



Superfund Record of Decision:

Palmetto Wood Preserving, SC

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16. ABSTRACT <p>The Palmetto Wood Preserving (PWP) Site is located in the rural community of Dixiana, South Carolina. The 5-acre site is a decommissioned wood preserving facility which operated between 1963 and 1985. PWP began operating in 1963 using a fluoride-chromate arsenate-phenol (FCAP) and an acid-copper-chromate (ACC) process. In 1980, Eastern Forest Products took over and switched to a chromate-copper-arsenate (CCA) process. Operations consisted of impregnating wood with a CCA solution under high pressure, and allowing the wood to drip-dry under normal conditions. Beginning in December 1981, the South Carolina Department of Health and Environmental Control (SCDHEC) received complaints of green liquids running off the PWP site during heavy rainfall. Subsequent soil sampling conducted by SCDHEC indicated the presence of high concentrations of chromium. Pentachlorophenol (PCP) and dinitrophenol residues were also detected. Well water sampling showed no evidence of contamination. In April 1983, a private well was found to contain high levels of chromium and copper. As a result of the findings, SCDHEC issued a Consent Order requesting Palmetto Wood Preserving to determine the extent of soil and ground water contamination. Primary contaminants of concern include chromium and arsenic.</p> <p>The selected remedial action for the site includes: extraction, filtration and onsite treatment of contaminated ground water with discharge to a nearby stream; (See Attached Sheet)</p>		
17. KEY WORDS AND DOCUMENT ANALYSIS		
a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision Palmetto Wood Preserving, SC First Remedial Action - Final Contaminated Media: gw, soil Key contaminants: chromium, arsenic		
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EPA/ROD/R04-87/026
Palmetto Wood Preserving, SC
First Remedial Action - Final

16. ABSTRACT (continued)

installation of a municipal water line or new well for a private residence; excavation, onsite flushing and onsite replacement of contaminated soils, with onsite treatment of flushing solution. The estimated capital cost of the remedy is \$1,393,000 with annual O&M of \$176,163.

DECLARATION FOR THE RECORD OF DECISION

REMEDIAL ALTERNATIVE SELECTION

Site: Palmetto Wood Preserving
Dixiana, Lexington County, South Carolina

Statement of Purpose:

This document represents the selected remedial action for this Site developed in accordance with CERCLA as amended by SARA, and to the extent practicable, the National Contingency Plan.

The State of South Carolina has concurred on the selected remedy.

Statement of Basis

This decision is based upon the administrative record for the Palmetto Wood Preserving Site. The attached index identifies the items which comprise the administrative record upon which the selection of a remedial action is based.

DESCRIPTION OF SELECTED REMEDY:

*Groundwater remedial activities will consist of the following elements:

- Extraction of contaminated groundwater
- On-site treatment of extracted groundwater
- Filtration of groundwater
- Discharge of treated groundwater to off-site stream
- Groundwater remediation will be performed until all contaminant concentrations fall below the Safe Drinking Water Act standards or criteria are reached
- Installation of a municipal water line or the drilling of a new wells for the Watts' residence, with the potential for other local residents to hook up, will be installed prior to implementation of the remedial alternative

***Soil Flushing/Extraction**

Contaminated soils on the Site will be decontaminated by removing heavy metal ions via ion exchange. This is source control measure to mitigate the threat of off-site migration (via air pathways or groundwater) of metal contamination.

-Excavation of contaminated soils.

-On-Site flushing of contaminated soil to remove Arsenic and Chromium via an acidic water solution.

-Treatment of soils in a two-stage system.

-Testing for decontamination verification and that soils are processed to original buffer capacity.

-Flushing solution is pumped to on-site water treatment facility for processing and recirculation through the soil unit.

-The treated material is transported back to the excavated area where natural aeration is supplemented by tilling and compaction.

DECLARATION

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate, and is cost-effective. This remedy satisfies the preference for treatment that reduces toxicity, mobility, or volume as a principal element. Finally, it is determined that this remedy utilizes permanent solution and alternative treatment technologies to the maximum extent practicable.

I have also determined that the action being taken is appropriate when balanced against the availability of trust fund monies for use at other sites.

Date

9/30/87

Joe R. Thompson for
Lee A. DeHhns III
Acting Regional Administrator

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

PALMETTO WOOD PRESERVING SITE

DIXIANA, SOUTH CAROLINA

Prepared by:

**U.S. Environmental Protection Agency
Region IV
Atlanta, Georgia**

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RECORD OF DECISION

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

PALMETTO WOOD PRESERVING SITE

DIXIANA, SOUTH CAROLINA

1.0 Introduction

The Palmetto Wood Preserving (PWP) Site was added to the National Priorities List (NPL) in September 1983. The Palmetto Site has been the subject of a Remedial Investigation (RI) and Feasibility Study (FS) performed by the Region IV REM II contractor, Camp, Dresser & McKee, Inc. (CDM). The RI Report, which examines air, sediment, soil, surface water, and groundwater contamination at the Site, was issued January 19, 1987. The FS, which develops and examines alternatives for remediation of the Site, was issued in draft form to the public on August 26, 1987.

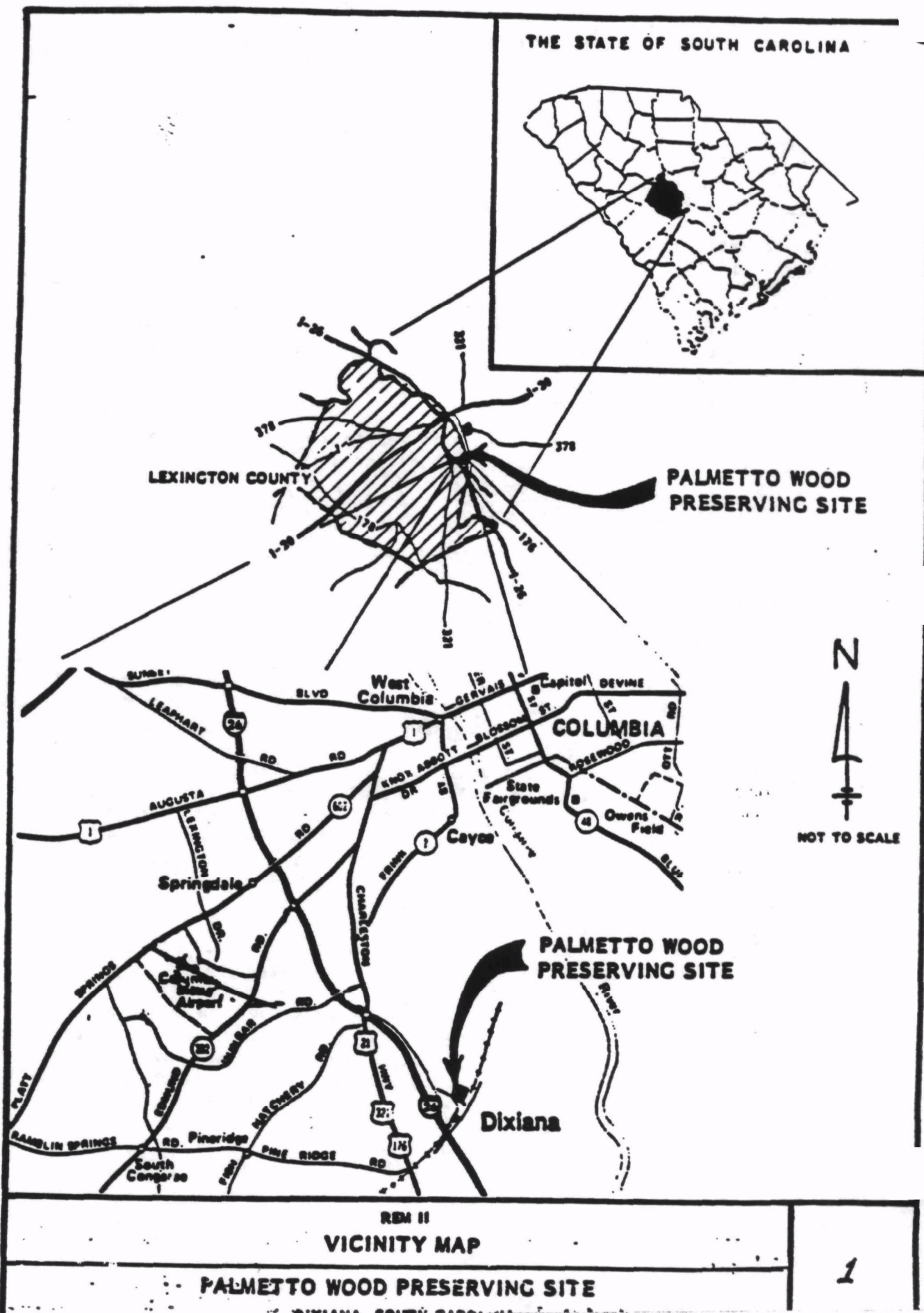
This Record of Decision has been prepared to summarize the remedial alternative selection process and to present the selected remedial alternative.

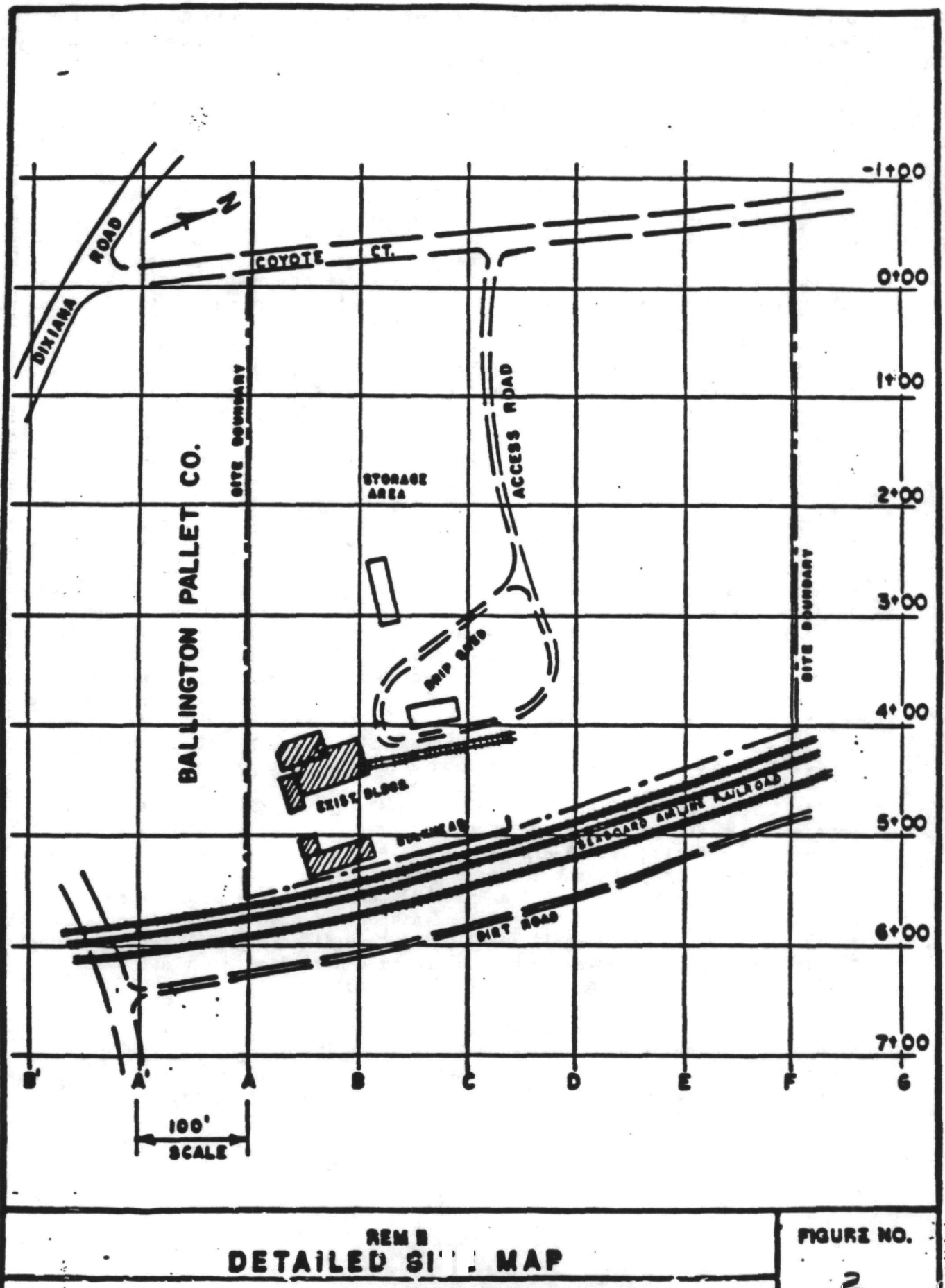
1.1 Site Location and Description

The PWP Site is a decommissioned wood preserving facility located at latitude 33 degrees 55 minutes 06 seconds north and longitude 81 degrees 03 minutes 09 seconds west in the rural community of Dixiana, in Lexington, County, South Carolina (Figure 1). It is 0.25 miles northeast of I-26 and 1.34 miles southeast of I-26 Interchange Number 115 on Route 129/Dixiana Road. This area is approximately 1.5 miles southeast of West Columbia, and 6.4 miles southwest of Columbia, South Carolina. The Dixiana area lies in South Carolina's upper Coastal Plain Physiographic Province. This area is characterized by generally flat to slightly rolling land with many low, wet areas and slow-moving streams.

