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Draft
Remedial Action Work Plan
Soil and Groundwater Remediation
Operable Unit 2, Site 6 and 82
MCB Camp LeJeune, North Carolina
Contract No. N62470-93-D-3032

Prepared for:

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OHM Project No. 16032

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1.0 INTRODUCTION

This Remedial Action Work Plan (RAWP) reviews OHM Remediation Services Corp. (OHM) approach to implementation of the scope of work under Delivery Order No. 0015 of Navy Contract N62470-93-D-3032. Several other plans have been developed for this delivery order and are to be considered attachments to this work plan. They include:

- Site Specific Health & Safety Plan (SHSP)
- Environmental Protection Plan (EPP)
- Construction Quality Control Plan (CQCP)
- Quality Assurance Project Plan (QAPP)

This RAWP identifies and describes how OHM will implement the major tasks encompassing the remedial action for Operable Unit No. 2 (OU No. 2) in conformance with the contract requirements. It includes the following sections:

- Section 2.0 Remedial Action Objectives
- Section 3.0 Pre-construction Activities
- Section 4.0 Site Preparation and Mobilization
- Section 5.0 Soil Remediation
- Section 6.0 Groundwater Remediation Systems and Installation
- Section 7.0 Operations and Maintenance
- Section 8.0 Schedule

1.1 SITE BACKGROUND

MCB Camp LeJeune was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), National Priorities List (NPL) effective October 4, 1989 (54 Federal Register 41015, October 4, 1989). Subsequent to this listing, the United States Environmental Protection Agency (USEPA) Region IV, the North Carolina Department of Environment, Health and Natural Resources (NC) and the United States Department of the Navy (DoN) entered into a Federal Facilities Agreement (FFA) for MCB Camp LeJeune. The primary purpose of the FFA was to ensure that environmental impacts

associated with past and present activities at MCB Camp LeJeune were thoroughly investigated and appropriate CERCLA response/Resources Conservation and Recovery Act (RCRA) corrective action alternatives were developed and implemented as necessary to protect the public health and the environment.

Following a CERCLA Remedial Investigation of OU No. 2 in 1993, the United States Navy, Naval Facilities Engineering Command, Atlantic Division (LANTDIV) contracted Baker Environmental, Inc. to conduct a remedial design for the remediation of contaminated soil and groundwater. The remedial design efforts reflect the remedy which was selected and documented in the final Record of Decision (ROD) for the site in September, 1993. On May 10, 1994 Baker delivered a pre-final (30%) design package to OHM for soil and groundwater remediation of OU No. 2. OHM's scope of work as the remedial contractor includes completion of the remedial design, construction, and operation and maintenance of the soil and groundwater remediation systems. The selected remedy for OU No. 2 includes the following primary actions:

- In-situ soil vapor extraction to treat VOC contaminated soils within area of concern (AOC) 1 at Site 82.

we know that this will change

- Excavation, transportation, and disposal of approximately 850 cubic yards of PCB and pesticide contaminated soil and debris from AOC 2 through AOC 6.

- Groundwater extraction and treatment for shallow and deep groundwater containing VOCs and metals. Approximately six wells (three shallow and three deep) will be installed to extract and pump contaminated groundwater to a wastewater treatment plant designed for 500 gallons per minute (gpm) flow.

approximately

1.2 SITE DESCRIPTION

Camp LeJeune is a training base for the U.S. Marine Corps, located in Onslow County, North Carolina. The Base covers approximately 170 square miles and includes 14 miles of coast line. MCB Camp LeJeune is bound to the southeast by the Atlantic Ocean, to the northeast by State Route 24, and to the west by U.S. Route 17. The town of Jacksonville, North Carolina is located north of the Base. The remedial action area, OU No. 2 is one of 13 operable units within Camp LeJeune. An "operable unit" as defined by the National Contingency Plan (NCP) is a discrete action that comprises an incremental step toward comprehensively addressing site problems. OU No. 2, which covers an area of approximately 210 acres, is comprised of three sites: sites 6, 9 and 82. OU No. 2 is located approximately two miles east of the New River and two miles south of State Route 24. The Operable Unit is bordered to the north by Wallace Creek, to the west by Holcomb Boulevard, to the east by Piney Green Road, and to the south by Sneads Ferry Road.

Within Site 6, there are four main areas of concern: open storage Lot 201; open storage Lot 203; the wooded areas which surround these storage lots; and a ravine. Open storage Lot 201 is a fenced lot located in the southern central portion of Site 6. This lot is currently used to store military equipment and vehicles, lumber, hydraulic oils and lubricants, non-polychlorinated biphenyl (PCB) transformers, and other supplies. Lot 201 is approximately 25 acres in size.

Open Storage Lot 203 is a fenced lot situated in the northern portion of Site 6, bordering Site 82 to the south. Based on a review of historical aerial photographs, it appears that the fenced boundaries of this lot have changed since the lot was in operation. Currently the fenced portion of Lot 203 is approximately 41 acres in size. In the past, the storage lot was reportedly used for the disposal of various chemicals including PCBs, cleaning solvents, electrolytes from used batteries, and waste oils. Storage Lot 203 is no longer used as an active storage area.

The ravine is located in the northwest section of Site 6 (along the northern boundary of Lot 203) and bisects Site 82. The upper portion of the ravine was, at one time, used as a disposal area. The presence of battery packs, drums, fencing, tires, wire cables, respirators cartridges, empty drums, commercial ovens, commodes, and other surficial debris is evidence of past disposal practices.

Woods and open fields surround both Storage Lots 201 and 203 and make up the remaining area of Site 6. These areas are randomly littered with debris including spent ammunition casings, and empty or rusted drums.

Site 9 is the "Fire Fighting Training Pit at Piney Green Road". The site covers and area of approximately 2.6 acres. Site 9 is bound by Holcomb Boulevard on the west, Bear Head Creek approximately 500 feet to the north, Piney Green Road on the east and Sneads Ferry Road on the south. Site 6 also borders Site 9 to the north. Locally Site 9 is bounded by unnamed streets leading to various storage buildings in the vicinity. Site 9 consist of an asphalt lined fire training pit, an oil/water separator, four above ground storage tanks (ASTs), three propane tanks, and a fire tower (smoke house). The fire training pit, located in the southern area of the site, is used to conduct training exercises for extinguishing fires caused by flammable liquids. The oil/water separator is located next to the fire training pit to collect water used in the training exercises and storm water that falls into the pit. the recovered product collected in the oil/water separator is disposed of off-site. Two of the ASTs at Site 9 are 2,500-gallon steel tanks labeled "DO NOT USE". These tanks are not currently in use. Two additional ASTs located within a concrete containment area are currently in use. These tanks are constructed of steel and have a capacity of 500 gallons each.

Site 82, the Piney Green Road VOC Site, is located directly adjacent to Site 6 and encompasses approximately 30 acres. The site is predominantly covered by woodlands and is randomly littered with debris such as communication wire, spent ammunition casing, and empty or rusted drums.

1.3 SITE HISTORY

Site 6 has a history of various uses, including the disposal and storage of waste and supplies. Pesticides have reportedly been stored in the northeast and southeast portions of Lot 201. Transformers containing PCBs were reportedly stored in the southeast and southwest portions of lot 201. Open Storage Lot 203 previously served as a waste disposal and storage area from as early as the 1940s to the late 1980s. Reports detailing activities within Lot 203 are vague; there is little indication as to the types and quantities of material disposed of through the lot, with the exception of pesticides. Pesticides were reported to have been stored in a tailer on Lot 203 as well as in the southeast portion of the lot. Former employees at Lot 203 have reported disposal of various chemicals including PCBs, cleaning solvents, electrolytes from used batteries, and waste oils.

Site 9 has been used for fire fighting training exercises from the early 1960s to the present. Until 1981, training exercises were conducted in an unlined pit. The pit is currently asphalt lined. Flammable liquids including used oil, solvents, and contaminated fuels (unleaded) were used as accelerants during training exercises. Approximately 30,000 to 40,000 gallons of JP-4 and JP-5 fuels were also burned in the fire training pit.

No organized disposal operations are documented for Site 82. It appears that the site area was used for disposal of miscellaneous debris from Lot 203, since similar items were identified at both sites. No known documentation exists of the quantity or the location of the disposal of volatile organic compounds (VOCs).

1.4 SOIL AND GROUNDWATER CONTAMINATION

Based on the information collected during the Remedial Investigation (RI), remedial action alternatives (RAAs) were developed as part of the Feasibility Study (FS) to address contaminated media (both soil and groundwater) at various AOC's within OU No. 2. The following soil and groundwater AOCs are to be remediated.

Figure 1.1 is a site layout which identifies the relative locations of soil AOC 1 though AOC 6.

AREA	DESCRIPTION
AOC 1	Sources of groundwater contamination at Site 82.
AOC 2	Upper portion of the ravine at Site 6 with detected levels of PAHs, PCBs and metals in soil and sediment.
AOC 3	North central portion of Lot 203 with detected levels of PCBs in soil.
AOC 4	Northwest portion of Lot 203 with detected levels of PCBs in soil.
AOC 5	Northeastern corner of Lot 201 with detected levels of pesticides in soil.
AOC 6	Wooded area east of Lot 201 and adjacent to Piney Green Road with detected levels of PCBs in soil.
VOC	Contaminated groundwater plumes (shallow and deep) originating from Site 82.

