level will be based on total organic concentration levels for a 1-min detector reading in the breathing zone. The following protection levels will be used for concentration measurements in the breathing zone:

For known contaminants only, to determine a protection level from PID or OVA data, the SSC will multiply the TLV of the known compound by 25. This is the limit for Level C protection for that compound. If the PID or OVA readings exceed 25 times the TLV, Level B protection will be required. Also, regardless of the TLV, a PID/OVA reading of 1,000 ppm or more will indicate that the cartridges may become overloaded and will necessitate Level B protection.

Levels of volatile organic compounds will be measured in the air at active work sites at least once every hour or more and at the support zone once every hour when levels are detected above background in the exclusion zone.

12.4 Air Monitoring Log. All air-monitoring data results will be reported on a data sheet by the IH and record kept file (attached). The data sheet will contain the following information:

- Date and time of monitoring
- Air monitoring location
- Instrument, model #, serial #
- Calibration/background levels
- Results of monitoring
- HSO signature

12.5 Calibration Requirements. The PID/OVA, LEL/02 meter and sampling pumps required with fixed-media air sampling will be calibrated daily prior to use. A separate log will be kept detailing date, time, span gas, or other standard, and the name of the person performing the calibration.

13.0 RADIOLOGICAL/MUSTARD GAS CONTAMINATION

No radiation hazards are expected at the OBP or MG. If a radiation problem arises, it will be handled as follows. With a Ludlum Model 3 portable survey meter, the Site Safety Coordinator will screen samples, equipment and personnel for alpha, beta, and gamma contamination. The survey meter will be operated according to its manufacturer specifications regarding use and limitations. If elevated radioactivity levels are detected in a work area, the

investigation site will be evacuated and the Site Safety Coordinator will notify the Wilmington District Safety and Occupational Health Office for further instruction. Following exposure to elevated radioactivity levels, workers will submit a bioassay to be analyzed for Thorium 232. Along with instrument monitoring, each worker will wear a thermoluminescent dosimeter badge.

Mustard Gas. No mustard gas hazards are expected at the OBP or MG. See emergency decontamination (14.6.1).

14.0 CONTINGENCY PLAN/EMERGENCY RESPONSE

Prior to field activities, the SSC will plan emergency egress routes and discuss them with all field personnel. These routes will be posted.

14.1 Line of Authority. The SSC will ensure that all participants conduct their work in accordance with the HASP, and will direct any employee to leave the site if the employee fails to observe safety requirements or in any way creates a safety hazard. The SSC will be backed up by a specified alternate _____. Other personnel who may be involved in emergency response will be identified and their respective roles defined, at least two emergency response personnel on the job shall be certified in CPR and First Aid.

14.2 Pre-emergency Planning. The SSC will contact the local hospital emergency room, the local poison control center, and the NWSCC security, fire and ambulance services before activities begin. The SSC will inform the hospital emergency and ambulance service of probable emergencies.

14.3 Emergency Services/Communication. At the investigation site, the SSC shall ensure that adequate emergency equipment is at the investigation site.

Emergency equipment shall include:

- Mobile telephone/Radio Communication (optional) and in this project not authorized, Phone Number _____
- First Aid Kits
- Portable Eyewash and shower
- Blankets
- Stretchers
- Water in portable containers
- Fire-fighting equipment and supplies
- Level B PPE, available from NWSCC

The SSC shall ensure that the emergency signals, audible and universal hand signals are understood, in case of radio failure. The following standard hand signals will be mandatory for all employees regardless of other means of communication:

- Three vehicle horn blasts is an emergency signal to leave Exclusion Zone
- Hands gripping throat (Out of AIR)
- Grip Partners Wrist (Leave Area NOW)
- Hands on Head (Need Assistance)

- Thumbs UP (OK, Allright)
- Thumbs Down (No, negative)

14.4 Fire and Accident Procedures. All employees will be made aware of the fire and accident response procedures by site-specific training prior to start of work. And the available support from the local Crane Spill Response Team.

14.5 Emergency Evacuation from Exclusion and Contamination Reduction Zone. Any personnel requiring emergency medical attention will be evacuated immediately from the EZ and CRZ. Personnel will not enter the area to attempt a rescue if their own lives would be threatened. The SS and SSC decision whether or not to decontaminate a victim prior to evacuation is based on the type of severity of the injury and the nature of the contaminant.