The PWP Site occupies approximately 5 acres of land, of which 3.67 acres is owned by George K. Bellinger of South Carolina (Figure 2). The remaining parcel of land is owned by South Carolina Electric and Gas. PWP began operating in 1963, using a fluoride-chromate-arsenate-phenol (FCAP) and an acid-copper-chromate (ACC) process. In 1980, new owners, Eastern Forest Products, took over and switched to a chromate-copper-arsenate (CCA) process. During the treatment process, wood was loaded onto a small, narrow-gauge railcar and moved into a pressure vessel where the material was pressure impregnated with the solution. The wood was then removed and allowed to dry, either in a drip shed or in the storage yard areas.

During the period of operation, the Site consisted of the plant structure and equipment (the pressure vessel, narrow gauge rail line, solution storage tanks, drip shed, storage and office building). When the company ceased operations in 1985, all equipment (including pressure cells, piping, narrow gauge rail line and above ground storage tanks) was removed from the Site to an unknown location.





1.2 Site History - Permit and Regulatory History

During December 1981 and occasionally during 1982, the South Carolina Department of Health and Environmental Control (SCDHEC), received complaints of green liquids running off the PWP Site and puddling on the adjacent property and roads during heavy rains. These complaints came from residents near the plant site and from the Pallet Manufacturing Company, whose property adjoins the Site. As a result of these complaints, in February 1982, SCDHEC inspected the PWP Site and collected surface soil samples on-site, and water samples from private wells of varying depths in the immediate vicinity. None of the water samples showed evidence of contamination. However, two of the three soil samples collected on-site showed chromium levels of 2,440 mg/kg and 1,700 mg/kg. These levels were sufficient for "the chromium contaminated soil to be classified as a hazardous waste" because the soil leachate measured by the standard extraction procedure (EP) toxicity test (EPA 1980), had a chromium extent concentration of more than 5 mg/l (RCRA hazardous waste limit). Testing of the soil samples also indicated contamination by pentachlorophenol (PCP), which is listed as a hazardous waste in 40 CFR part 261.33 and may have been used by the previous owners during the wood preserving process. However, the plant foreman, a long-time employee, stated that PCP had never been used since it was an oil (fuel oil) based preservative. The foreman stated that dinitrophenol, a water soluble product had been used. This has been confirmed by subsequent sampling which also showed dinitrophenol residue present along with the PCP residue.

In November 1982, SCDHEC received another complaint. The subsequent investigation revealed that liquid from freshly treated lumber was flowing onto and puddling on adjacent property. SCDHEC issued a Notice of Violation to the company on March 29, 1983. During subsequent conferences between SCDHEC and plant personnel, the need for, and nature of, on-site improvements were discussed to minimize further problems. A major plant improvement discussed was the installation of a concrete drip pad under the narrow gauge rail tracks. The pad would be curbed and constructed to collect and recycle CCA drip solution. However, plans to install concrete drip collection pads were never implemented. According to officials at SCDHEC, no action was taken because agreement was never reached between SCDHEC and the plant owners on how to clean up the contaminated soils upon which the drip pads would be placed.

In April 1983, a new drinking water well was drilled at the Watts' residence, approximately 200 feet from the PWP Site. This well was allegedly needed because the existing well had become dry. During initial pumping of the new well by the driller, the water turned bright yellow and did not clear up after many hours of pumping. The PWP submitted a sample of the water to an independent laboratory for analysis and discovered high levels of copper (0.13 mg/l) and chromium (67.3 mg/l). Following this discovery, PWP began to supply the residence with drinking water by running a hose from the plant's own private well to the Watts' residence (Figure 13).

From May 4 to 5, 1983, private wells within the surrounding area of the PWP Site were sampled by SCDHEC personnel. The results of the well survey indicated that only the Watts' well was contaminated (80 mg/l chromium). No contamination was noted by SCDHEC at the other local area private wells identified in their survey.

As a result of the pollution findings, SCDHEC issued a Consent Order requiring PWP to determine the extent of soil and ground water contamination and to develop a plan for disposing of the contaminated materials. PWP subsequently hired Law Engineering Testing Company (LETCO) to perform a preliminary assessment of the suspected site contamination. The results of the study, released in November 1983, entitled Report of Preliminary Assessment of the Ground Water and Soil Contamination - Phase 1, indicated contamination of soil and ground water beneath the main process area of the plant site. Monitor wells installed off-site in the vicinity of the Watts' well, however, failed to detect any evidence of contamination. Resampling of the Watts' well in November 1983 did reveal elevated levels of chromium (11.5 mg/l), but these levels were significantly less than the original analysis had indicated (67.3 mg/l). Results of the SCDHEC and LETCO investigations led to speculation by SCDHEC and the owners of the plant that vandalism could have caused the initial contamination discovered in the well.

Plans for further investigation of the contamination problem were developed by LETCO, but were never implemented. At the end of 1983, SCDHEC turned over responsibility for further work on PWP to EPA. At the same time, SCDHEC ended sampling of private wells in the vicinity (NUS, 1985). In September 1983, the Site was placed on the National Priorities List (NPL) with a Hazardous Rating Score of 38.43. Subsequently, the U.S. Environmental Protection Agency (EPA), under work assignment number 136-4LB7.0, tasked the REM II team to conduct a Remedial Investigation and Feasibility Study (RI/FS) of the PWP Site. The Remedial Investigation was performed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), otherwise known as Superfund. The investigation was conducted from April to July 1986.

2.0 Enforcement Analysis

The Palmetto Wood Preserving Site was added to the National Priorities List (NPL) in September 1983 and EPA assumed lead responsibility for the Site at that time. An EPA contractor completed a Potential Responsible Party (PRP) search in January 1985. Notice Letters were sent to Potentially Responsible Parties in July 1985. Two PRPs were found, but were judged not viable by the financial assessment, therefore, EPA proceeded to implement the RI/FS with Superfund monies in September 1985.

3.0 Current Site Status

3.1 Hydrogeologic Setting

The Palmetto Wood Preserving Site lies within the Coastal Plain Province and is underlain entirely by the Middendorf Aquifer System. The subsurface soil and ground water conditions encountered during Law Engineering and Testing Company's (LETCO's) investigation suggest two aquifers. For the purpose of the RI Report, they are defined as the un-confined unit of the sufficial aquifer (shallow aquifer) where contamination of chromium has been detected and the semi-confined or confined aquifer system of the deep aquifer. These two units of concern are divided from the deeper Middendorf Aquifer system, which lies at an average of over 200 feet below surface in the area, by several confining beds composed of clay or silty clay. The shallow aquifer extends to an average depth of 27 feet below ground surface at the Site and has a low hydraulic conductivity on the order of 10^{-5} cm/sec. The deep aquifer extends to an average depth of 41 feet below ground surface and has a low hydraulic conductivity on the order of 10^{-4} cm/sec. Water level data collected during

the Remedial Investigation show that locally, ground water flow in the un-confined unit of the surficial is toward the east (Figure 3). Figure 4 shows general flow direction in the semi-confined or confined unit of the deeper aquifer is toward the east/southeast.

3.2 Site Contamination

Since 1982, several site investigations have been conducted in and around the PWP Site. The first study was undertaken by SCDHEC in February 1982. SCDHEC collected surface soil samples and private well water samples. None of the water samples showed contamination. However, two of the soil samples showed elevated chromium levels and PCP contamination.

A second investigation in November 1982 revealed that liquid from freshly treated lumber was flowing onto and puddling on adjacent property. In April 1983, PWP submitted a sample of water from a new well at the Watts' residence to an independent laboratory and analysis revealed high levels of chromium.

Again, in May 1983, SCDHEC sampled the Watts' well, in addition to several other local private wells. The results of the samples indicated elevated levels of chromium. In November 1983, LETCO released a report on their preliminary assessment of suspected Site contamination. The investigation indicated contamination of soil and ground water beneath the main process area of the plant site. However, off-site wells failed to detect any contamination and resampling of the Watts' wells showed significantly lower levels of chromium than the original analysis indicated (11.5 mg/l compared to 67.3 mg/l).

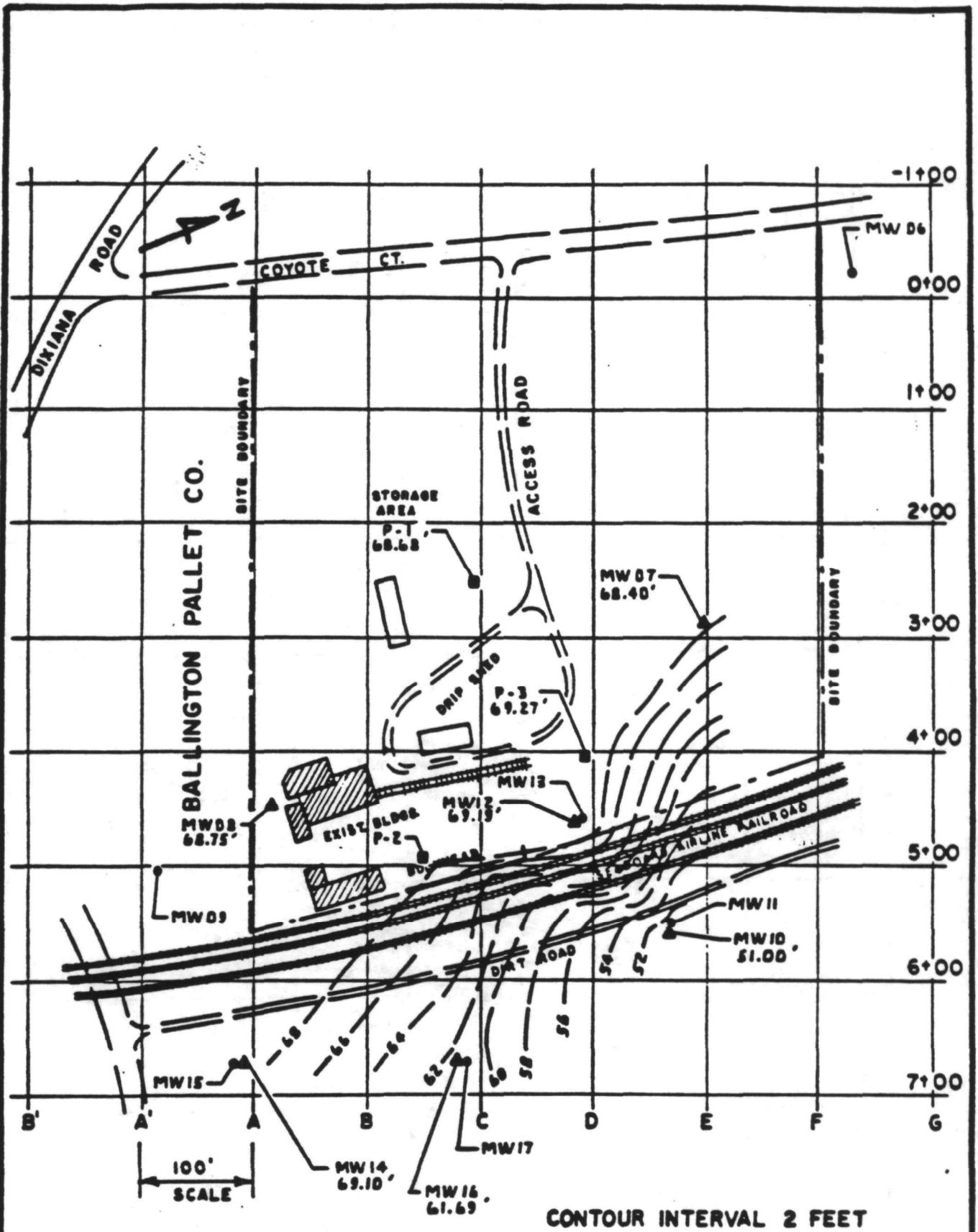
Most recently, the REM II team completed a Remedial Investigation (RI), which documents the present level of contamination of air, soil, ground water, and surface water/surface sediment.

The RI study, conducted April through July 1986, determined the presence and extent of the contamination in the soil, ground water, surface waters and sediments on the Site and surrounding areas. Samples were taken of each of the media to document the source of contamination and its boundaries, the extent of on-site and off-site contamination, and the presence and location of a ground water contamination plume. Data were collected to characterize the Site and support the analysis of remedial alternatives during the Feasibility Study.

3.3 Air Contamination

The most common sources of air contamination at hazardous waste sites are the volatilization of toxic organic chemicals and the spread of airborne contaminated dust particles. In July 1985, an ambient air sampling investigation was conducted at PWP using an Organic Vapor Analyzer (OVA). The instrument indicated no response from the existing monitor wells and soils.

During the recent RI, Site personnel used an HNu photoionization analyzer for air monitoring while taking surface soils samples, installing monitor wells, and drilling temporary boreholes. An action level of 5 ppm was established in the PWP Project Operations Plan (POP), but this level was never attained during the field activities.