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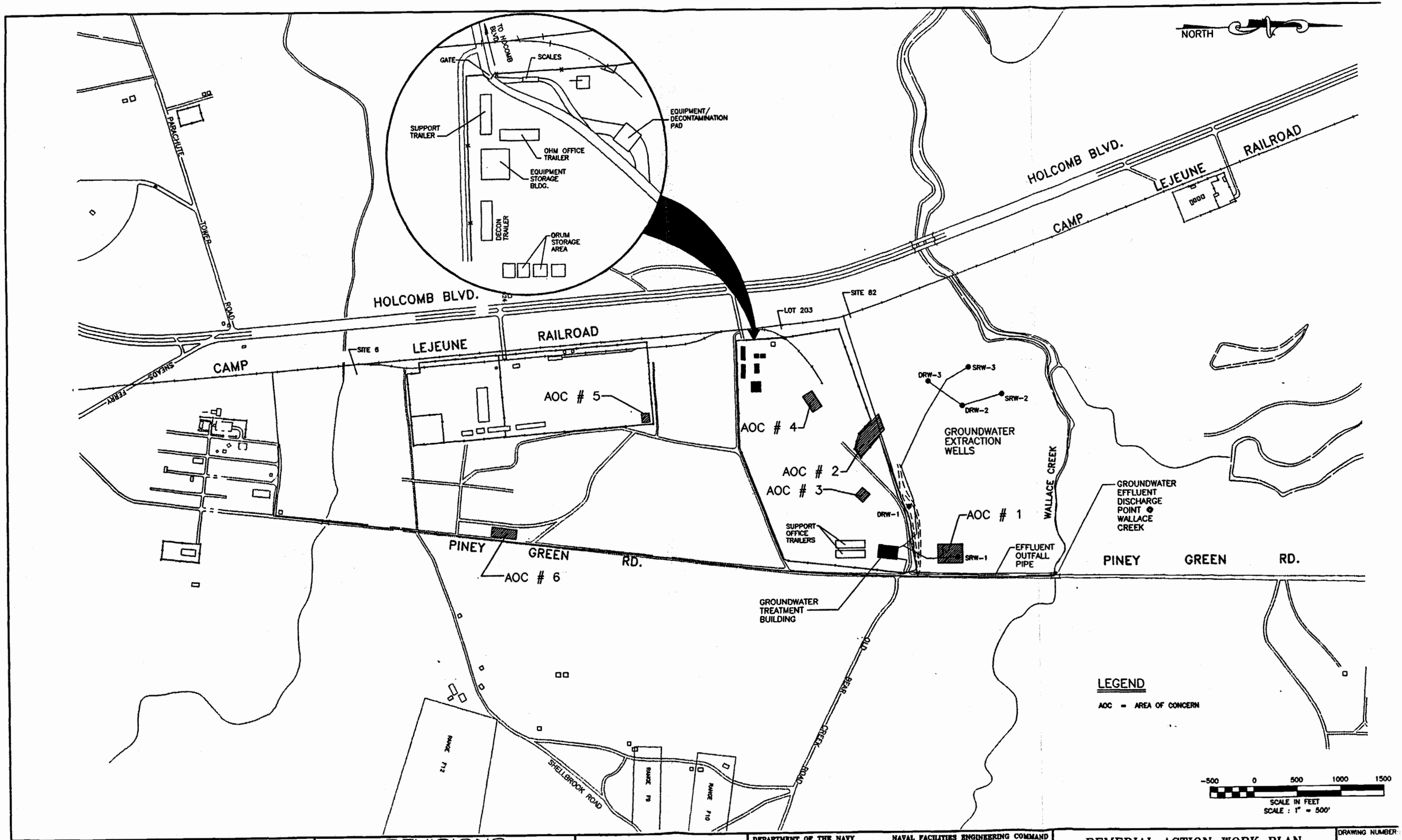


OHM Remediation Services Corp.
Norcross, Georgia
A Subsidiary of OHM Corporation

SUBMITTED: _____ PROJECT MANAGER: _____ DATE: _____
APPROVED: _____ DATE: _____

AT FULL SCALE (IF NOT 2"-SCALE ACCORDINGLY)
CADD FILE: _____
DRAWN: B. MATTHEWS
DESIGNED: _____
CHECKED: _____

REVISIONS

ZONE	REV.	DESCRIPTION	BY	DATE	APP.

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NAVAL STATION — NORFOLK, VIRGINIA
LANTDIV RAC CONTRACT N62470-93-D-3032 — DELIVERY ORDER NO. 0015

REMEDIAL ACTION WORK PLAN

SITE PLAN

DRAWING NUMBER: C-1
SHEET NUMBER: 1 of 1
DATE: 6\28\94

2.0 REMEDIAL ACTION OBJECTIVES

In accordance with Section 121(d)(1) of CERCLA, remedial actions must attain a degree of clean-up which assures protection of human health and the environment. Remedial goals have been based on meeting an Applicable or Relevant and Appropriate Requirement (ARAR), or a site-specific risk based action level. For groundwater restoration, the ARAR used as a basis for determining the remedial goal was either federal Maximum Contamination Level (MCL), a North Carolina Water Quality Standards (NCWQS), or site-specific risk-based action level. Soil remedial goals were established based on ARARs or risk-based action levels for the protection of public health or groundwater. Two sets of site remediation goals, or action levels, have been developed for OU No. 2, one for soil, and one for groundwater, respectively.

2.1 REMEDIAL ACTION OBJECTIVES FOR SOIL

The remediation goals for OU No. 2 were provided in the final design package Basis of Design Report by Baker Environmental dated May 10, 1994. Table 2.1 presents the applicable requirements for contaminated soil in AOC 1 through AOC 6.

Table 2.1
Remediation Goals for OU No. 2 –Soil and Groundwater Remediation

Media	Contaminant of Concern	Preliminary Remediation Goal	Unit	Basis
Soil	PCBs	10,000	ug/kg	TSCA
	4,4'-DDT	60,000	ug/kg	Risk-Dermal Contact
	Benzene	5.4	ug/kg	Risk-Protect Groundwater
	Trichloroethene	32.2	ug/kg	Risk-Protect Groundwater
	Tetrachloroethene	10.5	ug/kg	Risk-Protect Groundwater
	Arsenic	23,000	ug/kg	Risk-Ingestion
	Cadmium	39,000	ug/kg	Risk-Ingestion
	Manganese	390,000	ug/kg	Risk-Ingestion
Ground-water	1,2-Dichloroethane	0.38	ug/L	NCWQS
	Trans-1,2Dichloroethene	70	ug/L	NCWQS
	Ethylbenzene	29	ug/L	NCWQS
	Tetrachloroethene	0.7	ug/L	NCWQS
	Trichloroethene	2.8	ug/L	NCWQS
	Vinyl Chloride	0.015	ug/L	NCWQS
	Arsenic	50	ug/L	NCWQS
	Barium	1,000	ug/L	NCWQS
	Beryllium	4	ug/L	MCL
	Chromium	50	ug/L	NCWQS
	Lead	15	ug/L	MCL
	Manganese	50	ug/L	NCWQS
	Mercury	1.1	ug/L	NCWQS
	Vanadium	80	ug/L	Health Advisory

NCWQS = North Carolina Water Quality Standard
MCL = Maximum Contaminant Level

The primary constituents of concern for AOCs 3, 4, 5, and 6 are PCBs (Aroclor-1260) and 4,4'-DDT. Although other Aroclors and metabolites of DDT were detected, the aforementioned PCB and pesticide compounds represent the primary constituents of concern. Soil in each of the these AOCs will undergo excavation and off-site disposal (incineration). The debris and contaminated soil exceeding the clean-up goals in AOC 2 (ravine) will be removed/excavated and disposed of off-site as non-hazardous waste. The soils in AOC 1 exceeding the clean-up criteria will be treated in-situ using soil vapor extraction technology. Table 2.2 summarizes the AOCs, estimated volumes of soil from each AOC, and the proposed method of disposal.

TABLE 2.2

AOC	Area of Excavation (sq. ft.)	Depth of Excavation (ft.)	Volume (c.y.)	Disposal
1	In-situ	N/A	16,500	In-Situ SVE
2	20,000	1	750	Landfill
3	100	4	15	Incineration
4	280	1	10	Incineration
5	700	1	26	Incineration
6	450	1	17	Incineration

2.2 REMEDIAL ACTION OBJECTIVES FOR GROUNDWATER

Table 2.1 also identifies the clean-up objectives for remediating the surficial and deep groundwater within OU No. 2, Site 82.

The network deep and shallow extraction wells for the groundwater pump and treat system will focus on the worst area of groundwater contamination. The rationale for this approach is that the major source areas of the groundwater contamination can be isolated and handled more feasibly than the entire area of impacted groundwater. The cone of influence created by extraction wells are expected to reach the down gradient boundary of the plume. A network of extraction wells will be placed within the highest contamination levels of the plume. Approximately three deep extraction wells (110 feet deep) will be installed and pumped at a rate of approximately 150 gpm. In addition, three shallow (35 feet deep) extraction wells will be installed and pumped at a rate of approximately 5 gpm. The extracted groundwater will be treated via a

conventional treatment train which consists of, but not be limited to, equalization, precipitation, clarification, filtration, neutralization, precipitation, air stripping, and activated carbon absorption. A more detailed system description is provided in Section 6. The treated effluent will be discharged to Wallace Creek.

3.0 PRE-CONSTRUCTION ACTIVITIES

Many pre-construction activities will be performed by OHM prior to mobilization, system installation, and operation. Key pre-construction activities include the following:

Design Completion

The 100% complete design package being prepared by OHM is based upon the 30% Pre-Final Design package prepared by Baker Environmental for OU No. 2. The Final Plans and Specifications included with this package, will be submitted to LANTDIV by September 15, 1994. This submittal will be equivalent to the FFA termed "100% Final Construction Drawings and Specifications". The design package is currently at various stages of completion, ranging from 5% for the SVE system, to 75% for the groundwater recovery and treatment systems.

The OHM design team is working closely with Baker to complete the remedial design and incorporate modifications as needed to provide operable systems which meet the intent of the Pre-Final Design and which are consistent with the overall clean-up objectives.

Take out! I don't think we need this in here.

AOC 1 Soil Sampling

Completion of this RAWP will require additional on-site sampling in AOC 1 to determine the extent of contaminated soil, boundaries for the proposed SVE systems, and obtain important design information to properly scope and implement an SVE remedy. This sampling will include OHM personnel, a subcontract driller, and analytical services. A separate work plan for this effort has been prepared and submitted to LANTDIV. Field work will be performed the week of July 11, 1994. Analytical results will be summarized in the final RAWP.

Additional Plans

After design completion, OHM will meet with the Contracting Officer to discuss the proposed Environmental Protection Plan and other pre-construction submittals. At this time photographs will be taken of the project sites for pre-construction documentation of existing conditions.