14.6 Emergency Decontamination. If immediate medical treatment is required to save a life, decontamination will be delayed until the victim is stabilized. If decontamination can be performed without interfering with essential first aid, decontamination will be performed immediately.

If decontamination cannot be performed immediately emergency personnel will:

- Wrap victim in blankets or plastic to reduce contamination of other personnel and emergency vehicles.
- Alert emergency and medical personnel to potential contamination; instruct them about specific decontamination procedures.
- Send site personnel familiar with the incident to the hospital with the victim.

14.6.1 Emergency Decontamination for Mustard Exposure.

a. Eye and mucous membrane contamination-speed in decontamination of the eyes is absolutely essential. The procedure is very effective for mustard in the first few seconds after exposure but is of very little value in later exposure. Remove personnel from the liquid source and flush eyes immediately, with water by tilting the head to the side, pulling the eye lids apart with the fingers and pouring water slowly into the eyes. Note, do not cover the eyes with bandages but, if necessary, protect the eyes by means of dark or opaque glasses. Transfer the individual to a medical facility.

b. Skin contamination - Remove person from agent source immediately. Flush skin and clothes with 5% sodium hypochlorite solution for one minute. Cut and remove contaminated clothing, flush contaminated skin area with soap and water. If shower facilities are available, wash thoroughly and transfer to medical facility. (If thickened agent is involved, remove by scraping with something dull instrument such as a putty knife or trowel.

14.7 First Aid. Qualified personnel only will give first aid and stabilize an individual needing assistance. Professional medical assistance will be obtained at the earliest possible opportunity. A minimum of two first aid/CPR qualified individuals will be on site at OBP and MG, they are:

1.
2.

14.8 Emergency Actions. If actual or suspected serious injury occurs, these steps will be taken:

- Remove the injured or exposed worker(s) from the immediate danger.
- If decontamination can be done, first wash, rinse and/or cut off protective clothing and equipment, next render first aid as needed, and then call for transport to the hospital.
- If decontamination cannot be done, first wrap the victim in blankets or plastic to reduce contamination of other personnel. Next alert emergency and off-site medical personnel of potential contamination and instruct them of specific procedures if necessary.
- Evacuate other personnel from the immediate affected area to a safe location until the Safety Coordinator determines that the site is safe for work to resume.

14.9 General Evacuation Plan. In the general case of a large fire, explosion, or toxic vapor release, a site evacuation will be ordered and will follow these steps:

- Sound applicable alarm, Three loud blasts (air horn).
- Evaluate the immediate situation and downwind direction. All personnel will evacuate in the upwind direction.
- All personnel will assemble in an upwind area. When the situation permits, a head count and buddy check will be taken.
- Determine the extent of the problem. Dispatch a response team in protective clothing and SCBA's on site to evacuate any missing personnel or to correct the problem.

14.10 Fire Procedures

- Sound alarm
- Only attempt to extinguish small controllable fires which can be easily controlled with portable fire fighting equipment (i.e. 5 lb ABC, CO_2) until help arrives, unless imminent danger exists. Evacuation will be necessary whenever an uncontrollable fire threatens health and safety at the site. Notify the NWSCC fire department immediately following evacuation.

15.0 EMERGENCY INFORMATION

15.1 Site Maps. Site maps showing topographic features, prevailing wind direction, work zones, and evacuation routes shall be posted conspicuously at the work site in locations known to all personnel. Site personnel must verify these numbers upon arrival to the site and prior to beginning any activities.

15.2 Emergency Telephone Numbers. The following list of emergency telephone numbers will be posted conspicuously. And all site personnel will be told their locations (attached).

EMERGENCY SERVICE/CONTACTS	TELEPHONE NUMBER
- USEPA Environmental Response Team	201/321-6460
- US Coast Guard Environmental Response Team	800/424-8802
- Association of American Railroads Response Team	202/293-4048
- Project Manager _____	
- Health & Safety Officer _____	
- Alternate HSO/SSC _____	
- Fire Department NWSCC CRANE	812/845-1235 or 854-1333
- Police/Security Department NWSCC CRANE	812/854-3300
- State Police INDIANA STATE POLICE	812/332-4411
- Hospital NWSCC CRANE	812/854-1220
BEDFORD MEDICAL CENTER	812/854-1339
- Ambulance On-Site/Off-Site NWSCC CRANE	812/854-1100
LAWRENCE CO	812/279-6545
- Poison Control Center	800/382-9097

15.3 Emergency Documentation. All incidents involving personal injury shall be investigated and documented so that preventive measures may be taken to avoid similar incidents. At a minimum, the following steps shall be taken:

- Notify the Safety and Occupational Health Office
- Prepare the Accident Report, EN.3394, in accordance with Corps of Engineers regulations.
- Prevent the work area from being disturbed until the accident investigation is completed.
- Notify NWSCC personnel in accordance with their regulations.