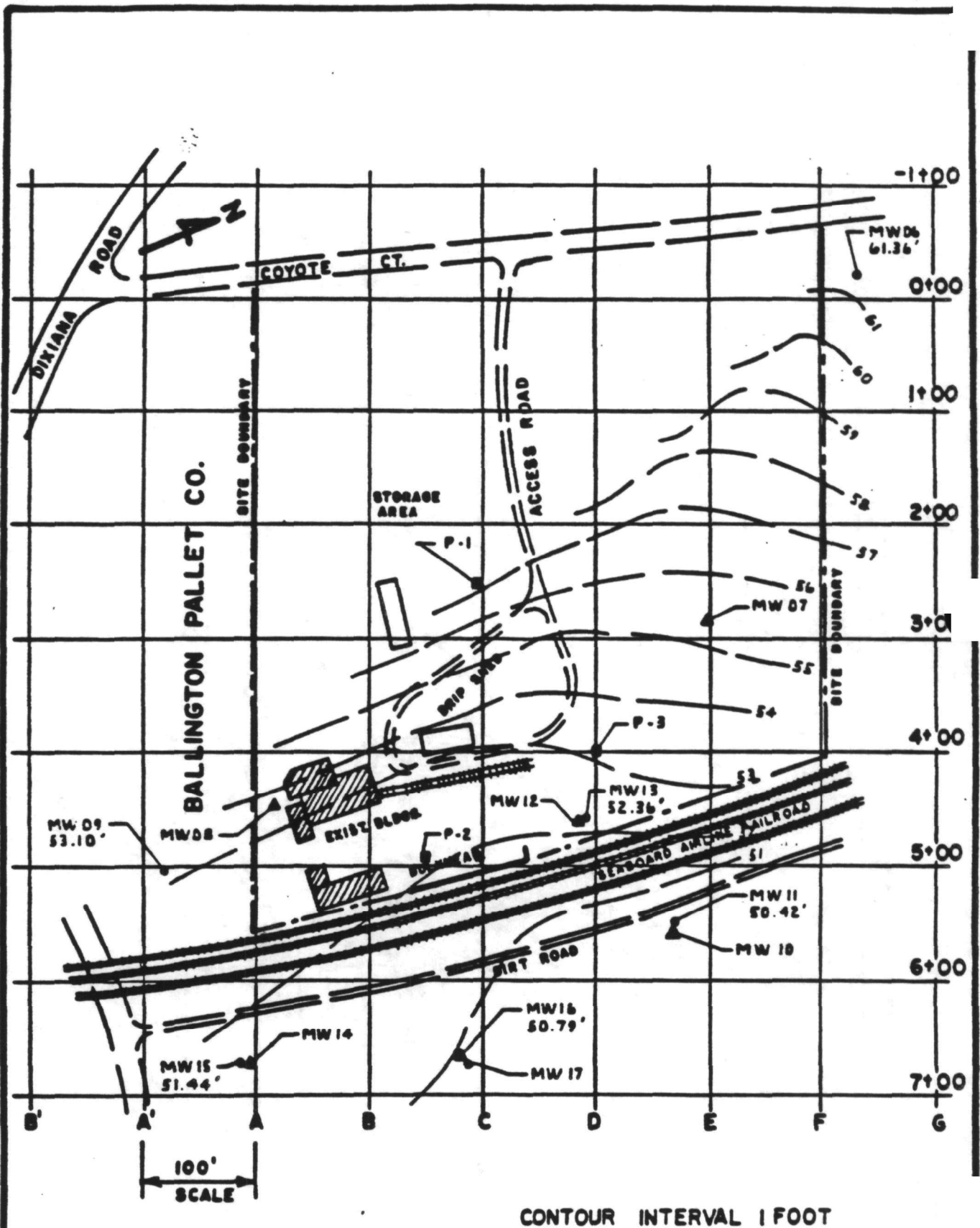


REM II
GENERALIZED POTENTIOMETRIC SURFACE-SHALLOW AQUIFER

PALMETTO WOOD PRESERVING SITE
BRYAN, SOUTH CAROLINA

FIGURE NO.

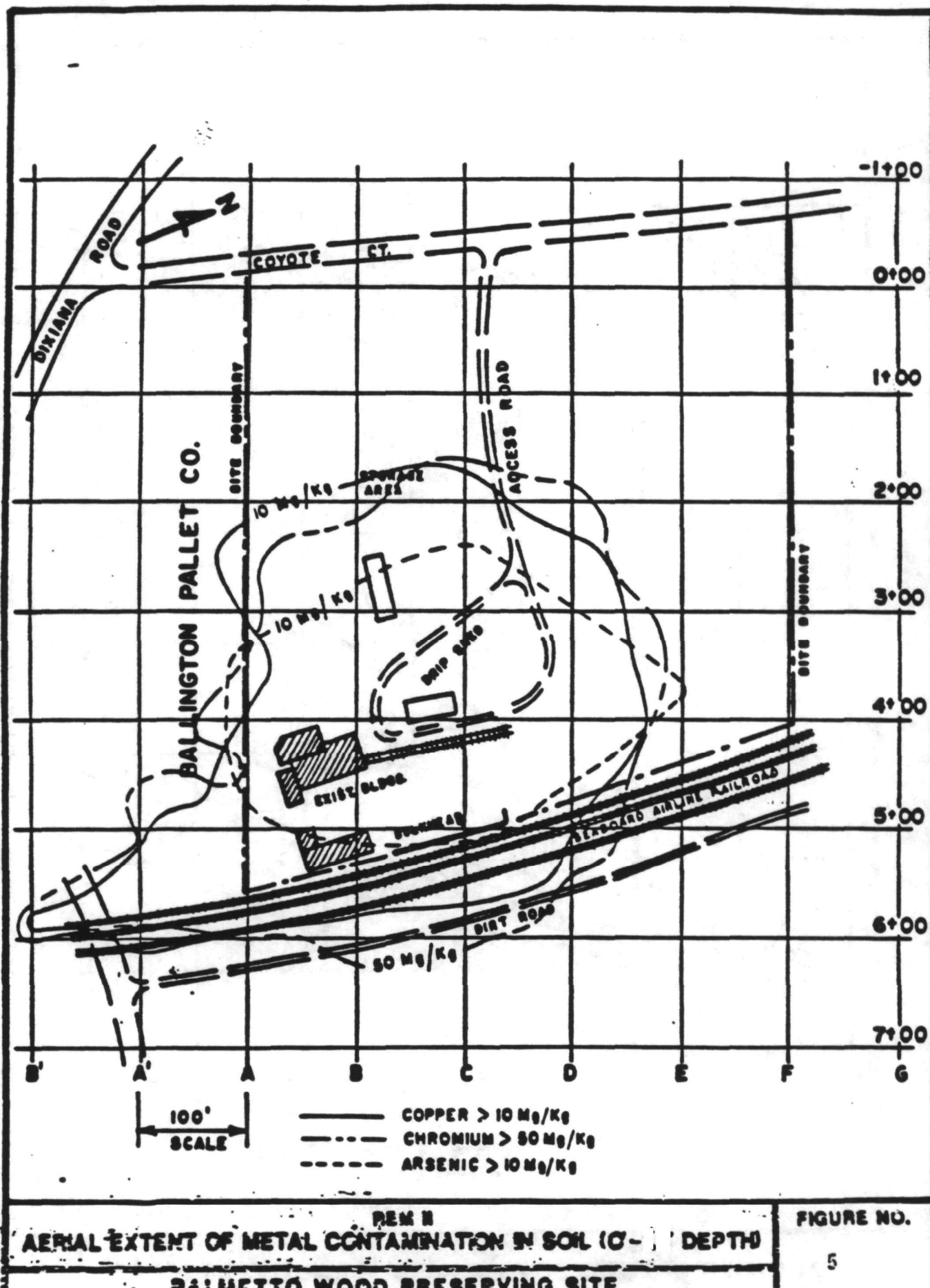
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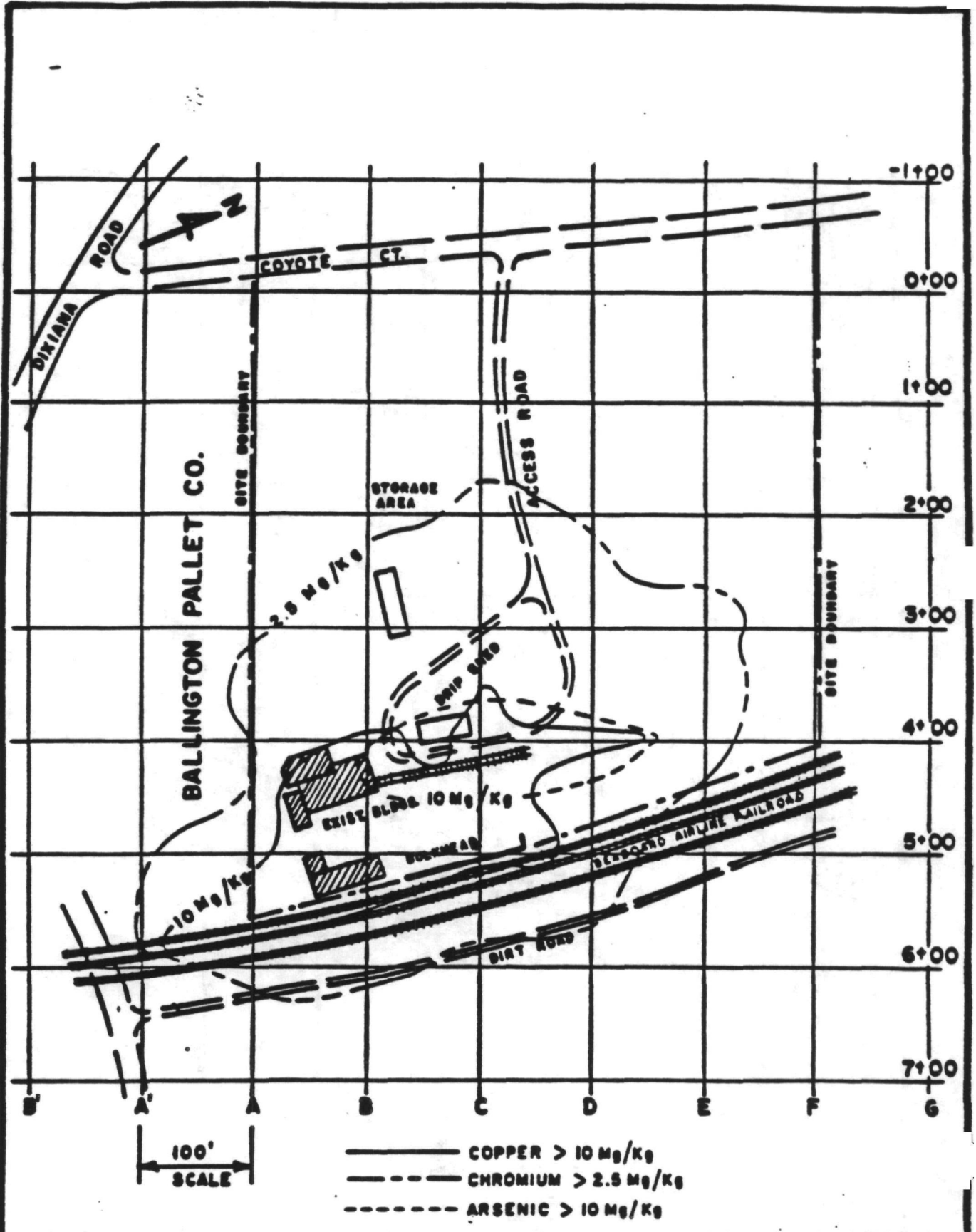


REM II
GENERALIZED POTENTIOMETRIC SURFACE-DEEP AQUIFER
PALMETTO WOOD PRESERVING SITE

FIGURE NO.

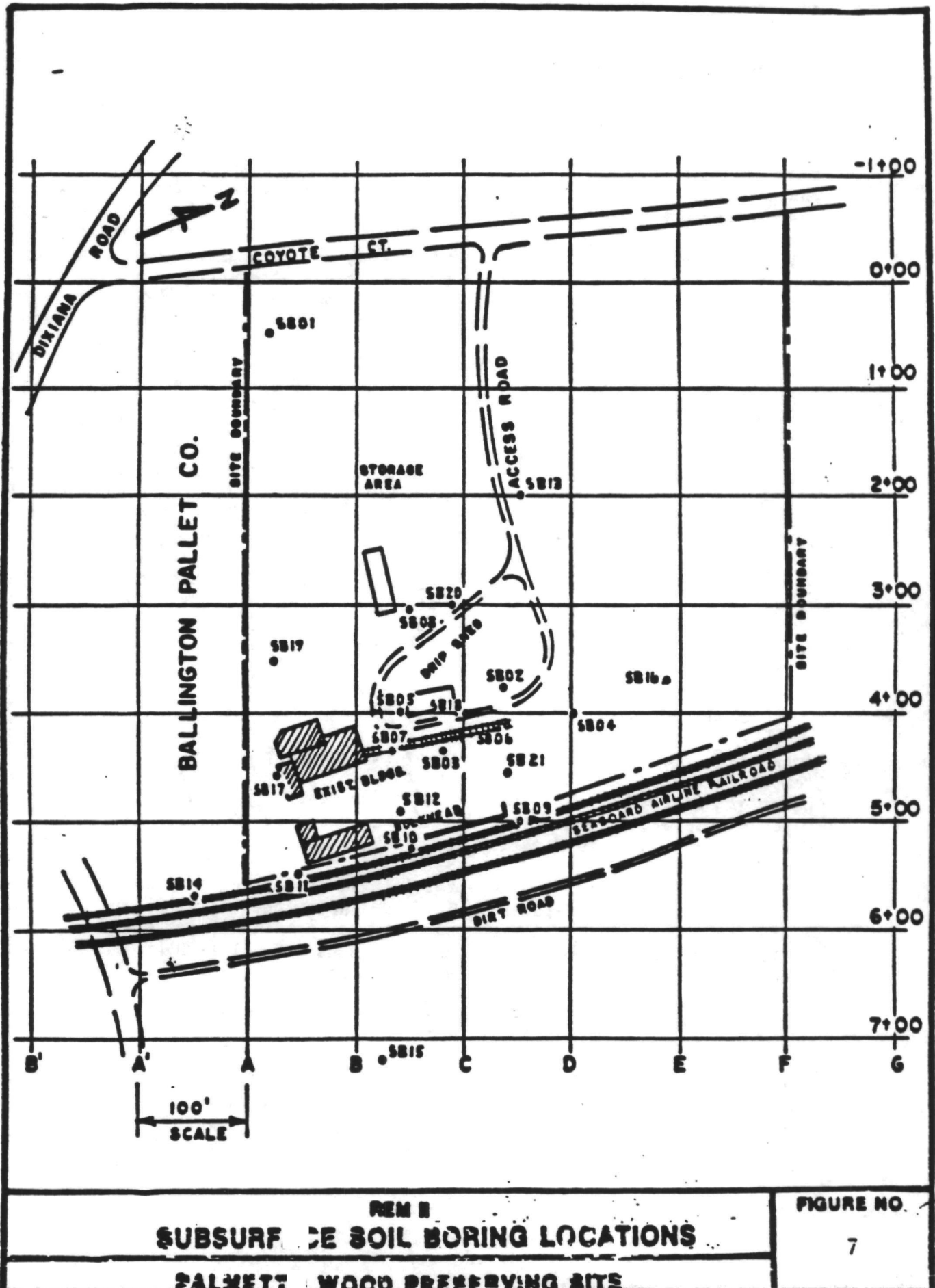
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AERIAL EXTENT OF REM N TAL CONTAMINATION IN SOIL (1.5'-3.0' DEPTH)

FIGURE NO.