Subcontractor Procurement

No later than November 1, 1994, OHM will submit the qualifications and licenses of subcontractors performing hazardous waste transportation and disposal. The qualifications of subcontractors including small and disadvantaged businesses performing work at the site will also be submitted at this time. Additionally, other material/product submittals jointly identified as necessary will be submitted at this time in accordance with the approved submittal register.

Pre-Construction Meeting

One week prior to mobilization OHM will arrange a pre-construction meeting on the Base with the contracting officer and other responsible parties. The purpose of this meeting is to:

- Confirm roles and responsibilities of key personnel and flow of communication for project execution.
- Review the project schedule, sequence of tasks and key milestones.
- Identify and discuss Base-specific issues relative to the upcoming mobilization and construction activities.
- Obtain the necessary security clearances for operations personnel.

4.0 SITE PREPARATION AND MOBILIZATION

OHM will mobilize personnel and equipment from its Southern Region offices, including Morrisville, North Carolina, Covington, Georgia, and Gallatin, Tennessee offices. Prior to any work on site, a training meeting will be conducted to brief all site personnel on the Site Specific Health and Safety Plan, construction drawings, and other relevant site specific plans. Site hazards and conditions will be discussed and all personnel will acknowledge their understanding and compliance with the plan by signing an approved acceptance form.

Project mobilization and site setup will consist of the following main activities:

- **Site Survey** - A professional licensed surveyor will be subcontracted to provide a layout of the extraction and treatment systems, the limits of excavation for each AOC, and location of other features such a construction roads and equipment laydown areas.

- **Temporary Facilities Installation** - OHM will utilize its office trailer already located at Lot 203 as an administrative area and command center. This area will serve as the control check point for contractor/subcontractor personnel entering the site. A decontamination trailer will also be mobilize and placed adjacent to the office trailer.

- **Temporary Utilities Installation** - OHM will provide primary electrical service to the trailers and treatment plant site along with telephone and sanitary/solid waste services.

- **Clearing and Grubbing** - Trees located within the excavation zones will be cut and staged in a convenient location for pickup by the Forestry Service. Upgrade access roads, roads leading to the project site will be graded and if necessary stone will be placed in low, soft or water accumulating areas.

- **Parking Areas** - OHM will establish storage and parking areas for on-site vehicles and materials to be delivered for construction activities near the command trailer.

- **Erosion and Sedimentation Control** - OHM will establish controls to prevent erosion and sedimentation through the use of sediment fencing and diversion berms. In this manner, OHM will mitigate the spread of contamination to other areas and minimize the intrusion of rainwater into the active work area. Silt fencing will be placed on the down gradient sides of each excavations. Clean soil will be used to construct a berm on the up gradient side of the excavation areas to prevent the intrusion of surface water into the excavation prior to backfill.

- **Install Construction Fences** - OHM personnel will erect safety fencing around the planned excavations in AOC 2 through AOC 6. Fencing will be three foot high, bright orange, polyethylene, mesh fence to prevent personnel from accidentally entering the open excavation. Additional fencing will be placed around monitoring wells located in close proximity to construction activities.

- **Decontamination Areas** - Personnel and equipment decontamination areas will be provided within the Contamination Reduction Zones (CRZ) upon exiting the contaminated working areas. The site specific Health and Safety Plan addresses these areas in detail.

- **Site Security** - The OHM command trailer will serve as a security check point for the project site. All persons entering the site will be required to sign in and out daily. OHM reserves the right to deny access to any individual not showing proof of compliance with the training requirements outlined in 29 CFR 1910.120 or proper identification. Site security will be provided during all non-work hours and during work hours by OHM personnel.

- **Haul Roads** - Haul roads will be constructed to the lines and grades as shown on the drawings and as further determined by the initial site survey. Haul roads will be graded and compacted as necessary. If needed, crushed limestone will be placed on the prepared subgrade.

- **Health and Safety Zones** - The site will be segregated into work areas on the basis of degree of hazard and PPE requirements. In general, the fenced area will comprise the contamination reduction zone (CRZ). Personnel working within the CRZ will be required to wear the appropriate PPE as outlined in the Site Specific Health and Safety Plan (HASP). Excavation areas within the CRZ will be designated the exclusion zone and will be delineated by orange safety fencing. OHM health and safety personnel will provide continuous site air monitoring and will adjust work zone boundaries as appropriate.

- **Personnel Decontamination Facility** - OHM will mobilize and setup personnel decontamination trailer at the site. The trailer will be situated near the command trailer (Lot 203) and/or near construction areas depending on the phase of remediation activities. It will be furnished with showers and hand-basins, and washer and dryer facilities for crew uniforms. All decontamination and cleaning water generated from the decontamination trailer will be collected and stored prior to treatment in the wastewater treatment facility.

5.0 SOIL REMEDIATION

5.1 AOC 1-SOIL VAPOR EXTRACTION

5.1.1 Pre-Design Sampling

A work plan for additional site investigation activities of Site 82 at AOC 1 has been completed and received by LANTDIV. The purpose of the work is to determine the vertical and horizontal extent of VOC contamination in AOC 1 which exceeds the established soil clean-up objectives (RAOs). This information is needed to prepare a final design for remediation for AOC 1. Soil vapor extraction technology has been selected as the remedy for the estimated 16,000 cubic yards of VOC contaminated soil in AOC 1. This sampling event will help to accomplish the following:

- Verify the quantity and location of VOC contaminated soil exceeding soil RAOs;
- Determine the size configuration and costs of the proposed SVE system; and
- Confirm whether in-situ treatment using SVE technology is the most cost effective remedy for AOC 1 soils.

The field investigation is scheduled for the week of July 11, 1994. Sampling results will be discussed with Baker and LANTDIV prior to finalizing the RAWP for OU No. 2. OHM's approach for remedation of AOC 2 may be modified based on the results and subsequent discussion with LANTDIV.

5.1.2 Design Completion

Consistent with Delivery Order No. 0015, OHM has assumed responsibility for completing the remedial design initiated by Baker Environmental Inc. Design completion consists of two phases; finalization of this work plan by July 29, 1994 and submittal of 100% specifications and drawings by September 15, 1994. To meet the December 7, 1994 construction start date, equipment services bids will be obtained and evaluated. Purchase recommendations with backup will

accompany the September 15 submittal to LANTDIV and other appropriate parties. It is important that purchase authorization follow by October 3, 1994.

5.2 DEBRIS REMOVAL AND SOIL EXCAVATION

AOC 2, 3, 4, 5 and 6 contain in-situ soils which have been determined to be contaminated with either PCBs or Pesticide compounds in excess of the Remedial Action Objectives (RAOs) for site soils. The soil will be characterized in-place for disposal prior to excavation in accordance with the attached Quality Assurance Project Plan (QAPP). These areas will be excavated by OHM to the vertical and horizontal limits based on the drawings and in-place sampling. Excavated soil will be directly loaded into transport vehicles weighed, and transported to the selected treatment facility. Off-site incineration is planned for the soils from these AOCs. Confirmation sampling will verify that remaining soils meet RAOs prior to backfilling these areas.

The approximate dimensions of each AOC will be clearly delineated prior to beginning excavation. The contaminated soils in each AOC will be removed to the pre-determined dimensions as identified from the in-place sampling effort. A track excavator equipped with a 1/2 yard bucket will carefully excavate soil. Excavation depths will be manually monitored with a tape measure or equivalent measuring device to avoid any over excavation of soil. After excavation to the specific limits, a visual inspection will be performed on the surrounding soil. If the visual inspections reveal evidence of contaminated soil, OHM will consult with the NTR to discuss and/or recommend the extent of additional excavation. Exposed excavation areas with no evidence of contaminated soil will undergo confirmation sampling. Samples will be collected and sent to the designated analytical laboratory for analysis as discussed in the QAPP.

All trucks used for transporting material will be decontaminated on the equipment decon pad prior to leaving the project site to prevent the off-site spread of contaminants. When all contaminated soils have been loaded for transportation, OHM will remove residual soils from the excavator by scraping and brushing, prior to moving to the next AOC. Upon completion of excavation

activities, the excavator will be moved to the decon pad for final decontamination by pressure washing.

Personnel involved with excavation, will be attired in Level C Personal Protective Equipment. Used PPE will be placed in the trucks with the soil for disposal.

All hazardous waste destined for disposal will be transported by licensed hazardous waste haulers. All trucks will pre-weigh at Lot 203 at the entrance to the secured area to establish their tare weight prior to being loaded with contaminated soil. After loading and prior to exiting the controlled area, a pressure washer will be used to decon the truck's tires and trailer sides. The trailer will then be tarped, and weighed to determine gross and net weights. Each load will be properly manifested for the designated hazardous waste disposal facility. LANTDIV, or designated MCB Camp LeJeune personnel, will be responsible for signing manifests as the generator for each off-Base shipment.

Backfilling of the excavated AOCs will begin only after receipt of all confirmation testing results and the approval of the NTR. Each excavation will be backfilled to the pre-existing grade. Backfill will be placed in 12 inch lifts and compacted to the design specifications. OHM will utilize the on-site Base borrow pit for the source of fill material for the excavations.

5.3 CONFIRMATION SAMPLING

Subsequent to removal of contaminated soils, AOC 2 through AOC 6 will be sampled to determine if the RAOs for site soils have been met. Sampling will be based on the surface area of each AOC excavated, with approximately one sample being taken for each 500 square feet of surface area and one sample for each 50 linear feet of sidewall. A detailed explanation of confirmation sampling, as well as any additional required soil sampling, is outlined in the QAPP.

6.0 GROUNDWATER REMEDIATION SYSTEM INSTALLATION

6.1 ELECTRICAL SERVICE

Immediately after mobilization has been completed, utility construction will commence. The existing overhead power line at the southwest corner of the treatment building site will be relocated. Concurrently, construction of the 1,300 foot section of 12.47 KV primary line will begin. The 500 KVA transformer will be placed on a new concrete pad outside the building "footprint". After the primary line to the job site and transformer installation is complete, a small temporary 480/277 Y construction electrical service will be installed. It will provide lighting and power during the groundwater treatment building erection.