15.4 Logs, Records, and Reports. The following logs, reports, and records shall be developed, retained and made available to entitled regulatory agencies upon request: (1) Training logs; (2) Medical records; (3) Daily safety meeting reports; (4) Daily air monitoring logs; and (5) Daily safety inspections logs. The daily records for safety meetings, air monitoring, and inspections will be kept in a separate safety and health log book, Appendix B contains blank record forms.

16.0 CHANGES TO THE SSHP

The Site Safety Coordinator will submit changes to the SSHP for approval by the District Safety and Occupational Health Office prior to implementing the changes.

17.0 PLAN APPROVAL

District Safety Officer

_____	_____	_____
Name	Signature	Date
_____	_____	_____

Other Approval

18.0 HEALTH AND SAFETY PLAN CERTIFICATION

The following signature certifies that they have read, understand and comply with the guidelines set forth in this Safety Plan.

Site Name (PRINT)	Signature	Personnel/Visitors Date

19.0 REFERENCES

(1) U.S. Army Corps of Engineers (USACE), Safety and Health Requirements Manual, EM 385-1-1, October 1987.

(2) Occupational Safety and Health Administration (OSHA), Construction Industry Standards, 29 CFR 1926, and General Industry Standards, 29 CFR 1910; 29 CFR 1910.120 "Hazardous Waste Site Operations and Emergency Response," Federal Register, Vol. 54, No. 42, dated 6 March 1990.

(3) NIOSH/OSHA/USCG/EPA, Occupational Safety and Health Guidance Manual for Hazardous Waster Site Activities," October 1985.

(4) EPA "Standard Operating Safety Guides," July 1988.

(5) Hawley's, Condensed Chemical Dictionary, 11 Edition, Van Nostrand Reinhold Company, NY. 1987.

(6) Sax, Dangerous Properties of Industrial Materials, Fifth Edition, Van Nostrand Reinhold Company, NY, 79.

(7) ACGIH, Threshold Limit Values and Biological Exposure Indices for 1989-1990, 2nd Edition, Cincinnati, Ohio.

(8) NIOSH, NIOSH, Pocket Guide to Chemical Hazards, 1990. DHHS Publication No. 90-117.

February 11, 1992

Subject: Response to EPA comments on the RFI Work Plan for the Old Burn Pit and McComish Gorge at the Naval Weapons Support Center, Crane

COMMENTS:

1. Page 1
   a. Paragraph 2, Line 2

      There should be a sentence break as follows....sites were investigated. Of these 19 sites....

      Concur. Corrected as above.

   b. Last paragraph

      1) Separate the township-range and the latitude-longitude description of each site.

      Concur. This was done.

2. Page 4.
   a. Paragraph 3

      --should indicate in this paragraph that metals contamination has been found--

      concur. done.

   b. Last Paragraph.

      There should be compatibility of boring and monitoring well designations between the text and figures.

      concur. All figures were corrected.

3. Page 9
   a. information regarding the hydraulic characteristics of the Mansfield bedrock under the site.

      No information available. It should be pointed out that the geomorphic map (Wayne) was not depicting conditions at the OBP or MG but providing general concepts.

      What does 4.9 refer to ?

Typo. 4.9 deleted

b. Para. 4

figure 14 should be referenced from this paragraph.

concur. added.

4. Page 16, Figure 13

The figure title should make clear that the area of high metal concentration is drawn based on the results of soil sample analysis.

concur. Title changed to reflect this.

5. Page 17, Fig. 14

A north arrow should be added----

concur. Added.

6. Page 18

a. Para. 2

figure 14 shows groundwater contours at OBP not clay and silt thickness.

Concur. Typo. Changed to reflect above.

b. Para. 3.

24DNTOL is not a standard chemical abbreviation---should be 2,4-dinitrotoluene (2,4-DNT)

concur. Changed as per above.

c, Last Para.