In addition to the HNu, a respirable dust monitor was used to monitor airborne contamination. No readings exceeding action levels designated in the POP were reached.

3.4 Soil Contamination

Metal contamination in soil, particularly chromium and arsenic, are of concern as a health risk. Although elevated concentration levels of copper were far above background, the Public Health Evaluation (PHE) determined copper contamination does not pose a health threat. Areal extent of soil contamination is based on results of the surface soil sampling plan performed during the investigation. Vertical extent of soil contamination is based on the soil boring plan performed during the investigation. The areas presenting the highest concentrations of contamination were the narrow gauge and drip shed areas. Less elevated contaminant concentrations were detected in the area extending from the eastern border of the storage yard, across the narrow gauge and drip shed areas towards the east of the Site, along the railroad tracks. Analytical results from 53 surface soil sampling locations were filed into a computer program to generate maps showing metal concentrations in soil. Figures 5 and 6 illustrate the computer generated areal extent of metal concentration in soil at two depth intervals (0'-1.5' and 1.5'-3.0').

The soil data indicated that vertical extent of contamination is variable across the Site (Figure 7). The highest levels occur at the surface and decrease in a nearly linear fashion to background levels within the first 12 feet. Metal concentrations well above background were detected to depths as great as 17 feet in a number of locations (SB02, SB03, SB04, SB05, SB06, SB07, SB09, SB10, SB11, SB12, SB17, SB18, and SB21), with one location (SB18) revealing elevated chromium at 22 feet. The highest concentrations of metals in subsurface soils are associated with the narrow gauge/drip shed areas.

The range of concentrations in soils of copper, chromium, and arsenic are shown in Table 1.

3.5 Ground Water Contamination

Analysis of samples from 6 clusters of 12 permanent monitor wells and 21 temporary wells found metal contamination in many of the wells above drinking water or other applicable standards. The ranges of concentrations in ground water of copper, chromium, and arsenic are shown in Table 1. The locations of the wells are shown in Figure 8.

The extent of contamination in water is principally confined to the shallow un-confined aquifer. Figures 9, 10, and 11 show the extent of ground water contamination aquifer. Figures 9 and 10 show the worst case scenarios in the shallow aquifer based on the Maximum Contaminant Level (MCL) for chromium and arsenic, respectively. Both MCL's were established at 50 ug/l. Figure 11 shows the worst case scenario in the shallow aquifer based on the MCL for copper at 1,000 ug/l. The highest concentrations of metals occur within the confines of the Site.

Three monitor wells (MW08, MW10, and MW12) and nine temporary wells (GW03, GW04, GW05, GW08, GW10, GW16, GW17, GW18, and GW19) indicated elevated chromium concentrations in the shallow un-confined aquifer. Elevated chromium concentrations were detected in one private well (Watts' well, located east of the Site). Although the Watts' well indicates chromium above the MCL, the well

has an ambiguous history, i.e. not installed under EPA guidance, assumed screening intervals of 65 feet below ground surface, and conflicting data on chromium levels from past sampling activities, prudence dictates that the well should not be used as a potable source of water. One monitor well (MW08) and five temporary wells (GW03, GW04, GW08, GW17, and GW19) indicated elevated arsenic in the shallow un-confined aquifer. One monitor well (MW16) and three temporary wells (GW03, GW08, and GW10) indicated elevated copper in the shallow un-confined aquifer. The levels of contaminants detected at these wells do not present an immediate risk, however, the use of on-site ground water in the future would present environmental and public health risks.

3.6 Surface Water and Sediment Data

During the recent RI, Surface water and surface sediment samples were collected from four locations. A fifth sample was collected to provide background data on surface water and sediment quality in the area. Analyses of these samples found no metal contamination above EPA maximum concentration limits.

The background sediment sample was collected from a drainage feature at the discharge point of the pond, approximately 150 feet southwest of the Site. The sample was found to contain the following metals: arsenic (33 mg/kg), barium (80 mg/kg), lead (130 mg/kg) vanadium (63 mg/kg), zinc (160 mg/kg), aluminum (12,500 mg/kg), manganese (220 mg/kg), calcium (830 mg/kg), and iron (81,000 mg/kg). In addition, the background surface water sample collected at this location was found to contain arsenic (78 ug/l), barium (54 ug/l), chromium (27 ug/l), copper (23 ug/l), strontium (20 ug/l), vanadium (13 ug/l), zinc (110 ug/l), aluminum (3,100 ug/l), manganese (440 ug/l), calcium (.0029 ug/l), magnesium (.0086 ug/l) and iron (.077 ug/l).

Surface water and sediment samples collected downgradient of the Site contained the same suite of metals as mentioned before and at comparable concentrations. Further, no organic compounds were detected in these surface water and sediment samples. Because migration is not currently taking place, no remedial action will be considered for surface water and sediments.

3.7 Ground Water Discharge to Wetlands

The ground water beneath the Site is severely contaminated. The shallow aquifer has higher concentrations of metals than the deeper aquifer, but some leakage from the shallow to the deep aquifer is evident. Ground water flows in both aquifers toward the wetlands east of the Site, and it is possible that one or both aquifers discharge to this area. At the current estimated flow rates of approximately 4 m/yr in the shallow aquifer, contaminated ground water may reach the wetlands in 100 years.

4.0 Clean-Up Criteria

The extent of contamination was defined in Section 3.0 Current Site Status. This section examines the relevance and appropriateness of water quality criteria under the circumstances of release of contaminants at this Site. Based upon criteria found to be relevant and appropriate, the minimum goals of remedial action at this Site have been developed.

TABLE 1

RANGE OF CONCENTRATIONS OF INDICATOR CHEMICALS
IN GROUND WATER
PALMETTO WOOD PRESERVING SITE
DIXIANA, SOUTH CAROLINA

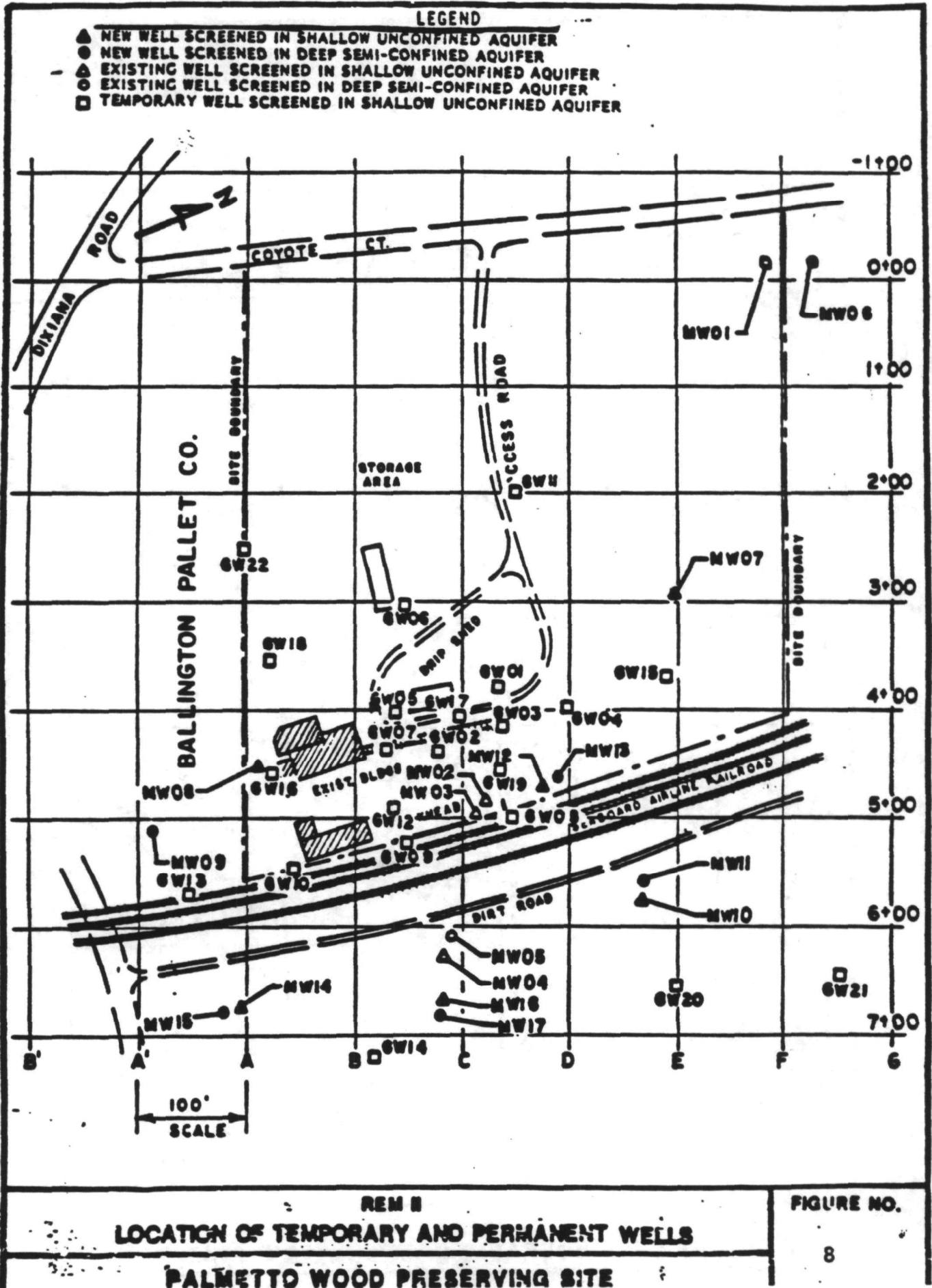
REM II

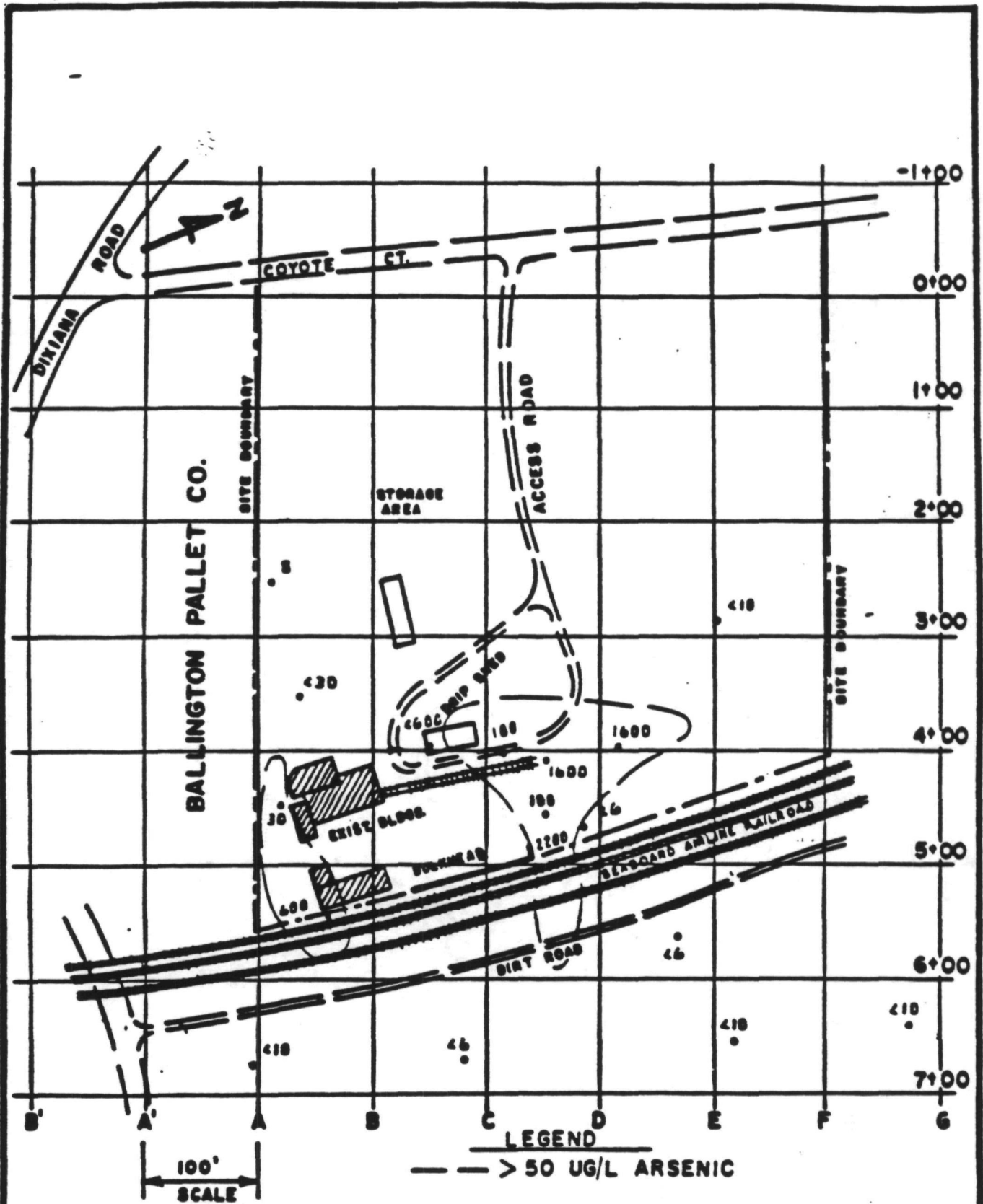
Chemical	Concentration Range (ug/l) ^a
Arsenic	ND - 2,200
Chromium	13 - 110,000
Copper	6 - 2,700

^a Based on samples collected from locations indicated in the RI report.
Data analyses were performed by an EPA-approved contract laboratory.
Sample results have met EPA validation requirements.