6.2 TREATMENT PLANT BUILDING CONSTRUCTION

OHM will subcontract construction of the groundwater treatment plant building. The concrete and building construction, including the building finish work and mechanical systems, is scheduled to be completed in a three month period. The facility will have an interior dimension of 60'-0" x 100'-0" approximately 6,000 square feet, and an have height of 18'-0". In general the building features will conform to the design specifications: cavity wall masonry system, hollow metal doors, large steel slat coil doors, pre-engineered structural framing, and 24 gauge standing seam roof with insulation.

The following systems are included in the mechanical system design for the building:

- Heating, ventilation and air conditioning
- General area exhaust
- Process system industrial exhaust
- Bathroom exhaust
- Interior propane piping
- Exterior propane piping
- Propane storage tanks

- Interior water and sanitary plumbing
- Eye wash and safety shower

OHM will install the piping runs for the potable water and sewer utility services concurrent with the building construction. These piping runs are estimated to be 1300 feet in length. Power and telephone service will be brought into the area by an electrical subcontractor during the early stages of site set-up. OHM will determine the final terminations during completion of the remedial design.

6.3 PHASE I GROUNDWATER EXTRACTION SYSTEM

The Phase I extraction system will involve the installation of one deep (DEW-1) and one shallow extraction well (SEW-1) by a subcontracted driller. A qualified professional OHM geologist (PG) will supervise installation and log the wells. The deep extraction well will be approximately 110 feet deep. The shallow extraction well will be approximately 35 feet deep. Each well will be constructed from 6-inch diameter stainless steel screen and riser in a nominal 20-inch boring. Drilling fluids and cuttings generated during drilling will be stored in bulk containers (drums, tankers and/or roll off boxes) for sampling prior to off-site disposal. Well development water will be stored in polyethylene storage tanks for eventual treatment through the groundwater treatment system.

Each extraction wells will be constructed in accordance to NC - DEHNR standards and when applicable to Drawing C-10 "Recovery Well Details". Screen interval(s) for the Phase I extraction wells will be determined during field installation and review of the site specific lithology.

OHM personnel will install the groundwater recovery piping during well installation. The well head enclosures and well pumps will be installed after well construction is completed. The electrical subcontractor will install the extraction well power and control wiring in an OHM-prepared utility trench. The electrical duct bank will be placed in red concrete in the trench. The recovery piping will be installed in a separate trench next to the electrical trench. Prior to backfilling, all pipe will be hydrostatistically pressure tested to insure integrity. The well head

enclosures, recovery piping and electrical duct banks will be constructed in accordance with the design drawings and specifications.

6.4 TREATMENT PLANT DISCHARGE LINE INSTALLATION

Following completion of the Phase I groundwater recovery utility trench construction, the crew and machinery will be moved to install the 10 inch diameter discharge line from the groundwater treatment building to Wallace Creek. This line will push on end SDR 35 PVC sewer pipe. This line will be approximately 1300 ft. long and will be buried to provide a minimum of 18 inches cover. The trench will be run parallel to Piney Green Road. The pipe will be surrounded by a 3 inch layer of protective sand. The pipe will be installed to insure a constant minimum fall of 2 ft per 100 ft of length. Installation will be coordinated to leave no greater than 50 ft. of open trench over night or during anticipated rainfall events of greater than 1 hour duration. In the event of rainfall, trenches will be pumped out and allowed to dry for a minimum of two hours prior to initialization of additional work. Four inch diameter cleanouts will be provided at locations where the pipe changes direction. Installation of the outfall and cleanouts will be in accordance with the details provided in the final plans and specifications.

6.5 GROUNDWATER TREATMENT PLANT INSTALLATION

Near the completion of the groundwater treatment plant building, OHM will begin installation of the treatment plant components. The process equipment will be procured early in the project to allow delivery during this phase. Mechanical and process equipment will be plumbed and wired during their installation in the plant. OHM will subcontract certified welders/pipe fitters during this phase to assist the plumbing effort. An OHM Project Engineer will oversee installation by all subcontractors to insure proper placement of components. Plumbing includes process piping, caustic piping, air piping, acid piping, and polymer piping. The designated Quality Control Engineer will be

responsible for the necessary inspection schedule for process components and other construction activities as outlined in the attached CQCP.

The treatment system consists of five (5) major unit operations: shallow groundwater recovery/iron removal, deep groundwater equalization/pH adjustment, air stripping, granular activated carbon (GAC) absorption, and treated effluent storage/discharge. The installation of the process equipment will be in accordance with the final plans and specifications.

6.5.1 Shallow Groundwater Extraction and Iron Removal

The groundwater from the shallow wells will be pumped by a submergible stainless steel well pump through 1 1/2 inch diameter high density polyethylene pipe to the inlet compartment or reactor of an iron removal system. Sodium Hydroxide and compressed air will be added to raise the pH to 8 - 8.5. This will precipitate iron in the form of ferric hydroxide, $Fe(OH)_3$. Water will then flow by gravity to another compartment or tank that is still to allow for de-aeration. Water then flows by gravity to another compartment or tank where a polymer will be added to assist in flocculation of the precipitated iron. Water flows by gravity to a high rate clarifier for settling suspended solids. The clean over flow from the settling area will flow by gravity to a head tank. The water will be pumped from the head tank to the equalization tank. Settled sludge will be pumped from the bottom of the clarifier to either the inlet compartment or a sludge thickening tank. The destination will be determined by a three way valve operated on a timer. Thickened sludge will be periodically dewatered in a plate and frame filter press. Filtrate from the press and overflow from the sludge thickener will be directed to the final compartment of the reaction tank (system) filter cake will be accumulated in a bulk container for off-site disposal. At this time, it is assumed the filter cake can be managed as a non-hazardous industrial waste. To insure proper functioning and facilitate installation of this system, all components (except the filter press and feed pump) will be procured as a skid mounted system from a single vendor engaged in the manufacture of such systems for a minimum of five years. The filter press will be procured directly from the filter press vendor. All units will be installed in accordance with the final plans and specifications.

6.5.2 Deep Groundwater Recovery/Storage/pH Adjustment

The ground water from the deep wells will be pumped by stainless steel submergible well pumps through 6 inch diameter HDPE pipe to the glass lined steel Equalization Tank located outside the building. Concentrated sulfuric acid will be added to this tank to adjust the pH to 7.5 - 8 in order to inhibit scale formation in downstream equipment. The tank will be mixed by a stainless steel floating mixer confined by location rails inside the tank. Water will be pumped by a 540 gpm at 60 ft. THD ductile iron pump to the air stripper. The units will be installed in accordance with the final plans and specifications.

6.5.3 Air Stripping

The process water enters the top of an air stripper which will be located outside the building. The preliminary dimensions of the tower are 5 ft. diameter by 58 ft. overall height including the air stripper effluent tank. At the design flow rate, the tower will remove all volatile organic chemicals to the discharge level or lower. The tower will also be equipped with connections that will facilitate future cleaning of accumulated oxidized metals, biological fouling, or scale build-up of various salts that are naturally present in the groundwater. The process water will collect in a sump (holding tank) below the packed tower and then be pumped by a 540 gpm at 50 ft. ductile iron pump through cartridge filters and GAC cells.

6.5.4 Granular Activated Carbon Adsorption

The process water will be pumped through a set of 25 micron cartridge filters before entering a set of two (2) GAC units in parallel at a design flow rate of 225 gpm through each unit. Backwash of the GACs will be manual and will be based on differential pressure across both vessels. The process water will then be sent by remaining pressure to the treated effluent storage tank.

6.5.5 Groundwater Storage and Discharge

The treated groundwater will be stored in an effluent storage tank located outside the building. The tank will provide water for GAC cell backwash. The treated groundwater will be discharged by gravity through an 8-inch diameter pipe to Wallace Creek. At this time no plans are approved for placement of the treated effluent into the potable water supply line located on Green Piney Road.

Therefore the effluent storage and discharge system will be installed in accordance with the final plans and specifications.

6.5.6 Treatment System Piping

Piping requirements of the treatment system for groundwater, process water, sludge, or treated water are under review. Pumps and motors will be connected to the piping with flexible joints to reduce vibration and wear. Piping will be installed by a combination of OHM personnel and a mechanical subcontractor. Universal flanges will be used in order to reduce the engineering effort required and to make pipe spools to fit in the field.

6.6 INSTRUMENTATION AND CONTROL SYSTEM

Control of the groundwater treatment system will be achieved through the use of a set of programmable logic controller modules to accept a total of 224 inputs/outputs (170 digital and 54 analog). Software configured for 224 I/Os, will be utilized for the control of individual unit operations from a 486 processor PC located in the treatment system building office. All instrumentation including flow meters, level switches, transmitters, valves, and controllers will be interfaced with the PLC system. The intent is to minimize the amount of operations labor. The PLC modules will be housed in a NEMA 4X enclosure with external interface devices mounted on the panel exterior. The appropriate instrument terminations, as well as control system drawings and documentation will be mounted in the panel interior. Additionally, during system shakedown, the I & C subcontractor will provide start-up service/training on-site.

6.7 START-UP

After electrical installation is complete and all motors have been bumped to assure proper rotation and the system is judged ready, the system will be tested with potable water until hydraulic and mechanical control is obtained. The system will be operated in this manner until all failure modes have been simulated and the proper functioning of all equipment, controls, and instrumentation has been demonstrated.

Following this phase, the Phase 1 groundwater extraction system will be activated and recovered water will be treated. Influent and effluent samples, as well as samples between the various stages of treatment, to will be taken to evaluate system efficiency in accordance with the QAPP.

6.8 PUMP TEST/PHASE II EXTRACTION SYSTEM

The Phase I shallow and deep extraction wells will be tested for a minimum of three days of continuous operation. During this test, temporary observation wells and existing monitoring wells will be used to monitor the groundwater levels and transport. Following completion of the pump test and data assimilation, OHM will meet with LANTDIV, Baker, and OHM appropriate parties to discuss the results to coverage on a course of action for Phase II installation. With LANTDIV concurrence, the groundwater data will be modeled by OHM using a three dimensional contaminant transport model to determine the optimum location of the remaining wells. Installation of additional wells and associated equipment will occur after approval of final plans by LANTDIV and be similar to the Phase I extraction system installation.