Exponent missing on line 6.

Typo. Corrected as per Dunbar's report.

Add words to last sentence---Thickest sands shown on Figure 15 would act....

Concur. Added as above.

7. Page 19, Fig. 15

Appropriate units should be added.

concur. Added

8. Page 20, Figure 16
A scale must be included.

concur. scale added.

9. Page 28

a. Paragraph 2

This paragraph indicates that the shallowest aquifer discharges into Culpepper Branch. Has stream been monitored?

The stream has not been sampled but will be under upcoming Surface Water sampling plans. Remark to that effect added to text.

b. Para 3

It is standard practice when studying a site....that a well construction table be provided....

concur. This table has been provided.

c.Para. 5

The first sentence should be rewritten.

concur. This was done.

The last sentence in this paragraph states that the purpose of this study is to conduct RFI Phase III.....Para. 8 has RFI II..

Phase III Groundwater is correct, Typo has been corrected.

10. Page 29, Fig 24

The author should provide well numbers.....

concur. Provided.

11. Page 30

a. Para. 2

In line 2 DBP should be OBP

In line 5....monitoring wells will.....

concur. Typos corrected.

b. Sect. 2.2.2

Change first sentence to reflect correct subject sites....

concur. Typo corrected.

c. Sec. 2.2.3

Existing groundwater wells and "newly installed wells"..

concur. "newly installed wells" added

A survey plan should be provided.

concur. Plan has been added.

12. Page 31

a. Para 1

Fig 24 and 25 are not in agreement with figure references...

concur. Typos corrected.

b. Para 2

This paragraph indicates samples will be taken from the least contaminated locations first. If relative contamination levels are to be based on the analysis of prior well samples, this should be stated.

concur. Stated as above.

c, Par. 3

Should the undefined table on Line 3 be table 3.1.3?

Yes. Defined as above.

13. Page 34

a. Section 3.1.2

The three-dimensional perspective should be tied to the hydrostatic units and Figure 27 in this paragraph.

Concur. This paragraph was rewritten to explain that figure 27 is general and that type of subsurface detail does not exist for the subject sites.

b. Section 3.1.3

Line 6, correct contaminants

Line 7, bases should be basis

concur. Typos corrected.

14. Pages 34-37

The discussion of metal analyses to be performed does not say if samples are to be filtered.

Samples will be filtered as in past sampling at similar sites at NWSCC.

15. Page 39

a. Section 3.2.1 Para. 2

Line 2 it is redundant to talk of measuring water levels and potentiometric surfaces.

They are not necessarily the same by definition but this has been reworded as per above.

b. All wells in a cluster must be logged.....

It has been noted that within 5 to 10 feet the stratigraphy changes very little in this area. Any abrupt changes are logged but complete logging of all wells is believed to be an unnecessary expense.

c. Section 3.2.4

What observations have resulted in screen slot size selection...why not sieve analysis.....

Most of the wells have been in hard rock and there was no need to sieve to determine slot size. The .020 in. slots have been performing satisfactorily. If unconsolidated materials are encountered they will be addressed on a hole by hole basis. The methods have been included for determining screen slot size if they are needed.

16. Page 40

a. Para. 1

What is the procedure to be used for determining the filter sand size....

This procedure has been added to the work plan.

b. Section 3.2.5 Para 2

Reference for statement that oil can be introduced into an aquifer even if an inline filter is used...

This is based on hands on experience with Corps of Engineers.

Para 2 and 4 are duplicates.

concur. Typing error corrected.

17. Page 42

a. Para. 1 Line 4

What is the definition of "stable"...?

Stable has been deleted from the text.

b. Table 3.2.3

1) Chloride and conductance are not listed on parameter list...

Chloride and conductance are routine parameters which are always ran so they were not listed specifically.

2) Cyanide is included in List of parameters but not in sample preservation techniques.

concur. Sample preservation techniques have been added.

3) Total Organic Halogen is included in this table....

Total organic halogen will not be run. It was deleted from the table.

c. Section 3.3.5

How will it be determined if the waste water is contaminated and therefore must be collected?

This section has been rewritten to handle the waste water as investigation-derived waste to avoid having to drum the waste water.

18, Page 43. Section 3.4.3. Step 7

preservation should be preservative

concur. Typo has been corrected.

19. Page. Fig. 29

The sample analyses planned are not represented on the sample tag.

Spaces are provided on the tags to add them as needed.