CHEMICAL	SOIL CONCENTRATION	CONCENTRATION RANGE (ppm)
Arsenic		2.4 - 6,200
Chromium		4 - 2,200
Copper		3.7 - 3,600

CHEMICAL	SUB-SURFACE CONCENTRATION	CONCENTRATION (ppm)
Arsenic		5.4 - 970
Chromium		4 - 1400
Copper		3.7 - 1100

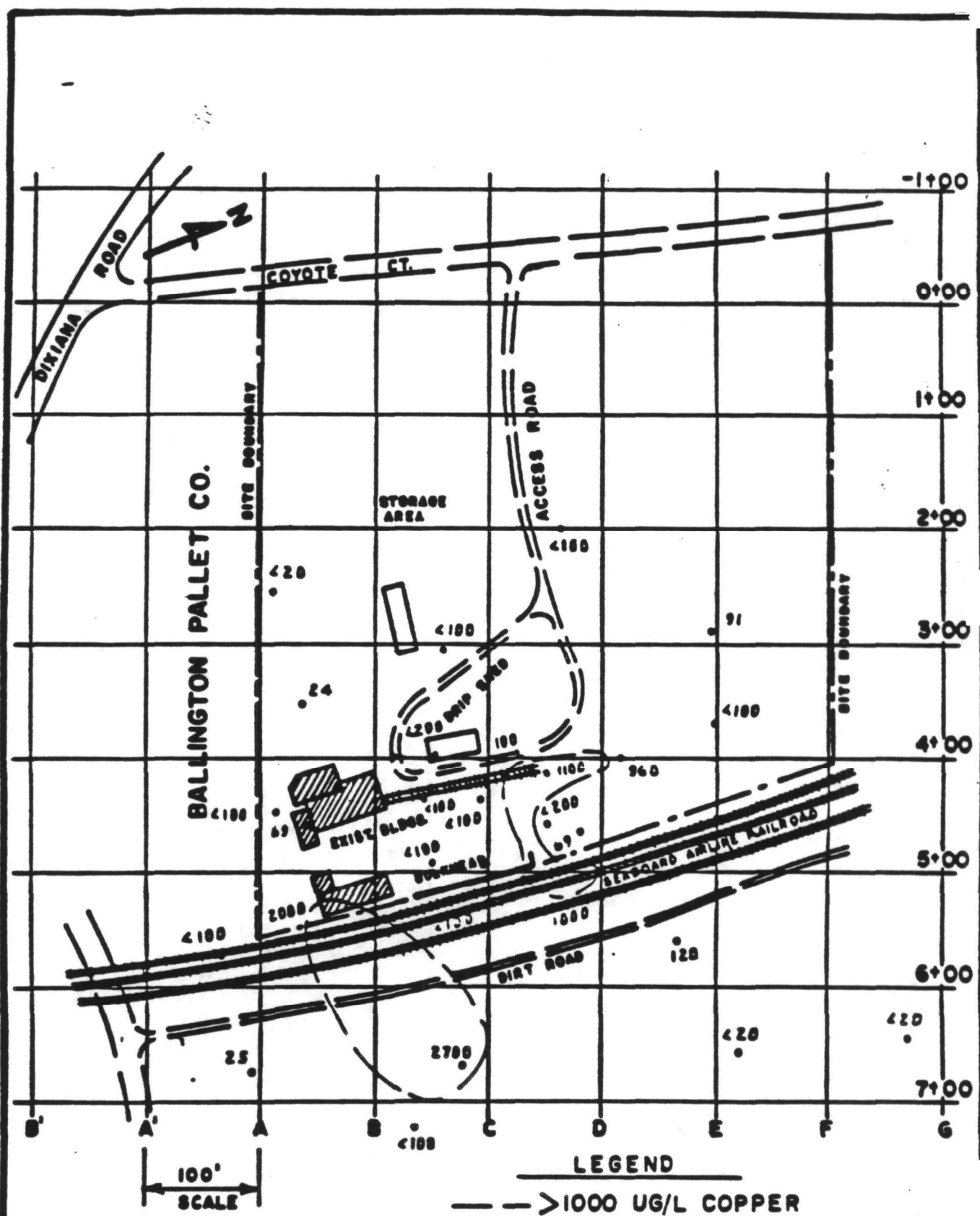




REM 3
WORST CASE SCENARIO As IN SHALLOW AQUIFER
PALMETTO WOOD PRESERVING SITE

FIGURE NO.

10



REM II
WORST CASE SCENARIO Cu IN SHALLOW AQUIFER

FIGURE NO.

11

TABLE 2

INDICATOR CHEMICALS
PALMETTO WOOD PRESERVING SITE
DIXIANA, SOUTH CAROLINA

REM II

Contaminant	Site-Specific Maximum ug/l	Standard or Criteria ug/l
Arsenic	2,200	50 ^a
Chromium	110,000	50 ^a
Copper	2,700	1,000 ^b

^aSafe Drinking Water Act criteria.

^bBased on taste and odor effects

ug/l = micrograms/liter

Public Health Assessment/Consultation

Environmental Pathways

Contaminants found in surface soil can travel off-site via surface runoff and wind erosion. Those found in the subsurface soil can leach into the ground water beneath the Site. Those found in ground water can seep to wells and be withdrawn for human consumption. They can also reach the surface through seeps and springs.

At this site, the primary contaminated media are surface soil and ground water. Although the subsurface soil is contaminated, the contamination decreases rapidly with depth and there is little likelihood of human contact with it.

Human Exposure Pathways

Human exposure can occur through inhalation of contaminated dust, ingestion of contaminated soil, dermal contact with the soil, or through drinking contaminated surface or ground water. Consumption of contaminated fish or vegetables is sometimes possible although this exposure route does not appear to be a concern at this Site. Because the media which have been contaminated are surface soil and groundwater, which is used as a water supply by some people in the area, dermal contact, inhalation, and ingestion of soil and ground water were evaluated as human exposure pathways. The concentrations of metals found at the Site do not pose a dermal threat at the soil and water concentrations measured. Therefore, this exposure pathway was eliminated

Health Evaluation

There have been no reported instances of health complaints or concerns by persons living nearby with the exception of complaints about the runoff of the green liquid in 1981 and 1982. Neither the RI nor the Public Health Evaluation (PHE) mentioned any health effects of the Site on the nearby population.

Discussion

The RI documented the fact that the surface of the Site had been contaminated by the solutions used in the pressure treating of lumber. This material had been allowed to drip onto the soil, be washed from the Site by surface runoff, and percolate into the ground, reaching the water table. The arsenic and chromium levels were high in the soil in the work area where the treated lumber was allowed to drip dry. Since the valence of chromium has a direct relationship to its toxicity and since the report did not state which valence state was reported, it is assumed that the +6 state was reported. This is the most toxic form of chromium. Risk evaluations of the possible effects caused by the levels of these chemicals found on the surface were performed. These showed significant cancer potential levels for children playing on the Site or for future industrial workers on the Site if it is redeveloped. The concentration of copper found in the surface soil was not high enough to be of concern.

Chromium was the contaminant with the highest concentration in the ground water. Both arsenic and chromium concentrations in the shallow ground water on-site are high enough to render the water unusable. The high arsenic concentration was confined to the shallow ground water on-site. Contaminant

transport projections indicated that it was possible for the arsenic concentrations in nearby wells to approach the EPA primary drinking water maximum contaminant level; although at this time, the levels of arsenic are not high enough in the nearby wells to be of concern. Chromium, at the level detected in the nearby Watts well, is high enough (8600 ug/l) to be a public health concern. The EPA primary drinking water standard for chromium is 50 ug/l. None of the other private wells sampled in the area showed high levels of chromium. There is no primary drinking water standard for copper in the United States. The secondary limit for copper (1.0 mg/l) is based on taste, not on health. Copper was found in ground water in temporary wells and in permanent monitoring wells at concentrations which exceeded this secondary limit (2.7 mg/l maximum); however, this is less than the European limit of 3.0 mg/l for water which has been in contact with plumbing for 16 hours.

Health Consultation from the Public Health Service Agency for Toxic Substances and Disease Registry (ATSDR)

Based upon the data and information provided, it is the opinion of the ATSDR that the health threat based arsenic soil clean-up criteria of 1 ppm recommended by the contractors in the Public Health Evaluation is unrealistic, unachievable and grossly overconservative for this Site. It is the ATSDR opinion that the allowable health based soil clean-up criteria should be around 200 ppm if the Site is to be considered a potential future residential area. If the Site is to be considered for industrial use or continue to be rural, then the allowable health threat based level could be set even higher.

4.2 Ground Water Remediation

In determining the degree of ground water clean-up, Section 121(d) of the Superfund Amendments and Reauthorization Act of 1986 (SARA) requires that the selected remedial actions establish a level or standard of control which complies with all "applicable and relevant or appropriate regulations" (ARARs).

This remedy is a cost-effective remedy which achieves a level protective of human health and will remove the threats this Site poses to the environment. The remedy will meet appropriate requirements, and is cost-effective. Finally, the remedy utilizes permanent treatment technologies to the maximum extent practicable.

4.3 Soil Remediation

The Public Health Assessment in the RI Report determined that risks to human health as a result of exposure to on-site contaminants via inhalation, ingestion, and dermal contact are very low under present use conditions at the Site. For potential future use scenarios, the risk is slightly higher. Therefore, remediation or institutional controls will be necessary to assure that an increased risk to human health is not posed in the future.

Since the health-based clean-up level for chromium is above background levels for this chemical at the Site, this value (approximately 600 mg/kg would) probably be an appropriate clean-up goal. Levels ranging from 1 mg/kg to 50 mg/kg of arsenic have been seen to occur naturally in soils.

TABLE 2.2

SOIL STANDARDS AND CRITERIA
PALMETTO WOOD PRESERVING SITE
DIXIANA, SOUTH CAROLINA

REM II

	ATSDR ^d Based Cleanup Level <u>mg/kg</u>	Health Based Soil ^a Cleanup Level <u>mg/kg</u>	Background ^b Concentrations <u>mg/kg</u>	Common Range for Soil <u>mg/kg</u>
Arsenic	200	less than 1	less than 6 10 less than 6.3	1-50
Chromium	—	627	5 22 14	1-1000
Copper	—	Not a health risk	less than 10 less than 20 less than 10	2-100

^a Following EPA's current guidelines for carcinogenic risk assessment.

^b Concentrations of metals in background samples BG01, SB01-001, and SB01-004.

^c Lindsay, W.H., Chemical Equilibrium in Solids, John Wiley and Sons, New York, 1979, 24, 449.

^d Following the Agency for Toxic Substances and Disease Registry, September 10, 1987.

Based upon the data and information provided in the Public Health Evaluation, the Agency for Toxic Substances and Disease Registry stated that the health threat based arsenic soil clean-up criteria of 1 ppm recommended by the contractors in the Public Health Evaluation is unrealistic, unachievable and grossly overconservative for this Site. The allowable health based soils clean-up criteria should be around 200 ppm if the Site is to be considered a potential future residential area. The EPA Headquarters Hazardous Site Control Division Director concurred with this rationale during a September 9, 1987 consultation.

5.0 Alternative Evaluation

The purpose of remedial action at the Palmetto Wood Preserving Site is to mitigate and minimize contamination in the soils and ground water, and to reduce potential risks to human health and the environment. The following clean-up objectives were determined based on regulatory requirements and levels of contamination found at the Site:

- * To protect the public health and the environment from exposure to contaminated on-site soils through inhalation, direct contact, and erosion of soils into surface waters and wetlands;
- * To prevent off-site movement of contaminated groundwater.
- * To restore contaminated ground water to levels protective of human health and the environment.

An initial screening of applicable technologies was performed to identify those which best meet the criteria of Section 300.65 of the National Contingency Plan (NCP). Following the initial screening of technologies, potential remedial action alternatives were identified and analyzed. These alternatives were screened and those which best satisfied the clean-up objectives, while also being cost-effective and technically feasible, were developed further.

Table 3-8 summarizes the results of the screening process. Each of the remaining alternatives for soils and ground water remediation was evaluated based upon cost, technical feasibility, institutional requirements, and degree of protection of public health and the environment. A cost summary is presented in Table 10-13 State Cost-Sharing.

5.1 Alternatives for Ground Water Remediation

Alternative A-1: Slurry Wall and Cap

Unlike other ground water alternatives in which contaminated water is removed and treated, the purpose of this alternative is to prevent contaminant migration by containing the plume.