7.0 OPERATION AND MAINTENANCE

7.1 O&M MANUALS

Five complete copies of comprehensive Operation and Maintenance Manuals will be provided prior to system start-up. Separate manuals for the shallow groundwater recovery and iron removal system, deep groundwater recovery/pH adjustment system, the air stripping and GAC filtration system, and PLC system are anticipated. Each manual will contain: operating instructions outlining the step-by-step procedures required for system start up, normal operation, short and long term deactivation, and shutdown. An introduction and overall equipment description, purpose, functions, and a simplified theory of operation, piping layouts, wiring, and control diagrams, routine maintenance procedures, calibration procedures, repair procedures, trouble shooting guides, recommended preventative maintenance schedule, equipment and instrument lists including vendor and local representative names, addresses, phone numbers, FAX numbers, vendor catalogs, and O & M Manuals.

7.2 OPERATOR TRAINING

A training course for the system and equipment installed will be conducted by OHM with the assistance of appropriate subcontractor representatives. The training course will be performed by personnel familiar with and knowledgeable about the installed system and equipment. The course will include overviews of the operation and maintenance instructions, and shall include practical in-the-field demonstrations of normal operation and maintenance procedures. The training course shall be 16 hours (two days) in duration.

Field training of the Base operating personnel will be conducted during the mechanical testing. Prior to system start-up, a two day review session will be conducted that will include preventive maintenance, sampling techniques, sampling frequency and trouble shooting.

8.0 SCHEDULE

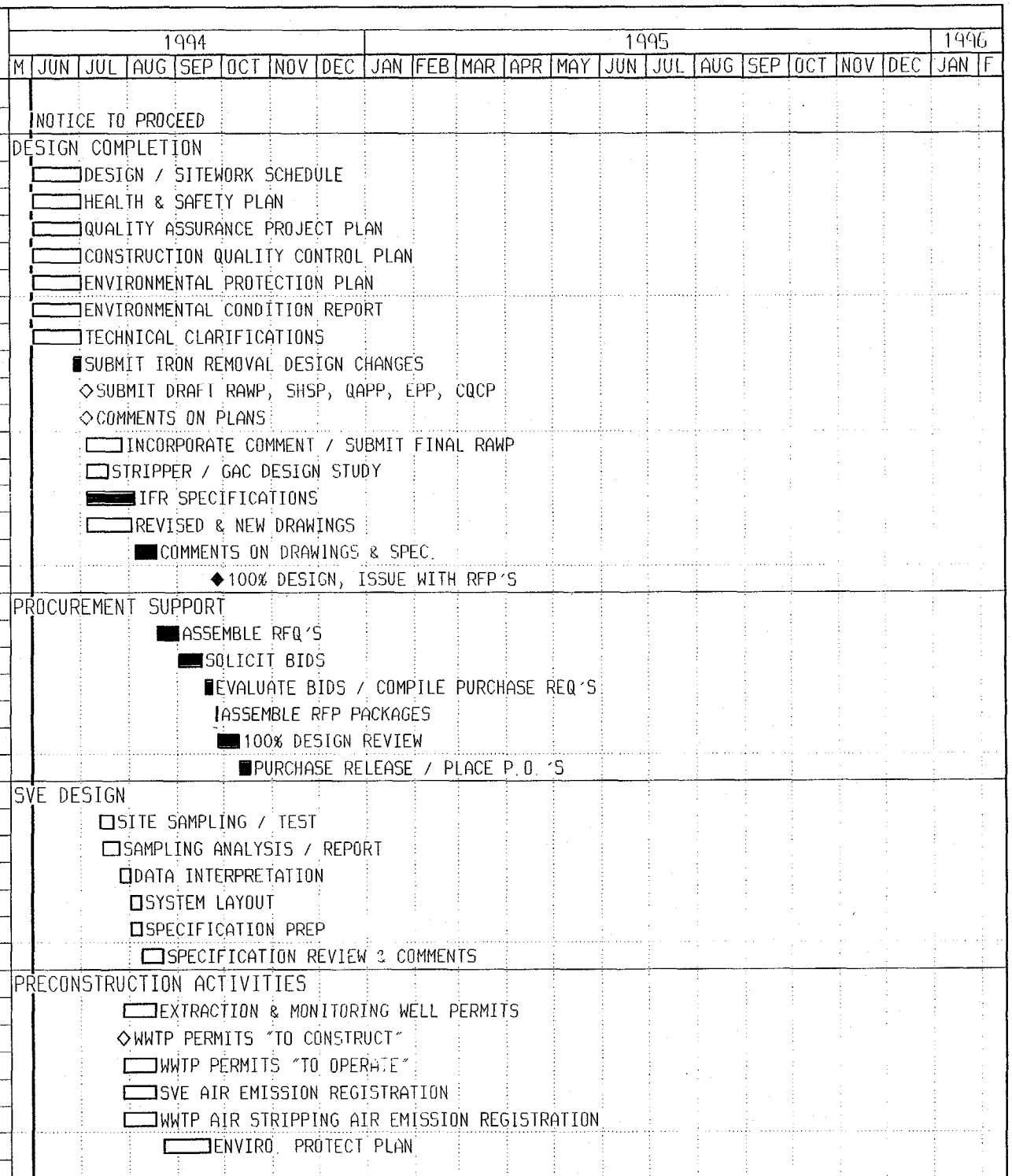
The project schedule presents the major tasks and durations to perform the remediation of AOC 2 through AOC 6. It also includes the milestones and deliverables necessary to design, construct, start-up, operate, and maintain the groundwater extraction and treatment system in Area 82 per the design drawings and specifications. The schedule components for remediating AOC 1 using soil vapor extraction are preliminary based upon results of pending additional site investigation activities in this area. The AOC 1 remediation schedule will be finalized at a later time once the scope of work is more defined.

The significant elements of the project schedule include:

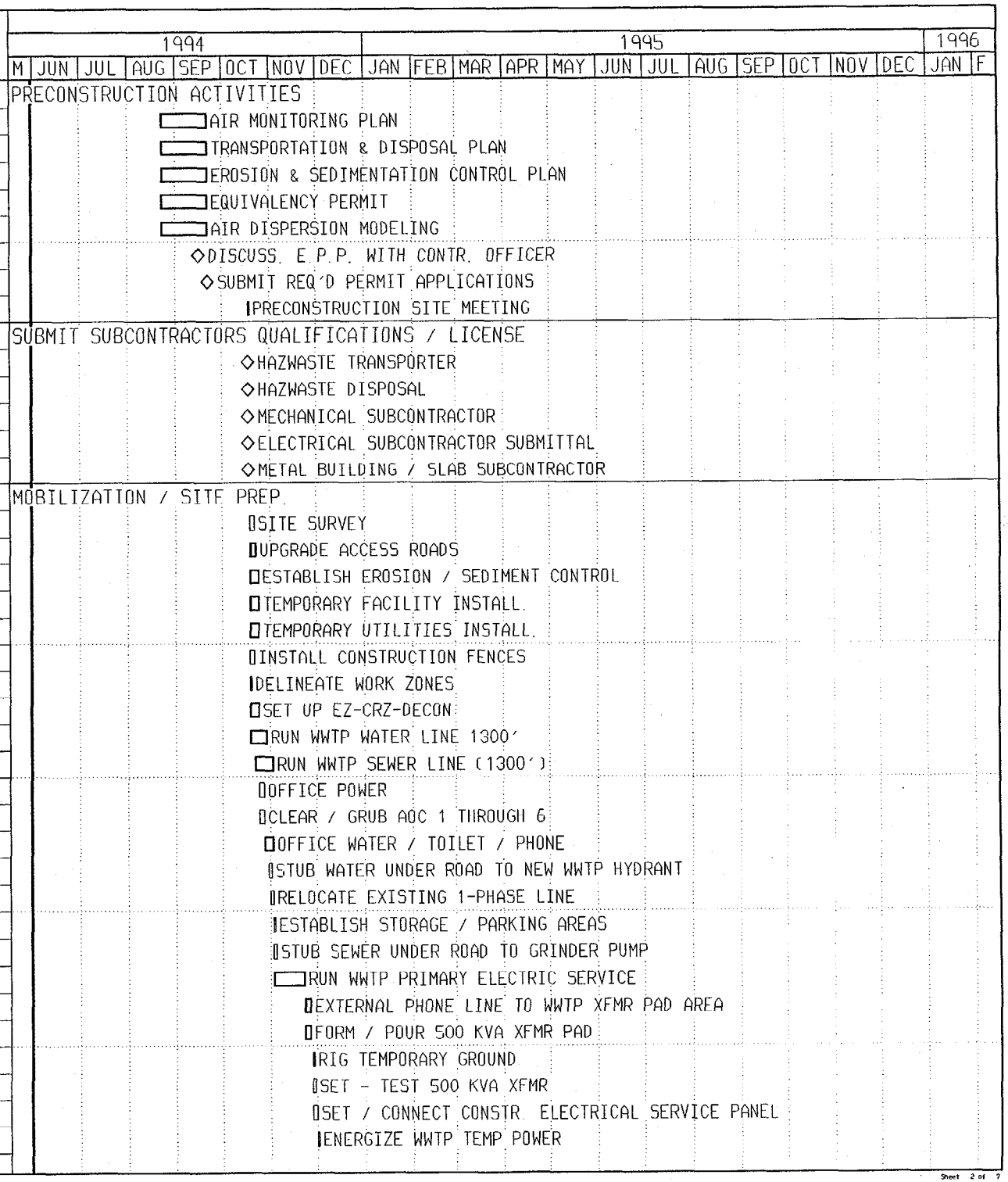
- Draft specifications and drawings
- 100% design submittal
- Pre-construction meeting
- Mobilization and set-up
- WWT building construction
- Excavation tasks for AOC 2 through AOC 6
- Groundwater and preliminary SVE system construction
- WWT components installation
- Phase I extraction well start-up and WWT system shakedown
- Aquifer tests and phase II design
- Phase II extraction system tie-in
- Construction demobilization
- Plant optimization and testing
- Operations and maintenance
- Turnover, final reports, and training