COMMENTS ON THE RFI QAPP

GENERAL RESPONSE

The majority of the comments concerned the lack of reference to a current CLP document. WES has this document (WES QAP, 1991) and it has been referenced and limit tables provided in the QAPP plan.

1. Page 2. Para 7, Lines 5-6

Fluoride and sulfate are not metals.

Concur. Changed accordingly.

2. Page 3

a. Para.1. Line 1-2

....run to detect "the" presence of....

concur. Typo corrected.

b. Para. 1, Line 2

Suggest "toxic" be deleted from test....

concur. Deleted.

3, Page 5

a. Paragraph 4, Line 3

What is A 12 separate...

concur. Delete 12

b. Paragraph 7

Instrument specific procedures to calibrate field instruments...

concur. Paragraph added.

4. Page 7

a. Para. 1, Line 4

We do not feel that current CLP criteria shall be used... is acceptable...

Concur, CLP criteria has been referenced to WES ALG QAP, 1991.

b. Para 2

1) Lines 4-5
Reference to acceptance criteria

concur. Properly referenced.

2) quality of data that must be achieved for a study...more detail needed on calibration...

concur. Properly referenced.

c. Para 4, Line 4

The QAPP should specify the method detection limits to be achieved for each analyte.

concur. These limits have been provided in Table 3.

d. Bottom

..instrument results will be recorded and the results used to detect any drift in the instrument reading.

concur. Reworded and properly referenced.

5. Page 9. Control Samples

We feel that the information in this section is inadequate.

Concur. Revised to reflect the use of proper CLP reference.

6. Page 10

a. Data Reduction

..detection data "are" reduced

concur. Corrected

What are these data reduction procedures and reference.

concur. Addressed and reference cited.

b. Data Reduction

...data "are" determined..

concur. Corrected

c. Data Reduction

....slug test data "are" recorded...

concur. Corrected

d. Bottom

The CLP should be tied to a specific date.....

concur. Properly referenced.

7. Page 13

a. Internal QC limits set by laboratory must be stated....

concur. Provided in Table 2.

b. The surrogate section refers to un referenced CLP limits....

concur. Properly referenced.

c. The approach presented has no stated detection limits...

concur. Limits provided.

d. Matrix/Spike samples Surrogates, Blanks and Matrix Spike limit data.....

concur. Limit data provided and referenced.

8. Page 14

Similar comments on CLP limits....

concur. Limit data provided and referenced.

Page 15

a. Method Blanks, Line 4

Delete No.

concur. Typo corrected.

b. Blank/Spike Lab Control Samples

What are the internal QC limits being referred to?

concur. Limits have been provided.

c. Bottom

...Maintained on "at" least a weekly...

concur. Typo corrected.

10.Page 16. Control Charts

The QAPP does not discuss the creation of Control Charts or control chart limits....

concur. Section on control charts added and limits provided.

11. Pages 15-16

This section does not address performance audits....

concur. Section on performance audits added.

12. Page 17, Element 14

The project QAPP does not present any goals for completeness, accuracy, or precision.....

concur. Limits are provided.

COMMENTS ON HEALTH AND SAFETY PLAN

1. The plan is very generic.....too much boiler plate

concur. Has been revised to be more site specific.

2. The training topic outline does not include the following required topics--names of personnel responsible for site safety and health.....

concur. Revised with tentative names provided.

3. Termination physical not mentioned...

concur. Rewritten to include termination physical.

4. Reference page 13, Paragraph 10.2.3.1 The last sentence of this paragraph is incomplete.

concur. Typing corrected.

5. The plan contains very general information on types of air monitoring, personnel monitoring, and environmental sampling techniques.....

concur. This portion completely rewritten.

6. appropriate site control procedures be implemented....

concur. This portion rewritten.

7. Pages 17 and 18 appear to be out of place.

concur, adjustment made.

8. The Contingency Plan does not appear to include all the required topics.....

concur. Rewritten.

9. Confined space entry procedures not included.

No confined space entry is anticipated but the procedures have been included anyway.

10. The Spill Contingency Plan contains poorly organized data and appears of little value to drill site personnel...

concur. Data from Spill Contingency Plan (SCP) incorporated into body of plan and SCP removed.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons lwho manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant pernalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

SIGNATURE

Assistant Public Works Officer 21 Feb 92

TITLE DATE

Enclosure (3)