This alternative involves the installation of a circumferential slurry wall around the perimeter of the ground water contamination plume. The slurry trench would be excavated down to the layer separating the shallow aquifer from the deep aquifer (approximately 35 feet below ground surface). The backfill material would consist of a mixture of excavated soils and bentonite clay. The permeability of the walls would be minimized. The low permeability of the underlying layer separating the two aquifers minimizes vertical movement of the ground water. Because the slurry walls would be keyed into this layer, the

TABLE 3

TECHNOLOGIES CONSIDERED FOR SCREENING
PALMETTO WOOD PRESERVING SITE
DIXIANA, SOUTH CAROLINA

REM II

<u>Possible Technology</u>	<u>Eliminated (E) or Retained (R)</u>	<u>If Screened Out Reason for Doing So</u>
I. Ground Water TSD Technologies		
A. Passive Ground Water Controls		
1. Impermeable barriers		
a. Slurry Wall	R	
b. Grout Curtain	E	More costly and less effective than slurry walls
c. Sheet Piling	E	Inadequate wall, long term effectiveness and not initially impermeable
B. Active Ground Water Controls		
1. Extraction Wells	R	
2. Subsurface Drains	R	

TABLE 4

TECHNOLOGIES CONSIDERED FOR SCREENING
PALMETTO WOOD PRESERVING SITE,
DIXIANA, SOUTH CAROLINA

REM II

<u>Possible Technology</u>	<u>Eliminated (E) or Retained (R)</u>	<u>If Screened Out Reason for Doing So</u>
C. Ground Water Treatment		
1. Oxidation/Reduction	R	
2. Precipitation	R	
3. Filtration	R	
4. Reverse Osmosis	E	Too expensive; not a proven technology for high flow rates and non-precious metal recovery
5. Land Treatment	E	Not applicable for high metal contaminants
6. Ion Exchange/Sorptive Resins	R	
7. Carbon Adsorption	R	
8. Insitu Ground Water Treatment	E	Not a proven technology
D. Ground Water Disposal		
1. Discharge to Surface Water	R	
2. ReInjection into Ground	R	
3. Pump to Local Wastewater Treatment Plant	R	
4. Subsurface Soil Absorption	R	
II. Soil TSD Technologies		
1. Extraction (Soil Flushing)	R	
2. Solidification/Stabilization	E	CrVI does not stabilize in this process.
3. Attenuation	E	Contaminated area is too extensive for process. Contaminated soil is

TABLE 5
TECHNOLOGIES CONSIDERED FOR SCREENING
PALMETTO WOOD PRESERVING SITE
DIXIANA, SOUTH CAROLINA

REM II

<u>Possible Technology</u>	<u>Eliminated (E) or Retained (R)</u>	<u>If Screened Out Reason for Doing So</u>
4. Capping	R	
5. Vegetative Cover	R	
6. Excavation and Offsite Disposal	R	
7. Partial Excavation with Onsite Disposal	E	Not applicable. Limited offsite contamination + justify partial excavation.
8. Onsite Containment/Encapsulation	R	
9. Vitrification	E	Expensive, high energy requirements, unproven

TABLE 6

APPLICABLE REMEDIAL TECHNOLOGIES
PALMETTO WOOD PRESERVING SITE
DIXIANA, SOUTH CAROLINA

REM II

Remedial Technologies	Comments
Ground Water Containment and Recovery	
● Slurry Wall	May require pressure release well or impermeable cover. Construction must be done with care to avoid cross contamination of underlying aquifer.
● Extraction Wells	Uncertain design of well point system. Slow extraction of ground water.
● Subsurface Drain	Effective for low volume extraction of ground water.
Ground Water Treatment	
● Oxidation Reduction	Not applicable alone.
● Filtration	Not applicable alone.
● Precipitation	Not applicable alone.
● Ion Exchange	May not be applicable alone.
Ground Water Disposal	
● Surface Water Discharge	Effective for low volume discharge rates.

TABLE 7

APPLICABLE REMEDIAL TECHNOLOGIES
PALMETTO WOOD PRESERVING SITE
DIXIANA, SOUTH CAROLINA

REM II

Remedial Technologies	Comments
<hr/>	
Soil Storage/Disposal	
● Extraction/Soil Flushing	Expensive, effectiveness dependent on treatability tests.
● Surface Capping	Not entirely effective alone.
● Onsite Containment/Encapsulation	Expensive. Contaminated soil remains onsite.
● Excavation/Offsite Disposal	Expensive NCP required analysis.

TABLE 8

ELIMINATED TECHNOLOGIES
PALMETTO WOOD PRESERVING SITE
DIXIANA, SOUTH CAROLINA

REM II

Technologies	Reason for Elimination
Ground Water TSD Technologies	
● Activated Carbon Adsorption	Expensive and uncertain effectiveness
● Injection Wells	Injection wells currently banned in South Carolina. May not be compatible with hydro-geologic characteristics.
● Subsurface Soil Absorption	More expensive with no added benefits compared to surface water discharge.
● Wastewater Treatment Discharge	Expensive. The three closest POTWs will not accept treated water.
Soil TSD Technologies	
● Vegetative Cover	Does not effectively meet remedial objectives, not applicable alone

potential for migration of contaminated water under the walls would be low.

An impermeable cap would be constructed within the contaminated area to prevent the area enclosed by the walls from leaching contaminants into the ground water and from filling with an excess amount of water. The cap would consist of a 12-inch layer of vegetated topsoil, a layer of geotextile filter fabric drain net, a 60-mil synthetic liner, and 24 inches of compacted clay.

Estimated Cost: \$1.37 - \$2.74 million.

Alternative A-2: Slurry Wall and Encapsulation

The purpose of this alternative, similar to Alternative A-1, is to prevent contaminant migration by containing the plume. This alternative involves the installation of a circumferential slurry wall around the perimeter of the ground contamination plume. The slurry trench would be excavated down to the layer separating the shallow aquifer from the deep aquifer (approximately 35 feet below ground surface). The backfill material would consist of a mixture of excavated soil and bentonite clay. The permeability of the walls would be greatly reduced because of swelling properties of the clay. Thus, the lateral migration of contaminated ground water within the walls would be minimized. The low permeability of the underlying layer separating the two aquifers would be keyed into this layer, the potential for migration of contaminated water under the walls would be low.

A containment cell (encapsulation cell) would be constructed within the contaminated area to prevent the area enclosed by the walls from leaching contaminants into the ground water and from filling with an excess amount of water. The cell construction involves excavation to as deep as eight feet below surface of contaminated soils and returning the contaminated soils to synthetic membrane lined excavation trenches (containment area). In addition, a composite cap consisting of clay and a synthetic membrane line will be constructed over the containment area to ensure total encapsulation within the circumference of the slurry wall.

Estimated Cost: \$1.84 - \$2.21 Million.

Alternative A-3: Extraction, Filtration, Ion Exchange, Discharge

Under this alternative, ground water would be extracted from the Site and would involve treating the ground water at the PWP Site by removing heavy metal ions via ion exchange. Treatment consists of passing prefiltered ground water through synthetic resins. The metal ions adsorb onto the material, displacing non-toxic ions, such as sodium, from the resin surface.

Due to the low flow rates expected from the extraction system, treatment would be conducted on a batch basis. Untreated ground water would be pumped first to a storage tank, which would hold approximately one weeks flow. Operators would arrive on-site weekly to initiate treatment.

The stored ground water would first be pumped to a filtration unit as the preliminary treatment step. Filtration is necessary to prevent suspended solids from clogging the ion exchange units. The prefiltered water would then be pumped through a series of ion exchange units. The prefiltered water would then be pumped through a series of ion exchange columns. Operating experience indicates that probably two types of ion exchange resins will be required.

Resins which remove hexavalent chromium are very selective and are generally not effective for treatment of other metals. A second, less selective, resin would be required for removal of the copper and arsenic ions, and any trivalent chromium ions which may be present. The treated ground water would be discharged to a stream located southwest of the Site. Approximately 10.5 million gallons of water would be treated.

Estimated Cost: \$746,000 - \$2.1 Million.

Alternative A-4: Extraction, Reduction, Precipitation, Filtration Discharge

Under this alternative, ground water would be extracted from the Site and would involve treating the ground water at the PWP Site by removing heavy metal ions via reduction and precipitation. Treatment consists of adding chemical reducing agents to convert hexavalent chromium to the trivalent form, and then precipitating the chromium, copper, and arsenic ions out of the solution. Treated water would be filtered prior to discharge to further reduce contaminant concentrations.

Due to the low flow rates expected from the extraction system, treatment would be conducted on a batch basis. Untreated ground water would be pumped first to a storage tank, which would hold approximately one-week's flow. Operators would arrive on-site weekly to initiate treatment.

The stored ground water would first be pumped to a tank, where the pH would be lowered to 2, utilizing sulfuric acid. Following pH adjustment, a chemical reducing agent, such as sodium metabisulfite, would be added to convert the hexavalent chromium to the trivalent form. Approximately 30 minutes of agitation time in the reactor will be required to complete the reaction. A simple and accurate field analysis will confirm that all hexavalent chromium is converted.

Following reduction, the ground water will flow into a second tank, where a precipitation agent, such as lime or sodium hydroxide, will be added until a pH of approximately 9.5 is achieved. These chemicals add an excess of hydroxide ions to the ground water, which form insoluble compounds with the copper, chromium and arsenic ions. Once the proper pH is reached, a polyelectrolyte (polymer) will be added to aid in the flocculation of the insoluble precipitates. The water will then flow by gravity into a clarifier, where the floc will settle out of solution. Effluent from the clarifier will be filtered prior to discharge, in order to remove any fine solids which remain in the wastewater. The treated ground water would be discharged to a stream located southwest of the Site. Approximately 10.5 million gallons of water would be treated.

Estimated Cost: \$760,000 - \$2.0 Million.

Alternative A-5: Extraction, Filtration, Ion Exchange, Precipitation, Filtration, Discharge

Under this alternative, ground water would be extracted from the Site and would involve treating the ground water at the PWP Site by removing heavy metal ions via a combination of ion exchange and precipitation. Treatment consists of passing prefiltered ground water through a synthetic resin, followed by precipitation. In ion exchange, the metal ions adsorb onto the material, displacing non-toxic ions, such as sodium, from the resin surface. For this alternative, only one ion exchange column would be required and would remove hexavalent chromium. Precipitation would remove the trivalent chromium, copper, and arsenic ions from the ground water. Treated water would be filtered again prior to further reduce contaminant concentrations.

Due to the low flow rates expected from the extraction system, treatment would be conducted on a batch basis. Untreated ground water would be pumped first to a storage tank, which would hold approximately one week's flow. Operators would arrive on-site weekly to initiate treatment.

The stored ground water would first be pumped to a filtration unit as the preliminary treatment step. Filtration is necessary to prevent suspended solids from clogging the ion exchange units. The prefiltered water would then be pumped through an ion exchange column for removal of hexavalent chromium.

Following ion exchange, the ground water will flow into a tank where a precipitation agent, such as lime or sodium hydroxide, will be added until a pH of approximately 9.5 is achieved. These chemicals add an excess of hydroxide ions to the ground water, which form insoluble compounds with the copper, trivalent chromium, and arsenic ions. Once the proper pH is reached, a polyelectrolyte (polymer) will be added to aid in the flocculation of the insoluble precipitates. The water will then flow by gravity into a clarifier, where the floc will settle out of solution. Effluent from the clarifier will be filtered prior to discharge, in order to remove any fine solids which remain in the wastewater. The treated ground water would be discharged to a stream located southwest of the Site. Approximately 10.5 million gallons of water would be treated.

Estimated Cost: \$1.0 - \$2.8 Million.

5.2 Alternatives for Soils Remediation

B-1: Surface Capping

Capping of the contaminated area would involve the construction of a composite cap conforming to RCRA guidelines. The area to be capped encompasses approximately 144,000 square feet,

This operation would first consist of the placement of a two-foot clay layer, compacted in six-inch lifts. A 60-mil synthetic liner would then be placed over the clay. Next, a synthetic drainage net would be spread and overlain with geotextile fabric. The geotextile fabric would maintain the drainage layer and help to stabilize a final layer of 12 inches of topsoil by keeping fine topsoil particles from filling the pore space of the drain net. The topsoil would be vegetated to prevent erosion. Also, the cap would have a minimum slope of 2 percent to the east. Drainage channels will be constructed to direct surface runoff to the swampy area east of the Site. Precipitation that percolates through the topsoil would flow laterally through the drain net and over the impermeable synthetic and clay barrier and into the drainage channels.

Estimated Cost: \$.75 - \$1.4 Million

Alternative B-2: On-Site Containment/Encapsulation

This remedial alternative involves excavation of contaminated soils and returning the contaminated soils to synthetic membrane lined excavation trenches (containment area). In addition, a surface composite cap consisting of clay and a synthetic membrane liner will be constructed over the containment area to ensure total encapsulation.

This remedial alternative evaluation is based on the following assumptions:

- * Excavation of approximately 19,895 cubic yards of contaminated soils, constructing a landfill that meets RCRA standards, replacement of contaminated soils and materials in the landfill, and placing a composite cap over the landfill for encapsulation.
- * The landfill will be constructed with a double leachate collection system and a composite cap.
- * Fluids collected during excavation will be stored, analyzed, and processed. Leachate collected from the landfill will be pumped from a central header to the surface to be analyzed and treated.

Estimated Cost: \$1.61 Million

Alternative B-3: Extraction/Soil Flushing

This alternative would involve treating contaminated soils at the PWP Site by removing arsenic and chromium via an acidic water wash (pH of approximately 2.5). Treatment consists of flushing soils with an acidic water solution. Due to the increased solubility of metals in a low pH environment, the contaminated particles leach out of the soil and into the flushing solution which is directed to a water treatment system.