DRAFT
PROJECT SCHEDULE
MCB CAMP LEJEUNE OU NO. 2
SOIL AND GROUNDWATER REMEDIATION

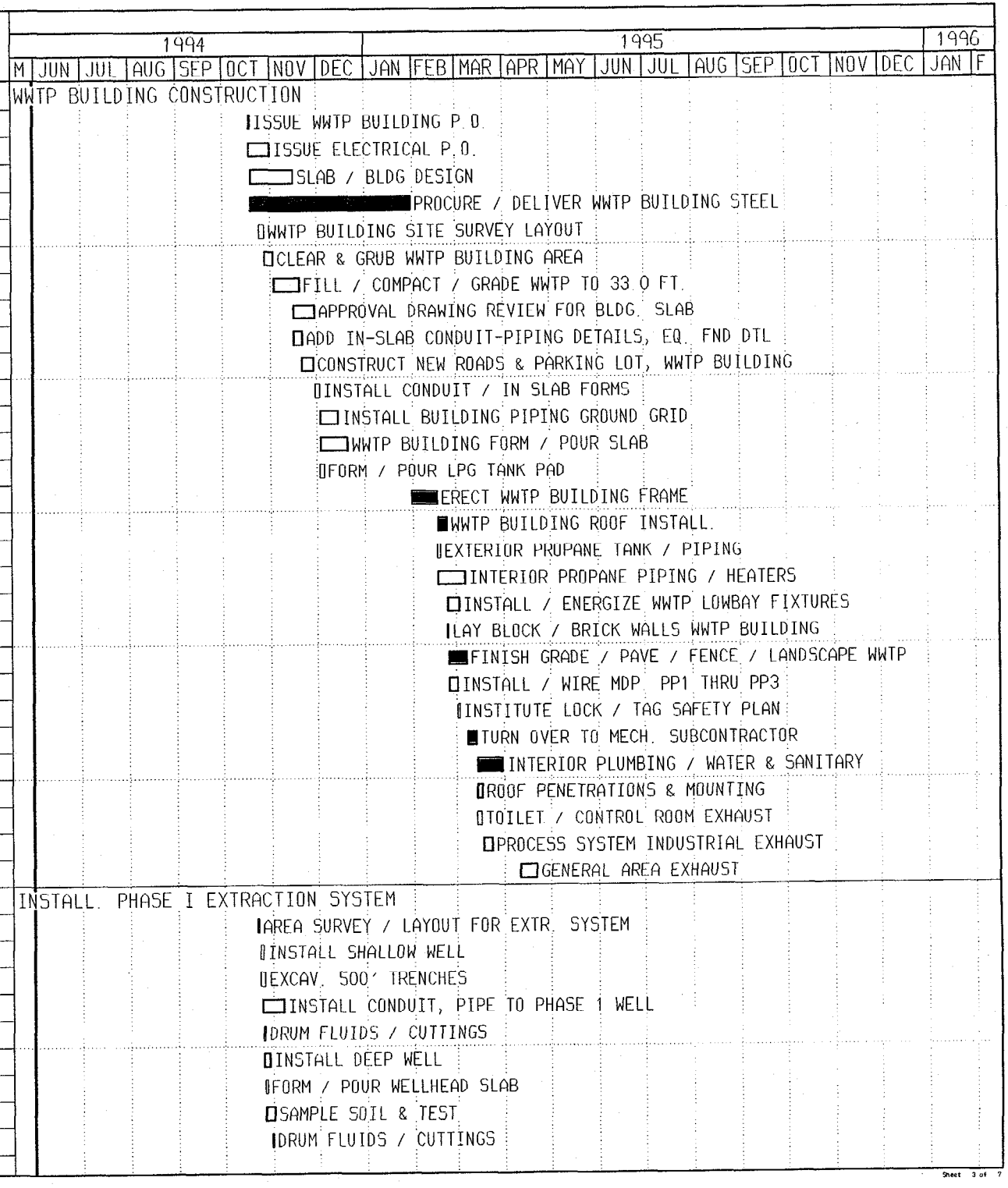
ACTIVITY ID	EARLY START	EARLY FINISH	ORIG DUR
110100	31MAY94	31MAY94	1
110200	1JUN94	1JUL94	23
110300	1JUN94	1JUL94	23
110400	1JUN94	1JUL94	23
110500	1JUN94	1JUL94	23
110600	1JUN94	1JUL94	23
110700	1JUN94	1JUL94	23
120000	1JUN94	1JUL94	23
120100	27JUN94	1JUL94	5
110800	5JUL94	1JUL94	0
110900	5JUL94	1JUL94	0
110950	5JUL94	27JUL94	17
120200	5JUL94	18JUL94	10
120300	5JUL94	4AUG94	23
120400	5JUL94	2AUG94	21
120500	5AUG94	18AUG94	10
130900	27SEP94	26SEP94	0
130550	19AUG94	1SEP94	10
130600	2SEP94	16SEP94	10
130700	19SEP94	23SEP94	5
130800	26SEP94	26SEP94	1
130925	27SEP94	10OCT94	10
130950	11OCT94	17OCT94	5
140200	13JUL94	21JUL94	7
140400	15JUL94	25JUL94	7
140600	26JUL94	1AUG94	5
140800	2AUG94	8AUG94	5
140900	2AUG94	8AUG94	5
141000	9AUG94	22AUG94	10
230100	28JUL94	17AUG94	15
230200	28JUL94	27JUL94	0
230300	28JUL94	17AUG94	15
230400	28JUL94	17AUG94	15
230500	28JUL94	17AUG94	15
220000	23AUG94	21SEP94	21



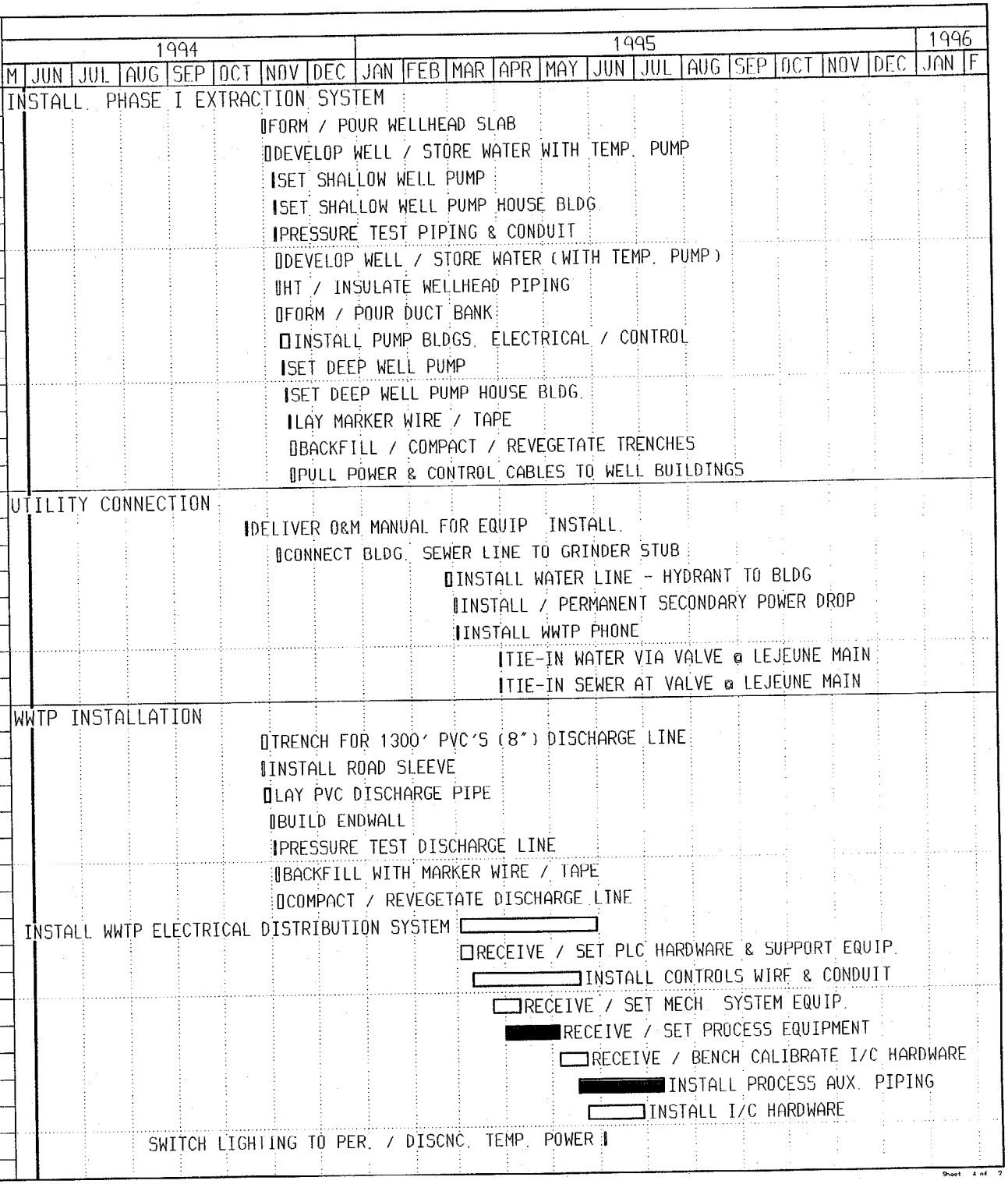
ACTIVITY ID	EARLY START	EARLY FINISH	ORIG DUR
222000	23AUG94	21SEP94	21
224000	23AUG94	21SEP94	21
226000	23AUG94	21SEP94	21
232000	23AUG94	21SEP94	21
232500	23AUG94	21SEP94	21
210000	16SEP94	15SEP94	0
230000	22SEP94	21SEP94	0
232600	18OCT94	18OCT94	1
241000	18OCT94	17OCT94	0
241500	18OCT94	17OCT94	0
242000	18OCT94	17OCT94	0
242500	18OCT94	17OCT94	0
243000	18OCT94	17OCT94	0
311000	19OCT94	21OCT94	3
311200	19OCT94	22OCT94	4
311300	19OCT94	24OCT94	5
312000	19OCT94	24OCT94	5
313000	19OCT94	24OCT94	5
313110	19OCT94	21OCT94	3
313115	19OCT94	19OCT94	1
313120	19OCT94	24OCT94	5
313125	19OCT94	29OCT94	10
313225	22OCT94	2NOV94	10
313200	25OCT94	27OCT94	3
315000	25OCT94	27OCT94	3
313100	28OCT94	2NOV94	5
313150	31OCT94	1NOV94	2
313520	1NOV94	2NOV94	2
311100	3NOV94	3NOV94	1
313250	3NOV94	4NOV94	2
313500	3NOV94	22NOV94	17
313505	23NOV94	26NOV94	2
313510	23NOV94	26NOV94	2
313515	28NOV94	28NOV94	1
313530	28NOV94	29NOV94	2
313540	28NOV94	30NOV94	3
313550	1DEC94	1DEC94	1