The initial step involves excavating soil in a similar manner as alternative B-2 and B-4. After the soils are excavated, they are placed in the treatment unit. The soils are conveyed through two stages of treatment which are identical. The system is an independent two-stage system, however, if the system is utilized, a counter current configuration would be considered. The first stage consists of adding acidic water solution to the soils, mixing and then dewatering. Soil is then conveyed to stage two where the same process is repeated. Operating experience indicates that two stages of soil flushing are needed, however, additional flushing will be performed as required until effluent criteria is attained. Soil is tested for decontamination verification, and processed to original buffer capacity. The treated soil is replaced in the original excavation trench where natural aeration is supplemented by tilling and compaction. The flushing solution is pumped to an on-site water treatment facility for processing and recirculation through the soil treatment unit.

Estimated Cost: \$1,712,000

Alternative B-4: Excavation and Off-Site Disposal

This alternative includes the excavation of all contaminated areas and the final disposal of the waste in an off-site RCRA permitted facility. Approximately 20,000 cubic yards of contaminated soils would be excavated. Excavation of soils would be accomplished with standard earth moving equipment.

GSX Services, Inc. of Pinewood, South Carolina, was contacted and indicated available capacity and interest in managing the soils removed from the PWP Site. This facility is located approximately 70 miles from the Site.

Estimated Cost: \$5.86 Million

No-Action Alternative

Under the no-action alternative, groundwater and soil would not be remediated. Monitoring is an option which may or may not be implemented. This alternative is presented to provide a base-level action, against which other alternatives may be compared.

This no-action alternative would not be protective of human health and the environment. Contaminated ground water could eventually migrate to residential wells downgradient of the Site, and could discharge into the Wallace River wetlands, which are inhabited by endangered species.

The no-action alternative is rejected for these reasons, and because it would not comply with SARA requirements to reduce the volume, mobility, or toxicity of hazardous substances when treatment to accomplish this is feasible.

6.0 Recommended Alternatives

6.1 Description of Recommended Remedy

The recommended alternative for remediation of ground water at the Palmetto Wood Preserving Site include extraction, filtration, ion exchange and discharge of treated ground water to a stream located southwest of the Site or a wastewater/private treatment facility.

The recommended alternative for remediation of contaminated soil include the extraction and flushing soils with an acidic water solution. Treated soil is replaced in the original excavation trench where natural aeration is supplemented by tilling and compaction.

These recommended alternatives meet the requirements of the National Oil and Hazardous Substance Contingency Plan (NCP), 40 CFR 300.68(j), and the Superfund Amendments and Reauthorization Act of 1986 (SARA). This remedy permanently and significantly reduces the volume of hazardous substances in the ground water, and reduces the volume and/or mobility of contaminants in the soil.

These alternatives are cost-effective when compared with other applicable alternatives. Alternative A-1 has a high risk of spreading contamination; A-2 does not remove source material. Alternatives B-1 and B-2 would leave source material on-site, in contact with ground water; B-4 would remove contaminated soil from the Site, but would landfill it off-site. Alternative B-3 is considered cost-effective because it would be a permanent remedy, providing the greatest protection to human health and the environment.

6.2 Operation and Maintenance

This remedy will require approximately 27 years for ground water treatment and approximately one month would be needed to optimize the soil flushing system. The soil system would operate daily at a rate of 100 cubic yards per day. If no major problems or shut-down occurred, the duration of the operation would be approximately 2 years. The annual O & M costs are estimated to be \$ 176,163.

Long-term ground water monitoring will be required to assure the effectiveness and permanence of the soil and ground water remedies. Monitoring wells and residential wells on and off the Site will be included in the monitoring program. Ground water sampling will be conducted quarterly for the first two years, and yearly after that. Thirty years of monitoring was included in cost estimates, but this period may be significantly less.

6.3 Cost of Recommended Alternative

Capital cost of ground water remediation is \$746,000 - \$2.1 million and the annually system operating cost is \$123,000 after treatment is completed, the yearly O & M cost would include monitoring only.

6.4 Schedule

The planned schedule for remedial activities at the Palmetto Wood Site is as follows:

October 1987 - Approve Record of Decision

December 1987 - Begin Remedial Design

August 1988 - Complete Remedial Design and Begin Mobilization

August 1989 - Complete Mobilization, Equipment Installation, and Testing

August 1999 - Complete Remedial Activities

6.5 Future Actions

Following completion of remedial activities, no further action will need to be performed to maintain this remedy. The recommended alternatives are permanent remedies. The soil remediation will require no long-term operation or maintenance. Long-term ground water monitoring will be required to assure the effectiveness of this remedy.

6.6 Consistency with Other Environmental Laws

Remedial actions performed under CERCLA must comply with all applicable Federal and State regulations. All alternatives considered for the Palmetto Wood Preserving Site were evaluated on the basis of the degree to which they complied with these regulations. The recommended alternatives were found to meet or exceed all applicable environmental laws, as discussed below.

*** Resource Conservation and Recovery Act (RCRA)**

The recommended remedy for soil contamination includes excavation and soil flushing. This is an on-site remedial action which meets the technical requirement of this regulation.

*** Clean Water Act**

No contaminants have been detected in the surface water or wetlands near the Site. Soil remediation and ground water remediation are aimed at source control, and implementation of the recommendation alternatives would eliminate the possibility of future contamination of wetlands and surface waters.

*** Floodplain Management Executive Order 11988**

This Site does not lie within a floodplain and thus is not subject to the requirements of E. O. 11988.

*** Department of Transportation**

Transportation of hazardous waste is regulated by the Department of Transportation (DOT). If residual material results from ground water or soil treatment systems, it will be shipped to an off-site disposal facility. If tests on the material indicate the need for disposal in a hazardous waste facility, DOT regulations governing its shipment will be followed.

*** Occupational Safety and Health Administration**

A health and safety plan will be developed during the remedial design and will be followed during field activities to assure that regulations of the Occupational Safety and Health Administration (OSHA) are followed.

*** Safe Drinking Water Act**

Maximum Contaminant Levels (MCLs) established under the Safe Drinking Water Act were found to be relevant and appropriate to remedial action at the Palmetto Wood Preserving Site. The clean-up Goals for ground water established in Section 4 use the MCLs.

*** National Pollutant Discharge Elimination System**

Discharge of treated ground water is part of the recommended remedial alternative. This discharge will meet effluent limit requirements of the National Pollutant Discharge Elimination System (NPDES). Bioassays will be conducted where appropriate during design of this alternative, set effluent limits, and to optimize the ground water treatment system so that these effluent limits are met.

*** Endangered Species Act**

The recommended remedial alternative is protective of species listed as endangered or threatened under the Endangered Species

Act. Requirements of the Interagency Section 7 Consultation Process, 50 CFR, Part 402, will be met. The Department of Interior, Fish and Wildlife Services, will be consulted during remedial design to assure that endangered or threatened species are not adversely impacted by implementation of this remedy.

* Ambient Air Quality Standards

The ground water and soil remediation systems will be designed and monitored to assure that air emissions meet all State and Federal standards.

* State Drinking Water Standards

Maximum contaminant levels established by the State of South Carolina regulations are adopted from those of the Federal Safe Drinking Water Act, and will be met as discussed above.

7.0 Community Relations

A public meeting was held on August 26, 1987, at the County Administration Building located at South Lake Drive, Lexington, South Carolina. At this meeting, the remedial alternatives developed in the Feasibility Study were discussed. The preferred alternative was reviewed. No comments in regard to any of the alternatives were received during the three-week comment period which ended September 15, 1987.

The public did show a desire for remediation of the Site, and seemed to favor treatment of ground water and soil flushing of contaminated soil. No opposition from the public is expected if the recommended remedial alternative is implemented.

A Responsiveness Summary has been prepared to summarize community concerns and EPA's community relations activities.

8.0 State Involvement

As required by CERCLA, Section 104(C), the State must assure payment of ten percent of all costs of remedial action. Remedial action has been defined in SARA as including all construction and implementation activities until site remediation is completed. Activities required to maintain the effectiveness of the remedy following completion of the remedial action is considered operation and maintenance (O & M). If surface water or ground water treatment is part of the remedy, only the first ten years of such treatment will be considered as remedial action; the remaining period of treatment will be a part of the O & M activities. The State is required to pay 100 percent of all O & M following completion of the remedial action. EPA and the State may enter into an agreement whereby EPA would fund 90% of O & M costs for a period not to exceed one year, until the remedy is determined to be operational and functional.

The State of South Carolina has been consulted on the selection of this remedy. The State has concurred, but has pointed out that their funds for cost-sharing are limited. Although the State presently has funding to cover their part of this remedial action, they are concerned about funding problems on future remedial actions at other NPL sites in the State.

TABLE 9

QUANTITY OF SOIL TO REMOVE CALCULATIONS
PALMETTO WOOD PRESERVING SITE
DIXIANA, SOUTH CAROLINA

REM II

ZONE	AVERAGE AREA(UNITS)	ADJUSTED AREA(UNITS)	AREA(FT)	AVERAGE DEPTH(FT)	VOLUME (CUBIC FEET)	VOLUME (CUBIC YARDS)
A	2.30	2.30	2,070	17.5	36,225	1,342
B	10.64	8.34	7,506	12.5	93,825	3,475
C	16.74	6.10	5,490	9	49,410	1,830
D	25.45	8.71	7,839	5.5	43,115	1,597
E	33.33	32.45	29,205	1.5	43,808	1,623
F	0.88	0.88	792	18	14,256	528
G	0.22	0.22	198	10	1,980	73
H	0.51	0.29	261	9.5	2,480	92
I	1.00	0.49	441	8.5	3,749	139
J	0.17	0.17	153	7	1,071	40
K	2.99	1.82	1,638	6.5	10,647	394
L	4.65	1.66	1,494	5.5	8,217	304
M	6.78	2.13	1,917	4.5	8,627	320
N	11.46	4.68	4,212	3.5	14,742	546
O	41.34	41.34	37,206	1.5	55,809	2,067
P	44.21	44.21	39,789	1.5	59,684	2,211
TOTAL					447,642	16,579
TOTAL (WITH AN EXPANSION FACTOR OF 20%)					537,170	19,895

TABLE 10

**COST ESTIMATE FOR ALTERNATIVE B-3
PALMETTO WOOD PRESERVING SITE
DIXIANA, SOUTH CAROLINA**

REN II

Table Number: B-3
Alternative Number: B-3
Activities: EXTRACTION/Soil Flushing
Number: 240
Site Name: PALMETTO WOOD PRESERVING

OPERATION & MAINTENANCE COSTS
Date: 16-Sep-87

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	TOTAL COST
ALLOCATION				
Transport Equipment and Staff	hr	1	135,000.00	135,000
Contractor's Permits and Bonds	hr	1	114,100.00	114,100
Temporary Facilities	sq	40	14,000.00	560,000
100% SITE DEVELOPMENT COST				
Site Preparation	hr	1	10100,000.00	10100,000
EQUIPMENT AND SUPPLIES - SOIL				
Excavation Equipment & Labor	cu. yd.	17,073	63.20	1081,054
Soil Leaching	hr	1	10200,000.00	10200,000
Soil Flushing	hr	1	100,000.00	100,000
Application	sq. ft.	140,000	00.02	2,800
Flushing	sq. ft.	1,000	040.00	40,000
Deep Transport Equipment	10/1000 gal	4,000	042.00	168,000
WATERING EQUIPMENT & SUPPLIES	sq	40	1000.00	40,000
TRUCK	hr	1	100,000.00	100,000
UTILITY MAINTENANCE	hrs	200	1400.00	280,000
WATER AND ELECTRICITY	hrs	1,000	100.00	100,000
MAINTENANCE	hr	1	112,000.00	112,000

Total - Capital Cost				1080,054
Tractor Fee - Cost Based on 10% of Capital Cost				108,005
Oil Fees, License & Permits - Cost Based on 10% of Capital Cost				108,005
Insurance & Administrative - Cost Based on 10% of Capital Cost				112,010
Total				1410,074
11 - Cost Based on 10% of Subtotal				155,108
12 - Construction Cost				110,307,474
13 - North of 800 Costs				1000,340
14 - PRESENT NORTH COST				111,711,015

Table Number: B-3
Alternative Number: B-3
Activities: EXTRACTION/Soil Flushing
Site Number: 240
Site Name: PALMETTO WOOD PRESERVING

OPERATION & MAINTENANCE COSTS
Date: 16-Sep-87

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	TOTAL COST	OPERATION & MAINTENANCE COSTS	TIME, hrs
CONTRACTOR'S LABOR						
Inspection	yr	1	1000.00	1000	30	60,713
Miscellaneous	sq	1	12,500.00	12,500	30	121,567
System Operation	hr	4,000	130.00	520,000	1	1121,636
HEAVY CHEMICAL/WASTE DISPOSAL	10/1000 gal	1,500	125.00	187,500	1	102,102
PERMIT	hr	30,500	00.00	12,125	1	11,741
MAINTENANCE	10/1000 gal	2	1000.00	2,000	30	10,427
100% YEAR MAINTENANCE						
Personnel & Supplies	hrs	4	11,500.00	46,000	2	110,413
Laboratory	sq	40	1450.00	58,000	2	137,400
100% YEAR MAINTENANCE						
Personnel & Supplies	hrs	1	11,500.00	11,500	20	111,700
Laboratory	sq	12	1450.00	17,400	20	150,700
TOTAL				1,770,075		1,367,703
CONTRACTOR - Cost Based on 10% of Subtotal				177,007		135,700
TOTAL				1,947,082		1,503,403

TABLE 11-

Table Number: A-3

Alternative Number: A-3

Alternatives: EXTRACTION, FILTRATION, ION EXCHANGE, DISCHARGE

Site Number: 240

Site Name: PALMETTO WOOD PRESERVING

PRESENT WORTH COSTS

Date: 01-Jul-87

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	TOTAL COST
			\$	\$
MOBILIZATION				
Transport Equipment and Staff	to	1	015,000	015,000
Contractor's Permits and Bonds	to	1	01,700	01,700
Temporary Facilities	sh	13	0350	05,250
LAND & SITE DEVELOPMENT COST				
Earthwork	to	1	03,500	03,500
Concrete	to	1	010,000	010,000
EQUIPMENT AND SUPPLIES				
Influent Storage Tank/Bag	ea	1	03,500	03,500
Cartridge Filter	ea	2	04,500	09,000
Pumps & Misc. Equipment	ea	1	03,000	03,000
Ion Exchange Column	ea	2	010,300	020,600
Backwash & Regenerant Equip	ea	2	010,500	021,000
Pipe & Appurtenances	to	1	00,500	00,500
Portal Building	ea	1	015,000	015,000
INSTALLATION				
Equipment Installation @ 006				033,000
Health & Safety Equipment	dys	120	050	06,000
Decontamination Facilities	to	1	05,000	05,000
MISCELLANEOUS				06,000
EFFLUENT PIPE	to	1	02,000	02,000
WATER QUALITY MONITORING	dys	40	0100	04,000
Subtotal - Capital Cost				0170,050
Contractor fee 10%				017,405
Legal Fees, Licenses & Permits (100)				017,405
Engineering & Administrative (150)				026,270
Subtotal				0231,130
Contingency (100)				023,113
Total Construction Cost				0254,243
Present Worth of O&M Costs				01,110,363
TOTAL PRESENT WORTH COST				01,370,217

Table Number: A-3

Alternative Number: A-3

Alternatives: EXTRACTION, FILTRATION, ION EXCHANGE, DISCHARGE

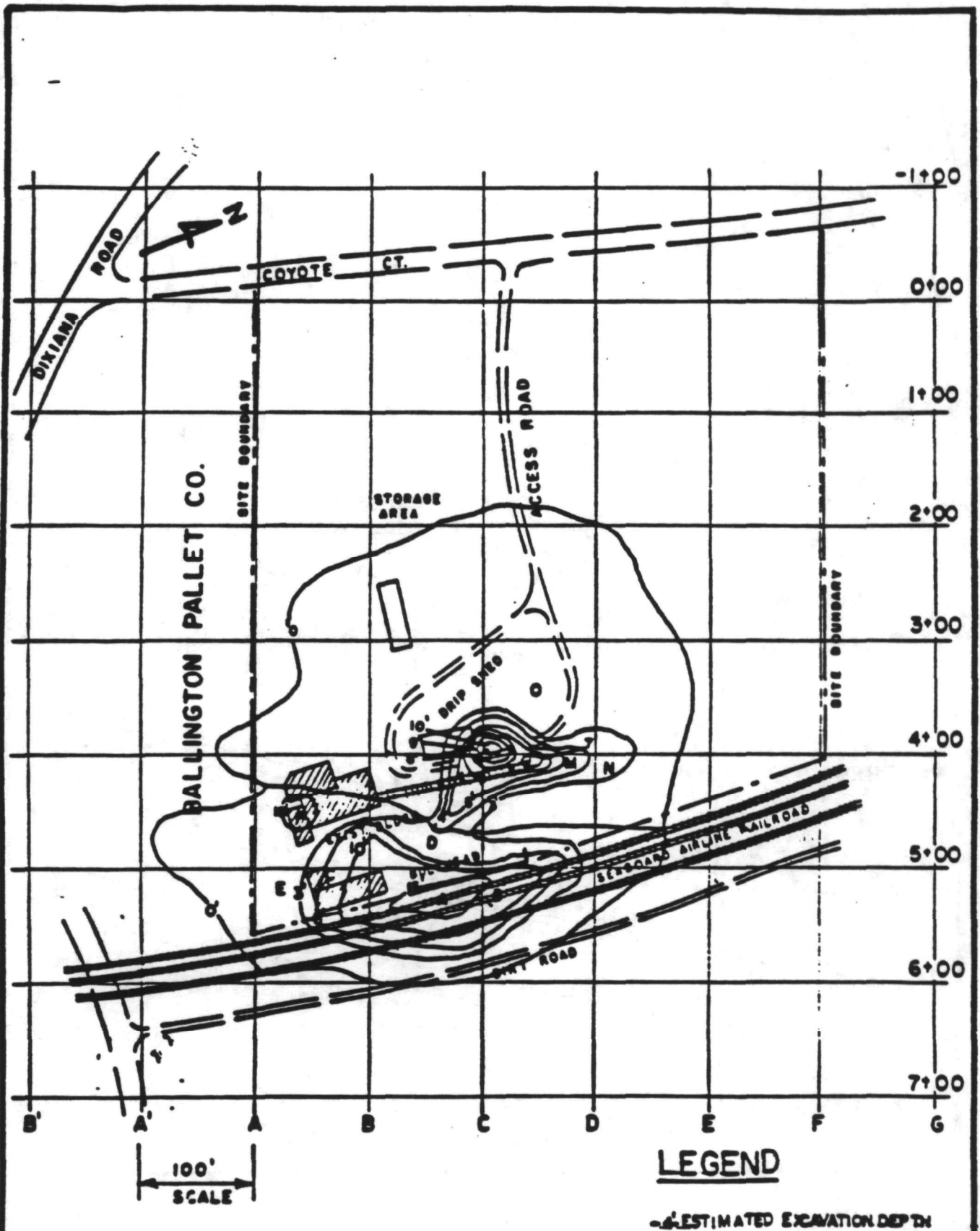
Site Number: 240

Site Name: PALMETTO WOOD PRESERVING

OPERATION & MAINTENANCE COSTS

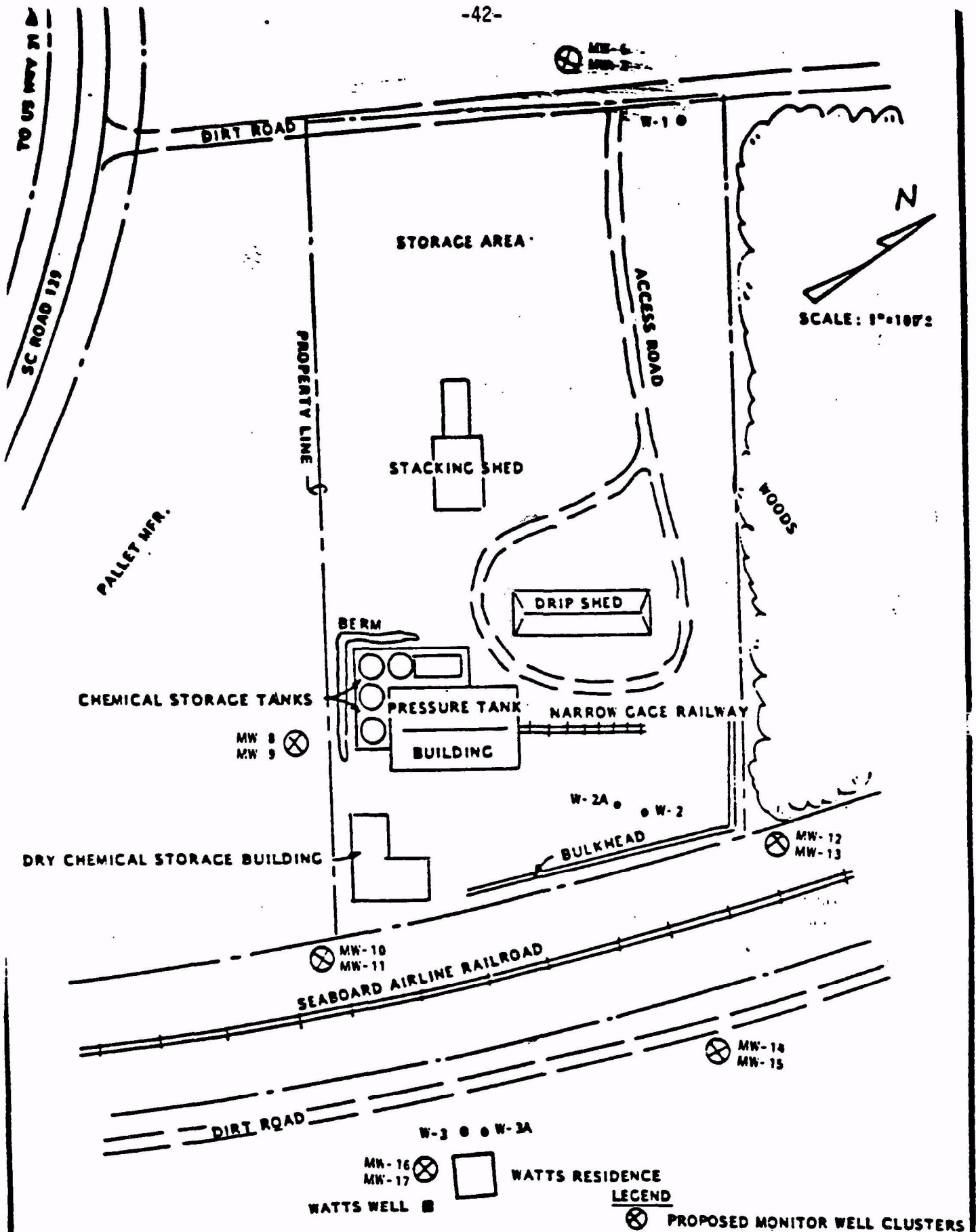
Date: 01-Jul-87

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	TOTAL ANNUAL COST, \$	OPERATION TIME, Yrs	PRESENT WORTH \$
CONTRACTOR'S LABOR						
Operation	hr	1,520	034.00	051,680	27	0477,300
Miscellaneous	hr	220	034.00	07,752	27	071,607
REGENERANT	to	10,000	00.07	0700	27	06,466
ION EXCHANGE RESIN	to	5,000	00.35	02,250	27	023,402
NEEDLEMAN CHEMICALS	gal	0,000	01.00	00,000	27	073,070
DISPOSAL OF REGENERANT						
Regenerant	gal	0,000	01.50	012,000	27	0110,047
Ion Exchange Resin	ton	2.5	0300.00	01,250	27	011,547
TREATMENT MONITORING	sh	52	0150.00	07,800	27	072,050
FILTER MEDIA	ea	24	015.00	0360	27	03,325
SHORT TERM MONITORING						
Personnel & Supplies	dys	0	01,500.00	00,000	27	053,423
Laboratory	ea	40	0150.00	07,200	27	065,500
LONG TERM MONITORING						
Personnel & Supplies	dys	1	01,500.00	01,500	3	03,730
Laboratory	ea	12	0150.00	01,800	3	04,476
SUBTOTAL				0100,792		0902,660
REPLACEMENT OF CAPITAL EQUIPMENT				02,917	27	026,944
CONTINGENCY				011,171		0100,760
TOTAL				0122,000		01,110,363
REPLACEMENT EQUIPMENT						
Pumps & Misc. Equipment	3	0	03,000.00	009,000	27	013,472
Backwash & Regenerant Equip	3	0	03,000.00	009,000	27	013,472
TOTAL REPLACEMENT COSTS				018,000		026,944



ITEM 6
ESTIMATED SOIL QUANTITIES
PALMETTO WOOD PRESERVING SITE

FIGURE NO.



PROPOSED MONITOR WELL CLUSTER LOCATIONS

PALMETTO WOOD PRESERVING SITE

DIXIANA, SOUTH CAROLINA

FIGURE NO

13

TABLE 12

STATE COST-SHARING
PALMETTO WOOD PRESERVING SITE

TOTAL FOR A-3 AND B-3

A-3 EXTRACTION, FILTRATION, ION EXCHANGE, DISCHARGE
B-3 EXTRACTION/SOIL

	TOTAL	EPA	STATE
DESIGN	174,126	174,126	-
CAPITAL COSTS	1,393,000	1,253,700	139,300
IMPLEMENTATION	1,231,497	561,679	669,818
O & M	33,000	990	32,010
MONITORING	143,163	49,183	93,980
TOTAL	2,974,786	2,039,678	935,108

TABLE 13

ALTERATIVE A-3 EXTRACTION, FILTRATION, ION EXCHANGE, DISCHARGE

	TOTAL	EPA	STATE
DESIGN	28,851	28,851	-
CAPITAL COSTS	230,802	207,722	23,080
REPLACEMENT EQUIPMENT	26,944	8,981	17,963
TEN-YEAR IMPLEMENTATION	347,320	312,588	34,732
17-YEAR IMPLEMENTATION	590,444	-	590,444
11-YEAR MONITORING	54,648	48,183	5,465
19-YEAR MONITORING	88,515	-	88,515
TOTAL	1,367,524	607,325	760,199

NOTES: Implementation based on 27 years at \$34,732 per year

Monitoring based on 27 years at \$4,968 per year

3 years at \$3009 per year

TABLE 14

Alternative B-3: Extraction/Soil Flushing

	Total	EPA	State
DESIGN	\$ 145,275	145,275	-
CAPITAL COSTS	1,162,198	1,045,978	116,220
IMPLEMENTATION	266,789	240,110	26,679
FIRST-YEAR O&M*	1,100	990	110
LONG-TERM O&M*	31,900	-	31,900
TOTAL	1,607,262	1,432,353	174,909

NOTES: O&M includes mowing only
GW Monitoring is included in Alternative A-3