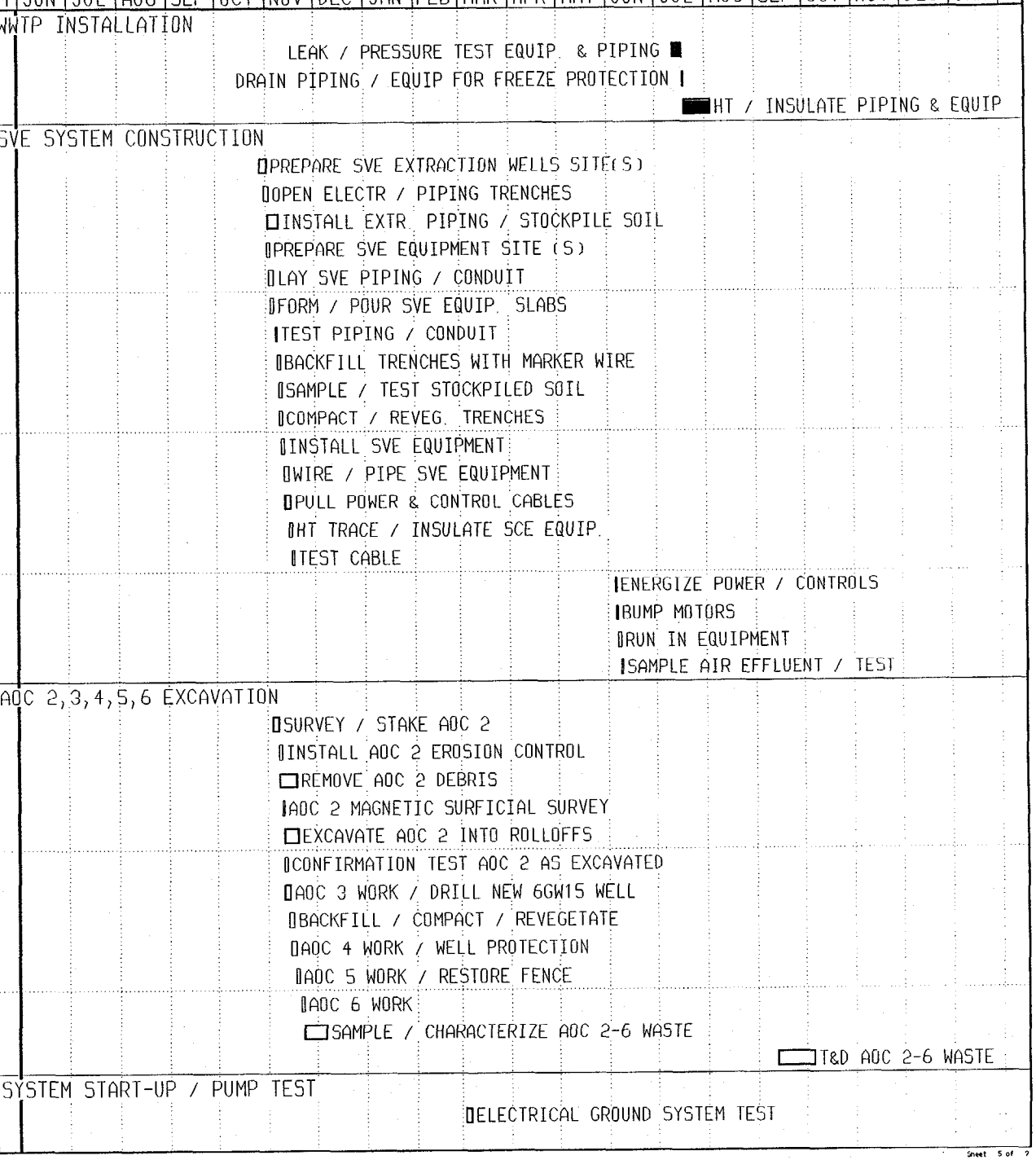
ACTIVITY ID	EARLY START	EARLY FINISH	ORIG DUR
320050	18OCT94	18OCT94	1
320075	18OCT94	31OCT94	10
320100	19OCT94	15NOV94	20
320200	19OCT94	30JAN95	70
320225	25OCT94	27OCT94	3
320230	28OCT94	2NOV94	5
320235	3NOV94	19NOV94	15
320140	16NOV94	29NOV94	10
320150	16NOV94	21NOV94	5
320240	21NOV94	28NOV94	5
320245	30NOV94	2DEC94	3
320247	3DEC94	14DEC94	10
320250	3DEC94	20DEC94	15
320275	3DEC94	5DEC94	2
320300	31JAN95	16FEB95	15
320350	17FEB95	22FEB95	5
320520	17FEB95	18FEB95	2
320530	17FEB95	6MAR95	15
320375	23FEB95	2MAR95	6
320400	23FEB95	23FEB95	1
320450	24FEB95	7MAR95	10
320615	24FEB95	1MAR95	5
320620	2MAR95	2MAR95	1
320425	8MAR95	13MAR95	5
320510	14MAR95	30MAR95	15
320540	14MAR95	17MAR95	4
320570	14MAR95	16MAR95	3
320560	18MAR95	23MAR95	5
320550	11APR95	21APR95	10
330100	22OCT94	22OCT94	1
330200	24OCT94	25OCT94	2
330400	24OCT94	26OCT94	3
330500	25OCT94	7NOV94	12
330210	26OCT94	26OCT94	1
330300	26OCT94	29OCT94	4
330215	27OCT94	27OCT94	1
330410	27OCT94	1NOV94	5
330310	31OCT94	31OCT94	1



ACTIVITY ID	EARLY START	EARLY FINISH	ORIG DUR
330315	1NOV94	2NOV94	2
330220	3NOV94	5NOV94	3
330230	7NOV94	7NOV94	1
330240	8NOV94	8NOV94	1
330600	8NOV94	8NOV94	1
330320	9NOV94	11NOV94	3
330650	9NOV94	10NOV94	2
330700	9NOV94	11NOV94	3
330925	11NOV94	16NOV94	5
330330	12NOV94	12NOV94	1
330340	14NOV94	14NOV94	1
330750	16NOV94	16NOV94	1
330800	17NOV94	19NOV94	3
330900	17NOV94	18NOV94	2
347000	18OCT94	18OCT94	1
342000	7NOV94	8NOV94	2
341000	24FEB95	27FEB95	2
343000	2MAR95	2MAR95	1
344000	3MAR95	3MAR95	1
341100	31MAR95	31MAR95	1
342100	31MAR95	31MAR95	1
350900	27OCT94	29OCT94	3
350910	27OCT94	27OCT94	1
350920	28OCT94	31OCT94	3
350930	1NOV94	2NOV94	2
350940	3NOV94	3NOV94	1
350950	4NOV94	5NOV94	2
350960	5NOV94	7NOV94	2
350300	3MAR95	30MAY95	75
350400	3MAR95	10MAR95	7
350500	11MAR95	19MAY95	60
350200	24MAR95	10APR95	15
350100	1APR95	5MAY95	30
350650	6MAY95	23MAY95	15
350150	18MAY95	11JUL95	45
350675	24MAY95	28JUN95	30
350325	3JUN95	3JUN95	1



ACTIVITY ID	EARLY START	EARLY FINISH	ORIG DUR
350700	12JUL95	17JUL95	5
350750	18JUL95	18JUL95	1
350800	19JUL95	4AUG95	15
400100	28OCT94	1NOV94	4
400350	31OCT94	2NOV94	3
400200	2NOV94	8NOV94	6
400275	2NOV94	3NOV94	2
400360	3NOV94	5NOV94	3
400300	4NOV94	5NOV94	2
400375	7NOV94	7NOV94	1
400385	8NOV94	9NOV94	2
400250	9NOV94	10NOV94	2
400390	9NOV94	10NOV94	2
400400	10NOV94	11NOV94	2
400410	12NOV94	14NOV94	2
400450	12NOV94	15NOV94	3
400425	15NOV94	16NOV94	2
400475	17NOV94	17NOV94	1
400525	5JUN95	5JUN95	1
400550	6JUN95	6JUN95	1
400575	7JUN95	8JUN95	2
400600	9JUN95	9JUN95	1
500210	4NOV94	7NOV94	3
500215	8NOV94	9NOV94	2
500220	8NOV94	18NOV94	10
500230	10NOV94	10NOV94	1
500240	11NOV94	19NOV94	8
500250	11NOV94	12NOV94	2
500300	11NOV94	14NOV94	3
500260	14NOV94	16NOV94	3
500400	15NOV94	17NOV94	3
500500	18NOV94	19NOV94	2
500600	21NOV94	22NOV94	2
500650	23NOV94	6DEC94	10
500700	13SEP95	5OCT95	20
600405	3MAR95	6MAR95	2



ACTIVITY ID	EARLY START	EARLY FINISH	ORIG DUR
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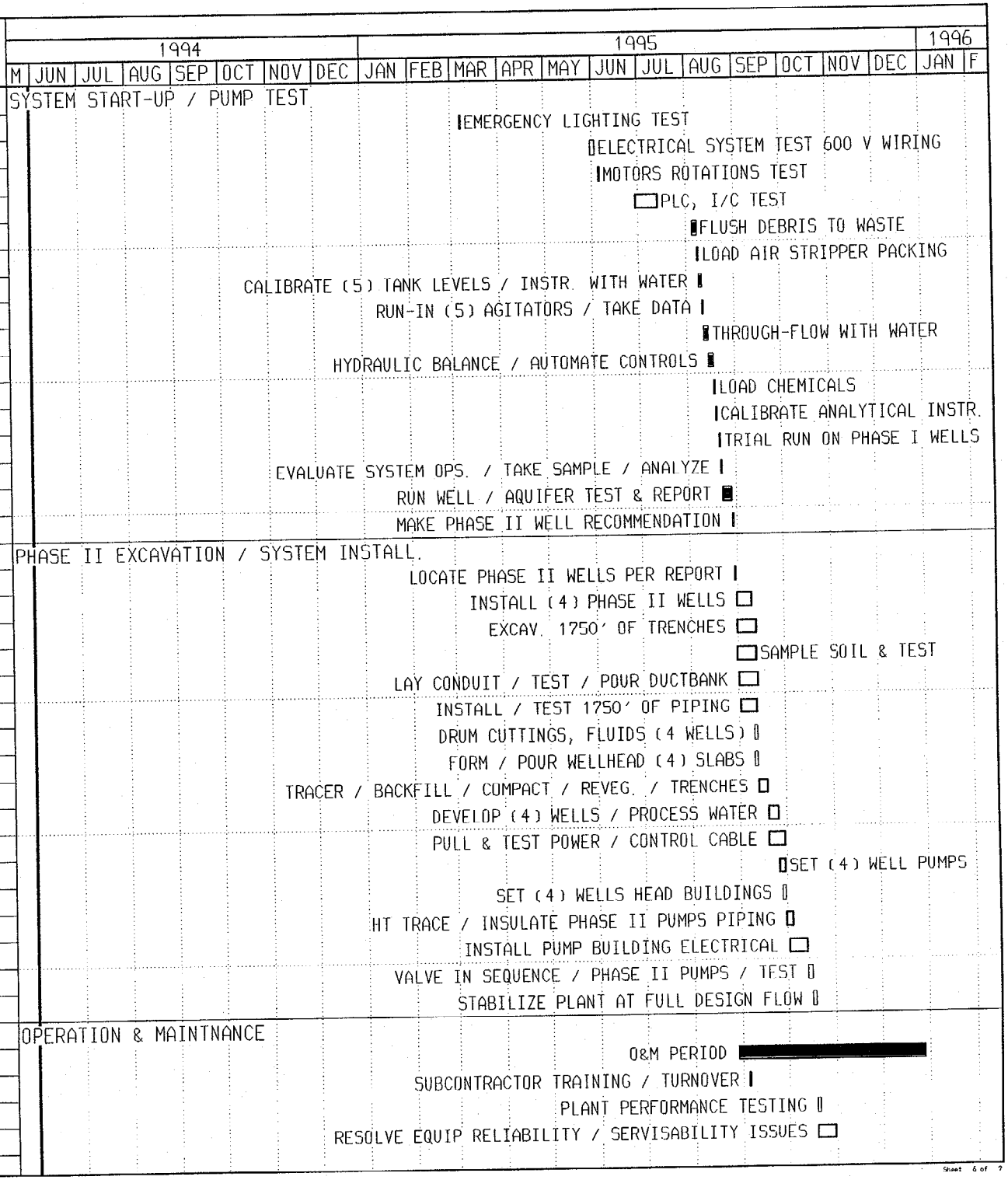
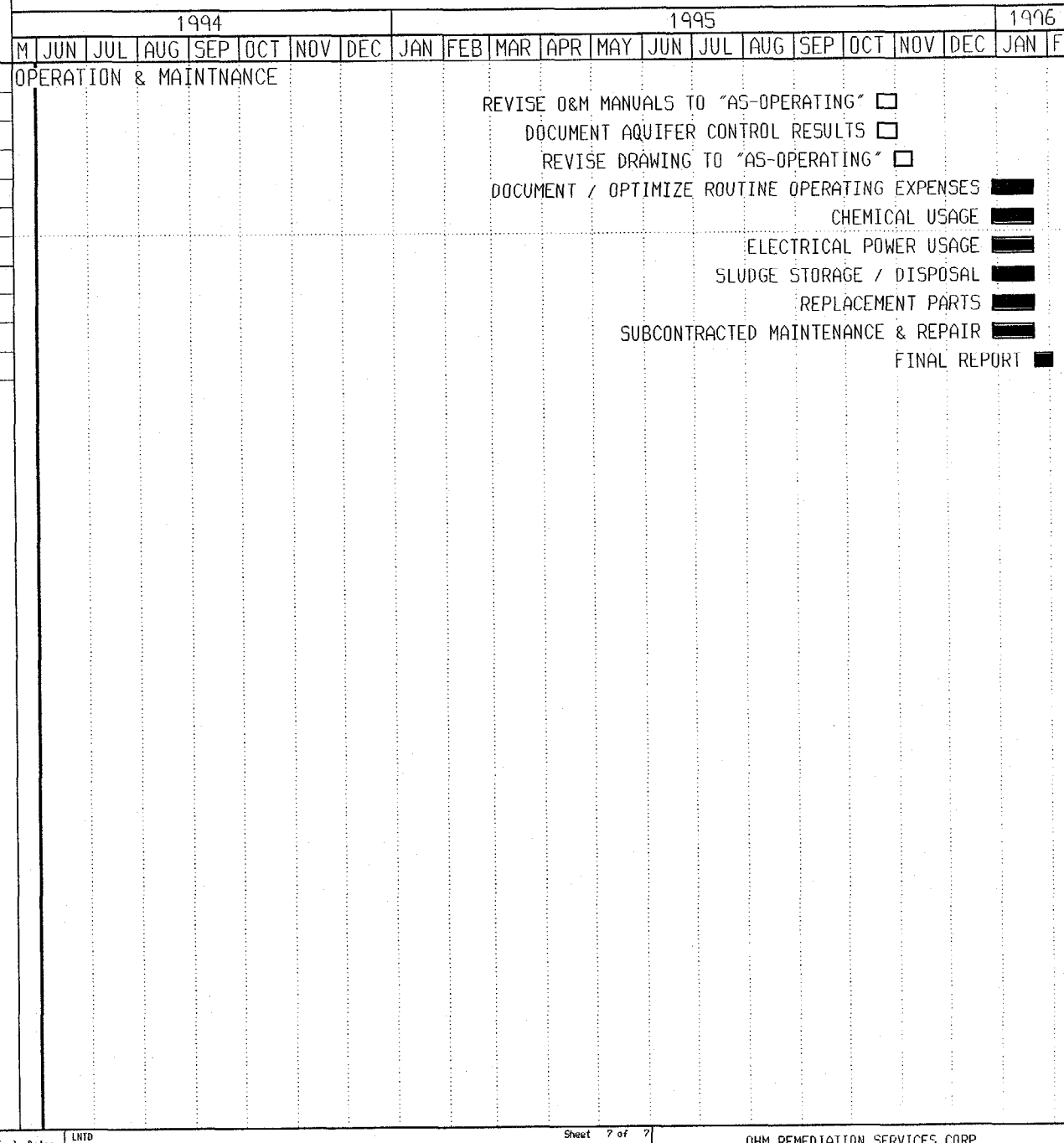
600400	31MAY95	2JUN95	3
600410	5JUN95	5JUN95	1
600420	29JUN95	13JUL95	10
600100	5AUG95	7AUG95	2
600150	8AUG95	8AUG95	1
600200	9AUG95	10AUG95	2
600300	11AUG95	11AUG95	1
600500	12AUG95	14AUG95	2
600600	15AUG95	17AUG95	3
600700	18AUG95	18AUG95	1
600750	19AUG95	19AUG95	1
600800	21AUG95	21AUG95	1
600900	22AUG95	22AUG95	1
600950	23AUG95	28AUG95	5
600975	29AUG95	29AUG95	1
650100	30AUG95	30AUG95	1
650200	31AUG95	9SEP95	8
650310	31AUG95	12SEP95	10
650315	31AUG95	12SEP95	10
650320	1SEP95	13SEP95	10
650330	2SEP95	12SEP95	8
650220	11SEP95	12SEP95	2
650225	11SEP95	12SEP95	2
650340	13SEP95	18SEP95	5
650230	19SEP95	25SEP95	6
650350	19SEP95	29SEP95	10
650240	26SEP95	29SEP95	4
650250	28SEP95	29SEP95	2
650335	30SEP95	4OCT95	4
650325	2OCT95	13OCT95	10
650400	14OCT95	16OCT95	2
650500	17OCT95	18OCT95	2
700400	29AUG95	28DEC95	100
700450	5SEP95	5SEP95	1
700100	19OCT95	20OCT95	2
700420	19OCT95	30OCT95	10



ACTIVITY ID	EARLY START	EARLY FINISH	ORIG DUR
700300	21OCT95	1NOV95	10
700410	21OCT95	1NOV95	10
700200	31OCT95	10NOV95	10
700440	29DEC95	22JAN96	20
700441	29DEC95	22JAN96	20
700442	29DEC95	22JAN96	20
700443	29DEC95	22JAN96	20
700444	29DEC95	22JAN96	20
700445	29DEC95	22JAN96	20
700460	23JAN96	2FEB96	10



Plot Date 29JUN94
Data Date 31MAY94
Project Start 31MAY94
Project Finish 2FEB96

Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Flag Activity

LNTD

Sheet 7 of 7

LANTDIV
SOIL & GROUNDWATER REMEDIATION
BAR CHART

OHM REMEDIATION SERVICES CORP

Date	Revision	Checked	Approved